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General Catalogue

1908-1909

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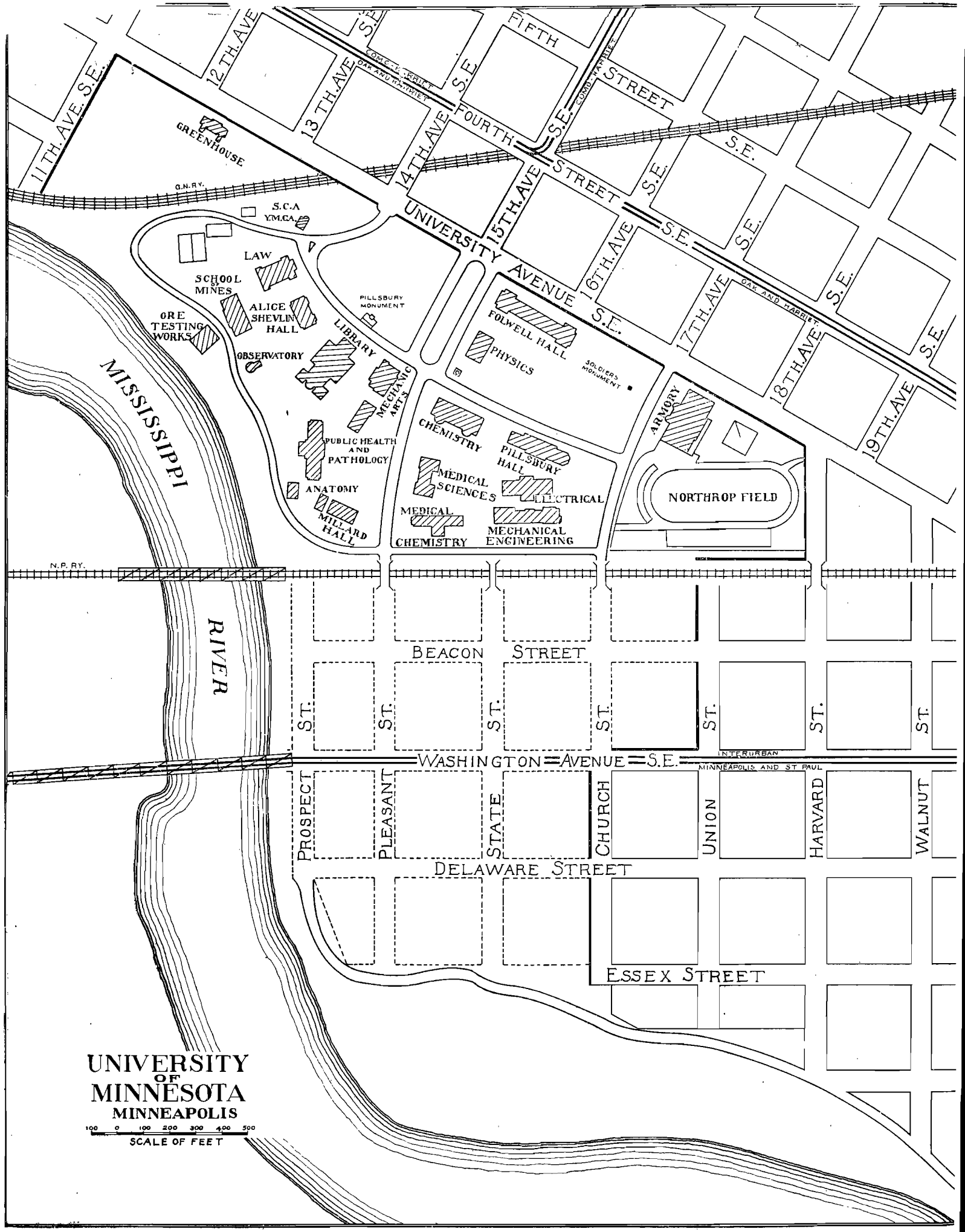
THE REGISTRAR,

The University of Minnesota,

Minneapolis, Minnesota.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COMO-HARRIET
OAK AND HARRIET
GREENHOUSE
G.N. RY.
S.C.A
Y.M.C.A.
LAW
SCHOOL OF MINES
ALICE SHEVLIN HALL
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CHEMISTRY
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MEDICAL SCIENCES
ELECTRICAL
MEDICAL CHEMISTRY
MECHANICAL ENGINEERING
ARMORY
NORTHROP FIELD
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WASHINGTON AVENUE S.E.
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STATE ST.
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UNION ST.
HARVARD ST.
WALNUT ST.
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UNIVERSITY OF MINNESOTA
MINNEAPOLIS
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SCALE OF FEET

THE UNIVERSITY OF MINNESOTA

CATALOGUE

FOR THE YEAR

1908-1909

AND

ANNOUNCEMENTS

FOR THE YEAR

1909-1910

Entered as Second-class Matter in the Postoffice at Minneapolis

PUBLISHED BY THE UNIVERSITY
MINNEAPOLIS
1909


GREAT WESTERN
CORPORATION

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GENERAL UNIVERSITY INFORMATION

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1909

JULY

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SEPTEMBER

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NOVEMBER

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DECEMBER

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1910

JANUARY

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University Calendar, 1909-1910

THE UNIVERSITY YEAR

The University year covers a period of thirty-eight weeks beginning on the second Tuesday in September. Commencement day is always the second Thursday in June.

1909			
Sept.	7	Tuesday	Registration begins
Sept.	7-12	Week	Entrance examinations, condition examinations, registration
Sept.	14	Tuesday	First semester begins
Sept.	20	Monday	University Council meeting
Oct.	4	Monday	School of Agriculture session begins
Oct.	7	Thursday	Board of Regents meeting
Nov.	10	Wednesday	First quarter ends
Nov.	11	Thursday	Second quarter begins
Nov.	22	Monday	University Council meeting
Nov.	25	Thursday	Thanksgiving Day, recess three days
Dec.	14	Tuesday	Board of Regents meeting
Dec.	18	Friday	Holiday recess begins 5:40 P. M.
1910			
Jan.	4	Tuesday	Holiday recess ends 8:30 A. M.
Jan.	27	Thursday	First semester ends
Jan.	28	Friday	Registration for second semester begins
Jan.	31	Monday	Registration for second semester closes
Feb.	1	Tuesday	Second semester begins
Feb.	12	Saturday	Lincoln's birthday, holiday
Feb.	22	Tuesday	Washington's birthday, holiday
March	19	Saturday	Easter recess begins 5:40 P. M.
March	28	Monday	Easter recess ends 8:30 A.M.
April	1	Monday	University Council meeting
April	6	Wednesday	Third quarter ends
April	7	Thursday	Fourth quarter begins
May	5	Thursday	Board of Regents meeting
May	23	Monday	University Council meeting
May	30	Monday	Decoration Day, holiday
June	4	Saturday	Second semester ends. Semester examinations close
June	5	Sunday	Baccalaureate service
June	6	Monday	Senior class exercises
June	7	Tuesday	Phi Beta Kappa address 8:00 P. M.
June	7	Tuesday	Senior Promenade 9:00 P. M.
June	8	Wednesday	Alumni Day
June	8	Wednesday	Board of Regents meeting
June	9	Thursday	Thirty-eighth annual commencement
June	10	Friday	Summer vacation begins

Program—Entrance Examinations
1909–10

Sept.	7	Tuesday	9 A. M.	Astronomy
				Botany
				Geology
				Chemistry
				Physiography
				Zoology
			2 P. M.	American Government
				History
				Political Economy
				Physics
Sept.	8	Wednesday	9 A. M.	English
			2 P. M.	German
				French
				Latin
				Scandinavian
Sept.	9	Thursday	9 A. M.	Elementary Algebra
				Commercial Geography
			2. P M.	Higher Algebra
Sept.	10	Friday	9 A. M	Plane Geometry
			2 P. M.	Solid Geometry

All candidates for examinations should report at the scheduled time in Room 13 Library Building.

The School Year for 1910–11 will begin Tuesday, September 13.

The University

THE UNIVERSITY OF MINNESOTA comprises the following named schools, colleges and departments:

THE COLLEGE OF SCIENCE, LITERATURE AND THE ARTS

THE COLLEGE OF ENGINEERING AND THE MECHANIC ARTS

THE DEPARTMENT OF AGRICULTURE, including—

- THE COLLEGE OF AGRICULTTRE
- THE SCHOOL OF AGRICULTURE
- SHORT COURSE FOR FARMERS
- THE DAIRY SCHOOL
- THE CROOKSTON SCHOOL OF AGRICULTURE

THE COLLEGE OF LAW

THE COLLEGE OF MEDICINE AND SURGERY, including

- THE UNIVERSITY TRAINING SCHOOL FOR NURSES

THE COLLEGE OF DENTISTRY

THE COLLEGE OF PHARMACY

THE SCHOOL OF MINES

THE SCHOOL OF ANALYTICAL AND APPLIED CHEMISTRY

THE COLLEGE OF EDUCATION

THE GRADUATE SCHOOL

The Regents of the University have entrusted to their charge:

THE EXPERIMENT STATIONS, including—

- THE MAIN STATION AT ST. ANTHONY PARK
- THE SUB-STATION AT CROOKSTON
- THE SUB-STATION AT GRAND RAPIDS

THE GEOLOGICAL AND NATURAL HISTORY SURVEY

Bulletins of these schools, colleges and departments may be obtained upon application to the University Registrar.

Description of Departments

In the College of Science, Literature and the Arts, there is a four-year course of study leading to the degree of Bachelor of Arts. The work of the first two years is elective within certain limitations as to the range of subjects from which the electives may be chosen. The remaining work of the course is entirely elective, with the provision that a certain number of long courses be selected. The course is so elastic that it permits the student to make the general scope of his course classical, scientific or literary, to suit his individual purpose.

In this college are given also the two years of college work required for entrance to the College of Medicine and Surgery; the first two years of work of the six-year course in Science and Medicine, leading to the degrees of Bachelor of Science and Doctor of Medicine; the one year of college work required for entrance to the College of Law; and various non-professional subjects required in other schools and colleges of the University.

The College of Engineering and the Mechanic Arts was founded "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, electrical and municipal engineering, leading to the degrees of civil, mechanical or electrical engineer, the degree of Bachelor of Science being 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.

The College of Agriculture offers a four-year course in agriculture. The degree of Bachelor of Science, in Agriculture is conferred upon completion of the course. Students in this College may specialize along the line of forestry or of home economics and secure the degree, Bachelor of Science (in Forestry, or in Home Economics).

The School of Agriculture offers a three-year course of study and is a training school for practical farm life and in domestic economy. The College of Agriculture is open to graduates of this School who have completed the fourth year of work required for admission to the College.

The Dairy School offers practical instruction in dairying, specially designed for those who are actually engaged in the manufacture of butter and cheese.

The Short Course for Farmers is designed to be of the greatest help possible to those actually engaged in farming.

THE CROOKSTON SCHOOL OF AGRICULTURE offers a course of study quite similar to that given in the School of Agriculture.

THE COLLEGE OF LAW aims to educate its students by means of the study of jurisprudence, familiarizing them with the fundamental principles of positive law. Education, and not simply information, is the prime object. The power to think clearly, to reason cogently, to investigate thoroly, to generalize clearly, and to express thoughts accurately are the prime objects of legal education. The mathod of work generally pursued consists in the study of reported cases, preparing written analysis of the same, and such lectures as are necessary to give the student a symmetrical view of the science of jurisprudence. The art of practice is taught so far as possible in the law school. A system of courts embracing a court of the Justice of the Peace, and the District and Supreme Courts of the state is organized and maintained. The students pass through each of these courts in order. Students familiarize themselves with the rules of the District and Supreme courts of the state. Jury trials are conducted throughout the senior year. Appeals, motions for new trials, arguments, and all the other points of practice in the courts of the state are considered. The degree of Bachelor of Laws is granted upon the completion of the three year day course, or the four year evening course, which degree entitles the holder to admission to the bar without examination.

THE COLLEGE OF MEDICINE AND SURGERY was established as such in 1888, the University Medical Department having been established in 1884 to examine students and confer degrees. The College provides now the only medical teaching in Minnesota, having taken over the Medical Department and students of Hamline University in 1908.

The requirements for entrance are a four year high school course including two years of Latin; and two years of college work equivalent to the academic work of this University and including at least one year each of physics, inorganic chemistry, qualitative analysis, biology and language. Four years of thirty-six full weeks of laboratory, recitational, didactic and clinical work are required in medicine.

The college is housed on the campus in six commodious modern buildings. The University owns and controls a dispensary near by and controls the St. Paul dispensary. The Elliott Memorial Hospital is in process of organization on the campus.

The Twin Cities' population of 550,000, with hospitals and dispensaries are used for teaching.

The following courses of study are offered:

1. M. D. Course.—Four years of grade study.

2. Combined B. S., M. D. Course.—Two years of required courses in the academic department, in biology, botany, mathematics, language

and economics, followed by four years of medicine, permit of the double degree in six years.

3. Combined B. A., M. D. Course.—Students presenting three years of college work in the academic department, which include the B. A. degree at the end of their required entrance studies, may take the first year in medicine.

Similar affiliations with outside colleges have been made whereby the B. A. degree is conferred by the outside colleges.

4. Training School for Nurses.—(See school bulletin).

5. Embalming School.—(See special announcement).

6. Graduate and research work is offered to qualified students.

THE COLLEGE OF HOMEOPATHIC MEDICINE AND SURGERY offers two courses of study: A four year course of nine months each leading to the degree of M. D., requiring two years of collegiate work for admission; a six year course, the first two years in the College of Science, Literature and the Arts and the last four years in the College of Homeopathic Medicine and Surgery—at the completion of four year's work the degree of B. S. is conferred, and, on completion of the six years, the degree of M. D.—requiring the high school diploma for admission.

THE COLLEGE OF DENTISTRY offers a three-year course of study, of nine months each. Upon completion of the prescribed course the degree of Doctor of Dental Surgery is conferred.

THE COLLEGE OF PHARMACY was organized in 1891 upon request of the Minnesota State Pharmaceutical Association. In the organization and conduct of the college, the Board of Regents and the faculty have had and have the co-operation of the pharmacists of the Northwest. The college is of the University grade and maintains a high standard of entrance and graduation requirements. Every effort is made to comply with the demands of the pharmaceutical profession of the Northwest and elsewhere. The college offers a regular course extending over two or three years leading to the degree Bachelor of Pharmacy, and two post-graduate courses, the first requiring at least one additional year of resident work and leading to the degree Master of Pharmacy, and the second requiring one or two additional years of work and leading to the degree Doctor of Pharmacy. It is now contemplated to add a four-year course to include somewhat more than is now included in the regular two-year course and about two years of academic work. This course will lead to the degree Bachelor of Science in Pharmacy, and will in all respects be at least the equal of similar courses given in other University colleges of pharmacy. The course will probably be inaugurated in 1910. The Board of Regents have also authorized a course somewhat lower than the regular course now given to comply however with the requirements of the American Conference of

Pharmaceutical Facilities. This course probably will not begin until 1911 and will probably not lead to any degree or to the degree Pharmaceutical Graduate.

THE SCHOOL OF MINES was established in 1889. Its buildings and laboratories are located on the grounds of the University of Minnesota. Students of the School of Mines have therefore, all the opportunities afforded by a large university. Two regular courses of study are offered, namely, mining engineering and metallurgy, leading to the degrees of Engineer of Mines (E. M.) and Metallurgical Engineer (Met. E.), respectively. The courses in the school are designed with a view of preparing men to enter their profession with a thorough grounding in mathematics, in the sciences, and in the fundamental principles of mining engineering and merallurgy. The technical courses consist of lecture work in mining, matallurgy and allied subjects supplemented by laboratory work in assaying, chemistry, ore dressing and metallurgy; field work in plane and underground surveying; actual practical mining and metallurgical work in Minnesota and western mining centers. A system of apprenticeship during summer vacation has been inaugurated. This work has become part of the curriculum and is required of all students who are candidates for degrees.

Minnesota's enormous iron ore production continually brings before the public the necessity for trained men to aid in the development of the country's mineral resources. The state has developed its School of Mines with this end in view.

THE COLLEGE OF EDUCATION offers a practical and a theoretical training for prospective high school teachers and principals, for principals of elementary schools, for supervisors of special studies, and for superintendents of school systems.

Students are admitted to the college only after the completion of at least two full years of college work, during which time they should have pursued at least one course in general psychology, and prospective high school teachers should have given especial attention to one or more of the subjects which they expect to teach. The two years' course of study, beginning with the junior year, leads to the degree of Bachelor of Arts in Education. Preparation for teaching is planned to include a thorough grounding in the correct use of English, an adequate training in general and in educational psychology, in the history and organization of schools, in educational theory, and in the practice of teaching; and also, quite aside from the liberal training of the regular college course, specific preparation in both the subject matter and the methods of those subjects in the secondary curriculum which candidate proposes to teach. A third year leads to the degree of master of arts, including advanced studies in

education and philosophy, and in one or more of the subjects of the secondary curriculum, at the option of the candidate.

In addition to the ordinary academic and professional studies connected with the training of the teacher, the college offers an opportunity for observation and practice teaching under supervision, as well as special facilities in voice culture, public school music, and physical culture, together with elementary and advanced courses in drawing, domestic art and domestic science, manual training and business education—those specialized forms of the secondary curriculum which are being introduced so rapidly into the public high schools of Minnesota.

THE SCHOOL OF ANALYTICAL AND APPLIED CHEMISTRY offers three courses. Two of these, the Analytical and the five year course in Arts and Chemistry, are designed for those who wish to become teachers of chemistry, Cnalysts and investigators. 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 Arts at the end of four years and Chemical Engineer at the end of the fifth. These courses aim to give the student a broad foundation in chemistry and some of the allied sciences.

The two buildings occupied by the school contain six large laboratories and about twenty smaller ones well equipped for carrying on a wide range of work.

THE GRADUATE SCHOOL gathers into a single organization and unites for the purposes of administration all the activities of the University in all its schools and colleges in so far as they relate to advanced instruction offered for the second or higher degrees, viz.: Master of Arts and Doctor of Philosophy conferred for advanced, non-technical study; Master of Science and Doctor of Science for technical study; Master of Laws and Doctor of Civil Law for advanced legal studies. The privileges of this school are in general open to all Bachelors of Arts, of Science, pure and applied, and of Laws, from reputable colleges and universities having courses substantially equivalent to those at this University.

THE UNIVERSITY SUMMER SCHOOL is organized for a six weeks' session in June and July under the direction of the State Department of Public Instruction. In the elementary section courses are given for teachers in all the common school branches and in preparation for the state teacher's certificates. In the college section courses are given for high school teachers and in preparation for the state professional certificate. Students who desire University entrance credits and credits toward the bachelor's degree may secure these by pursuing not more than two full courses at each session.

SPECIAL COURSES. In practically all of the colleges, students of mature age and adequate preparation are permitted to pursue, under the direction of the faculty, one or two distinct lines of study.

EXTENSION LECTURES. Professors in the University are prepared to give a limited number of extension lectures from time to time. For subjects, speakers , terms and dates, application should be made to the chairman of the committee on University Extension.

Historical Sketch

When Minnesota was organized as a territory March 3, 1849, it was understood that a grant of public lands would be made by Congress for the endowment and support of a university as in the case of all other states carved out of this old northwest territory.

On December 10, 1850, delegate Sibley gave notice of a bill to grant two townships (46,080 acres) which became law on February 19, 1851. Meantime the Minnesota legislature had by Act, Feb. 13, created the University of Minnesota and made over to that corporation the proceeds of all lands which Congress might grant.

The location of the institution was fixed by this law "at or near the Falls of St. Anthony," by virtue of an understanding relating to the distribution of public buildings. A board of twelve regents elected in classes by the legislature had charge till 1860. In the fall of 1851, a preparatory school was opened. In 1856 intoxicated by the boom which was then raging, the regents began the erection of the rear part of the "old main" building. Before it was finished the panic of 1857 came on. The board could not pay the contractors nor meet the interest on the bonds they had been authorized to sell.

In the winter of 1860 the legislature replaced the old board of twelve regents by one of five appointed by the Governor. At the end of four years this board had not been able to put the finances of the University on a sound footing. Senator John S. Pillsbury laid before the legislature of 1864 a plan to pay off the accumulated debt by the sale of less than one-third of the land grant. A special board of three regents, headed by Mr. Pillsbury, was created to make the experiment. At the close of 1866 this board reported the debt substantially liquidated. A debt of gratitude is due to the creditors and bondholders for scaling down their just claims and accepting sums far below their dues. By means of a small appropriation the special board renovated the building, purchased furniture and appliances, and in November, 1867, opened the preparatory department, to which girls as well as boys were admitted.

This board having accomplished its purpose prepared for the legislature the bill which enacted into law February 13, 1868, became the actual charter of the University. By far the most important element was that which united with the University endowment proper the expected income from the congressional land grant of 1862 for the support of colleges of Agricultural and Mechanic Arts.

At the close of the college year of 1869 a small company of preparatory students were found ready for college instruction. A faculty of nine professors and instructors was elected and began their work in September. In this year William Watts Folwell was appointed president.

In 1873 two students were graduated at the first commencement. Some twenty years now passed in quiet work and growth, mostly in the academic department. A good beginning was made in that of engineering and mechanic arts, but in spite of most earnest endeavors by the regents the College of Agriculture developed slowly. There was little demand for proper agricultural instruction and the pedagogy of that branch had not been developed.

In the year 1870 Congress confirmed to the state a second grant of public land for a state university ingeniously embodied in the enabling act of Feb. 26, 1857, which the departmental authorities at Washington had persistently refused to recognize.

In September, 1884, Cyrus Northrop succeeded to the presidency and not long after began that great development familiar to all.

The Colleges of Law and Medicine were organized on a self-paying basis. New buildings sprang up, nobly equipped, and the faculties were reinforced as means accumulated. The growth of the College of Agriculture has been remarkable. The congressional appropriations for experiment stations and additional endowment have greatly increased its efficiency and prosperity. The College of Engineering has also enjoyed a rapid and cumulative development. The Colleges of Pharmacy, Dentistry, the School of Mines, Chemistry, Education, and the Graduate School have been added in recent years, the result of public demands for special technical training and research.

II

OFFICERS of the UNIVERSITY

The Board of Regents

CYRUS NORTHROP, LL.D., MINNEAPOLIS The President of the University	*Ex-Officio*
The HON. JOHN LIND, MINNEAPOLIS The President of the Board	1914
The HON. JOHN A. JOHNSON, ST. PETER The Governor of the State	*Ex-Officio*
The HON. C. G. SCHULZ, ST. PAUL The State Superintendent of Public Instruction	*Ex-Officio*
The HON. THOMAS WILSON, ST. PAUL	1915
The HON. A. E. RICE, WILLMAR	1915
The HON. B. F. NELSON, MINNEAPOLIS	1910
The HON. PIERCE BUTLER, ST. PAUL	1910
The HON. CHARLES A. SMITH, MINNEAPOLIS	1910
The HON. S. M. OWEN, MINNEAPOLIS	1913
The HON. W. J. MAYO, ROCHESTER	1913
The HON. HENRY B. HOVLAND, DULUTH	1914

C. D. DECKER, MINNEAPOLIS,
Secretary of the Board

Executive Officers

THE UNIVERSITY

CYRUS NORTHROP, LL. D., President

ERNEST B. PIERCE, B. A., Registrar

JAMES T. GEROULD, B. A., Librarian

C. D. DECKER, Purchasing Agent

J. D. BREN, Cashier

THE COLLEGES

JOHN F. DOWNEY, M.A., C. E., Dean of the College of Science, Literature and the Arts

FREDERICK S. JONES, M.A., Dean of the College of Engineering and the Mechanic Arts

JOHN W. OLSEN, B.S., Dean and Director of the Department of Agriculture

WILLIAM S. PATTEE, LL.D., Dean of the College of Law

FRANK FAIRCHILD WESBROOK, M.A., M.D., C.M., Dean of the College of Medicine and Surgery

EUGENE L. MANN, B.A., M.D., Dean of the College of Homeopathic Medicine and Surgery

ALFRED OWRE, D.M.D., M.D., Dean of the College of Dentistry

FREDERICK J. WULLING, Phm.D., LL.M., Dean of the College of Pharmacy

WILLIAM R. APPLEBY, M.A., Dean of the School of Mines

GEORGE B. FRANKFORTER, M.A., Ph.D., Dean of the School of Chemistry

GEORGE F. JAMES, Ph.D., Dean of the College of Education

HENRY T. EDDY, C.E., Ph.D., LL.D., Dean of the Graduate School

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ADA L. COMSTOCK, M.A., Dean of Women

The University Council

At the regular meeting of the Board of Regents of the University, May 31st, 1905, a University Council was established according to the following plan:

I. The name of the body shall be The University Council. It shall consist of the President of the University, the Deans of the various colleges and schools, one elected representative from each college or school for each 400 students or major fraction thereof, and one representative of the general alumni association.

II. The elected members shall serve for a period of one year. They shall be chosen from the various faculties at the time of the selection of standing committees. The representative of the general alumni association shall be chosen by that body at its annual meeting from among the alumni who are not members of the University.

III. The Council shall be authorized to—

a) Appoint the following committees or the faculty representation thereon:

The University auditing committee
The University press committee
The committee on athletics
The committee on University relations to other institutions of higher learning
The committee on health and sanitation
The committee on commencement and other University functions
The committee on catalogue, programs and courses of study
The committee on student entertainments and social affairs
And such other committees as the general University interests may require.

b) Receive reports from such committees and make such recommendations as may be required.

c) Consider and act upon any matter of general University interest beyond the province of a single faculty which may be referred to it by the President of the University or any faculty.

IV. The Council shall hold stated meetings upon the first Monday of October, December, April and June, and such other meetings as the President of the University may call.

Representatives to the Council

The University

President Cyrus Northrop

The College of Science, Literature and the Arts

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JOHN B. BRIMHALL, M.D. 74 Central Ave., St. Paul
Clinical Instructor in Orthopedic Surgery

H. A. Britzius, M.A., M.S., 2806 Aldrich Ave. N.
Instructor in Technique

A. M. BULL 2237 Knapp, St. St. Paul
Instructor in Drawing

MARY BULL 1385 Raymond, St. Paul
Instructor in Domestic Science

FRANK E. BURCH, M.D. 706 Grand Ave., St. Paul
Clinical Instructor in Diseases of the Eye and Ear

ANNA M. BUTNER The Concord
Instructor in Physical Culture

FREDERICK K. BUTTERS, M.S. 815 S. 7th St.
Instructor in Pharmaceutical Botany, Microscopy and Pharmacognosy.

LEROY CADY, B.Agr. 2081 Buford St., St. Paul
Instructor in Horticulture

R. A. CAMPBELL, M.D. Century Building, St. Paul
Clinical Instructor in Rhinology and Laryngology

HENRIETTA CLOPATH 701 Delaware St.
Intsructor in Drawing

W. O. CLURE 209 Pleasant St. S. E.
Instructor in Rhetoric

LILLIAN COHEN, M.A. 415 Fourteenth St. E.
Instructor in Chemistry

WILLIAM H. CONDIT, B.S., M. D. 1018 4th St. S. E.
Instructor in Therapeutics and Materia Medica

GEORGE M. COON, M.D. 916 Hague Ave., St. Paul
Clinical Instructor in Genito-Urinary Diseases

T. P. COOPER, B.S. in Agr. St. Anthony Park
Instructor in Agriculture

JOHN L. COULTER, M.A. 815 6th St. S. E.
Instructor in Economics

NORMAN J. COX, B.S., D.M.D. 986 15th Ave. S. E
Instructor in Operative Dentistry

JOSEPHINE CRAIG 2090 Commonwealth Ave., St. Paul
Instructor in Agricultural Chemistry

J. GROSVENOR CROSS, B.S., M.D. 422 Ridgewood Ave.
Clinical Instructor in Medicine

ALVIN S. CUTLER, C.E. 529 Oak St. S. E.
Instructor in Railway Engineering

J. M. DAMON, D.D.S. 30 W. 37th St.
Instructor in Prosthetic Dentistry and Dental Anatomy

WARREN A. DENNIS, B.S., M.D. 657 Goodrich, Ave., St. Paul
Clinical Instructor in Surgery

CHARLES F. DIGHT, M.D. Minneapolis
Instructor in Pharmacology

C. F. DISEN, M.D. 2600 E. 22nd St.
Demonstrator of Anatomy

J. M. DREW 1307 Chelmsford, St. St., Paul
Instructor in Blacksmithing and Poultry, Registrar of the School of Agriculture.

A. W. DUNNING, M.D. 807 Ashland, Ave.,St. Paul
Clinical Instructor in Nervous and Mental Diseases

J. L. EDMUNDS, B.S. in Agr. St. Anthony Park
Instructor in Animal Husbandry

R. E. FARR, M.D. 2524 Clinton Ave.
Clinical Instructor in Surgery

EDWARD FIDLAR, B.A., M.D. 425 12th Ave. S. E.
Junior Demonstrator of Pathology and Bacteriology

OSCAR W. FIRKINS, M.A. 1528 4th St. S. E.
Instructor in English and Rhetoric

HENRY J. FRANKLIN, Ph.D. 1472 Raymond Ave., St. Paul
Instructor in Entomology

FRANCIS C. FRARY, M.S. 1307 6th St. S. E.
Instructor in Chemistry

W. H. FRAZIER, B.S. 1155 Raymond Ave., St. Paul
Instructor in Agricultural Chemistry and Soils

JAMES GILFILLAN, M.D. 287 So. Exchange St. St. Paul
Clinical Instructor in Medicine

HALDOR B. GISLASON, B.A., LL.B. 217 Harvard St. S. E.
Instructor in Rhetoric

H. S. GODFREY, D.M.D. 1117 Harmon Place
Instructor in Operative Dentistry

JUDD GOODRICH, M.D. 300 Goodrich Ave., St. Paul
Clinical Instructor in Surgery

ROBERT L. GREEN, D.D.S. 3210 15th Ave. S.
Instructor in Operative Dentistry

C. P. GROUT, B.S. in Agr. St. Anthony Park
Instructor in Dairy Husbandry

FRANK F. GROUT, B.S. 1202 7th. St. S. E.
Instructor in Geology and Mineralogy

CHARLES A. GRIFFITH, D.D.S. 420 13th Ave. S. E.
Instructor in Operative Dentistry

GEORGE D. HAGGARD, M.D. 2400 Chicago Ave.
Instructor in Physiology

ARTHUR S. HAMILTON, B.S., M.D. 600 Washington Ave. S. E.
Instructor in Pathology of the Nervous System

JOHN A. HANDY, Ph.C. 220 Harvard S. E.
Instructor in Chemistry

W. F. HANDSCHIN St Anthony Park
Instructor in Animal Husbandry

EARLE R. HARE, B.S., M.D. 327 14th Ave. S. E.
Instructor in Anatomy

MARY V. HARTZELL, D.M.D. 2508 Pillsbury Ave.
Instructor in Comparative Dental Anatomy

ROWLAND HAYNES, M.A. 606 7th St. S. E.
Instructor in Psychology

GEORGE D. HEAD, B.S., M.D. 56 Dell Place
Instructor in Clinical Microscopy

A. C. HEATH, M.D. 516 Portland Ave., St. Paul
Clinical Instructor of Diseases of the Nose and Throat

U. E. HEDDY, D.D.S. 710 21st Ave. S.
Instructor in Crown and Bridge Work

P. A. HOFF, M.D. 225 Arundel Ave., St. Paul
Clinical Instructor in Medicine.

CHARLES M. HOLT, B.A. Waverly Hotel
Instructor in Education

OLAF HOVDA, B.A. 1519 7th St. S. E.
Instructor in Engineering Mathematics

H. W. JONES, M.D. 2418 W. 22nd St.
Clinical Instructor in Nervous and Mental Diseases

R. R. JONES, D.D.S. 4320 Upton Ave.
Instructor in Operative Dentistry

LEULAH H. JUDSON, M.A. 1221 5th St. S. E.
Instructor in History

A. R. KOHLER, B.S.A. 1455 No. Cleveland Ave., St. Paul
Instructor in Horticulture

ALOIS F. KOVARIK, M.A. 1523 7th St. S. E
Instructor in Physics

W. F. LASBY, B.S., D.D.S. 602 Essex St. S. E.
Instructor in Prosthetic Dentistry

ARTHUR A. LAW, M.D. 1912 Hennepin Ave.
Instructor in Operative Surgery

HARRY C. LAWTON, D.D.S. 489 Grand Ave. St. Paul
Instructor in Prosthetic Dentistry and Dental Anatomy

J. F. LEMSTROM, M.D. 115 N. 12th St.
Instructor in Histology and Embryology

CHARLES N. MCCLOUD, Phm.D., M.D. 965 Selby Ave., St. Paul
Lecturer on First Aids to the Injured

JEANETTE M. MCLAREN, M.D. 441 Selby Ave., St. Paul
Clinical Instructor in Obstetrics

J. S. MACNIE, M.D. 2113 Bryant Ave. S.
Clinical Instructor in Diseases of the Eye and Ear

JAMES E. MANCHESTER, Sc.D. 405 Oak St. S. E.
Instructor in Mathematics

HERMAN A. MAVES, D.D.S. 711 Douglas Ave.
Instructor in Operative Dentistry

CARL M. MELOM, M.A. 506 15th Ave. S. E.
Instructor in French and Spanish

MARTHA B. MOORHEAD, M.D. 914 2nd Ave. So.
Lecturer in Domestic Hygiene

OSCAR B. NELSON, C.E. 1827 14th Ave, So.
Instructor in Civil Engineering

WILLIAM B. NEWHALL, M.E. 2702 Humboldt Ave. So.
Instructor in Civil Engineering

CHARLES W. NICHOLS, M.A. 313 8th Ave. S. E.
Instructor in Rhetoric

WALLACE NOTESTEIN, Ph.D. 812 4th St. S. E.
Instructor in History

OSCAR OWRE, M.D. 511 W. Franklin Ave.
Instructor in Oral Surgery

E. H. PARKER, M.D. 1311 Yale Place
Clinical Instructor in Diseases of Nose and Throat

PETER PETERSON 3709 Clinton Ave.
Instructor in Foundry Practice

RAYMOND V. PHELAN, Ph.D. 1629 University Ave. S. E.
Instructor in Economics

JAY N. PIKE, D.D.S. 1617 Franklin Ave.
Instructor in Orthodontia.

C. E. PYLE, B.S., D.V.M. 2225 Langford Ave., St. Paul
Instructor in Domestic Bacteriology

EDWARD QUIGLEY 2442 15th Ave. S.
Instructor in Forge Work

WALTER R. RAMSEY, M.D. The Angus, St. Paul
Clinical Instructor in Diseases of Children

JEAN RANKIN, M.A. 916 5th St. S. E.
Instructor in Education

SOREN P. REES, B.S., M.D. 1721 James Ave. S.
Instructor in Physical Diagnosis and Clinical Medicine

H. M. REID, D.D.S. 2014 Queen Ave. S.
Instructor in Prosthetic Dentistry

WILLIAM H. RICHARDS 416 Havard St. S. E.
Instructor in Carpentry and Pattern Work

HARRY P. RITCHIE, Ph.B., M.D. 46 Crocus Place, St. Paul
Clinical Instructor in Surgery

H. E. ROBERTSON, B.A., M.D. 627 Oak St. S. E.
Demonstrator in Pathology

H. B. ROE Agricultural College
Instructor in Mathematics

BERT A. ROSE 41 S. 6th St.
Instructor of Cadet Band

NORMAN W. ROSE, M.E. 406 Oak St. S. E.
Instructor in Drawing

FRANK B. ROWLEY, B.S., M.E. 311 Havard St. S. E.
Instructor in Drawing

A. G. RUGGLES, M.A. 1465 Raymond Ave., St. Paul
Instructor in Entomology

WILLIAM T. RYAN, E.E. 1406 7th St. S. E.
Instructor in Electrical Engineering

J. FRANCIS SCHEFCIK, B.S., Ph.G., M.D., C.M. 1400 Spruce Place
Instructor in Materia Medica

JULIUS PARKER SEDGWICK, B.S., M.D. 2015 Kenwood Parkway
Instructor in Physiological Chemistry and Clinical Assistant in Diseases of Children.

W. D. SHELDON, M.D. 3233 Irving Ave. S.
Clinical Instructor in Medicine, and Instructor in Therapeutics

JUNIATA SHEPPERD, M.A. Agricultural College
Instructor in Domestic Science

S. CARL SHIPLEY, B.S., M.E. 209 State St. S. E.
Instructor in Machine Work

CHARLES F. SHOOP, B.S. 1916 14th Ave. N.
Instructor in Mechanical Engineering

ROYAL R. SHUMWAY, B.A. 716 12th Ave. S. E.
Instructor in Mathematics

ANNA M. SMITH 1485 Raymond Ave., St. Paul
Librarian School of Agriculture

CHARLES N. SPRATT, M.D. 1804 Park Ave.
Clinical Instructor in Diseases of the Eye and Ear

EDITH STAPLES St. Anthony Park
Instructor in Domestic Art

THOMAS W. STUMM, M.D. 394 Selby Ave. St. Paul
Clinical Instructor in Medicine

SAMUEL E. SWEITZER, M.D. 1729 Irving Ave. S.
Clinical Instructor in Dermatology and Genito-Urinary Diseases.

C. C. Tyrrell, B.A., M.D., 2428 Central Ave.
Prosector in Anatomy

Henry Ubrich 602 Buchanan St. S. E.
Instructor in Carpentry

Henry L. Ulrich, M.D. 519 1st Ave. S.
Assistant in Clinical Microscopy

J. A. Vye 1449 Cleveland Ave. N., St. Paul
Instructor in Farm Accounts and Secretary of the Experiment Station.

J. A. Watson, M.D. 1303 Yale Place
Clinical Instructor in Diseases of Nose and Throat

Amos S. Wells, B.A., D.D.S. 3901 Lyndale Ave. N.
Instructor in Crown and Bridge Work

Andrew J. Weiss 3705 Stevens Ave.
Instructor in Technics

H. B. White, B.S.A. School of Agriculture
Instructor in Carpentry

Nellie A. Whitney, B.A. 4432 Stevens Ave.
Instructor in Rhetoric

Grace B. Whitridge 654 Hague Ave., St. Paul
Instructor in Physical Culture

Van H. Wilcox, M.D. 812 Pillsbury Building
Instructor in Operative Surgery

A. D. Wilhoit, M.A. 1155 Raymond Ave., St. Paul
Instructor in Agricultural Chemistry and Soils

Charles Williams, M.A. 312 Union St. S. E.
Instructor in German

Archie D. Wilson, B.Agr. 1466 Raymond Ave., St. Paul
Instructor in Agriculture

Richard Wischkaemper 516 Beacon St. S. E.
Instructor in German

Frank R. Wright, D.D.S., M.D. 713 Pillsbury Building
Instructor in Anaesthesia and Oral Surgery.

James Zimmerman, B.A. 1201 5th St. S. E.
Instructor in Chemistry

III

EQUIPMENT

Equipment

GROUNDS AND BUILDINGS

The twenty-three buildings of the University used by all departments of instructoin save that of agriculture, are located upon the University campus, a tract of about fifty-five acres lying between University avenue and the river and between eleventh and nineteenth avenues southeast, in the city of Minneapolis. The campus is well wooded with a fine grove of native oaks and commands a beautiful view of St. Anthony Falls and the city, but is sufficiently removed from the business center to insure desirable quiet and retirement. At the last session of the legislature provision was made for the expenditure of four hundred fifty thousand dollars in campus enlargement during the course of the years 1907-1909. Private benefactors have added fifty thousand dollars to that amount. Condemnation proceedings are now in progress for the purpose of obtaining the land desired. About thirty additional acres situated to the south of the present campus will probably be secured· The Department of Agriculture, including the college and school of agriculture, has a separate campus at St. Anthony Park, in the city of St. Paul, where are located the twenty-five buildings provided for this department and the state experiment station. Adjoining this campus is the University farm of about four hundred twenty acres.

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 filar micrometer; a spectroscope by Brashear; a meridian circle and zenith telescope; a Repsold photographic measuring machine, a chronograph, and astronomical clocks.

GYMNASIUM

The gymnasium is located in the armory, and is well equipped with a variety of gymnastic appliances. The object of the gymnasium is to provide all of the students of the University opportunity for exercise to build up their general health. It also provides special training to correct physical defects and functional derangements. The gymnasium is in charge of a professional medical director and assistant, and the

training is under their direct supervision. A thorough physical examination is offered each student immediately before and after the gymnasium course, and a record is made of the same. The examination of these records shows a marked improvement in the standard of health of the average student during his college course. The gymnasium is open at all times to all young men in the University who are free to use the apparatus and to pursue a course of physical training under the direct supervision of the director and his assistant. In some of the colleges of the University this work is required of all men.

MILITARY DRILL

The Act of Congress of 1862, providing for the establishment of "Land Grant Colleges," requires that instruction be given in military science and tactics at all institutions that are its beneficiaries. The armory is located on the University campus and has all the facilities usually provided in a modern armory. The United States government supplies the University with the necessary arms, equipment and ammunition for instruction in infantry and artillery drill, and details a commissioned officer of the regular army to take charge of the department.

THE ONE-MILE LIQUOR LAW

A state law provides that "it shall be unlawful for any person to sell or dispose of any spirituous, vinous, or malt liquors within the distance of one mile of the Main Building of the University of Minnesota, as now located in the city of Minneapolis; provided that the provision of this section shall not apply to that part of the city of Minneapolis lying on the west side of the Mississippi River."

ATHLETIC ORGANIZATIONS

The Athletic Association is an organization having for its object the general physical well-being of the students and the encouragement of a proper spirit in favor of hearty, manly sports.

Board of Control for Athletics. The athletic sports of the University are under the supervision of a board of control made up of eleven members; two are members of the faculty, two are alumni, and seven are students. This board arranges the schedule of games, manages the finances, and exercises a general supervision over all matters connected with athletic contests. It has charge of the whole of the athletic grounds of the University, Northrop Field. This field, containing about six acres, lies immediately adjoining the armory. It contains a modern cinder track, tennis courts, baseball diamond, and football gridiron. The grand stands have a seating capacity of about fifteen thousand. A large portion of this field was a gift to the University from the heirs of the late John S. Pills-

bury, and the brick wall surrounding it is the gift of his son, Mr. A. F. Pillsbury. It is generally conceded to be one of the finest fields in the West.

MUSEUMS AND COLLECTIONS

The museums of the University contain material obtained from various sources, arranged with special reference to its use for illustration. Among the more notable collections are the following:

GEOLOGY AND MINERALOGY. This museum includes the Kunz collection of minerals, purchased of George F. Kunz; several suits of crystalline rocks secured from various sources; the Ward collection of casts contributed in part by citizens of Minneapolis; collection of rocks, fossils, minerals and economic products of Minnesota; upwards of 9,000 entries gathered by the geological survey of the State; the Sardeson collection of paleozoic fossils of Minnesota, Wisconsin, Iowa, and neighboring states, comprising 30,000 specimens; a series of 3,000 thin sections of typical rocks and minerals largely representing Minnesota localities; purchased material comprising a fine collection of crystals; 5,000 minerals and 3,000 specimens of economic minerals and crystalline rocks, and a collection of over 4,000 photographs and lantern slides.

Mr. Arus S. Williams, of Minneapolis, has given to the University his extensive collection of negatives and photographs. During many years of active work as a photographer, he has collected a series of several thousand plates representing geologic and geographic subjects, commercial views and historic scenes. These will prove of great value in illustrating the physical, commercial and political history of the State. They are recognized as the A. S. Williams collection of Photographs and Photographic Negatives.

ZOOLOGY. The zoological museum contains all the material collected by the Zoological survey; a collection of mounted Minnesota birds representing about one-third of the species found in the state; a number of the mammals of the state and a few from the more western states; a collection of fishes, molluscan shells, Philippine Island corals and other foreign material.

The ornithological room contains the excellent Thomas S. Roberts and Franklin Benner collection of skins, nests and eggs of Minnesota birds. The entomological collectian contains over 3000 named Minnesota insects, is particularly rich in aphidæ and contains the Guthrie collection of collembola. Other groups of animals are more or less numerously represented, and are receiving annual additions from the Zoological Survey.

BOTANY. The material forming the museum in botany includes the general herbarium numbering about 400,000 specimens and comprising the series of plants collected by the state botanist; an alcoholic collection of material for dissection; a collection of woods

of Minnesota; a limited series of carboniferous and cretaceous fossil plants, including the Lesquereaux collection from the Minnesota River localities.

MINING AND METALLURGY.—A museum of mining and metallurgy is located in the mining building. Representative ores of all the most important metals, drawings, photographs of furnaces, sectional furnace models and samples of all the different furnace products are exhibited to the public and are used as illustrative material for regular classes. Various mine appliances, pieces of machinery, underground photographs, models of mine timbering with sectional maps of some of the large Minnesota properties, complete the collection. A collection has been begun of ores from all the important mines on the Mesabi range. These samples with analyses show well the character of ore produced by the state.

SOCIOLOGY AND ANTHROPOLOGY. This department has recently acquired wall-charts and maps which present graphically a large number of sociological facts, from various parts of the United States; a collection of plaster-cast crania and skulls showing man's ancestors, fossil man from western Europe, typical members of the various living races and sub-races, both normal and artificially deformed; a collection of face-masks in color, presenting well the Oceanic peoples; a series of busts in white, presenting facial and cranial characteristics of a considerable number of different peoples; natural cranial, skull and skeletal materials from some dozen different continental and insular geographic areas; and the Guthrie collection of ethnologic specimens from the Bulu tribe of Kamerun province, Africa, presenting the material culture of a savage people in the Tropics.

TECHNOLOGY. A cabinet of specimens illustrating the products and processes of applied chemistry is being collected by the professor of chemistry, as opportunity offers. The collection embraces fuel, ores, furnace products, textile materials, both raw and manufactured, dyewoods and other materials used in dyeing; specimens illustrating the bleaching and printing of cotton, linen and woolen goods, earthenware, pottery, etc.

CLASSICS. Some material illustrating classical geography, topography, chronology, mythology, and art has been collected, consisting mainly of plans and charts, casts, pictorial illustrations, fac-similes of manuscripts and inscriptions.

ENGLISH. A few fac-similes of manuscripts, plates that may serve the purpose of archeological instruction, publication of texts, reprints of blackletter books and of original editions, photographs and portraits have been gathered.

CIVIL ENGINEERING. The department is collecting samples

of road material typical of the various localities of the State, and leading materials used in street paving, such as granite, trap rock, brick and asphaltum. A set of standard sections of steel and wrought iron is provided for illustration in the study of structural design.

MECHANICAL ENGINEERING. The collection consists of models of mechanical motions especially relating to the work in kinematics; sectioned apparatus, such as steam engines, pumps, valves, injectors, water meters and steam separators; various collections of drop forgings in iron, steel and copper; miscellaneous samples of commercial work representing the product of special machines; groups of standard nuts, bolts and screws; samples of belting, ropes, steel and iron cables, rawhide gears, pipe fittings and other material especially useful for illustrative purposes.

ELECTRICAL ENGINEERING. This museum contains a growing collection of samples furnished by various manufacturers and dealers for demonstrating the merits of different products and for illustrating modern practice; an excellent collection showing the development of electrical instruments, telephone apparatus, measuring instruments, lightning arresters, switches, primary and secondary batteries, early forms of dynamos and motors, lighting apparatus and various industrial applications of electricity; also a collection of samples from repair shops and elsewhere, illustrating the effects of wear, accidents and abuse.

ENGINEERING MATHEMATICS. This department has recently added to its apparatus used for illustration in teaching, several types of slide-rules, including those of Thatcher, Faber, Keuffel and Esser, Schureman's Computer, Boucher's Calculator; also Amsler's Polar Planimeter.

MATHEMATICS. The collection includes the Schroeder wooden and the Schilling gypsum, string and paper models for Solid Analytical Geometry, many of the Schilling models for illustrating the Theory of Surfaces, several of the Schilling mechanical devices for describing various loci, the Keufel and Esser models for Solid Geometry, and large slated globes, suitably mounted, for use in Spherical Geometry and Spherical Trigonometry.

LIBRARIES

THE UNIVERSITY LIBRARY CONSISTS OF:

1. The general library.
2. The college libraries, including those of law, medicine, engineering, agriculture, and mines.
3. The departmental libraries, including those of arts, astronomy, animal biology, botany, chemistry, French, geology, German, Greek, Latin, mathematics, military science, physics, rhetoric, and Scandinavian.

The whole number of bound volumes owned by the University is about one hundred and twenty thousand, unbound books and pamphlets

about twenty thousand. About seven hundred and thirty current periodicals are received.

The general library is open to students and the public from eight A. M. to ten P. M. except Sundays and legal holidays.

The departmental libraries are designed especially for the work of their respective departments and consist mainly of books of reference and current periodicals relating to technical subjects. The private collections of the professors are usually available upon application when necessary for research.

Besides the University library the following libraries are easily accessible: the Minneapolis public library, containing over one hundred sixty thousand bound volumes and over fourteen hundred of the leading newspapers, magazines and periodicals of the world; the St. Paul public library with about ninety-five thousand volumes; the Minnesota Historical Society library of about eighty-five thousand volumes, and the state library of about fifty-nine thousand volumes in the capitol in St. Paul; the Minnesota Academy of Natural Sciences library of twelve thousand titles.

IV

ASSISTANTS, SCHOLARSHIPS, LOANS AND PRIZES

Assistants, Scholarships, Loans and Prizes

ASSISTANTS

It is the policy of the University to encourage graduate study and to provide for assistance in laboratories, reading of test and examination papers, supervision of note books, and similar services by the appointment of assistants in departments where such services are required. The general principles which now control the making of such appointments are: (1) the appointments are made by the board of regents, upon the nomination of the head of the department concerned and its ratification by the dean of the college; (2) appointments are for one year only, but may be renewed; (3) the appointees must be graduate students, who are taking work along the lines of the assistantships to which they are appointed; (4) assistants are not regularly placed in charge of classes, and when exceptions are made to meet emergencies, the arrangement is regarded as a temporary one, and in no case to extend beyond the current year.

SCHOLARSHIPS

THE MOSES MARSTON SCHOLARSHIP IN ENGLISH

Friends and pupils of the late Professor Moses Marston have given one thousand dollars as a memorial fund. The annual income of the fund is to be used to help some student in the English course. The award of the income is made on the basis of pecuniary need and of deserving scholarship.

THE ALBERT HOWARD SCHOLARSHIP FUND

Under the last will and testament of Mr. James T. Howard, of the town of St. Johnsbury, Vermont, $4,166.81 was left to the University to establish a scholarship to be known as the Albert Howard Scholarship. This scholarship is assigned by the executive committee of the board of regents upon the recommendation of the faculty.

THE COLLEGE WOMEN'S CLUB SCHOLARSHIP

The College Women's Club of Minneapolis has established a scholarship for the benefit of women students in this University. For the year 1909-10 this scholarship amounts to $150. In awarding it the preference

will be given to students in the junior and senior classes and to graduate students. Application for this scholarship may be made to Miss Comstock, Dean of Women.

STUDENT LOAN FUNDS

THE GILFILLAN TRUST FUND

The Hon. John B. Gilfillan has given to the University the sum of fifty thousand dollars, yielding an annual income of two thousand dollars, to be used by the board of regents to assist worthy students, needing such aid, to secure an education. The regents are empowered to give this aid in the way of loans or gifts, according to the circumstances of the case. As a rule the fund is used as a loan fund, and a small rate of interest is charged. The details of the regulations which have been adopted by the regents for the administration of the fund may be learned by addressing the President of the University.

THE ELLIOT SCHOLARSHIP LOAN FUND

To fulfill the wishes 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 expenses of worthy students during sickness. The loans are to be repaid, without interest at the earliest convenience of the recipients.

THE PURITAN COLONY SCHOLARSHIP LOAN

The Puritan Colony of the National Society of New England Women has established a loan fund for women students of the University. For the year 1909-10 this scholarship loan amounts to one hundred dollars It is available for women students of New England birth or ancestry. In awarding it the preference will be given to young women in the junior and senior classes. Application for it may be made to Miss Comstock, Dean of Women.

STUDENTS' TRUST FUND

The class of 1902 left with the School of Agriculture a fund of $100 "to assist by temporary loans at a reasonable rate of interest, deserving students needing such help, who are not below the B class in the School of Agriculture." This fund is in charge of a committee constisting of the secretary, the principal, the preceptress, and the president of the A class.

THE LUDDEN TRUST

The Honorable John D. Ludden, of St. Paul, gave the University of Minnesota $5,000 to be held, invested and re-invested by the University, through its Board of Regents, and the income thereof to be collected, received and applied by said Board of Regents to the financial assistance of students of either sex in the school of agriculture..

This fund produces $200 a year. Those wishing to avail themselves of its benefits should apply to the executive committee of the Board of Regents of the University of Minnesota.

Mr. Ludden has since donated another $5,000 for a like purpose so that the yearly income is now $400.

PRIZES

THE JOHN S. PILLSBURY PRIZE

Three prizes of one hundred, fifty, and twenty-five dollars each, offered by the heirs of the late John S. Pillsbury, are awarded for the best work in the department of rhetoric, as evidenced finally by an oration in public.

THE '89 MEMORIAL PRIZE IN HISTORY

The class of 1889, at graduation, established a prize of twenty-five dollars each year, to be known as the '89 Memorial Prize, and to be given for the best thesis in history by a member of the graduation class. The award is made by a professor of history in some other institution.

THE WILLIAM H. DUNWOODY PRIZE

Mr. William H. Dunwoody has provided a cash prize of seventy-five dollars for the members of the team winning the inter sophomore debate, and another prize of twenty-five dollars for the student in the sophomore class writing and delivering the best oration.

THE FRANK H. PEAVEY PRIZE

Mrs. Frank T. Heffelfinger continues the prize of one hundred dollars. established by her father, the late Frank H. Peavey. This prize consists of seventy-five dollars for the members of the team winning the freshman-sophomore debate, and another prize of twenty-five dollars to the student in the freshman or sophomore class writing and delivering the best oration.

THE JAMES T. WYMAN PRIZE

A prize of twenty-five dollars is offered by the Hon. James T. Wyman, of Minneapolis, through the department of economics and political science,

for the best essay of three to five thousand words by an undergraduate student, on the subject of "The Influence of Immigration upon the Development of the Northwest."

THE WILLIAM JENNINGS BRYAN PRIZE

The Hon. William Jennings Bryan has given the University the sum of two hundred dollars for the encouragement of studies in political science. The annual income will be given as a prize to the writer of the best essay upon the topic to be announced each year. The competition is open to all students of the College of Science, Literature, and the Arts.

THE FRANK O. LOWDEN PRIZE

The Hon. Frank O. Lowden, of Chicago, offers as a prize to be competed for by the Northern Oratorical League, an endowment of three thousand dollars, which will yield an annual income of about one hundred seventy-five dollars. A prize of one hundred dollars will be given to the orator winning the first place, fifty dollars to the orator winning second place, and the remainder will be set aside each year for an interest fund to accumulate, and, in time, produce another endowment.

THE ROLLIN E. CUTTS PRIZE IN SURGERY

Dr. Mary E. Smith Cutts, '91 Medical, has given to the University, as a memorial of her husband, Dr. Rollin E. Cutts, '91 Medical, the sum of $500.00, the income from which is to be awarded in the form of a gold medal to that member of the senior class of the College of Medicine and Surgery who presents the best thesis showing original work upon a surgical subject.

THE BRIGGS PRIZE IN FOUNDRY PRACTICE

For the encouragement of studies in foundry practice, Mr. O. P. Briggs, commissioner of the National Foundrymen's Association, Detroit, Mich., offers $75 annually, in two prizes, which are to be accompanied by gold medals. The competition is open to sophomores in the College of Engineering, and the prize will be awarded for the best essay relative to the above subject. No prize will be awarded if less than five essays are submitted in competition. Essays should contain about 3,000 words, and must be submitted to the professor of rhetoric on or before May 1st.

THE GEORGE C. ANDREWS PRIZE

Mr. George C. Andrews, M. E. '87. has offered an annual prize to the Senior Mechanical Engineers for the best essay on any subject connected with heating and ventilation. The prize in this contest will consist

of $50.00 in cash accompanied by a suitable medal; a second prize will also be given which will consist of $25.00 in cash accompanied by a medal. The winner of the first prize will be offered a position with the George C. Andrews Heating Company.

PHARMACEUTICAL ASSOCIATION PRIZE

Nomination for membership in the American Pharmaceutical Association and the first year's dues are offered annually by Dean Wulling to the student in the College of Pharmacy earning the highest total average of all standings.

V

STUDENT ORGANIZATIONS AND PUBLICATIONS

Student Organizations and Publications

RELIGIOUS ORGANIZATIONS

THE STUDENTS' CHRISTIAN ASSOCIATION was organized in 1869, its object being to promote growth in Christian character, and to engage in such religious work as may be deemed expedient and necessary. The association owns a commodious building, which serves as the headquarters for student religious activity. All persons in sympathy with the object of the association are eligible to membership.

THE YOUNG MEN'S CHRISTIAN ASSOCIATION has as its obect the promotion of "growth in grace and Christian fellowship among its members and aggressive Christian work, by and for students." This association leases the Students' Christian Association building and keeps it constantly open, with a general secretary in charge. All men in sympathy with the object of the association are eligible to membership. This building is maintained as the social and religious headquarters of all young men in the University.

This association provides an employment bureau whose serivces are free to students in all departments of the institution, as well as a committee to help students find comfortable rooms and boarding places. The association also maintains an educational department in which students may make up their entrance conditions at a nominal charge for instruction. The general secretary will be pleased to correspond with any young man intending to come to the Univesity. Any inquiry about board, room, employment, or general information will gladly be answered, and a hand-book will be sent to anyone wishing it. Address the general secretary of the Young Men's Christian Association, University of Minnesota, Minneapolis, Minnesota.

THE YOUNG WOMEN'S CHRISTIAN ASSOCIATION is the center of Christian life among the women of the University. Its object is "to deepen spiritual thought in the University women, to environ her with a semblance of home, to bring to her friendship, assistance and sociability by stimulating student fellowship, to give her personal help when necessary; thus developing in her the Christ ideal of culture in womanhood."

To this end frequent socials and informal teas are given throughout the year; twice each week twenty-minute prayer meetings are held; a dozen circles meet one hour a week for devotinal Bible study; and from time to time missionary meetings are held. The general secretary

devotes all of her time to the association and will be pleased to correspond with any young woman who wishes information regarding the University.

All young women are invited to visit the Young Women's Christian Association before registering. Women from the upper classes will be there during the opening days to give advice and assistance.

THE BISHOP GILBERT SOCIETY was organized by the Episcopal students, about three years ago. The purpose of the organization is to promote the religious influences of the Episcopal students in the University. Prominent speakers address the society during the year. Besides this, the society tends to promote good fellowship among its members. A club house has been planned and will soon be in process of construction.

THE UNIVERSITY CATHOLIC ASSOCIATION was organized by the Catholic students in the spring of 1900. The purpose of the association is the study of the Bible and of the doctrines and history of the Catholic Church. Membership is open to anyone connected with the University. Regular meetings are held every Sunday afternoon in the rooms of either the Young Men's or Young Women's Christian Association, through the courtesy of these organizations. The association is planning to erect a building near the campus at an early date.

Aside from the religious objects, the association tends to promote good fellowship among its members. Early in each University year a reception is tendered to new students and during the year two or more socials are held. Further information may be obtained by addressing the secretary of the association at the University.

LITERARY, SCIENTIFIC, AND MUSICAL ORGANIZATIONS

PHI BETA KAPPA. A chapter of the honorary society of PHI BETA KAPPA was established at the University in 1892. A small proportion of the graduates of the College of Science, Literature, and the Arts are elected to membership each year. Election is based upon high scholarship and character.

SIGMA XI. A chapter of the honorary scientific society of SIGMA XI was established at the University in 1896. A small proportion of the graduates of the scientific and technical departments are elected to membership each year. Election is based upon high scholarship and character.

THE GRADUATE CLUB is a club organized for the purpose of fostering a greater interest in graduate work, for mutual help, and for discussion of topics under investigation.

THE MINNESOTA LITERARY UNION is a federation of the members of the following societies: Shakopean, Forum, Castalian, Minerva, and Arena. Four meetings are held each year.

LITERARY SOCIETIES. The above named literary societies of the

Minnesota Literary Union are mainly debating clubs. Every student is welcome to attend the literary sessions, but the business sessions are usually held behind closed doors. Students desiring to join should make early application to some member of the society he prefers, as the membership is limited. Membership limit: Shakopean 35 men; Forum 30 men; Minerva 30 women; Law Literary, unlimited, law students; Castalian 35 men; Theta Epsilon 30 women; Thalian 25 women; Acanthus 30 women.

THE DEBATING BOARD has charge of home and inter-collegiate oratorical contests.

THE NORTHERN ORATORICAL LEAGUE is composed of the oratorical associations of the University of Michigan, Northwestern University, the University of Wisconsin, Oberlin College, the State University of Iowa, the University of Chicago, and the University of Minnesota. Its purpose is to foster an interest in public speaking and to elevate the standard of oratory by holding annual contests. The contests are open only to undergraduates.

THE DRAMATIC CLUB is organized for the study and practice of dramatic art.

THE EUTERPEAN CLUB is a regularly organized body of singers, composed of forty of the women students of the University. The selection of voices is made at the beginning of each school year. The club is under the direction of Professor Scott.

THE GLEE AND MANDOLIN CLUBS give a public concert each year at the University and make a tour of the state during the holidays.

THE UNIVERSITY BAND is organized as a part of the military system of the University and is composed of about sixty musicians. It is under the efficient leadership of an instructor in music, and furnishes music for military and many other University affairs.

AMERICAN CHEMICAL SOCIETY. A local section of the American Chemical Society has been organized in Minnesota with headquarters at the University.

THE SOCIETY OF ENGINEERS meets once in two weeks to listen to addresses by prominent engineers and for the discussion of various engineering topics. The Year Book of this society is published annually. It is devoted to the publication of articles upon engineering subjects by professors and students.

THE SCHOOL OF MINES SOCIETY meets once a month to listen to addresses by students, alumni and well-known mining and metallurgical engineers on various topics interesting to the professions. All students regularly registered in the School of Mines are eligible to membership. This society forms an important connecting link between the graduates in the field and the School of Mines.

THE MINNESOTA SECTION OF THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS meets monthly in St. Paul and Minneapolis alternately. Students of the College of Engineering are wlecome at these meetings.

THE GRANGE is comprised of the members of the faculty of the Department of Agriculture and others connected with the institution and interested in its welfare. Meetings are held on the first and third Monday evenings of each month. The order is intended to bring those connected with the College and Station in closer touch with one another and with the many lines of work carried on in the several divisions. Its further purpose is to keep in closer touch with the scientific world and the grange work of the state and nation.

THE PHILOMETHIAN LITERARY SOCIETY is an organization of the students of the College of Agriculture, its object being to train its members in the art of public speaking, debating, and parliamentary practice. The society meets once a week and presents a program including readings, recitations, debates, etc. The membership is limited to forty and is only for students in the College of Agriculture.

THE FORESTRY CLUB was organized by the Forestry students for the promotion of good fellowship and mutual interests. The specific object of the club is to keep the members up to date on Forestry Literature and current affairs in the lumber world.

THE NORTHWESTERN BRANCH OF THE AMERICAN PHARMACEUTICAL ASSOCIATION meets six times a year at the College or elsewhere in the Twin Cities. Pharmacy students are always welcome at these meetings and are eligible to membership in the Branch.

PUBLICATIONS

THE MINNESOTA DAILY is published five times each week during the University year by an organization of University students.

THE JUNIOR ANNUAL, called "The Gopher" is a book published annually by the junior class of the University.

THE MINNESOTA MAGAZINE is a monthly magazine devoted to the cultivation of literary taste and effort among the students of the University. It is managed by a board of editors chosen from the senior class.

THE MINNE-HA-HA is a humorous monthly magazine, published by the students of the University. It depicts life upon the campus in a satirical vein. The board of editors consists of ten members, chosen from the student body.

THE MINNESOTA ALUMNI WEEKLY is published every Monday during the University year. The Weekly is published entirely in the interest of the alumni and is devoted to alumni news and such University news as may be of special interest to the alumni.

THE YEAR-BOOK OF THE SOCIETY OF ENGINEERS is published annually It is devoted to the publication of articles upon engineering subjects by professors and students.

THE MINNESOTA FORESTER is the official organ of the Minnesota State Forestry Association. It is edited by the Forestry Department of the University and is devoted to the advancement of the Forestry movement with special emphasis on farm forestry.

THE SCHOOL OF MINES BULLETIN is published annually in April. It is devoted entirely to information concerning the alumni of the School of Mines. A complete record of each alumnus is published from the time of graduation to the time of publication of the Bulletin. The School of Mines Society issues this publication and sends it to every alumnus of the School.

THE MINNESOTA FARM REVIEW is a paper published and managed by the Alumni Association of the School of Agriculture. It is the official organ of the Alumni Association and the Farmers' Club. The REVIEW is intended to be a medium through which former students may keep in touch with the Agricultural School and with one another. It also endeavors to bring the farmers of the State into closer touch with the School, the College and the Experiment Station. To this end, the paper strives to present the latest progress in the experimental work of the various Stations and to call attention to the most practical farm practices.

WOMEN STUDENTS

After June first, 1909, the Registrar will supply a list of recommended boarding and rooming places to any women requesting such information. Young women who wish to earn a part of their expenses may generally learn of opportunities by communicating with Miss Ada Comstock, Dean of Women. During the college year Miss Comstock holds office hours every week day in the council room in Alice Shevlin Hall. At such times she welcomes any woman student who cares to come to her whether for advice, information, or an informal talk.

During the summer Miss Comstock's address is Moorhead, Minnesota. She will be glad to correspond with young women who are planning to enter the University or with their parents.

SHEVLIN HALL.—Through the generosity of Hon. Thomas H. Shevlin, the University now possesses in Alice Shevlin Hall a building admirably designed and equipped for the use of its women students. It is a two-story and basement structure, the material used being pressed brick with stone trimmings. It has a frontage of one hundred and fourteen feet on Pillsbury avenue and a depth of fifty-five feet. The purpose of this building is to furnish suitable rest and study rooms for the women attending the University. The building contains several society rooms, a large lunch room, and a general reception hall.

THE STUDENT GOVERNMENT ASSOCIATION FOR WOMEN.—This organization was formed for the purpose of aiding in the care and conduct of Alice Shevlin Hall. Every women student in the University is regarded as a member. There are no dues. The association makes rules for the guidance of those using Alice Shevlin Hall; it provides committees to enforce the rules; it gives permission for the holding of social functions in the building; and it controls the expenditure of any surplus in the receipts from the lunch room.

THE WOMEN'S LEAGUE.—This organization is open to all women who are students in the University. It is governed by a council made up of student members from the four college classes. It makes its headquarters in the council room in Alice Shevlin Hall. The aim of the organization is to promote good fellowship and sociability among the women of the University. For this purpose it gives receptions and parties for girls at regular intervals throughout the year. It also endeavors to aid in any project which may be of benefit to the University, and particularly to the women students. At present it is interested in the effort to secure dormitories.

Admission

Admission to the colleges or schools of the University is either by certificate or by examination. The candidate must offer fifteen year credits of high school work so chosen as to include those subjects required by the college or school which he wishes to enter. Of these fifteen year credits prescribed for admission the six in list A are required for admission to the freshman class in all the colleges and schools of the University except the College of Pharmacy, and no substitutions are accepted.

Certain of the nine additional credits to be selected from list B are prescribed by individual colleges, as indicated under requirements of individual colleges.

The term CREDIT 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 a credit means the equivalent of ten recitation periods per week for thirty-six weeks.

LIST A

English.....four credits
Elementary Algebra.....one credit
Plane Geometry.....one credit

LIST B

MATHEMATICS
- Higher algebra, one half credit
- Solid geometry, one half credit

LATIN
- Grammar, one credit
- Caesar, four books, one credit
- Cicero, six orations, one credit
- Virgil, six books, one credit

GREEK
- Grammar, one credit
- Anabasis, four books, one credit

GERMAN
- Grammar, one credit
- Literature, one credit

FRENCH
- Grammar, one credit
- Literature, one credit

SPANISH
- Grammar, one credit
- Literature, one credit

NORWEGIAN-SWEDISH
- Grammar, one credit
- Literature. one credit

HISTORY
- Ancient to Charlemagne, one credit
- Modern, from Charlemagne, one credit
- English, one half credit
- Senior American, one half credit

AMERICAN GOVERNMENT, one half credit
PHYSICS, one credit
CHEMISTRY, one credit
BOTANY, one half or one credit
ZOOLOGY, one half or one credit
ASTRONOMY, one half credit
GEOLOGY, one half credit
PHYSIOGRAPHY, one half credit
COMMERCIAL GEOGRAPHY, one half or one credit
BUSINESS SUBJECTS, accepted only as parts of a well defined course
- History of commerce, one half credit
- Economic History of England, one half credit
- Economic History of the United States, one half credit
- Elementary economics, one half credit
- Business law, one half credit
- Elementary bookkeeping, one half credit
- Advanced bookkeeping and business practice, one credit
- Stenography and typewriting, two credits
- Business spelling and correspondence, one half credit

MANUAL SUBJECTS, accepted only as parts of a well defined course
- Freehand drawing, two credits
- Mechanical drawing, two credits
- Shop work, two credits
- Modeling and wood carving, one credit
- Domestic art and science, two credits

REQUIREMENTS OF INDIVIDUAL COLLEGES

College of Science, Literature, and the Arts

List A.....6 credits
List B, elective.....9 credits

Entrance examination in English is required of all candidates for admission to the freshman class.

All who do not present credits for both higher algebra and solid geometry are required to take mathematics five times per week through the freshman year.

Graduates of accredited schools shall present all entrance grades marked; "passed," "passed with credit," or "passed with honor," and each subject marked "passed" shall count as an entrance condition unless a State High School Board certificate be presented for each subject so marked. For further detailed information see bulletin of the college.

College of Engineering and the Mechanic Arts

List A.....6 credits
List B
Chemistry.....1 credit
Higher Algebra.....½ credit
Solid Geometry.....½ credit
Language .....2 credits
*Elective.....5 credits

Entrance examinations in elementary and higher algebra, plane and solid geometry are required of all except those who present Minnesota High School Board certificates for these subjects.

*Business subjects will not be accepted, and of the manual subjects only mechanical drawing and shop work may be counted towards admission.

College of Agriculture

For high school graduates,
List A.....6 credits
List B.....9 credits

For graduates of the School of Agriculture see bulletin of the College of Agriculture.

School of Agriculture

See bulletin of the School of Agriculture.

College of Law

List A.....6 credits
List B.....9 credits

In addition students must present credits showing the completion of one full year of collegiate work in Arts and Science.

College of Medicine and Surgery

1. For Candidates for the Degrees B. S. & M. D.

List A.....6 credits
List B.
Latin.....2 credits

Higher Algebra.....½ credit
Solid Geometry.....½ credit
Elective.....6 credits

In addition two years of prescribed college work in science, literature and the arts, comprising the following named subjects:

Second-part Higher Algebra.....one semester
Trigonometry.....one semester
General Inorganic Chemistry.....one year
Qualitative Analysis.....one year
General Zoology.....one year
Comparative Anatomy of Vertebrates.....one year
General Botany.....one year
Elements of Economics.....one semester
Economic Conditions in American Cities.....one semester
Rhetoric.....one year
Physics.....one year
Military Drill.....two years
Physical Culture.....one year
*German.....two years
or German and French.....two years

*Students who enter without German are required to take two years of German.

Students who enter with two years of German must take one year of German, and may elect German or French for the other year.

2. For Candidates for the Degree M. D.

List A.....6 credits

List B.
Latin.....2 credits
Elective.....7 credits

Two years of regular college work in science, literature and the arts including specifically the following subjects:

Biology (Zoology or Botany).....one year
General Inorganic Chemistry.....one year
Qualitative Analysis.....one year
Language (German or French).....one year
Physics.....one year

College of Homeopathic Medicine and Surgery

Same as for Medicine and Surgery above.

College of Dentistry

List A.....6 credits
List B.
Latin.....1 credit
Manual Training.....1 credits
Elective.....7 credits

College of Pharmacy

English.....2 credit
Elementary Algebra.....1 credit
Plane Geometry.....1 credit
Physics.....1 credit
Latin.....2 credits
Elective, (see bulletin College of Pharmacy)

School of Mines

List A.....6 credits
List B.
Higher Algebra.....½ credit
Solid Geometry.....½ credit
Elective.....8 credits

Entrance examinations in elementary and higher algebra, plane and solid geometry are required of all candidates for admission.

School of Analytical and Applied Chemistry

List A.....6 credits
List B.
Higher Algebra.....½ credit
Solid Geometry.....½ credit
Chemistry .....1 credit
Elective .....7 credits

Every applicant for admission to the Applied Course must either present State High School Board certificates for the mathematical subjects required for admission, or take the entrance examinations in said subjects at the University.

College of Education

List A.....6 credits
List B.....9 credits

In addition two years of collegiate work in any college or university of recognized standing are required.

Graduate School

See bulletin of that school.

ADMISSION BY CERTIFICATE

Graduates of the following courses, provided their preparation satisfies the specific requirements of the college they desire to enter, will be admitted to the freshman class without conditions, except where entrance examinations are required.

(a) Any four-year course of a Minnesota State High School or other accredited school in the state.

(b) A four-year course of schools in any other state accredited to the State University of that state.

(c) The advanced Latin or English course of the Minnesota state normal schools.

A candidate wishing to enter the University from an accredited school should furnish the registrar an official statement of his preparatory work certified to by the principal of the school from which he comes. Blank certificates for admission for school year 1909-1910 may be secured from the registrar, and should be filled out and returned to him for approval before August 1st, 1909. An applicant will be admitted conditionally who is deficient in not more than three half year credits (one year credit in the College of Engineering), and such entrance conditions must be removed before the beginning of the sophomore year; provided, that no student entering the College of Engineering or the School of Mines may be conditioned in Mathematics except upon special permission of the department of Mathematics.

ADMISSION BY EXAMINATION

For program of entrance examinations see page 3.

Whenever admission is by examination, the candidate must pass examinations in the credits specifically, required for entrance to the college in question, and in addition sufficient credits from the group of electives in list B, to make a total of fifteen year credits; provided that, if the total deficiency does not exceed three half year credits (in the College of Engineering one year credit), the applicant shall be admitted conditionally and be given one year in which to make up the entrance conditions. Provided that no student entering the College of Engineering or the School of Mines may be conditioned in mathematics except upon special permission of the department of mathematics.

LIST OF ACCREDITED SCHOOLS

Graduates of the following Minnesota State High Schools will be admitted to the University of Minnesota without conditions, provided

that their credentials satisfy the specific requirements of the college to which entrance is desired.

Ada
Adrian
Aitkin
Albert Lea
Akeley
Alden
Alexandria
Amboy
Annandale
Anoka
Appleton
Argyle
Arlington
Atwater
Austin
Bagley
Barnesville
Belle Plaine
Bemidji
Benson
Bird Island
Biwabik
Blooming Prairie
Blue Earth
Brainerd
Breckenridge
Browns Valley
Buffalo
Caledonia
Cambridge
Canby
Cannon Falls
Cass Lake
Chaska
Chatfield
Chisholm
Clarkfield
Cloquet
Cokato
Cottonwood
Crookston
Dawson
Delano
Detroit
Dodge Center
Duluth
  Central
  Industrial
Eagle Bend
E. Grand Forks
Elbow Lake
Elgin
Elk River
Elmore
Ely
Eveleth
Excelsior
Fairfax
Fairmount
Faribault
Farmington
Fergus Falls
Fertile
Fosston
Frazee
Fulda
Gaylord
Glencoe
Glenwood
Graceville
Grand Meadow
Grand Rapids
Granite Falls
Hallock
Halstad
Harmony
Hastings
Hawley
Hector
Henderson
Herman
Heron Lake
Hibbing
Hinckley
Hopkins
Houston
Howard Lake
Hutchinson
Jackson
Janesville
Jordan
Kasota
Kasson
Kenyon
Kerkhoven
Lake Benton
Lake City
Lake Crystal
Lakefield
Lake Park
Lamberton
Lanesboro
Le Roy
Le Sueur
Le Sueur Center
Litchfield
Little Falls
Long Prairie
Luverne
Lyle
McIntosh
Mabel
Madelia
Madison
Mankato
Mantorville
Mapleton
Marshall
Mazeppa
Milaca
Minneapolis
  Central
  East
  North
  South
  West
Minneota
Montevideo
Montgomery
Monticello
Moorhead
Mora
Morris
Morton
Mountain Lake
New Prague
New Richland
New Ulm
Northfield
North St. Paul
Olivia
Ortonville
Osakis
Owatonna
Park Rapids
Paynesville
Pelican Rapids
Perham
Pine City
Pine Island
Pipestone
Plainview
Preston
Princeton
Red Lake Falls
Red Wing

Redwood Falls
Renville
Rochester
Royalton
Rush City
Rushford
St. Charles
St. Cloud
St. James
St. Louis Park
St. Paul
  Central
  Cleveland
  Humboldt
  Mechanic Arts
St. Peter
Sandstone
Sauk Center
Sauk Rapids
Shakopee
Sherburn
Slayton
Sleepy Eye
South St. Paul
Springfield
Spring Grove
Spring Valley
Staples
Stephen
Stewartville
Stillwater
Thief River Falls
Tracy
Two Harbors
Tyler
Virginia
Wabasha
Wadena
Warren
Waseca
Waterville
Welcome
Wells
West Concord
Wheaton
White Bear
Willmar
Willow River
Windom
Winnebago
Winona
Winthrop
Worthington
Zumbrota

Graduates of the following private schools will be admitted to the freshman class under same conditions governing admission of high school graduates, provided, that the regular four-year course taken satisfies the specific requirements of the college to which entrance is desired and provided also, that the student be recommended by the principal of the school for admission to the University:

St. Mary's Hall, Faribault
St. Paul Academy
Shattuck Military Academy, Faribault

Stanley Hall, Minneapolis
Windom Institute, Montevideo

Concordia College, Moorhead
Pillsbury Academy, Owatonna
St. Joseph's Academy, St. Paul
St. Paul's College, St. Paul Park
The Loomis School, St. Paul
The Backus School for Girls, St. Paul
The College of St. Catherine, St. Paul
St. Margaret's Academy, Minneapolis
The Winona Seminary, Winona
St. John's College, Collegeville
St. Thomas College

ADMISSION AS UNCLASSED STUDENTS

Whenever in the judgment of the enrollment committee an applicant presents satisfactory reasons for not taking the regular course, such applicant may be admitted as an unclassed student. He must take the same examinations or present the same credentials as are required of those who enter the freshman class. Exceptions can be made only upon vote of the faculty. A new application must be made each semester to the enrollment committee. Provided, that no unclassed student shall be admitted to the School of Mines.

ADMISSION TO STUDY MUSIC

Students who enter the University for the express purpose of studying music, must take the same examinations or present the same credits that are required of those who apply for admission to the freshman class. No student is admitted for the purpose of studying music, unless he presents a certificate from the department of music showing that he is qualified to pursue the courses offered.

ADMISSION TO ADVANCED STANDING

1. FROM OTHER COLLEGES

This University accepts records from all reputable colleges for credit to advanced standing. Such records are accepted as far as they are equivalent to the work done in the college to which admission is sought, subject to the approval of the departments concerned. 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 time spent upon each subject
(c) Ground covered in laboratory work, in case of laboratory subjects
(d) The result. It is sufficient to state that the subject was completed creditably.

Records from institutions whose entrance requirements are not as high as those of this University will not be accepted for equivalent rank. The credits to be allowed in such cases will be determined by the Enrollment Committee of the college in question.

2. FROM MINNESOTA NORMAL SCHOOLS

Graduates of the "advanced graduate course" of a Minnesota State Normal School are admitted to the College of Science, Literature, and the Arts (see bulletin of College of Science, Literature, and the Arts) with advanced standing equivalent to one year's credit.

Individual graduates of the "Advanced Latin course" (five year) or of the "Advanced English course" (five year) of a Minnesota State Normal School, who on the basis of maturity and ability, present certificates of special fitness from the president of the Normal School, will be admitted with advanced standing under the same regulation and proviso.

DESCRIPTION OF SUBJECTS ACCEPTED FOR ADMISSION

The following statements indicate in a general way the preparation which the University expects in the various subjects accepted for admission.

ENGLISH (four years)

In order to secure a definite plan of study and unity of method on the part of preparatory schools, the entrance requirement in English is outlined below somewhat in detail. To satisfy this requirement a four-year course of not less than four hours per week must be pursued. The headings under which instruction will naturally fall are:

(a) English Classics
(b) The Principles of Rhetoric
(c) Practice in Written Expression

(a) English Classics should include a critical reading, in class, of English masterpieces. The following are suggested as well adapted for such study: Shakespeare's *Macbeth*; Milton's *Paradise Lost*; Carlyle's essay on *Burns*. In the study of these works the student should know the leading facts connected with the author and his time; he should become familiar with the subject matter of the work and thoroughly at home with the story, and should have a clear idea of the form and structure of the work as a whole.

A less critical knowledge of other standard or classic works, which may perhaps be read by the student at home, with written reports and brief oral discussions in class, is desirable. The following works are noted as indicative of the minimum amount of work expected: at least two of Shakespeare's plays, beside the one read in class, one of Irving's works, one of Hawthorne's novels, one of Stevenson's novels, one of Webster's orations.

(b) The work in the principles of composition should include the principles and technical terms of ordinary texts upon the subject, whether acquired by the direct study of such texts or mainly by the study of selected English masterpieces. It should not be forgotten that this is not an end in itself, but simply a means of teaching the student the correct use of English.

(c) Not less than one hour each week throughout the four years of the high school course should be devoted to practice in written expression. The instructor may choose such topics as local conditions may require or make most profitable; but whatever line of work is pursued, the student should be taught to use language correctly and forcibly and learn to express himself clearly and logically in writing.

ELEMENTARY ALGEBRA (one year). Addition, subtraction, multiplication, division, factoring, highest common divisor, lowest common multiple, fractions, simple equations, with one, two, and several unknown quantities followed by problems, theory of exponents, involution (including the binomial theorem for positive integral exponents), evolution, radicals, inequalities, ratio, proportion, progression, and quadratic equations, with problems.

HIGHER ALGEBRA, FIRST PART (one-half year). While this subject does not include any topics not named under elementary algebra, a much fuller treatment of those topics is expected in this work. Principles as well as processes should be learned, theorems and rules should be rigorously demonstrated, the exercises and problems should be more difficult, and students should be drilled in short methods and rapid work. Unless candidates have a good knowledge of the fundamental topics named below, they are not prepared to pursue successfully at the University the second part of higher algebra.

The topics are addition, subtraction, multiplication, division, factoring, highest common divisor, lowest common multiple, fractions, theory of exponents, involution, evolution, surds, imaginaries and simple equations with problems.

PLANE GEOMETRY (one year). Any of the standard texts on this subject will furnish the necessary preparation. Isoperimetry, symmetry and maxima and minima of figures are not required. The exercises requiring solutions and demonstrations should not be omitted.

SOLID GEOMETRY (one-half year). Any of the standard texts on this subject will furnish the necessary preparation. The exercises requiring solutions and demonstrations should not be omitted.

LATIN GRAMMAR (one year). This will include the subjects of orthography, etymology and syntax. Proficiency is particularly desired in the following subjects: the analysis of the verb forms, the rules of syntax, and the principal parts of the irregular verbs.

CAESAR (one year). First four books or selections from the seven books equivalent to four; or three books, with thirty pages of Cornelius Nepos, or two books with sixty pages of Cornelius Nepos. Special attention should be paid to the translation of passages of the text into correct and idiomatic English; grammatical questions connected with the text; more especially on the subjunctive mood, indirect discourse and the sequence of tenses. The student is expected to be familiar with the life of Caesar and an account of his wars.

CICERO (one year). Any six orations from the following list. AGAINST CATILINE, POET ARCHIAS, LIGARIUS, MARCELLUS, MANILIAN LAW (to count as two orations), the fourteenth PHILLIPIC. The student should also be familiar with the life of Cicero.

VIRGIL (one year). Six books of the AENEID, or five of the AENEID and one of the METAMORPHOSES of Ovid, or the ECLOGUES. The student should be familiar with the life of Virgil and an account of his times and writings. A correct rythmical reading of the text is to be encouraged.

GREEK GRAMMAR (one year)

XENOPHON'S ANABASIS (one year)—Four books

GERMAN (two years)

First year the pupil should acquire:

(1) A correct pronunciation, training of the ear, eye and organs of speech.

(2) A vocabulary of a thousand words of every day use; facility in combining these words into simple sentences. As a means to this, 100 to 150 pages of easy narrative prose and poetry should be read, from which questions and answers may be formed. To test the student's memory and knowledge of the word-order he should relate or write out the story anew in his own words.

(3) From two to three hundred German idioms.

(4) The essentials of German grammar, to be taught by means of oral and written exercises based upon the reading lessons.

Second year:

(1) Read one hundred and fifty to two hundred pages of prose and poetry.

(2) Practice in reading smoothly and with expression.

(3) Carefully translate selected passages of the text into idiomatic English. To translate easy sentences which the student already understands is a waste of time.

(4) Translate sentences from English into German, using words and idioms of the text read.

(5) Study topically German grammar; chief rules of orthography, etymology and syntax; illustrate these by words, phrases and sentences selected or composed by the student.

FRENCH (two years). The principles of French grammar, including acquaintance with the verb, regular and irregular; an ability to translate easy English sentences into French and simple French prose into English.

SPANISH (two years). First year, grammar and reader; second year, grammar reviewed; reading of some modern writer; composition and conversation.

NORWEGIAN (two years). First year, grammar and reader; one of Bjornson's stories. Second year, grammar reviewed; Raabe's History of Norway and a modern story or some easy play; composition and conversation.

SWEDISH (two years). First year, the essentials of Swedish grammar; reading of easy prose and verse. Second year, grammar reviewed and composition; works of Tegner and Runeberg; elementary history of literature.

ANCIENT HISTORY (one year)

(a) This study should begin with from five to seven weeks upon the oriental peoples who have most influenced European development, noting the early civilizations in the valleys of the Nile and Euphrates, the spreading and meeting of these civilizations in the intermediate region, with notice of the more important states in that district, and the union of the East under Persia. This survey should aim to give an idea of the reach of recorded history, of the distinguishing features of the successive oriental nations, and of their more important influence upon later European development.

(b) In the Greek and Roman age emphasis should be put upon the evolution of institutions, and considerable attention should be paid to the later Hellenistic period, after the rise of Macedon, and to the Roman Empire, with its bearing upon subsequent history. Some of the work should be illustrated by the use of sources, and maps should be used constantly.

(c) The subject should be carried down to the establishment of Charlemagne's empire. This will bring together all the chief lines of influence which were afterward to make our modern world, will show the meaning of the preceding eras as can not be done if the study stops at an early date, and will leave the subject at a period of comparative order and simplicity.

MODERN HISTORY (one year). From Charlemagne to the present. The topics to which special attention are called are the period of disorder after Charlemagne and the consequent rise of feudalism, the Holy Roman Empire and the papacy, the medieval church, the crusades, the free cities, the rise of national monarchies, the intellectual renaissance and the protestant reformation, the French revolution and the subsequent democratic movements in politics and industry.

It is desirable to give at least half of the year to this last period from 1789.

ENGLISH HISTORY (one-half year). The Saxon period should be passed over rapidly. In the remainder of the work, besides the narrative, constitutional points should receive attention, and easily accessible documents, like Magna Charta, should receive careful study.

SENIOR AMERICAN HISTORY (one-half year). No attempt should be made to cover the whole field in this time. Either the colonial history or the period from 1783 to 1832 offers quite enough material. In any case, considerable use should be made of collections of documents, and sources.

AMERICAN GOVERNMENT (one-half year.) This should be a study of our government, national, state and local,as it is organized and actually operated today. Students should be made familiar with the purpose and salient features of important instruments of government and other public acts like the Declaration of Independence, Articles of Confederation, the Constitution of the United States, the constitution of Minnesota, and a local city or village charter.

In no case, however, should the instruction consist wholly or largely of an analysis of documents. It should rather aim to impart information essential to intelligent, active citizenship,such as the division of the government into departments, their organization and function; the methods of nominating, electing, and appointing men to office; of framing and amending constitutions, city charters and statutes; of drawing grand and petit juries and the duty of the citizen to serve on them; the distinction between common law, state law, and constitutional law, between equity, civil and criminal cases.

To make the government seem a real working organization to the student, he

should be encouraged to observe public proceedings by attending school meetings, town meetings, sessions of the county commissioners, city council, state legislature, a trial in court, and party primaries and conventions. He should also be led to read about and observe public affairs for himself. To that end let him collect statistics and accounts of work done by particular offices and departments from published reports and by personal inquiry.

PHYSICS (one year). It is suggested that the year's work be confined to four of the seven subjects mentioned below.

(1) Mechanics of solids, (2) liquids and gases, (3) sound, (4) heat, (5) light, (6) and (7) electricity and magnetism (to count as two subjects, but not to be divided).

CHEMISTRY (one year). The full year's work should include a study of both the non-metals and metals with laboratory experiments illustrating the common chemical laws and the commoner chemical reactions.

BOTANY (one or one-half year). Schools which give one-half year of botany should devote particular attention to plant relations, making the course largely ecologic in bearing. When a whole year is given to the subject, additional work upon plant structures should be offered, and together with fundamental conceptions of ecology, a general idea of morphology and taxonomy should be the aim of the course.

ZOOLOGY (one or one-half year. The course of zoology, whether a half year or a year course, should be a natural history rather than a modern morphological course. Collecting and classifying (as a means) should be encouraged as much as possible. Animals should be studied as living units, in their relation to one another and their environment. The general and special structural feature in relation to the habits, the food and manner of obtaining it, the enemies and means of protection against them, hibernation, migration, the differences in habits, form and structure between the old or mature animal and the young, the relation of parents to their offspring, etc. —in short, all about the life of the animal under consideration should be made out by direct observation of the animal in its natural home and in confinement.

The course, on the whole, should aim to foster and develop a love for nature, train the power of observation toward accuracy and give a healthful stimulation to the imagination. The pupil should be guarded against the habit of confounding the facts of observation with his interpretation and his judgments.

The animals for direct observation should be selected from as many branches of the animal kingdom as possible, and the changes during the year in the character of the fauna of the locality in general as well as of some particular region should be noted. In some localities the work will of necessity be largely restricted to land and air animals, but no locality in Minnesota is so poor in animal life that very profitable work cannot be laid out along the line indicated above.

It will be noticed that such a course of necessity includes so-called laboratory work. The amount and extent of the laboratory work will depend upon conditions, but even under the best conditions it is hardly advisable to go into detailed dissections and embryology. Continued, repeated, and close observation, aided now and then, by a simple hand lens or a compound microscope, will reveal an abundance of material and opportunity for disciplining the mind.

ASTRONOMY (one-half year). An elementary course in general astronomy as presented in any good modern text-book.

GEOLOGY (one-half year). These subdivisions should receive special attention: physiographic geology, which treats of the building of the land and the evolution of its existing contours; geo-dynamics, the study of the forces, atmosphere, water, terrestrial heat, plants and animals modifying the earth; and a brief survey of historical geology.

PHYSIOGRAPHY (one-half year). The following topics should be emphasized: meteorology, the leading facts relating to the atmosphere and its phenomena, includ-

ing some acquaintance with the work of the United States weather bureau; land sculpture, as it treats of the origin, development and decadence of land forms, and the influence of these processes on the physical environment of man.

COMMERCIAL GEOGRAPHY (one-half or one year). As the history of commerce is concerned with the past, so commercial geography describes and seeks to explain the commerce of today. The work should cover the ways in which commerce depends on nature and on man, the development of means of transportation and communication, and a detailed study of the several commercial nations of the world with reference to resources, industries, transportation facilities and commerce. It should be based on a text book supplemented by map work and assigned readings.

BUSINESS SUBJECTS

THESE ARE ACCEPTED FOR ADMISSION ONLY WHEN CONSTITUTING PARTS OF A BUSINESS COURSE

The following syllabi are offered by the University in order that the schools may be informed concerning the preparation expected in business subjects, in view of the fact that the graduates of business courses are now admitted to certain colleges of the University on the same footing as the graduates of other courses.

It is not intended or expected that many schools, or perhaps any one school, will offer all the subjects indicated. Not to exceed forty per cent of the units for admission should in any case be taken from the list of technical business subjects named below. The other sixty per cent should embrace the required English and mathematics, together with some work in history, science and the modern languages. The University is strongly of the opinion that no business course should be offered which does not include at least two years of some one modern language.

Under the head of business subjects are included two distinct lines of work: first, courses dealing with the history, description, theory and law of business, including the history of commerce, commercial geography, elementary economics and business law; second, courses dealing with the technique of business. The latter may be further subdivided into the mathematics of business, including business arithmetic, bookkeeping and business practice; and the language of business, including stenography, typewriting and business correspondence.

HISTORY OF COMMERCE (one-half or one year). The history of commerce forms the natural introduction to the study of present economic conditions. It would be well to give special attention to the economic history of England and the United States. The work should be based on a text book, supplemented by carefully directed map work and assigned readings. This should be preceded by a year course of medieval and modern European history.

ECONOMIC HISTORY OF THE UNITED STATES (one-half year). A study of American history with special attention to the economic factor. It should be based on some text book such as Wright, Coman or Nogart and supplemented by collateral reading, especially in books such as Semple and Brigham on geographic influences.

This course will naturally follow the one on English history and may take the place of the usual political American history.

ECONOMIC HISTORY OF ENGLAND (one-half year). A study of English history with special reference to causes and effects of her economic development. It should be based on some of the smaller economic histories such as Cheyney, Price or Cunningham and McArthur.

This course, where given, will naturally follow the courses in general European history, and may take the place of the usual political English history.

ELEMENTARY ECONOMICS (one-half year). In the study of economics it is desirable to avoid two extremes, abstract theory on the one hand, and controversial questions such as the tariff, trusts, and trade unions on the other hand. Emphasis

should be placed on historical and descriptive matter, especially relating to the economic development of England and the United States. Some good elementary text book should be mastered and a reasonable amount of collateral reading required.

Business Law (one-half year). The object of this study is not to make "every man his own lawyer" but rather to enable him to keep out of legal complications. Text book supplemented by study of a few typical cases, and practice in drawing up ordinary legal papers such as bills, notes, checks, etc.

Business Arithmetic (one-half year). The object is first of all, absolute accuracy and secondly speed in ordinary business computations. The topics to be emphasized are fundamental operations, common fractions having as denominator 2, 3, 4, 6 and 8, a few common weights and measures, percentage and its applications, and useful short methods, especially the use of interest and other calculation tables The work should be based on a text book, supplemented by numerous live exercises from current sources.

Elementary Bookkeeping (one year). A text book should be employed with exercises so arranged that no two pupils will do exactly the same work, and no credit should be allowed unless the work is done neatly, accurately and at a satisfactory rate of speed. It is suggested that double periods be provided, and all work be done in class under the eye of the instructor. The set used should include the journal, cash book, sales book, ledger, check book, bank pass book and trial balance book.

Advanced Bookkeeping and Business Practice (one year). Thorough drill on standard business forms, such as bills, receipts, checks, notes, etc., also on the use and meaning of business symbols and abbreviations. The student should become acquainted with the bill book and invoice book, and loose leaf and voucher systems of bookkeeping. Each student should carry on a business of his own, first as an individual, then as a partnership, and finally as a corporation. Credit on this course should mean that the student lacks only age and actual business experience to become a competent bookkeeper.

Stenography and Typewriting (two years). This work is expected to occupy not less than two periods daily for two years. No credit should be given for either shorthand or typewriting if taken alone. Nothing but the touch method should be used in typewriting. The essentials are first, accuracy and speed in taking dictation and transcribing notes; secondly, correct spelling, capitalization, punctuation and paragraphing. The minimum speed at the end of the first year should be 75 words per minute in dictation and 25 words per minute on the machine; and at the end of the second year, 100 words per minute in dictation and 35 words per minute in transcribing notes. Thorough training should also be given in care of the machine, in modern methods of manifolding and in filing papers.

Spelling and Business Correspondence (one-half year). Preliminary review of five hundred common technical business words. Thorough training on business correspondence including (1) the proper form for business letters, (2) the proper choice of words and construction of sentences with reference to clearness and brevity, (3) capitalization, punctuation and paragraphing, (4) writing and answering telegrams and advertisements. The work should be based on a text book supplemented by letters relating to the most prominent industries of the locality.

MANUAL SUBJECTS

THESE ARE ACCEPTED FOR ADMISSION ONLY WHEN CONSTITUTING PARTS OF A MANUAL TRAINING COURSE

In view of the multiplication of manual training courses in the high schools, it seems well to define what the University expects in the line of manual training and drawing work. It is not implied that many schools, or perhaps any one school, should offer all of the subjects indicated. Not to exceed twenty-five

per cent of the units for admission to the University should in any case be taken from the list given below. The major part of the course should consist of the required English, and of mathematics, history, business subjects, science and foreign languages. Students taking a manual training course should be held to a full course in mathematics, and should be required to complete not less than two years of one foreign language.

Owing to the fact that drawing and shop work do not require outside preparation, it is not fair that they should be credited by the schools on the same basis as the academic subjects. It is therefore suggested that half the credits be allowed: that is to say, one full credit for two years of work one period daily, or for one year of work two periods daily, in each subject.

Freehand Drawing (two credits)

Mechanical Drawing (two credits)

Joinery (one-half credit)

Wood Turning and Cabinet Making (one-half credit)

Pattern Making and Forge Shop (one-half credit)

Machine Shop, including Chipping

Filing and Work on the Iron Lathe (one-half credit)

Drill Press and Iron Planer

Clay Modelling (one-half credit)

Wood Carving (one-half credit)

Domestic Art, including Carefully Graded Exercises in Sewing (one credit)

Domestic Science, including Practical Cookery, and Household Economy (one credit)

Degrees

The candidate for a degree must complete the requirements for graduation in his course. Any person may undergo, at suitable times, examination in any subject, and if such person pass in all the studies and exercises of the course, he is entitled to the appropriate degree; PROVIDED, however, that at least one full year (the one immediately preceeding the granting of the degree) must be spent at the University, before such degree shall be granted, and PROVIDED that examination, in every case, be held before a committee of the faculty appointed for that purpose.

For detailed information concerning requirements see the bulletins of the separate colleges and schools.

The degrees Bachelor of Arts, Bachelor of Arts in Education, Bachelor of Science, Master of Science, Master of Arts, Doctor of Philosophy, Civil Engineer, Mechanical Engineer, Electrical Engineer, Engineer of Mines, Metallurgical Engineer, Bachelor of Science in Chemistry, Bachelor of Science in Chemical Engineering, Bachelor of Science in Agriculture, Bachelor of Science in Forestry, Bachelor of Science in Home Economics, Doctor of Civil Law, Master of Laws, Bachelor of Laws, Doctor of Medicine, Doctor of Dental Surgery, and Bachelor of Pharmacy, are conferred, after recommendation by the deans of the respective colleges, by vote of the Regents.

THE UNIVERSITY STATE TEACHER'S CERTIFICATE

Graduates of the University may apply for and receive upon vote of the faculty, the University State Teacher's Certificate under the following conditions:

First: They must have maintained a good average of scholarship throughout the four years of college study.

Second: They must have the recommendation of at least one department concerned with high school studies.

Third: They must have completed one semester of Psychology and three semesters of Education, including courses 1 and 2.

This certificate by state law authorizes students to teach in the public schools of Minnesota for two years from date. After that time, upon satisfactory evidence of success, the certificate may be made permanent by the endorsement of the State Superintendent of Public Instruction and the President of the University.

VII

FEES AND EXPENSES

Expenses

All fees for incidental, laboratory or other charges are payable at the beginning of each semester or term.

FEES

College of Science, Literature and the Arts

	Per semester
Incidental fee, resident	$10.00
Incidental fee, non-resident	20.00
Animal Biology, courses 1 to 4, 8, 9, 15, each	3.00
Botany, courses 1 to 16, each	3.00
Chemistry 1, 2, 3, each	5.00
Chemistry, 4	7.00
Chemistry, 5	10.00
Geology 10 and 11, each	1.00
Mineralogy, 1 and 2	3.00
Mineralogy, 3	15.00
Music, 1, 2, 3 and 8, each	4.00
Music, 4 and 5	32.00 to 64.00
Music, 6	2.00
Physics, 2, 4, 5, 6, 7, 8, 9, 10, 12, 13, 15, 17, each	3.00
Physics, 7, 11, and 16, each	5.00

Drill suit, $15.00
Gymnasium suit, $2.00
Locker fees, $1.50
Deposit fee—military department, $5.00

College of Engineering

Incidental fee, resident	$15.00
Incidental fee, non-resident	30.00

Freshman Year

First semester	
Shop work	4.50
Second semester	
Shop work	4.50

Sophomore Year

First semester	Per semester
Chemistry	5.00
Physics	3.00
Shop work	4.50
Biology or Botany	3.00
Second semester	
Same as for first semester.	

For Classes Graduating in 1910-1911

Junior Year

First semester	
Shop work	$4.50
Materials Testing Laboratory	6.00
Electrical Laboratory	1.50
Physics	3.00
Second semester	
Steam Laboratory	3.00
Hydraulic Laboratory	3.00
Experimental Laboratory	4.50
Electrical Laboratory	6.00
Electric Power	3.00

Senior Year

First semester	
Electrical Laboratory	$3.00
Fuel and Gas analysis	5.00
Electric Power	3.00
Experimental Laboratory	3.00 to 4.50
Second semester	
Electrical Laboratory	$4.50
Electric Power	3.00
Gas Engine Laboratory	6.00
Deposit fee—military department, freshman and sophomore years	5.00
Drill suit	15.00

College of Agriculture

Incidental fee, resident	$10.00
Incidental fee, non-resident	20.00

Laboratory fees same as under College of Science, Literature and the Arts.

College of Law

Matriculation fee	$10.00
Incidental fee (three terms) per term	20.00
Book deposit fee, per year	5.00

College of Medicine and Surgery

	Per semester
Incidental fee	$50.00
Microscope fee, 1st year, 1st sem	4.00
2nd year, 1st sem., $3.00, 2nd sem	4.00
3rd year, 1st semester	4.00
4th year, Clinical Microscopy	2.00
For elective courses	2.00

	Per year
Breakage fee deposit	$5.00
Hospital fee (Jr. and Sr. year)	3.00

College of Homeopathic Medicine and Surgery

Same as for College of Medicine and Surgery

College of Dentistry

	Per semester
Incidental fee	$75.00

	Per year
Breakage deposit	5.00

College of Pharmacy

TWO YEAR COURSE

	Per year
First year	$75.00
Second year	90.00
	$165.00

THREE YEAR COURSE

First year	$45.00
Second year	55.00
Third year	65.00
	$165.00

School of Mines

FRESHMAN YEAR

	Per year
Incidental fee, resident	$30.00
Incidental fee, non-resident	60.00
Chemical laboratory fee	10.00
Mineralogical laboratory fee	6.00
Assaying laboratory fee	15.00

	Per year
Books	13.00
Draughting instruments	15.00
Note book and supplies	6.00
	$95.00

SOPHOMORE YEAR

Incidental fee, resident	$30.00
Incidental fee, non-resident	60.00
Chemical laboratory fee	14.00
Books	8.00
Note books and supplies	2.00
	$54.00

JUNIOR YEAR

Incidental fee, resident	$30.00
Incidental fee, non-resident	60.00
Steam laboratory	3.00
Trip to the mines	$100.00 to 175.00
Books	20.00
Note books and supplies	2.00
	$152.00 to 227.00

SENIOR YEAR

Incidental fee, resident	$30.00
Incidental fee, non-resident	60.00
Chemical laboratory fee	10.00
Electrical laboratory fee	5.00
Ore testing laboratory fee	10.00
Experimental laboratory fee	6.00
Books	30.00
Note books and supplies	2.00
	$93.00
Deposit fee	3.00

The School of Chemistry

	Per semester
Incidental fee, resident	$15.00
Incidental fee, non-resident	30.00
Shop	4.50
Assaying	15.00
Chemistry courses 1, 2, 3, 10, 14, 18, 19, 23	5.00
Chemistry courses 4, 5	7.00

	Per semester
Chemistry course 6	10.00
Chemistry courses 9, 11, 12, 13, 15, 16, 17, 20, 24	3.00

The College of Education

Incidental fee, resident	$10.00
Incidental fee, non-resident	20.00

Other fees same as for College of Science, Literature and the Arts.

The Graduate School

Incidental fee,	$10.00

Proportionate fees for less than full work.

A fee of 25 cents per day is charged for each day of delayed registration in each of the colleges except the graduate school.

LIVING EXPENSES

The University of Minnesota has no dormitory system, and all students are thrown upon their own responsibility in obtaining boarding and rooming places.

The expense of living at the University varies greatly according to individual habits and tastes. In general the scale of expense is below rather than above that of similar institutions in the middle west and is considerably lower than that of most institutions situated in the eastern states.

Several years ago a number of young men and women, at the request of University officials, kept careful account of their expenses for the University year. The result was that the expenses of the young men ranged from two hundred and seventeen to three hundred and ninety-seven dollars for the University year. The same students earned sums varying from two hundred and thirty-seven to two hundred and seventy-two dollars. The young women reported expenses varying from one hundred and fifty to three hundred and fifty-five dollars. These figures do not include fees and, as the cost of living has increased decidedly, probably twenty-five per cent should be added to these figures to make them safe.

The students upon whose statements these figures are based were representative students; they were not extravagant nor did they deny themselves unduly to get along. While students can live within the figures given above, they would not, owing to the increased cost of living, be able to live as comfortably nor to have as many privileges as these students had.

Meals can be had at prices ranging from three dollars per week to as high as the student can afford to pay. In private families board ranges from three to five dollars.

Furnished rooms vary in price from eight to twenty dollars per month. Two students rooming together would of course reduce this expense. It

is sometimes possible for a student, rooming alone, to secure a good room at an expense but little higher than when two room together; but such chances are the exception and not the rule. New students will find that they will be more likely to secure comfortable rooms and suitable board if they will consult the general secretary of either the Young Men's or Young Women's Christian Association immediately upon arrival at the University, or if they will correspond with these officers before coming to the University.

The student who learns some trade before coming to the University has a great advantage over the student who has to earn his money by ordinary manual labor. Students have earned their whole expenses while attending the University and have made good records at the same time. Other students have done so much work that they have not been able to keep up their studies, and have thus missed the one thing for which they were attending the University.

If it is possible for the student to have a part of his expenses paid, he should not attempt to earn his way entirely by his own exertions. It is a comparatively easy thing for a young man to earn half his living while attending the University and yet do good work in his classes. Students who want work seldom fail to find it. In coming to the University, the student should bring enough money with him so that he can live comfortably for a few weeks until he can find something to do.

Students who desire advice and assistance in securing a position to help pay their expenses should confer with the Secretary of the Y. M. C. A. at the University.

A pamphlet has been published containing five papers (one by a young woman) relating actual experiences of students who have made their way through the University. Students who contemplate making their own way through college will find here stated some very interesting and encouraging facts. A copy will be sent free to any address upon application.

VIII

Departments of Instruction

A

THE COLLEGE OF SCIENCE, LITERATURE AND THE ARTS

The College of Science, Literature and the Arts

FACULTY OF INSTRUCTION

CYRUS NORTHROP, LL. D., President

JOHN F. DOWNEY, M. A., C. E., Dean, Professor of Mathematics, Head of Department of Mathematics

ADA LOUISE COMSTOCK, M. A., Dean of Women, Professor of Rhetoric.

WILLIAM W. FOLWELL, LL. D., Emeritus Professor of Political Science

JABEZ BROOKS, D. D., Emeritus Professor of Greek

JOHN G. MOORE, B. A., Professor of German, Head of Department of German.

CHRISTOPHER W. HALL, M. A., Professor of Geology and Mineralogy, Head of Department of Geology

CHARLES WILLIAM BENTON, Litt. D., Professor of the French Language and Literature, Head of Department of Romance Languages

MARIA L. SANFORD, Emeritus Professor of Rhetoric

JOHN CORRIN HUTCHINSON, B. A., Professor of Greek, Head of Department of Greek.

JOHN SINCLAIR CLARK, B. A., Professor of Latin Language and Literature

HENRY F. NACHTRIEB, B. S., Professor of Animal Biology, Head of Department of Animal Biology

†FREDERICK S. JONES, M. A., Professor of Physics, Head of Department of Physics

GEORGE BELL FRANKFORTER, Ph. D., Professor of Chemistry, Head of Department of Chemistry.

WILLIS MASON WEST, M. A., Professor of History, Head of Department of History

FRANCIS P. LEAVENWORTH, M. A., Professor of Astronomy, Head of Department of Astronomy

FREDERICK KLAEBER, Ph. D., Professor of Comparative and English Philology, Head of Department of Comparative Philology

JOSEPH BROWN PIKE, M. A., Professor of Latin, Head of Department of Latin

CHARLES PETER SIGERFOOS, Ph. D., Professor of Zoology

RICHARD BURTON, Ph. D., Professor of English Literature, Head of Department of English

JOHN ZELENY, Ph. D., Professor of Physics, Head of Department of Physics

SAMUEL G. SMITH, Ph.D., LL.D., Professor of Sociology, Head of Department of Sociology and Anthropology

GEORGE FRANCIS JAMES, Ph.D., Professor of Education, Head of Department of Education

NORMAN WILDE, Ph.D., Professor of Philosophy and Psychology, Head of Department of Philosophy and Psychology

CARL SCHLENKER, B.A., Professor of German

FRANK MALOY ANDERSON, M.A., Professor of History

ALBERT ERNEST JENKS, Ph.D., Professor of Anthropology

WILLIAM A. SCHAPER, Ph.D., Professor of Political Science

CHARLES FREDERICK SIDENER, B.S., Professor of Chemistry

EDWARD SIGERFOOS, Ph.B., LL.B., Capt. U.S.S., Professor of Military Science, Head of Department of Military Science and Tactics

ALBERT WILLIAM RANKIN, B.A., Professor of Education

GEORGE NEANDER BAUER, Ph.D., Professor of Mathematics

FREDERIC EDWARD CLEMENTS, Ph.D., Professor of Botany, Head of Department of Botany

JOHN HENRY GRAY, Ph.D., Professor of Economics and Politics, Head of Department of Economics and Political Science

FRANCES SQUIRE POTTER, M.A., Professor of English

EDWARD VAN DYKE ROBINSON, Ph.D., Professor of Economics and Politics

ALBERT BEEBE WHITE, Ph.D., Professor of History

GISLE BOTHNE, M.A., Professor of Scandinavian Languages and Literature, Head of Department of Scandinavian Languages

ANDREW ADIN STOMBERG, M.A., Professor of Scandinavian Languages and Literature

CARLYLE SCOTT, Professor of Music

WILLIAM STEARNS DAVIS, Ph.D., Professor of Ancient History

JOSEPH M. THOMAS, M.A., Professor of Rhetoric, Head of Department of Rhetoric

JOHN EVENSON GRANRUD, Ph. D., Professor of Latin

CHARLES ALBERT SAVAGE, Ph.D., Professor of Greek

ANTHONY ZELENY, Ph.D., Professor of Physics

CHARLES MARTIN ANDRIST, M.L., Professor of French

FLETCHER HARPER SWIFT, Ph.D., Professor of Education

JOSEPH W. BEACH, Ph.D., Assistant Professor of English
JOHN C. BROWN, M.A., Assistant Professor of Animal Biology
OSCAR BURKHARD, M.A., Assistant Professor of German
WILLIAM HENRY BUSSEY, Ph.D., Assistant Professor of Mathematics
LOUIS JOSEPH COOKE, M.D., Director of Gymnasium.
SAMUEL N. DEINARD, Ph.D., Assistant Professor of Semitic Language and Literature
IRA H. DERBY, M.A., Assistant Professor of Chemistry
HAL DOWNEY, M.A., Assistant Professor of Animal Biology
HENRY ANTON ERIKSON, B.E.E., Assistant Professor of Physics
OSCAR W. FIRKINS, M.A., Assistant Professor of Rhetoric
JULIUS T. FRELIN, B.A., Assistant Professor of French
EVERHART P. HARDING, M.A., Assistant Professor of Chemistry
ROWLAND HAYNES, M.A., Assistant Professor of Psychology
HANS JUERGENSEN, M.A., Assistant Professor of German
EDWARD M. LEHNERTS, M.A., Assistant Professor of Geography
JAMES BURT MINER, Ph.D., Assistant Professor of Psychology
THOMAS WARNER MITCHELL, Ph.D., Assistant Professor of Business Administration
EDWARD E. NICHOLSON, M.A., Assistant Professor of Chemistry
OSCAR W. OESTLUND, Ph.D., Assistant Professor of Animal Biology
GEORGE PORTER PAINE, M.A., Assistant Professor of Mathematics
MARY GRAY PECK, M.A., Assistant Professor of English
FRANK M. RARIG, M.A., Assistant Professor of Rhetoric
†BENJAMIN M. RASTALL, M.A., Assistant Professor of Economics
SAMUEL N. REEP, M.A., Assistant Professor of Sociology
CARL OTTO ROSENDAHL, Ph.D., Assistant Professor of Botany
FREDERICK W. SARDESON, Ph.D., Assistant Professor of Paleontology
DAVID FERDINAND SWENSON, B.S., Assistant Professor of Philosophy
JOSEPHINE E. TILDEN, M.S., Assistant Professor of Botany
ANTHONY L. UNDERHILL, Ph.D., Assistant Professor of Mathematics
MATILDA JANE CAMPBELL WILKIN, M.L., Assistant Professor of German
HENRY L. WILLIAMS, M.D., Director of Athletics
JEREMIAH S. YOUNG, Ph.D., and RALPH H. HESS, Ph.D., Assistant Professors, Extension Work in Economics and Political Science

CEPHAS DANIEL ALLIN, M.A., LL.B., Instructor in Political Science
EMMA BERTIN, Instructor in French
ANNA M. BUTNER, Director of Physical Culture for Women
FREDERIC K. BUTTERS, B.A., Instructor in Botany
HENRIETTE CLOPATH, Instructor in Drawing
WILFORD O. CLURE, B.A., LL. B., Instructor in Rhetoric

LILLIAN COHEN, M.A., Instructor in Chemistry
JOHN L. COULTER, M.A., Instructor in Economics
FRANICS C. FRARY, M.S., Instructor in Chemistry
WILLIAM K. FOSTER, LL.B., Assistant Director of Gymnasium
HALDOR B. Gislason, B.A., LL.B., Instructor in Rhetoric
FRANK F. GROUT, B.S., Instructor in Geology and Mineralogy
JOHN A. HANDY, Ph. C., Instructor in Chemistry
WILLIAM F. HOLMAN, Ph.D., Instructor in Physics
NED L. HUFF, M.A., Instructor in Botany
LEULAH J. JUDSON, M.A., Instructor in History
ALOIS F. KOVARIK, M.A., Instructor in Physics
†JAMES E. MANCHESTER, Sc.D., Instructor in Mathematics
JAMES S. MIKESH, B. A., Instructor in Mathematics
CARL M. MELOM, M.A., Instructor in Spanish and French
CHARLES W. NICHOLS, M.A., Instructor in Rhetoric
WALLACE G. NOTESTEIN, Ph.D., Instructor in History
RAYMOND V. PHELAN, Ph.D., Instructor in Economics
ANNA H. PHELAN, Ph.D., Instructor in Rhetoric
BERT A. ROSE, Instructor of Band
ROYAL R. SHUMWAY, B.A., Instructor in Mathematics
NELLIE A. WHITNEY, B.L., Instructor in Rhetoric
RICHARD WISCHKAEMPER, M.A., Instructor in German
HURBERT H. WOODROW, Ph. D., Instructor in Psychology
JAMES ZIMMERMAN, Instructor in Chemistry
FRANZ AUST, B.A., Assistant in Physics
EDWARD ANDERSON, B.S., in Chem., Assistant in Chemistry
WALTER BADGER, B.A., B.S., Assistant in Chemistry
THOMAS CAHILL, Assistant in Rhetoric
CHARLES R. CRESSY, B.S., Assistant in Chemistry
JAMES DAVIES, Ph. D., Assistant in German
RENE M. DELAMARE, Assistant in French
RUPERT EICHHOLZER, M.A., Assistant in German
HELEN GRIFFITH, B.A., Assistant in Rhetoric
DAISY HONE M.A., Assistant in Botany
A. ALFRED JOHNSTON, B.A., Laboratory Assistant in Geology
CHARLES E. JOHNSON, M.A., Assistant in Animal Biology
ALFRED E. KOENIG, Assistant in German
LOUIS W. MCKEEHAN, B.S. in Engr., Assistant in Physics
JESSIE A. MATSON, Assistant in Physical Culture
LEON METZINGER, B.A., Assistant in German
ALICE M. MISZ, M.A., Assistant in Botany
PETER OKKELBERG, B.A., Assistant in Animal Biology
ELENOR SHELDON, B.A., Assistant in English
FRIEDA L. STAMM, B.A., Assistant in German

MAUDE STEWARD, Assistant in Drawing
EDITH VON KUSTER, Assistant in Chemistry
† Resigned

STUDENT HELPERS

For 1908-9

EDLA BERGER, B.A., Scholar in Mathematics
KEIVIN BURNS, B.A., Scholar in Astronomy
ARTHUR R. GRAVES, Scholar in Economics and Political Science
ALBERT N. GILBERTSON, B.A., Scholar in Sociology and Anthropology
INGEBRIGHT LILLIHI, B.A., Scholar in Philosophy
ALLISON MCMANIGAL, B.A., LL.B., Scholar in Sociology and Anthropology
WILLIAM W. NORTON, Scholar in Philosophy
ALICE POPE, B.A., Scholar in History
CHARLES PHILIPS, Scholar in Animal Biology
RASMUS S. SABY, M.A., Scholar in Economics and Political Science
DOROTHEA STEWART, B.A., Scholar in Geology
PETER A. SVEEGGAN, B.A., Scholar in Rhetoric
VICTOR N. VALGREN, B.A., Scholar in Economics and Political Science
TOSCA VON SCHULTEN, Scholar in German
ANNALEE WEISKOPF, B.A., Scholar in German

Faculty Committees

For 1909-10

Enrollment—HUTCHINSON, BAUER, SAVAGE, SWENSON, ZELENY, A.

Curriculum—MOORE, WEST, SIGERFOOS, RANKIN, ERIKSON, PIKE, ROBINSON.

Graduate Studies and Degrees—EDDY, GRAY, BROOKS, NACHTRIEB, SCHLENKER, GEROULD, HUTCHINSON (ex-officio).

Program—LEAVENWORTH, TILDEN, MINER

Students' Work—NICHOLSON, '09; WHITE, '10; COMSTOCK, '11; Wilde, '12; BUSSEY, '13

Relation of the University to the Public Schools—JAMES, BENTON, HALL, BOTHNE, ANDRIST

Public Lectures and University Functions—JENKS, POTTER, SIDENER, JUERGENSON, KLAEBER

Debate and Oratory—RARIG, SANFORD, WILLIS, SARDESON, SCHAPER

University Extension—JAMES, BURTON, FRANKFORTER, GRANRUD, ROSENDAHL, PECK

Catalogue—DOWNEY, ZELENY J., CLEMENTS, CLARK, ANDERSON STOMBERG, THE REGISTRAR

Admission

Every applicant for admission to this college must take an examination in writing, spelling, and English composition. (For details see page 105.)

Aside from this test, admission is either by certificate or by examination.

No student is admitted with more than three half-year conditions and all such conditions must be removed by examination within one year.

No student will be admitted to the work of the second semester unless he bring a certificate of advanced standing from another college showing his qualifications to continue the second semester's work. This is because all freshmen subjects begin in the fall and are continued throughout the year.

ADMISSION TO THE FRESHMAN CLASS BY CERTIFICATE

The following are admitted to the freshman class by certificate:

(a) Graduates of a four-year course of a Minnesota state high school, or other accredited school in Minnesota, provided:

1. That they have credits for four years of English and one year each of Algebra and Plane Geometry (all who do not present credits for both First Part Higher Algebra and Solid Geometry are required to take mathematics five times per week through the freshman year);

2. That they have nine additional year-credits for subjects selected from B below;

3. That they have records of "passed with credit" or "passed with honor" in all subjects presented.

This certificate privelege is further limited by the proviso that each school so accredited shall keep its records of standings in the following grades: "passed," "passed with credit," and "passed with honor, "or else shall show by a printed statement in the record book and in the catalogue of the school, how the marks in use are to be translated into these three grades.

The applicant for admission must present to the Registrar the principal's certificate containing his record on all the studies which were counted towards graduation.

All records shall be entered on this certificate as "passed," "passed with credit" or "passed with honor."*

Each mark below "passed with credit" shall count as a condition, unless a state high school board certificate shall be presented for the same subject.

Beginning in September, 1909, this rule for admission shall be applied to all work completed after June, 1908. Until it goes into effect for the full four years' work, applicants will be admitted provided they have not, on the average, more than one semester mark below "passed with credit" for each year subject to the rule.

(b) Graduates of a four-year course of a school in any other state which is accredited to the state university of that state.

(c) Graduates of the advanced Latin course of the Minnesota state normal schools.

*In per cent, these three grades are to be interpreted approximately as follows:

(1) In schools having 65 as a passing mark, passed = 65-75, passed with credit = 75-90, passed with honor = 90-100.

(2) In schools having 75 as a passing mark, passed = 75-80, passed with credit = 80-90, passed with honor = 90-100.

SUBJECTS ACCEPTED FOR ADMISSION

For list and description of subjects accepted for admission see pages 68 and 69 and 77 to 83.

2. ADMISSION TO THE FRESHMAN CLASS BY EXAMINATION

Students who enter by examination, besides the entrance examination in English must pass examinations in secondary school subjects as follows:

(1) The six year-credits under "A" above and

(2) Nine year-credits selected from the list of electives under "B," provided that, if the total of entrance conditions does not exceed three half-year credits, the applicant shall be admitted conditionally and be given one year in which to make up the entrance conditions.

The character of the preparation needed to pass the examinations is indicated in the descriptions of subjects above.

Entrance examinations are offered at the University during the opening week of the University year. The program for the year 1909-10 is printed in this bulletin on page 5. Certificates of Minnesota state high school board examinations will be accepted in place of University entrance examinations in whole or in part.

3. ADMISSION TO THE SIX-YEAR COURSE IN SCIENCE AND MEDICINE

The requirements are the same as under 1 and 2 above, except that the First Part Higher Algebra, Solid Geometry and two years of Latin are required.

4. ADMISSION TO THE TWO-YEAR COURSE WHICH PREPARES FOR THE COLLEGE OF MEDICINE AND SURGERY.

The requirements are the same as under 1 and 2 above, except that two years of Latin are required.

5. ADMISSION TO THE SOPHOMORE CLASS FROM MINNESOTA STATE NORMAL SCHOOLS

Graduates of the advanced graduate course of a Minnesota state normal school are admitted with advanced standing equivalent to one year's credit, and receive the degree of Bachelor of Arts upon completing in this college ninety-six credits including freshman mathematics, courses 3 and 4, provided the usual requirements regarding majors and minors on page 43 be complied with. Such students will not be permitted to elect education 5 or 7, mathematics 1 or 2, rhetoric 1, or history 1,

and upon registering for mathematics 3 and 4 will be required to make good any deficiency in preparatory mathematics.

Individual graduates of the advanced Latin course (five years) or of the advanced English course (five years) of a Minnesota state normal school who, on the basis of maturity and ability, present certificates of special fitness from the president of the normal school, will be admitted with advanced standing under the same regulations and proviso.

6. ADMISSION TO ADVANCED STANDING

This college 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 college. 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 time 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 with an explanation of the marking basis employed.

Candidates wishing to gain credits for advanced standing by examination are allowed examinations without additional charge, providing they be taken within six weeks after matriculating.

7. ADMISSION AS UNCLASSED STUDENTS

Whenever in the judgment of the enrollment committee an applicant presents satisfactory reasons for not taking the regular course, such applicant may be admitted as an unclassed student. He must take the same examinations or present the same credentials as are required of those who enter the freshman class. (See classes 1 and 2.) Exceptions can be made only upon vote of the faculty. A new application must be made each semester to the enrollment committee.

8. ADMISSION TO STUDY MUSIC

Students who enter the University for the express purpose of studying music must take the same examinations or present the same credits that are required by those who apply for admission to the freshman class (See classes 1 and 2.) No student is admitted for the purpose of studying music, unless he presents a certificate from the department of music showing that he is qualified to pursue the courses offered.

ENTRANCE EXAMINATION IN ENGLISH

All applicants for admission to the College of Science, Literature, and the Arts, except those belonging to classes 4 and 5 above, must be examined in writing, spelling, and English composition. The examination will be given in two parts.

Part I. Elementary.—Those who fail to pass this examination satisfactorily are required to take a special three-hour preparatory course in composition through their first year or longer if necessary. This work is not credited toward a degree. Students pursuing it are not allowed to take more than a maximum of seventeen hours of work per week, including this course. These students must take Rhetoric 1, but not until the preparatory work has been completed. At any time during the first half of the first semester the Department of Rhetoric may transfer promising students from the preparatory class to the class in Rhetoric 1.

Part II. Advanced.

Those who pass both parts of the examination with a grade of good or excellent take English 1 and 2, during their freshman year. Those who do not obtain one of these required grades register for Rhetoric 1.

The entrance examination will be given at the University in the chapel of the Library Building, Wednesday, Sept. 9, at 9:00 a. m.

The examination will be sent, upon application, to the principals of state high and other accredited schools in the state to be offered in each school at the option of the principal to members of the senior class who expect to enter the University. The examination, if given, must be held on Saturday, May 22, under the general rules which govern state high school board examinations. All papers must be sent immediately after examination to the Registrar of the University and will be marked by the proper University authority.

Students who enter the freshman class after the regular September examination without having taken the test in English may be given a special test if the Department of Rhetoric sees fit, or shall be registered for preparatory rhetoric with the provision that, if found proficient during the first six weeks, they may be promoted to the freshman rhetoric class. Such students must be prepared to suffer any furthur change in registration necessitated by the program and rules of the college.

Equipment

GROUNDS AND BUILDINGS

The buildings of the College of Science, Literature, and the Arts, along with those used by all departments of instruction save that of agriculture, are located upon the University campus, a tract of about fifty-five acres lying between University Avenue and the river and between Eleventh and Nineteenth Avenues Southeast. The campus is well wooded with a fine growth of native oaks and commands a beautiful view of St. Anthony Falls and the city, but is sufficiently removed from the business center to insure desirable quiet and retirement.

Ten of the twenty-three buildings on the campus are used largely or exclusively for the work of the College of Science, Literature and the Arts. They include Folwell Hall, a building three hundred and twenty-two feet in length and three stories in height above the basement, in which offices, class and seminar rooms are provided for the mathematical, linguistic, philosophical and pedagogical departments; the Library Building, with provision for the social science and English departments; Pillsbury Hall for Animal Biology, Botany and Geology; Physics Building; the Chemistry Building; the Observatory; a plant house; the Armory, for military purposes and physical training; Shevlin Hall, devoted to the exclusive use of women students; and the Y. M. C. A. Building.

LIBRARIES

Besides the General Library, the College of Science, Literature and the Arts has the following department libraries: viz., those of Astromomy, Animal Biology, Botany, Chemistry, Economics and Politics, French, Geology, German, Greek, History, Latin, Mathematics, Military Science, Philology, Philosophy, Physics, Rhetoric, Scandinavian, and Spanish.

The departmental libraries are designed especially for the work of their respective departments and consist mainly of books of reference and current perodicals relating to technical subjects.

The whole number of bound volumes owned by the University is about one hundred and twenty thousand, unbound books and pamphlets about twenty thousand. About seven hundred and thirty current periodicals are received.

General Information

FEES

Incidental fee			
Residents of Minnesota,	$10.00	per	semester
Non-residents,	20.00	"	"
Laboratory fees			
Animal Biology, couress 1, 2, 3, 4, 8, 9 and 15, each	3.00	"	"
Botany, all undergraduate courses, each	3.00	"	"
Chemistry, all undergraduate courses, each	5.00	"	"
Except course 4,	7.00	"	"
and course 5,	10.00	"	"
Geology, course 11,	1.00	"	"
Mineralogy, courses 1 and 2, each	3.00	"	"
Course 3,	15.00	"	"
Music, courses 1, 2, 3 and 8, each	4.00	"	"
Courses 4 and 5 (1½ hours per week),	32.00	"	"
Courses 4 and 5 (3 hours per week),	64.00	"	"
Course 6,	2.00	"	"
Physics, courses 2, 4, 6, 7, 8, 9, 10, 12. 15 and 17, each	3.00	"	"
Course 5,	2.00	"	"
Courses 13 and 18, each	5.00	"	"
Change of registration,	2.00	per	subject
Delay in registration, beginning with first day of recitations (except for first registration),	.25 per day		
Examination for removal of condition, at set time,	1.00		
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.

CLASS ROUTINE AND SCHOLASTIC REQUIREMENTS

Class work extends through six days of the week, except Saturday afternoon. The daily session is divided into eight class periods of fifty minutes each, four in the morning and four in the afternoon. The morning session begins at eight thirty and closes at twelve thirty-five; the afternoon session extends from two o'clock until five forty. A general assembly of the faculty and students is held at ten thirty a. m.

Most of the courses of instruction are given in three periods per week. One series is scheduled for Monday, Wednesday, and Friday, another series for Tuesday, Thursday, and Saturday. Students are advised to try to arrange their programs so as to secure as even a distribution as possible between the two series, and also, if possible, in such a manner that they may have half of each day free for study at their rooms, some laboratory, or in the University library. This arrangement can usually be secured without restricting the choice of subjects by careful study of the program and bulletin.

Examinations are held at the close of each semester. Students are graded upon the basis of their class work and examinations for each subject which they pursue as excellent, good, passed, incomplete, conditioned, or failed. For graduation an average of good must be secured in at least fifty per cent of the courses pursued. In computing the averages an excellent balances a pass, making an average of good for each of the two courses. An incomplete must be removed within one month after the opening of the following semester or it becomes a condition. A condition can be removed by passing an examination in the subject before the opening of the corresponding semester of the following year; if not so removed, it becomes a failure and is subject to the rules governing failures. A failure must be pursued again in class.

A student who at any time becomes deficient in more than the work of one half year loses his class rank and is regarded as a member of the next lower class. Students whose absences exceed four weeks in the aggregate during a semester are not permitted to take the semester examinations without special permission of the faculty. Any student receiving conditions or failures in sixty per cent of the work of the first semester is dropped from the rolls and not allowed to re-enter the University until the opening of the following year.

MILITARY DRILL

The act of Congress of 1862, providing for the establishment of "Land Grant Colleges," requires that instruction be given in military science and tactics at all institutions that are its beneficiaries. The armory is located on the University compus and has all the facilities usually provided in a

modern armory. The United States government supplies the University with the necessary arms, equipment and ammunition for instruction in infantry and artillery drill, and details a commissioned officer of the regular army to take charge of the department.

THE UNIVERSITY STATE TEACHER'S CERTIFICATE

Graduates of the College of Science, Literature, and the Arts may apply for and receive upon vote of the faculty the University state teacher's certificate under the following conditions:

First. They must have maintained a good average of scholarship throughout the four years of college study.

Second. They must have the recommendation of at least one department concerned with high school studies.

Third. They must have completed one semester of Psychology and three semesters of Education, including courses 1 and 2.

This certificate by state law authorizes students to teach in the public schools of Minnesota for two years from date. After that time, upon satisfactory evidence of success, the certificate may be made permanent by the endorsement of the State Superintendent of Public Instruction and the President of the University.

Courses of Study

I. FOUR-YEAR COURSE IN SCIENCE, LITERATURE AND THE ARTS, LEADING TO THE DEGREE OF BACHELOR OF ARTS

The degree of Bachelor of Arts will be conferred upon any student who fulfills the conditions as to amount, grade and distribution of work stated under A, B, and C below:

A. AMOUNT OF WORK.—The student must earn from the courses offered in the college one hundred and twenty-six credits, in addition to the required exercises in drill, gymnasium, and physical culture.

A credit is one hour per week through one semester.

Juniors and seniors pursuing beginning language courses (not including Spanish, Greek, and Hebrew), English 1 and 2, mathematics 1 and 2, chemistry 1 (a), rhetoric 1, or history 1, shall receive only half credits.

No student shall receive credit for more than two beginning modern language courses, save by special permission.

A double period in laboratory subjects counts as one credit hour.

B. GRADE.—In at least one-half his work (sixty-three credits), the student must secure a grade of "good." For the system of grades see page 41. For the purpose of this count each "excellent" shall balance one "pass," making an average of "good" for both records.

C. DISTRIBUTION OF WORK.—

1. The student must complete a major and four minors. A major is not less than eighteen credits and a minor is not less than twelve credits in one department. Two minors, or a major and a minor, may be combined in one department, but at least one of the five subjects shall be chosen from each of the following groups:
   (a) English, French, German, Greek, Latin, Rhetoric
   (b) Animal biology, astronomy, botany, chemistry, geology and mineralogy, physics
   (c) Economics and political science, history, mathematics, philosophy, sociology and anthropology.

   Majors are not offered in the Departments of Drawing, Music and Semitic.

In the statement of courses, departments may indicate any courses which shall not count toward a major or minor, and in no case shall the following courses be so counted: the first year of beginning languages (excepting Spanish, Greek, and Hebrew), English 1 and 2, mathematics 1 and 2, rhetoric 1, and history 1.

2. Each student must choose his major subject before the end of the sophomore year, and report to the Registrar his choice.
3. Upon the choice of his major subject, the department in which the student has made his selection shall assign him to an adviser in that department.
4. The student shall choose, under the advice and approval of his adviser, a sufficient amount of work to make with his major, a total of forty-eight credits, the additional subjects being such as to reinforce the major.

This rule applies for graduates of 1908-9 only to work in the junior and senior years, and for graduates of the year 1909-10 to work of the sophomore, junior, and senior years.

FRESHMAN YEAR

The subjects for which freshmen register must be continued through the year.

The amount of work must not be less than fifteen hours nor more than seventeen hours, exclusive of Military Drill and Gymnasium or Physical Culture.

REQUIRED

I.

ENGLISH, three hours, for those who have passed part 2 of the entrance examination in English with a grade of good or excellent; or

RHETORIC, three hours, for those who have not so passed.

II.

MATHEMATICS 1 and 2, five hours, for those who do not present entrance credits in both First Part Higher Algebra and Solid Geometry.

III.

MILITARY DRILL, three hours, and GYMNASIUM, one hour in two periods, for men; or

PHYSICAL CULTURE, three hours, for women.

ELECTIVE BY GROUPS

Each freshman must take at least one subject and not more than two subjects from each of the following groups; except that those who take mathematics 1 and 2, five hours, are not required, but are at lib rty (if the maximum number of hours will permit), to take another subject from Group III.

I.

FRENCH 1, five hours; or French 3, three hours, with or without French 4 (conversation), two hours.
GERMAN 1, five hours; or German 4, three hours, with or without German 5 (conversation), two hours.
LATIN 1, three hours.
SCANDINAVIAN 1, five hours, or 3, three hours; or Scandinavian 2, five hours, or 4, three hours.

II.

ANIMAL BIOLOGY 1, three hours.
BOTANY 1, three hours.
CHEMISTRY 1 or 2, three hours.

III.

GREEK 1, five hours; or Greek 3, three hours.
HISTORY 1 or 2, three hours.
MATHEMATICS 3 and 4, three hours each.

SOPHOMORE YEAR

REQUIRED

MILITARY DRILL, for men.

Not less than fifteen nor more than eighteen credit-hours of work from the following groups, selecting at least one from each group and not more than six credit hours from any one department.

Sophomores, so long as they conform to the above requirements, may elect courses in Comparative Philology, Scandinavian, Semitic, Drawing and any subjects of the freshman year which they have not already taken, except Rhetoric 1 by those who have taken English 1 and 2.

ELECTIVE BY GROUPS

I.

ENGLISH, courses 1, 2, 3, 4, 5, 6, 7, 9.
FRENCH AND SPANISH, courses 2, 3, 4, 5, 6, 7, 8, 11, 12.
GERMAN, courses 2, 3a, 4, 5, 6, 7, 8.
GREEK, courses 1, 2, 3, 4, 5, 13.
LATIN, courses 3, 4, 5.
RHETORIC AND PUBLIC SPEAKING, courses 2, 10.

II.

ANIMAL BIOLOGY, courses 2, 3, 4, 5, 7, 8, 9, 15, 16.
BOTANY, courses 2, 3, 14, 15.
CHEMISTRY, course 3.
MINERALOGY, courses 1, 2, 3.
PHYSICS, courses 1, 2, 3, 4, 5, 6.

III.

ECONOMICS, courses 1, 2, 3a, 3b, 4, 5a, 6, POLITICAL SCIENCE, course 1.
HISTORY, courses 1, 2, 3, 4, 5.
MATHEMATICS, courses 6, 7.
PHILOSOPHY AND PSYCHOLOGY, courses 1, 2, 3.

JUNIOR AND SENIOR YEARS

The work of these two years is elective, subject to the restrictions imposed by the requirement for a major course and four minor courses (see page 43), and the regulation that certain courses of the two preceding years count, when taken by juniors and seniors, for only half credit.

The number of credit-hours in any semester must be not less than fifteen nor more than eighteen, except by permission of the Committee on Students' Work.

REQUIREMENTS FOR THE DEGREE OF BACHELOR OF ARTS WITH DISTINCTION

Students may receive the degree of Bachelor of Arts with distinction in accordance with the following plan:

1. The degree with distinction shall be granted upon the basis of special excellence in the major subject, and shall be granted in only one department,.

2. To become a candidate for the degree of B. A. with distinction, the student must signify his intention by registration, upon the proper

blank, at some time between the close of the freshman year and the beginning of the senior year. Students wishing to become candidates for the degree are advised to register as such as early in the course as possible.

3. At the time of registration for such degree the applicant must have an average of *good* in all his previous work. (For the purpose of this count, each excellent shall balance one *pass*, making an average of *good* for both records).

4. To receive the degree with distinction at graduation, the student must fulfill the following requirements:

a. Comply with all the regulations applying to the ordinary degree of Bachelor of Arts.

b. Secure a record at graduation, higher than pass in four-fifths of all his work (provided that an excellent shall balance a pass as in B, page 43.)

c. By May 1st of his senior year, present a satisfactory thesis upon a subject approved by the adviser in charge of this work.

d. Comply with the special requirements of the department in which he takes his major work.

e. Be recommended by the department to the faculty for special excellence in his work; and

f. Be approved by vote of the faculty.

5. A student registered for the degree with distinction may withdraw his name at any time from such registration, or the registration may be cancelled by the department concerned, or by the Dean after consultation with the department; but students whose registration for the degree with distinction has been withdrawn or cancelled shall still receive the degree of Bachelor of Arts upon completion of the requirements therefor.

6. The degree shall be given in the diploma thus: Bachelor of Arts, with distinction.

7. The names of students recommended by the faculty for the degree with distinction shall appear in the commencement program, with the statement that distinction has been acquired in a certain department. A certificate signed by the head of the department and the Registrar shall be presented to the student who has attained the degree with distinction.

8. The special requirements of the departments in which distinction may be gained shall be authorized by the faculty, after recommendation by the Curriculum Committee.

COMBINATION COURSES

For the benefit of those who wish to begin a professional course before completing the four-year course in Science, Literature and the Arts, the following combination courses and short courses are offered.

2. SEVEN-YEAR COURSE IN ARTS AND MEDICINE, LEADING TO THE DEGREES OF BACHELOR OF ARTS AND DOCTOR OF MEDICINE

Seniors who intend to enter the College of Medicine and Surgery are permitted to take in that college anatomy, chemistry, histology and physiology (it being understood that no repetition of work is allowed,) and the work is credited as senior work, thirty-two credits, in the College of Science, Literature and the Arts and first-year work in the College of Medicine and Surgery. This privilege is conditioned upon their having credits for two years of Latin and for one year (three credit-hours per week) of each of the following: physics, general inorganic chemistry, qualitative analysis, zoology or botany, and German or French. They are required to complete a major and two minors, one in each of the groups (a), (b) and (c).

3. SIX-YEAR COURSE IN SCIENCE AND MEDICINE, LEADING TO THE DEGREES OF BACHELOR OF SCIENCE AND DOCTOR OF MEDICINE

For requirements for admission see page 28. The first two years of this course are given in the College of Science, Literature and the Arts, and the last four years are given in the College of Medicine and Surgery. It leads to the degree of Bachelor of Science at the e d of four years, and to the degree of Doctor of Medicine at the end of six years.

Students who enter without French or German are required to take German 1, ten credits, and German 3 (scientific), six credits.

Students entering with two years of German may take French 1, ten credits, in either first or second year, and German 3, six credits, in the other year.

Descriptions of the following courses, which are all required, are given in the respective departmental statements.

FIRST YEAR

ZOOLOGY, course 1, three hours.
BOTANY, course 1, three hours.
CHEMISTRY, course 1 or course 2, three hours.
GERMAN OR FRENCH (see note above).
SECOND PART HIGHER ALGEBRA AND TRIGONOMETRY, three hours.
MILITARY DRILL AND GYMNASIUM, for men; PHYSICAL CULTURE, for women.

SECOND YEAR

Comparative Anatomy of Vertebrates, three hours.
Qualitative Analysis, three hours.
Elements of Economics, three hours, first semester.
Economic Conditions in American Cities, three hours, second semester.
German or French (see note above).
Physics with Laboratory Practice, four hours.
Rhetoric, course 1, three hours.
Military Drill, for men.

The remaining years of the course are given in the College of Medicine and Surgery and the subjects may be found in the bulletin of that college.

4. TWO-YEAR COURSE FOR ADMISSION TO THE COLLEGE OF MEDICINE AND SURGERY

For admission to the College of Medicine and Surgery an entrance credit in two years of Latin and two years of work in the College of Science, Literature and the Arts are required. The subjects are the same as prescribed, under 1, for other freshmen and sophomores, but the following courses are required:

FIRST YEAR

Mathematics, courses 1 and 2, or 3 and 4.
Chemistry, course 1 or 2.
Animal Biology, course 1, or Botany, course 1.
German or French.

SECOND YEAR

Physics, courses 1, 2, 3, 4.
Chemistry, courses 3.

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

Seniors who intend to enter the College of Law are permitted to take in that college elements of contracts, domestic relations, commercial paper, torts and criminal law, and the work is credited as senior work, twelve credits, in the College of Science, Literature and the Arts and first-

year work in the College of Law, thus enabling students, by some extra work, to finish the law course in two more years.

6. ONE-YEAR COURSE FOR ADMISSION TO THE COLLEGE OF LAW

For admission to the College of Law one year of work is required in the College of Science, Literature and the Arts. The subjects are the same as prescribed, under 1, for other freshmen.

7. COURSE FOR MUSIC STUDENTS

Students who have entered the University for the express purpose of studying music are required to register for courses 1 and 4 in music and at least six credits in other courses outside the Department of Music, preferably modern languages, to be selected with the approval of the Enrollment Committee.

8. UNCLASSED STUDENTS

Unclassed students must take the same number of hours as regular students, and, unless advanced standing is obtained through credits from other institutions, four-fifths of the work during the first year must be taken from subjects offered to freshmen. A new application must be made each semester to the Enrollment Committee.

Any unclassed student who has satisfied the regular entrance requirements may classify at the beginning of either semester as a regular student, and become a candidate for the Bachelor of Arts degree by registering in accordance with the regulations governing amount and distribution of work as indicated on page 43.

RELATED DEPARTMENTS

The table below gives groups of related departments; but for convenience of reference the departments, in the departmental statements which follow, are arranged in alphebetical order.

I. English Language and Literature
   (a) English, (b) Comparative Philology, (c) Rhetoric
II. Ancient Languages and Literatures
   (a) Greek, (b) Latin, (c) Semitic Languages
III. Modern Languages and Literatures
   (a) German, (b) Romance Languages, (1) French, (2) Spanish, (3) Italian, (c) Scandinavian Languages
IV. Biological Sciences

(a) Animal Biology, (b) Botany, (c) Paleontology

V. PHYSICAL SCIENCES
(a) Chemistry, (b) Geology and Mineralogy, (c) Physics

VI. PURE AND APPLIED MATHEMATICS
(a) Mathematics, (b) Astronomy, (c) Mechanics, (d) Physics

VII. PHILOSOPHY, EDUCATION, AND ANTHROPOLOGY
(a) Philosophy and Psychology, (b) Education, (c) Anthropology

VIII. SOCIAL SCIENCES
(a) Economics and Political Science, (b) History, (c) Sociology and Anthropology

IX. FINE ARTS
(a) Drawing, (b) Music

X. MILITARY SCIENCE AND PHYSICAL CULTURE

Departmental Statements

ANIMAL BIOLOGY

HENRY F. NACHTRIEB, Professor, Head of Department of Animal Biology
CHARLES P. SIGERFOOS, Professor
OSCAR W. OESTLUND, Assistant Professor
HAL DOWNEY, Assistant Professor
JOHN C. BROWN, Assistant Professor
CHARLES E. JOHNSON, Assistant
PETER OKKELBERG, Assistant

REQUIREMENTS OF THE DEPARTMENT

FOR A MINOR, twelve credits.

FOR A MAJOR, eighteen credits, together with reinforcing subjects (thirty credits) selected from botany, geology, chemistry, physics, advanced modern language and additional animal biology.

FOR B.A., WITH DISTINCTION, the general requirements (page 46) and six credits in the department in addition to the requirements for a major.

FOR A TEACHER'S CERTIFICATE, an average of at least good in courses 1 and 15 and 2 or 3 or 4 or 5 and twelve additional credits in the biological sciences, six of which must be in botany. Course 13 in zoology is recommended.

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.

The laboratory fee for each of the courses 1, 2, 3, 4, 8, 9, 15 and 16 is three dollars psr semester.

COURSES

No.	Title	Semester	Credits	Offered to	Prereq. courses
1.	Gen. Zoology	1, 2	6	All	None
2.	Morphol. Invertebrates	1, 2	6*	Soph,. Jr., Sr.	1
3.	Histol.-Embryol	1, 2	6	Soph., Jr., Sr.	1
4.	Comp. Anat. Vertebrates	1, 2	6	Soph., Jr., Sr.	1
5.	Gen. Physiol	1, 2	6*	Soph., Jr., Sr.	1
6.	Experimental Zoology	1, 2	6	Jr., Sr.	1 and 3
7	Entomology	1, 2	3	Soph., Jr., Sr.	1
8.	Ichthyology	1	6*	Soph., Jr., Sr.	1
9.	Ornithology	2	3	Soph., Jr., Sr.	1
10.	History of Zoology	1	2	Jr., Sr.,	1
11.	Animal Habits—Intel	2	2	Jr., Sr.	See statement
12.	Economic Zoology	2	2	Jr., Sr.	1
13.	Teacher's Course	1	1	Jr,. Sr.	Eighteen credits
14.	Problems & Research	1, 2	6 or 12*	Jr., Sr.	See statement
15.	Entomol. & Ornith	1, 2	6*	Soph., Jr., Sr.	1
16.	Histol. & Embryol Technique	2	3	Soph., Jr., Sr.	1

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

1. General Zoology Messrs. Sigerfoos, Oestlund, Brown, Downey, Johnson and Okkelberg

Six credits (six hours per week) Both semesters

Open to all.

This course is a comparative study of the principles of structure, physiology, and development in animals. In the laboratory a brief study of insects and the dissection of the frog are used as a practical introduction to the course. Then follow a study of cell structure and cell division, a systematic study of representatives of the chief phyla or branches of the animal kingdom, and a study of the elements of embryology as illustrated by the development of the starfish and chick. Lectures, quizzes, and laboratory work. Text-book required: Hertwig's *Manual of Zoology*.

2. Morphology of Invertebrates Messrs. Sigerfoos and Johnson

Six credits (six hours per week) Both semesters

Open to those who have completed course one; both semesters must be completed before credit is given for the first semester.

The object of this course is to familiarize the students with the methods and principles of zoology thru an intensive study of two or three groups of animals and to aquaint him with the minor phyla not considered in course one. During the year 1908-9 the Protozoa and Crustacea will be the groups especially taken up.

3. Essentials of Histology and Embryology, Messrs. Nachtrieb and Downey

Six credits (six hours per week) Both semesters

Open to those who have completed course 1.

In this course are taken up the development and minute structue of the animal as an organism built up of tissues combined into organs, and the student is given practice in general methods, technique, and the use of apparatus. The course prepares directly for most of the advanced courses. Lectures, quizzes, and laboratory work.

4. Comparative Anatomy of Vertebrates Messrs. Brown and Johnson

Six credits (six hours per week) Both semesters

Open to those who have completed course 1 or its equivalent; both semesters must be completed before credit is given for the first semester.

The first semester's work is based upon a study of chordates, cartilaginous and bony fishes and all classes up to the mammalia; the second semester to a detailed study of the cat and comparative studies of the rabbit, sheep, and man. Lectures, quizzes, and laboratory work. Required text books: Davidson's *Mammalian Anatomy and* Burkholder's *Anatomy of the Brain*.

5. General Physiology Mr. Nachtrieb

Six credits (three hours per week) Both semesters

Open to those who have completed course one; both semesters must be completed before credit is given for the first semester.

In the first semester are considered the physical, structural, and functional features of living substance; the cell, present conditions, and expressions of life; and the theories of the origin of life and death. Demonstrations and simple experiments constitute an essential part of the course in both semesters.

In the second semester the life of the cell is considered in its relations to that of other cells and the course is concluded with special reference to the teaching of physiology in high schools.

6. Experimental Zoology

Six credits (six hours per week) Both semesters

Open to those who have completed courses 1 and 3; both semesters must be completed before credit is given for the first semester.

7. Entomology Mr. Oestlund

Six credits (six hours per week) Both semesters

Open to those who have completed course 1; both semesters must be completed before credit is given for the first semester.

The course covers, in general, the elements of entomology, structure, functions

development, and economics, leading up to a discusion of the principles of taxonomy and their application to the classification of insects. Folsom's *Entomology*, and Hertwig's *Zoology* are used as text-books and general guides.

8. ICHTHYOLOGY — MR. BROWN
Six credits (six hours per week) — First semester
Open to those who have completed course 1.

This course includes lectures, quizzes, and laboratory work in the structure, classification life history, and culture of fishes, with special reference to the fishes of our inland waters which are of economic importance.

9. ORNITHOLOGY — MR. BROWN
Six credits (six hours per week) — Second semester
Open to those who have completed course 1.

This course includes lectures, quizzes, laboratory and field work in the structure, classification, nest building, food, habits, and distinction of birds. The lectures consider the subjects of migration, coloration, flight, etc. Practical demonstrations are given of the preparation of birds and eggs for scientific purposes. Required: Chapman's *Hand-Book of Birds of Eastern North America.*

10. HISTORY OF ZOOLOGY — MR. NACHTRIEB
Two credits (two hours per week) — First semester
Open to juniors and seniors; students are advised to complete course 1 before electing this course.

A course of lectures on the history of zoology from ancient times to the present including a brief history of our domestic animals and those that have become extinct within historic times, and a discussion of the modern theories and problems of heredity and evolution.

11. ANIMAL HABITS AND INTELLIGENCE — MR. NACHTRIEB
Two credits (two hours per week) — Second semester
Open to juniors and seniors; students are advised to complete course 1 before electing this course; alternates with course twelve. Not offered in 1909-10.

The course consists of lectures and discussions on animal habits and intelligence, and concludes with a consideration of the development of mental power in animals.

12. ECONOMIC ZOOLOGY — MR. NACHTRIEB
Two credits (two hours per week) — Second semester
Open to juniors and seniors; alternates with course 11.

Lectures on the uses made of animals and their products, the production and protection of those animals of special economic importance, and the methods of protection against some of the disease-producing animals.

13. TEACHERS' COURSE — MR. NACHTRIEB AND ASSISTANTS
One credit (one hour per week) — First semester
Open to those who have completed a minor in zoology; given in alternate years.

Lectures and discussions on the ends to be attained through courses in general zoology and the methods and means by which such ends may be gained.

14. PROBLEMS AND RESEARCH — MR. NACHTRIEB AND ASSISTANTS
Six or twelve credits (six or twelve hours per week) — Both semesters
Open to those who have completed courses 1 and 3 or 1 and such other work as may be required by the instructor in charge; both semesters must be completed before credit is given for the first semester.

The course consists of advanced or essentially independent work carried on in some specific line under the direction of the professor in charge of that work. The lines of work open at present are:—

(a) Morphology of vertebrates under — Mr. Brown
(b) Blood and connective tissue of vertebrates under — Mr. Downey
(c) Entomology under — Mr. Oestlund
(d) Experimental zoology
(e) General physiology under — Mr. Nachtrieb

(f) Invertebrate embryology under — Mr. Sigerfoos
(g) Invertebrate morfology under — Mr. Sigerfoos
(h) Vertebrate embryology or morfology under — Mr. Nachtrieb

15. ELEMENTS OF ENTOMOLOGY AND ORNITHOLOGY, MESSRS. OESTLUND AND BROWN
Six credits (six hours per week) — Both semesters

Open to those who have completed course 1; both semesters must be completed before credit is given for the first semester.

This course is planned with special reference to candidates for the teacher's certificate. During the first semester the class meets with Mr. Oestlund during the third and fourth hours on Monday, Wednesday and Friday. During the second semester the class meets with Mr. Brown on Monday, Wednesday and Friday at the hours arranged with him.

16. ESSENTIALS OF HISTOLOGICAL AND EMBRYOLOGICAL TECHNIQUE, MESSRS. NACHTRIEB AND DOWNEY
Three credits (six hours per week) — Second semester

Open to juniors and seniors who have completed course 1 and the first semester of course 3.

This course consists essentially of practical work in the preparation and preservation of histological and embryological material, and in the methods of reconstruction.

ASTRONOMY

FRANCIS P. LEAVENWORTH, Professor, Head of the Department of Astronomy

REQUIREMENTS OF THE DEPARTMENT

FOR A MINOR, courses 1 and 3 (the latter taken as a three hour course).

FOR A MAJOR, courses 1 and 3 (the latter taken as a six hour course) together with five additional courses and reinforcing subjects, (thirty credits,) selected from mathematics, physics, mechanics, chemistry, geology and additional astronomy.

FOR B. A. WITH DISTINCTION, the general requirements (page 46) course 1, course 2 (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 filar micrometer; a spectroscope by Brashear; a meridian circle and zenith telescope; a Repsold photographic measuring machine, a chronograph, and astronomical clocks.

COURSES

No.	Title	Semester	Credits	Offered to	Prereq. courses
1.	Gen. Astronomy	1, 2	6	Jr., Sr.	Math. 4 or 2
2.	Observatory Practice	1, 2	6	Jr., Sr.	Math. 4 or 2
3.	Practical Astronomy	1, 2	6 or 12	Jr., Sr.	1 and Math. 7, 9 and 10
4.	Adv. Practical Astronomy	1, 2	6	Grad.	1 and 2
5.	Celestial Mechanics	1, 2	6	Grad.	1 and 2
6.	Astrophotography	1, 2	6	Grad.	1 and 2

1. GENERAL ASTRONOMY — MR. LEAVENWORTH
Six credits (three hours per week) — Both semesters

Open to juniors and seniors who have completed mathematics 4 or 2 (trigonometry).

A study of the general principles of astronomy illustrated by lantern slides and telescopic observations. This course may be combined with course 2.

2. Observatory Practice — Mr. Leavenworth
Six credits (three hours per week) — Both semesters
Open to those who have completed or are taking course 1.
Work at the observatory in connection with course one.

3. Practical Astronomy — Mr. Leavenworth
Six or twelve credits (three or six hours per week) — Both semesters
Open to juniors and seniors who have completed course 1 and mathematics 7, 9, and 10.

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.

4. Advanced Practical Astronomy — Mr. Leavenworth
Six credits (three hours per week) — Both semesters
Open to graduate students who have completed courses 1 and 3.

5. Celestial Mechanics — Mr. Leavenworth
Six credits (three hours per week) — Both semesters
Open to graduate students who have completed courses 1 and 3.

6. Astrophotography — Mr. Leavenworth
Both semesters
Open to graduate students who have completed courses 1 and 3.

Photography of the heavenly bodies, measurement of plates, determination of positions, parallax, etc.

BOTANY

Frederic E. Clements, Professor, Head of Department of Botany
Josephine E. Tilden, Assistant Professor
Carl Otto Rosendahl, Assistant Professor
Frederic K. Butters, Instructor
Ned L. Huff, Instructor
Alice Misz, Assistant

REQUIREMENTS OF THE DEPARTMENT

For a Minor, courses 1 and 2.

For a Major, courses 1 and 2, together with one advanced course covering two semesters, and reinforcing subjects (thirty credits) selected from zoology, chemistry, physics, geology, advanced modern languages, Greek, Latin, and additional botany.

For B. A. with Distinction, the general requirements (page), courses 1, 2 and any two advanced courses, each covering both semesters.

For a Teacher's Certificate, an average of at least good in courses 1, 2 and twelve additional credits in biological sciences, of which six shall be in zoology.

Courses 11 and 16 are recommended.

Students entering the department for the first time must take course 1, or present a satisfactory equivalent. Courses 1 and 2 are required for entrance to all advanced courses, with the exception of 11 to 15. Students are requested to confer with the head of the department before electing an advanced course.

The Botanical Seminar consists of advanced students in botany, together with the staff of the department. It meets every two weeks for the presentation of the results of investigation, and for the discussion of current problems.

The laboratory fee for each undergraduate course is three dollars per semester.

COURSES

No.	Title	Semester	Credits	Offered to	Prereq. courses
1.	Gen. Botany	1, 2	6*	All	None
2.	Adv. Botany	1, 2	6	Soph., Jr., Sr.	1
3.	Plant Phys. and Ecology	1, 2	6	Soph,. Jr., Sr.	See statement
4.	Algae	1, 2	6	Jr., Sr.	1 and 2
5.	Fungi	1, 2	6	Jr., Sr.	1 and 2
6.	Mosses and Ferns	1, 2	6	Jr., Sr.	1 and 2
7.	Flowering Plants	1, 2	6	Jr., Sr	1 and 2
8.	Ecology	1, 2	6	Jr., Sr.	1, 2 and 3
9.	Plant Physiology	1, 2	6	Jr., Sr.	1, 2 and 3
10.	Cytology	1, 2	6	Jr. Sr.	1 and 2
11.	Industrial Botany	1, 2	6	Jr., Sr.	1 and 2
13.	Water Supply Botany	2	3	Jr., Sr.	1
14.	Timber and Timber Diseases	1	3	Soph., Jr., Sr.	1
15.	Bot. Microchemistry	1, 2	3	Soph., Jr., Sr.	1
16.	Plant Studies	1, 2	3	Jr., Sr.	1 and 2
17.	Morph. and Taxonomy	1, 2	..	Grad.	See statement
18.	Problems in Algology	1, 2	..	Grad.	See statement
19.	Problems in Phys. and Ecology	1, 2	..	Grad.	See statement
20.	Problems in Cytology	1, 2	..	Grad.	See statement

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

GENERAL COURSES

Required for entrance to any special course, except those in technical botany 11 to 15 inclusive.

1. GENERAL BOTANY MESSRS. CLEMENTS, HUFF AND BUTTERS AND MISS MISZ.
Six credits (six hours per week) Both semesters
Open to all; both semesters must be completed before credit is given for the first semester.

Greenhouse study of the behavior and structure of flowering plants, following the life cycle from germination to seed production; laboratory study of the evolution of the plant kingdom, and the underlying principles of plant life; laboratory and greenhouse work in the identification and relationship of flowering plants, together with field work on the plants of forest and grassland; practical papers on selected topics, viz., bacteria, plant growth, evolution, etc.

2. ADVANCED BOTANY MR. CLEMENTS AND MR. ROSENDAHL
Six credits (six hours per week) Both semesters
Open to those who have completed course 1.

Systematic work in the naming and classification of plants, chiefly of the groups of economic importance, i. e., flowering plants, fungi and algae, with emphasis on the common plants of Minnesota; ecological study in the greenhouse of the structure and meaning of the adaptions of root, stem and leaf, and in the field of the principles of plant distribution, migration and grouping; cell study of growth, production of pollen and egg-cells, fertilization hybridization and seed formation; one practical paper each semester, cytology of plant breeding, plant adaptations, the life history of a forest, etc.

SPECIAL COURSES

3. PLANT PHYSIOLOGY AND ECOLOGY MESSRS. CLEMENTS AND HUFF
Six credits (six hours per week) Both semesters
Open to those who have completed courses 1 and 2; by permission of the department the course may be taken in conjunction with course 2.

Study of the factors which make the plant's home, viz., water, light, soil, heat, etc.; response of the plant to its home, absorption, transport, water-loss, food-making, storage, growth, fertilization and reproduction; adaptation of plants to their various homes, and the origin of new forms by selection, adaptation, mutation and hybridization; structure and development of vegetation, i. e., grouping, migration, competition, acclimatization, invasion, succession, zonation, etc. of plants; one practical paper each semester on selected topics, e. g., acclimatization, adaptation, origin of new forms, vegetation of Minnesota, of North America, etc.

4. Algae — Miss Tilden
Six credits (six hours per week) — Both semesters
Open to those who have completed courses 1 and 2.

A detailed comparative study of the structure and classification of the algae; the blue-green and yellow-green algae, together with a systematic examination of forms in the Minneapolis water supply, occupy the first semester, and the brown and the red marine algae the second semester. Lectures, laboratory and reference work.

5. Fungi — Mr. Clements
Six credits (six hours per week) — Both semesters
Open to those who have completed courses 1 and 2.

The classification and life-history of the various groups of fungil based on identification, cultures and field work, with particular reference to forms which cause plant and animal diseases. Lectures and discussions, laboratory, greenhouse and field work.

6. Mosses and Ferns — Messrs. Rosendahl and Huff
Six credits (six hours per week) — Both semesters
Open to those who have completed courses 1 and 2.

The course is designed for students who wish to pay special attention to the morphology and taxonomy of liverworts, mosses, and ferns. Lectures, laboratory and field work.

7. Flowering Plants — Mr. Rosendahl
Six credits (six hours per week) — Both semesters
Open to those who have completed courses 1 and 2.

The course is designed to afford the student an opportunity to become proficient in the determination of plant species and plant types, as well as to show the genetic development and relationships of the flowering plants. Lectures, reference reading, laboratory greenhouse and herbarium work. together with field work in the fall and spring.

8. Ecology — Mr. Clements
Six credits (six hours per week) — Both semesters
Open to those who have completed courses 1, 2 and 3.

A critical study of plant habitats by means of instruments, and the adaptations produced by water and by light, together with a careful examination of the causes and reactions of plant formations. Class discussions and quizzes, field and greenhouse work.

9. Plant Physiology — Mr. Clements
Six credits (six hours per week) — Both semesters
Open to those who have completed courses 1, 2 and 3.

A 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.

10. Cytology — Mr. Rosendahl
Six credits (six hours per week) — Both semesters
Open to those who have completed courses 1 and 2.

The course includes a survey of cell structure and the various phenomena of division, fusion and metamorphosis, together with a review of the history of cytologic investigation. Methods of cytological research indicated in the laboratory. Laboratory work and collateral reading.

11. INDUSTRIAL BOTANY — MISS TILDEN
Six credits (six hours per week) — Both semesters

Open to technical students who have completed courses 1, and to academic students who have completed courses 1 and 2.

A study of the origin, distribution and cultivation of plants yielding products of economic value, the nature and use of these products, and the processes by which they are obtained from the plants. Lectures, demonstrations, topics and laboratory work.

13. WATER SUPPLY BOTANY — MISS TILDEN
Three credits (six hours per week) — Second semester

Open to those who have completed course 1.

A technical course for municipal, sanitary and reclamation engineers, involving the determination of the forms prevalent in storage waters and in water supplies, and their abundance, together with methods of control or prevention. Lectures and references, laboratory and field work.

14. TIMBER AND TIMBER DISEASES — MR. HUFF
Three credits (six hours per week) — First semester

Open to those who have completed course 1.

A study of the source and structure of the important timbers with particular reference to their mechanical properties, together with a study of timber diseases, and methods of timber preservation. Lectures, laboratory work and references.

15. BOTANICAL MICROCHEMISTRY — MR. CLEMENTS
Six credits (six hours per week) — Both semesters

Open to those who have completed course 1.

A microscopical study by means of stains and reagents of the nature and structure of plant substances, in the natural condition as well as in the finished product. Lectures, laboratory and reference work.

16. PLANT STUDIES AND METHODS — MR. CLEMENTS
Six credits (six hours per week) — Both semesters

Open to those who have completed courses 1 and 2.

A course for teachers and for students intending to teach; the subjects of nature study and high school botany are presented as they are to be taught and not from the university point of view; the material is taken up in detail in its proper sequence, and training in method is afforded as far as possible by practice in the elementary school of the College of Education.

GRADUATE COURSES

17. MORPHOLOGY AND TAXONOMY — MR. ROSENDAHL
Both semesters

Open to graduate students; other arrangements may be ascertained upon application to the department.

Important literature and necessary material will be provided for whatever research is entered upon, and the results of the investigations will be required to be prepared for publication. The course is an elastic one and will be adapted to the special training and requirements of those pursuing it.

18. PROBLEMS IN ALGOLOGY — MISS TILDEN
Both semesters

Open to graduate students; other arrangements may be ascertained upon application to the department.

Research work may be done on special groups or along any of the following lines: The freshwater algae of Minnesota; the algae of the Minneapolis and St. Paul water supplies; the algae of hot springs; lime-depositing algae; arctic marine algae (material from Vancouver Island); tropical marine algae (material from the Hawaiian Islands). Special facilities for study are offered by the Minnesota Seaside Station on Vancouver Island, which is open during the summer vacation.

19. PROBLEMS IN PHYSIOLOGY AND ECOLOGY — MR. CLEMENTS
Both semesters

Open to graduate students; other arrangements may be ascertained upon application to the department.

Opportunity for research work in ecology and physiology is offered along the following lines: Critical investigation of the physical factors of the habitat by means of instruments; studies in plant functions and adaptations; the experimental production of new forms; investigations in the development and structure of vegetation, and especially in migration, competition, etc.

20. PROBLEMS IN CYTOLOGY AND EMBRYOLOGY — MR. CLEMENTS
Both semesters

Open to graduate students; other arrangements may be ascertained upon application to the department.

Research work may be taken along any of the following lines: The minute structure of the cell; microchemistry of the cell; development of sporangia and spores; fecundation; development of the embryo; origan and development of the primary tissues; development of organs; correlation, etc.

CHEMISTRY

GEORGE B. FRANKFORTER, Professor, Head of Department of Chemistry
CHARLES F. SIDENER, Professor
EDWARD E. NICHOLSON, Assistant Professor
EVERHART P. HARDING, Assistant Professor
IRA H. DERBY, Assistant Professor
LILLIAN COHEN, Instructor
FRANCIS C. FRARY, Instructor
JOHN A. HANDY, Instructor
JAMES ZIMMERMAN, Instructor
WALTER BADGER, Assistant
CHARLES R. CRESSY, Assistant
EDWARD ANDERSON, Assistant
EDITH VON KUSTER, Assistant

REQUIREMENTS OF THE DEPARTMENT

FOR A MINOR, twelve credits.

FOR A MAJOR, eighteen credits, together with supporting subjects (thirty credits) selected from physics, mathematics, geology, botany, zoology, advanced modern language and additional chemistry.

FOR B. A. WITH DISTINCTION, the general requirements (page 46) and six credits in addition to the requirements for a major.

FOR A TEACHER'S CERTIFICATE, an average of at least good in courses 1, 2, 3, 4 or 5, and 26.

The laboratory fee for each undergraduate course is five dollars per semester, except for course 4, which is seven dollars, for course 5, which is ten dollars, for course 26, which is three dollars, and for courses 6, 24 and 25, having no fee.

Courses

No.	Title	Semester	Credits	Offered to	Prereq. courses
1.	Gen. Chem.	1, 2	6*†	Those who enter without chemistry	
2.	Adv. Gen. Chem.	1, 2	6*	Those who enter with chemistry?	Entrance credit in chemistry
3.	Qual. Anal.	1, 2	6	Soph., Jr., Sr.	1 and 2
4.	Quant. Anal.	1, 2	6	Jr. Sr	3
5.	Organic Chem.	2	6	Jr., Sr.	3
6.	Theoretical Chemistry	2	2	Jr., Sr.	5
18.	Physical Chemistry	1, 2	3	Jr., Sr.	Chemistry 5 Physics 3 and 4
24.	Theoretical Electrochemistry	1	3	Sr., Jr.	Same as for Physical Chem.
25.	Radiochemistry	2	3	Jr., Sr.	24
26.	Teachers	2	1	Sr.	3
27.	Household and Sanitary Science	1, 2	6*	Jr., Sr.	1 or 2
28.	Spec. Inorganic			Grad.	
29.	Electrochemistry			Grad.	
30.	Organic Chemistry			Grad.	
31.	Alkaloids			Grad.	
32.	Analytical Chemistry			Grad.	

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

‡Juniors and seniors are allowed only half credit.

1. General Chemistry — Miss Cohen and Mr. Badger

Six credits (six hours per week) — Both semesters

Open to all who do not present any entrance credits in chemistry, but juniors and seniors receive only half credit; both semesters must be completed before cerdit is given for the first semester.

Recitation and laboratory work. The course includes a study of the common elements and their compounds, with an introduction to the modern theories of chemistry.

2. Advanced General Chemistry — Mr. Frankforter, Miss Cohen and Mr. Badger

Six credits (six hours per week) — Both semesters

Open to all who have completed a satisfactory course in general chemistry; both semesters must be completed before credit is given for the first semester.

Lectures and laboratory work. The ground covered includes an introduction to physical and technological chemistry with an exhaustive study of the chemical elements.

3. Qualitative Analysis — Messrs. Nicholson and Frary

Six credits (six hours per week) — Both semesters

Open to those who have completed course 2

Lectures and laboratory work, with recitations and collateral reading. The course 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.

4. Quantitative-Analysis — Mr. Sidener and Assistants

Six credits (six hours per week) — First and Second semesters

Prerequisite, Course 3.

The laboratory fee is seven dollars per semester.

The course includes a general discussion of quantitative method,s with laboratory work in gravimetric analysis, first semester; followed by a discussion of standard solutions and the necessary stoechiometric calculations with laboratory work in volumetric analysis, second semester.

5. ORGANIC CHEMISTRY, MESSRS. FRANKFORTER, DERBY, HANDY AND ASSISTANTS
Six credits (three lectures and twelve hours of laboratory work per week) Second semester

Prerequisite, Course 3.

This course includes the aliphatic and the aromatic series with the preparation of the more important compounds.

6. THEORETICAL CHEMISTRY MR. DERBY
Two credits (one lecture and one recitation per week) Second semester

Prerequisite, Course 5.

This course involves a study of the most important theories which coordinate and unify chemical and physico-chemical phenomena.

18. PHYSICAL CHEMISTRY MR. DERBY
Three credits. First and second semesters

Prerequisites, Chemistry 5, Physics 3 and 4.

The course enables the student to gain a wide and varied knowledge of physico-chemical principles and methods, both from the theoretical and practical standpoint.

24. THEORETICAL ELECTROCHEMISTRY MR. DERBY
Three credits. First semester

Prerequisites, Same as for Physical Chemistry.

This course includes the development of the most modern ideas relative to electro-chemical principles and phenomena, involving therewith the electron theory and electrical nature of matter.

25. RADIOCHEMISTRY MR. DERBY
Three credits. Second semester

This course is intended to follow the one in Theoretical Electrochemistry and has to do with the phenomena associated with the various radioactive elements including the chemical change which these elements undergo and the chemical reactions which may be induced while the changes are in progress.

26. TEACHER'S COURSE MISS COHEN
Two credits (two hours per week) Second semester

Prerequisites, Course 3.

The course is offered to those who are interested in the teaching of chemistry. No regular laboratory work will be offered, but certain experiments illustrating the difference between good and poor work may be given.

27. HOUSEHOLD AND SANITARY SCIENCE MR. FRANKFORTER
Six credits Both semesters

To obtain credit both semesters must be taken.

Open to women of the junior and senior classes.

Sanitation: Causes and control of germ diseases, disinfection, pests, etc.

Foodstuffs: origin, preparation, purity, analysis and adulteration, selection, preparation, preservation.

Personal Hygiene: dietetics, food values, clothing, exercise, etc.

The following professors will cooperate in giving the course; Messrs. Westbrook, Beard, Clements, Flather, Nachtrieb and Bass.

GRADUATE COURSES

The following are open to graduate students. Arrangements may be made upon application to the department.

28. SPECIAL INORGANIC CHEMISTRY.

29. ELECTROCHEMISTRY.

30. ORGANIC CHEMISTRY.

31. ALKALOIDS.

32. ANALYTICAL CHEMISTRY.

COMPARATIVE PHILOLOGY

FREDERICK KLAEBER, Professor, Head of Department of Comparative Philology

REQUIREMENTS OF THE DEPARTMENT

FOR A MINOR, courses 1, 2, 3, 4, 6.

FOR A MAJOR, courses 1, 2, 3, 4, 5, 6, together with two additional courses and reinforcing subjects (thirty credits) selected from English, ancient languages and advanced modern languages.

FOR B. A. WITH DISTINCTION, the general requirements (page 46) and English 3, 4 and 22 or English 3 and German 14 in addition to the requirements for a major.

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.	Title	Semester	Credits	Offered to	Prereq. courses
1.	Sc. of Lang.	1	2	Soph, Jr., Sr.,	None
2.	Life of Words	2	2	Soph., Jr., Sr.	None
3.	Teuton. Philol.	2	2	Soph., Jr., Sr.	None
4.	Esperanto	1	2	Jr., Sr.	None
5.	Seminar	2	2	Jr., Sr.	1
6.	Comp. Phonology	2	2	Jr., Sr.	See statement
7.	Comp. Grammar	..	..	Grad.	
8.	Gothic	..	..	Grad.	
9.	Urgerm. Gram.	..	..	Grad.	
10.	Old Saxon	..	..	Grad.	
11.	Old High German	..	..	Grad.	

1. GENERAL INTRODUCTION TO THE SCIENCE OF LANGUAGE — MR. KLAEBER
Two credits (two hours per week) — First semester
Open to sophomores, juniors, and seniors.
This course will be sufficiently general in its nature to be of use to all students who wish to obtain an insight into the life of language.

2. THE LIFE OF WORDS — MR. KLAEBER
Two credits (two hours per week) — Second semester
Open to sophomores, juniors, and seniors; alternates with course 3.
Etymology and semasiology. Growth of vocabulary; change of words in form aud meaning. Lectures and exercises with special reference to English and other Germanic languages.

3. INTRODUCTION TO TEUTONIC PHILOLOGY — MR. KLAEBER
Two credits (two hours per week) — Second semester
Open to sophomores, juniors, and seniors, who have a fair knowledge of German; alternates with course 2.
History of Germanic philology, biographies of leading scholars (J. Grimm and others). Classification of the Germanic languages. Rapid survey of the various branches of the Teutonic group (Gothic, Norse, English, Frisian, Dutch, Low German, High German)

4. ESPERANTO AND THE IDEA OF AN INTERNATIONAL LANGUAGE — MR. KLAEBER
Two credits (two hours per week) — First semester
Open to juniors and seniors.

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 the merits of Volapuk, Esperanto, and other artificial languages. Exercises in Esperanto.

5. PHILOLOGICAL SEMINAR MR. KLAEBER

Two credits (two hours per week) Second semester

Open to juniors and seniors who have completed course 1; alternates with course 6

Investigation of linguistic problems. Study of standard works (Paul, Delbrueck Wundt, Jespersen, etc.). Reports on recent publications.

6. COMPARATIVE PHONOLOGY OF ENGLISH AND GERMAN MR. KLAEBER

Two credits (two hours per week) Second semester

Open to juniors and seniors who have a fair knowledge of German. Alternates with course 5.

Elements of phonetics; history of English and German sounds; orthography. The lectures will be supplemented by practical exercises.

7. COMPARATIVE GRAMMAR OF THE GREEK, LATIN, AND GERMANIC LANGUAGES MR. KLAEBER

Open to graduate students who have taken an undergraduate major in a linguistic subject; other arrangements may be ascertained upon application to the department.

A general survey of the field of Indo-Germanic philology will be included.

8. GOTHIC MR. KLAEBER

Open to graduate students who have taken an undergraduate major in a linguistic subject; other arrangements may be ascertained upon application to the department.

The relation of Gothic to other Germanic dialects will be particularly emphasized. Study of the grammar (Braune, J. Wright, Streitberg) and reading of the gospels (Heyne's *Ulfilas*, 10th edition).

9. URGERMANISCHE GRAMMATIK MR. KLAEBER

Open to graduate students who have completed couse 8; other arrangements may be ascertained upon application to the department.

Lectures and study of standard works (Brugmann, Kluge, Noreen, Streitberg, et al.).

10. OLD SAXON MR. KLAEBER

Open to graduate students who have taken an undergraduate major in a linguistic subject; other arrangements may be ascertained upon application to the department.

Old Saxon Grammar and interpretation of the *Heliand*.

11. OLD HIGH GERMAN MR. KLAEBER

Open to graduates who have taken an undergraduate major in a linguistic subject; other arrangements may be ascertained upon application to the department.

Braune's *Althochdeutsche Grammatik*; Braune's *Althochdeutsches Lesebuch*.

This course is identical with German 14.

DRAWING

HENRIETTE CLOPATH, Instructor

MAUDE STEWARD, Assistant

REQUIREMENTS OF THE DEPARTMENT

FOR A MINOR, twelve credits.

A MAJOR is not offered.

FOR A TEACHER'S CERTIFICATE, an average of at least good in courses 1, 2, 3, 5 and 6

COURSES

No.	Title	Semester	Credit	Offered to	Prereq. courses
1.	Drawing and Painting in Representation	1, 2	6*	Soph., Jr., Sr.	None
2.	Adv. Drawing and Painting	1, 2	6	Jr. Sr.,	1
3.	Design	1, 2	6	Jr., Sr.	1 or 2
4.	2nd year Design	1, 2	6	Sr.	3
5.	Drawing and Education	1	3	Sr.	1 and 3
6.	Teaching of Drawing	1	1	Sr.	5

DRAWING AND PAINTING IN REPRESENTATION, MISS CLOPATH AND MISS STEWARD
Six credits (six hours per week) Both semesters
Open to sophomores (with the permission of the instructor), juniors and seniors.
The course consists of drawing of plant-form and landscape in pencil, in water color and in charcoal; the study of perspective and drawing of still life; drawing from the cast and sketching from life. Not credited toward a minor.
After having completed course 1 students may elect either course 2 or course 3.

2. ADVANCED DRAWING AND PAINTING MISS CLOPATH
Six credits (six hours per week) Both semesters
Open to juniors and seniors who have completed course 1.
More advanced work in cast drawing. Still life studies and figure poses in black and white and in color.

3. DESIGN MISS STEWARD
Six credits (six hours per week) Both semesters
Open to juniors and seniors who have completed course 1 or its equivalent.
The course includes the study of pure design and design in representation. Pure design: arrangement of lines, tones, and colors, in accordance with the principles of harmony, balance and rhythm. Historic ornament is introduced to show the application of these principles. Design in representation: the fundamental relation of design to pictorial art; composition as applied to plant form, landscape, still-life, and life drawing; compositions of the masters, and the making of original compositions.

4. DESIGN MISS STEWARD
Six credits (six hours per week) Both semesters
Open to seniors who have completed course 3.
This course includes advanced composition, book-decoration with especial attention to lettering, designs for stained glass, and design applied to leather, pottery, metal, and embroidery.

5. DRAWING AS RELATED TO EDUCATION MISS CLOPATH
Six credits (six hours per week) First semester
Open to seniors who have completed courses 1 and 3.
Exercises in all of the different kinds of work used in the schools; advanced work in black and white and in color.

6. THE TEACHING OF DRAWING MISS CLOPATH
One credit (two hours per week) Second semester
This course in conducted by lectures and collateral reading. Study of the methods that have proved most successful in public school teaching; the planning of work appropriate for each grade; the value and relation of art work in education as revealed through a study of the instincts and mental processes of the child.

ECONOMICS AND POLITICAL SCIENCE

JOHN H. GRAY, Professor, Head of Department of Economics and Political Science
EDWARD V. ROBINSON, Professor
WILLIAM A. SCHAPER, Professor
THOMAS WARNER MITCHELL, Assistant Professor
RAYMOND V. PHELAN, Instructor
CEPHAS D. ALLIN, Instructor
JOHN L. COULTER, Instructor
EUGENE T. LIES, Lecturer
JEREMIAH S. YOUNG, Ph.D., Assistant Professor, Extension Work
RALPH H. HESS, P .D., Assistant Professor, Extension Work

REQUIREMENTS OF THE DEPARTMENT

FOR A MINOR, twelve credits, all in Economics or all in Political Science.

FOR A MAJOR, eighteen credits, all in Economics or all in Political Science, together with reinforcing subjects (thirty credits) selected from the other line of work in the department (twelve credits of which are required), history and sociology (six credits in case of an ordinary major and twelve credits in case of B. A. with distinction being required), and additional economics and political science.

FOR B. A. WITH DISTINCTION, the general requirements (page 46), six credits in addition to the requirements for a major and in the same line, and the filing of a typewritten copy of the thesis in the department.

FOR A TEACHER'S CERTIFICATE, the following: in business subjects, including commercial geography, a major in economics, with an average of at least good; in government, a major in political science, with an average of at least good.

The departments of economics and political science, history, and sociology 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 at least with 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. To students who are interested in the work of these departments, but who do not care to elect their major before the end of the sophomore year, the departmenes unite in the following recommendations for the freshmen and sophomore years:

GENERAL RECOMMENDATIONS

I. Freshman and Sophomore Years:
   1. The student should take the elementary work of each department within the group as early as possible. Accordingly the following courses are recommended:

   Freshman year: history 2 (English constitutional): sophomore year: history 5 (American); economics 1, first or second semester; political science 1, first or second semester.

2. The student is advised to take in these years his required minor in science from the departments of botany or animal biology, and his required minor in language from the French or German beginning courses, unless he has a reading knowledge of both these languages at entrance.

II. Junior and Senior Years:

Elective under the direction of advisor selected from the department in which tne major subject is taken.

SUGGESTIONS TO STUDENTS

The work in economics and political science bears very directly on preparation for professional or business life and citizenship, no matter what occupation is finally chosen. But in order to aid students who have some idea as to their intended profession or calling to make a wise choice of courses, the following tabulated statement has been prepared.

Students intending to enter the law, for example, will find in the left-hand column the numbers of certain courses which are recommended to form a minor in economics; and in the next column, some additional courses which are suggested for those taking a major in economics. At the right, in like manner, are given the recommendations for a minor and a major in political science.

It should be noted: (1) that these recommendations are merely suggestive, not binding; (2) that more courses are sometimes recommended than suffice to make up a technical minor or major with the understanding that the student will consult the instructors and choose those courses which interest him the most.

Economics 1 and political science 1 are not included in these recommendations, as they must in any case precede the advanced courses; nor is economics 4 included, as it is required of all taking a major in economics.

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

ECONOMICS			POLITICAL SCIENCE	
Courses advised for a minor	Additional advised for a major	In Preparation for	Courses advised for a minor	Additional advised for a major
6, 7, 11, 10, 15	5a, 5b, 8, 9, 30a	Law	2, 3, 7, 8, 15, 17	4, 5, 10, 9, 12, 14, 20, 19, 18
3a, 3b, 6, 7, 11,10	29, 14, 15	Public Service	2, 3, 7, 15, 14, 9, 18, 20	8, 4, 5, 10, 12, 19, 17
2, 3a, 3b, 22, 12, 13, 29	5a, 5b, 19, 20a, 8, 9	Consular and Diplomatic Service	2, 3, 5, 10, 14, 20, 19, 18	4, 8, 12, 17
5a, 5b, 6, 7, 11,10	29, 30a, 16, 14	Journalism	2, 3, 7, 8, 9, 10, 17 20	4, 5, 12, 18, 19
8, 9, 11, 10	16, 20a, 20b, 21, 19	Engineering or Railway Service	6, 7, 14, 15	4, 8, 20
2, 12, 13, 11, 16, 22	20a, 21, 19, 29	Chemistry or Manufactures	2, 3, 7, 9	8, 12, 14, 18, 20
8, 9, 11, 16, 22	2, 12, 13, 21	Mining	2, 3, 7, 15, 9	8, 12, 14, 20
5a, 5b, 26a, 26b 29	20a, 20b, 20c, 21 25a	Insurance or Banking	2, 3, 7, 14, 15, 17	4, 8, 10, 12, 20
2, 3a, 3b, 5a, 5b, 12, 13	20a, 21, 19, 25, 27, 28	General Business	2, 3, 7, 15, 9, 17	8, 12, 19, 20
24a, 24b, 22, 2, 23, 12, 13	8, 9, 5a, 20a, 21	Forestry or Agriculture	2, 3, 15, 14	9, 12, 8, 20
2, 3a, 3b, 5a, 5b, 30a	20a, 21, 19, 30b	Teaching Business Subjects or American Government	2, 3, 7, 9, 15, 17, 18, 20	4, 5, 12, 10, 8, 14, 19
1, 3a, 3b, 5a, 18	6, 7, 11, 10	Medicine	2, 3, 7, 9	8, 12, 15, 20
3a, 3b, 16, 17, 18	14, 15, 30a or 30b	Charity Work or the Ministry	2, 3, 7, 8, 17	9, 12, 15, 18, 20

ECONOMICS

Courses

No.	Title	Semester	Credits	Offered to	Prereq. courses
	Introductory Courses:				
1.	Elements of Economics	1 or 2	3	Soph., Jr., Sr.	None
2a.	Economic Geography of United States	1	3	Soph., Jr., Sr.	None
2b.	Economic Geography of Foreign Countries	2	3	Soph., Jr., Sr.	2a
3a.	Industrial History of Europe	1	3	Soph., Jr., Sr.	None
3b.	Industrial History of the United States	2	3	Soph., Jr., Sr.	3a
	General Courses:				
4.	Advanced Economics	2	3	Soph., Jr., Sr.	1
5a.	Money and Banking	2	3	Soph., Jr., Sr.	1
5b.	Financ. Hist of the U. S.	2	3	Jr., Sr.	1 and 5a
6.	Public Finance	1	3	Jr., Sr.	1
7.	Problems in Taxation	2	3	Jr., Sr.	6
8.	Econs. of Transportation	2	3	Jr., Sr.	1
9	*Railway Problems	1	3	Jr., Sr.	1
10.	Municipal Industries	2	3	Jr., Sr.	1
11.	The Modern Bus. Corporation	1	3	Jr., Sr.	1
12.	*Economics of Commerce	1	3	Jr., Sr.	1, 2 or 3a
13.	*Econ. of Colonization	2	3	Soph., Jr., Sr.	1, 2 or 3a
14.	*Economic Reforms	1	3	Jr., Sr.	1
5.	*The State in Relation to Industry	2	3	Jr., Sr.	14
16.	Labor Problems, Part I	1	3	Jr., Sr.	1
17.	Labor Problems, Part II	2	3	Jr., Sr.	1 and 16
18.	Economic Conditions in American Cities	1 or 2	3	Jr., Sr.	1 or 3b, or Soc. 1
	Business Courses:				
19.	Business Organization	2	3	Soph., Jr., Sr.	1
20a.	The Principles of Accounting	1	3	Jr., Sr.	1
20b.	Corporation Accounting	2	3	Jr., Sr.	20a
20c.	*Problems in Accounting	1	3	Sr.	1, 20a, 20b
20d.	*Auditing	1	3	Sr.	1, 20a, 20b
21.	Business Law	2	3	Soph., Jr., Sr.	1
22.	Materials of Commerce	2	3	Soph., Jr., Sr.	2
23.	Economics of Forestry and Irrigation	1	3	Jr., Sr.	1 or 2
24a.	History of Agriculture	1	3	Jr., Sr.	1 or 2
24b.	Economics of Agriculture	2	3	Jr., Sr.	24a
25a.	*Economics of Investment and Speculation	1	3	Jr., Sr.	1 and 5a
25b.	*Mathematics of Investment	1	3	Jr., Sr.	Math. 3 and Econ. 1
26a.	*Personal Insurance	2	3	Jr., Sr.	1
26b.	*Property Insurance	2	3	Jr., Sr.	1
27.	*Commercial Credit	2	3	Jr., Sr.	1 and 19
28.	*Advertising	2	3	Jr., Sr.	1 and 19

COURSES (Continued)

No.	Title	Semester	Credits	Offered to	Prereq. courses
	ADVANCED AND GRADUATE COURSES:				
29.	*Theory and Practice of Statistics.....	1	2	Jr., Sr.	Six credits in Econ.
30a.	*Hist. of Econ. Thought.....	1	2	Jr., Sr.	Six credits in Econ.
30b.	*Methods of Investigation and Instruction.....	2	2	Jr., Sr.	Six credits in Econ.
31.	Seminar in Economics.....	1, 2,	6	Sr.	Twelve credits in Ec.

*Starred courses are not given every year.

INTRODUCTORY COURSES

1. ELEMENTS OF ECONOMICS MESSRS. ROBINSON, PHELAN AND COULTER
Three credits (three hours per week) Each semester

Open to sophomores, juniors, and seniors; designed for those who desire a general knowledge of economics and as an introduction to the more advanced courses offered in the department. Required of all taking the six year medical course.

A thorough course in the elements of economic theory, with special reference to present day economic and social problems. McVey's *Outline* and a text-book, supplemented by lectures and problems, with a weekly quiz.

2a. ECONOMIC GEOGRAPHY OF THE UNITED STATES MR. ROBINSON
Three credits (three hours per week) First semester

Open to sophomores, juniors, and seniors.

A study of the economic basis of modern civilization. The course embraces: (1) a brief survey of the stages of economic development; (2) an analysis of the causes, both in nature and man, which control the development and the localization of industry and commerce; (3) a study of the United States and its outlying possessions with referense to: (a) natural controls and resources; (b), labor and capital goods as factors in production; (c), localization and commercial importance of the principal extractive industries, viz., fishing, forestry, grazing, farming and mining; (d), ditto, of the principal manufacturing and distributive industries, including especially foreign commerce.

2b. ECONOMIC GEOGRAPHY OF FOREIGN COUNTRIES MR. ROBINSON
Three credits (three hours per week) Second semester

Open to those who have completed course 2a

(4) A study of the natural resources, chief industries, commercial products, and commercial relations of the leading foreign countries. Special attention is given to international competition for foreign markets, to international trade routes, both by land and sea, and to countries, such as Canada, Latin America and the Orient, which have a large prospective value as markets for American manufactures and as fields for the investment of American capital.

Text book supplemented by lectures and reports.

3a. MODERN INDUSTRIAL AND COMMERCIAL HISTORY OF EUROPE, MR. GRAY
Three credits (three hours per week) First semester

The industrial and commercial development of the chief European countries since the middle of the 18th century with special attention to Great Britain. The effects of mechanical invention and political change on industry and trade.

Course 3a requires no preliminary course and may be taken advantageously with course 1 or course 2. (see course 3b)

3b. THE INDUSTRIAL AND COMMERCIAL HISTORY OF THE UNITED STATES MR. GRAY
Three credits (three hours per week) Second semester

Open to those who have had 3a.

Courses 3a and 3b are conducted each with a text book, supplemented by lectures and prescribed topical readings. In each of these courses, one written report of considerable length will be required each semester.

GENERAL COURSES

4. ADVANCED ECONOMICS — MR. ROBINSON
Three credits (three hours per week) — Second semester
Open to those who have completed course 1; required for a major in economics.
An advanced course in general economics, devoted to a study of recent theories of distribution.
Assigned readings, reports, and discussions.

5a. MONEY AND BANKING — MR. PHELAN
Three credits (three hours per week) — Each semester
Open to those who have completed course 1.
The history and theory of money; nature and uses of credit; functions of banks, trust companies, and other financial institutions; foreign exchange and the settlement of international balances. Lectures, text-book, assigned readings, and discussions.

5b. FINANCIAL HISTORY OF THE UNITED STATES — MR. PHELAN
Three credits (three hours per week) — Second semester
Open to those who have completed courses 1 and 5a.
The main lines of our financial development, that is our monetary and banking history, are traced by means of lectures. Readings in the literature of the subject and topics for investigation are assigned. Lectures, text-book, assigned readings, topics, and discussions.

6. PUBLIC FINANCE — MR. ROBINSON
Three credits (three hours per week) — First semester
Open to those who have completed course 1.
The development of the state as an economic organism. Public expenditures from the view point of public wants. Budget systems of leading countries with special emphasis on the United States. Public revenues from public domains and industries. Principles, incidence, and administration of taxation. The theory of public debts. Text-books, supplemented by lectures and assigned readings.

7. PROBLEMS IN TAXATION — MR. ROBINSON
Three credits (three hours per week) — Second semester
Open to those who have completed course 6.
Study of tax systems, tax reforms, and special forms of taxation, such as the mortgage, corporation, income and inheritance taxes. Based on Seligman, and reports of state tax commissions, with lectures and reports on special topics.

8. ECONOMICS OF TRANSPORTATION AND COMMUNICATION — MR. ROBINSON
Three credits (three hours per week) — Second semester
Open to juniors and seniors who have completed course 1 and to students in the technical colleges. Offered especially for students of engineering.
A general course on the history and theory of transportation and communication with special reference to the United States; early routes and methods of migration and commerce; causes determining the location of railways; effect of steam and electricity in the consolidation of industries and of nations; signal systems, the post, telegraph and telephone; parcel post and express service; economic functions and relations of highways, interurban electric lines, steam railways, inland waterways, and ocean transportation; the organization of ocean commerce. Lectures, assigned readings, and discussions.

9. RAILWAY PROBLEMS — MR. ROBINSON
Three credits (three hours per week) — First semester
Open to those who have completed course 1

A course devoted to the study of railway problems and administration, including: (1) conditions affecting economy of operation; (2) passenger and goods traffic; (3) economic principles underlying the making of railway rates; (4) competition in relation to rate wars, discrimination between persons, places, and commodities, pooling, and various forms of combination; (5) the great railway systems of the United States; (6) regulation by the states and the federal government; (7) government ownership and operation of railways in Europe and Australasia. Lectures, assigned readings, and special topics.

10. MUNICIPAL INDUSTRIES — MR. GRAY
Three credits (three hours per week) — Second semester

Open to juniors and seniors who have completed course 1; if possible, should be preceded by course 11.

The causes and the social and economic effects of the recent rapid development of municipal industries. A comparison of the results of public and of private ownership. Text-books, lectures, and quizzes.

11. THE MODERN BUSINESS CORPORATION — MR. GRAY
Three credits (three hours per week.) — First semester

Open to those who have completed course 1.

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. Text-books; Ripley, *Trusts, Pools, and Corporations*, Meade's *Trust Finance*, Wyman's *Cases*. Lectures, class discussions, and reports.

12. ECONOMICS OF COMMERCE — MR. ROBINSON
Three credits (three hours per week) — First semester

Open to those who have completed course 1, 2, or 3a.

Causes and characteristics of commercial crises; history, theory and mechanism of international commerce; free trade, reciprocity and protection, with special emphasis on the tariff history and policy of the United States; the balance of trade; economic causes of the contest for foreign markets; organization of the export trade, commercial treaties and foreign politics; the consular and diplomatic service as a factor in commerce. Lectures, assigned readings, and reports on special topics.

13. ECONOMICS OF COLONIZATION — MR. ROBINSON
Three credits (three hours per week) — Second semester

Open to those who have completed course 1, 2, or 3a. Forms with course 12 in Political Science, a year course on colonization.

The economic causes of human migration; historical survey of colonization and classification of colonies with reference to their economic bases; existing colonial systems, with special attention to the outlying possessions of the United States; colonial commerce in relation to modern commercial and foreign policies; preferential tariffs and imperial federation. Lectures, assigned readings, and reports on special topics.

14. ECONOMIC REFORMS — MR. PHELAN
Three credits (three hours per week) — First semester

Open to juniors and seniors who have completed course 1.

A study of Utopias and economic reforms from Plato to Henry George, with special attention to modern scientific socialism as a philosophy of industrial evolution and as a program of economic reform. Lectures, assigned readings, reports, and discussions.

15. THE STATE IN RELATION TO INDUSTRY — MR. PHELAN
Three credits (three hours per week) — Second semester

Open to juniors and seniors who have completed courses 1 and 14.

A study of the influence exercised by society and by the state on the production and distribution of wealth. The force of custom; effect of private property and other social institutions; the results of economic legislation designed to limit the freedom,

or raise the plane, of competition. General survey of the relation of the state to industry. Lectures, assigned readings, and reports.

16. LABOR PROBLEMS: Part I — MR. PHELAN
Three credits (three hours per week) — First semester
Open to juniors and seniors who have completed course 1.

Labor unions, strikes, systems of wage payment, arbitration, poverty, child labor, etc. Efforts, public and private, to secure justice and social wellbeing through improvements in the working and living conditions of the laboring classes. Lectures' text-book, assigned readings, and discussions.

17. LABOR PROBLEMS: Part II — MR. PHELAN
Three credits (three hours per week) — Second semester
Open to juniors and seniors who have completed course 1, but should also be preceded by course 16.

A study of immigrants in America, with reference to their economic contributions; the economic conditions in foreign countries that lead to emigration; the general problem of immigration; the special economic problems of the Slav, the Italian, the negro, the Chinese and the Japanese. Lectures, text-book, topics and discussions.

18. ECONOMIC CONDITIONS IN AMERICAN CITIES, — MR. LIES
Open to juniors and seniors who have completed course 1, course 3a, or sociology 1; required in the six year medical course.

A study of the causes of economic dependence in American cities, the standard of living, and the constructive agencies for economic betterment. Given by lectures with assigned readings and visits of inspection in the Twin Cities.

BUSINESS COURSES

19. BUSINESS ORGANIZATION — MR. MITCHELL
Three credits (three hours per week) — Second semester
Open to those who have completed course 1.

General organization of the business field for productive efficiency. Competitive vs monopolistic industry. Division of industry as a problem before the entrepreneur. The importance of division and organization of production processes within the individual plant. Mismanagement and waste. The internal organization and management of large scale industry disclosing the elements of its technical advantages. Typical manufacturing and mercantile concerns in success and failure. Based on Sparling's *Introduction to Business Organization* with lectures, assigned reading, and discussions.

20a. THE PRINCIPLES OF ACCOUNTING — MR. MITCHELL
Three credits (three hours per week) — First semester
Open to juniors and seniors who have completed course 1.

Fundamentals in the theory and practice of accounting with a view to general business efficiency. The accountant, his essential qualities and work. Aims and essentials of a desirable system of accounts. The mathematical philosophy underlying all accountancy developing the demonstration of the principal specific fields of accounting. Practical application of all points of theory through numerous accounting sets taken from those in actual use in the business field.

Largely a laboratory course, with text and lectures.

20b. CORPORATION ACCOUNTING — MR. MITCHELL
Three credits (three hours per week) — Second semester
Open to juniors and seniors who have completed courses 1 and 20a.

The theory and general practice of modern systems of expert accounting. The general corporation and its financial accounts. The operating accounts, general office accounts, and reports, of manufactures, telegraph and express companies, banks, insurance companies, and transportation companies. Special studies in cost,

voucher, and loose leaf systems. Economical accounts. Examination of typical published reports from the standpoint of accountancy and interpretation. Inspection of the systems of running corporations.

20c. PROBLEMS IN EXPERT ACCOUNTING — MR. MITCHELL
Three credits (three hours per week) — First semester

Open to juniors and seniors who have completed courses 1, 20a and 20b.

Lectures on concrete problems of the type confronting the general public eccountant and class exercises taken largely from examinations for chartered public accountants, the aim being to give such information as shall be most suggestive and useful in preparing for C. P. A. examinations. Given alternate years with course 20d.

20d. AUDITING — MR. MITCHELL
Three credits (three hours per week) — First semester

Open to juniors and seniors who have completed courses 1, 20a and 20b.

The principal duties and qualifications of the auditor. The nature of his work and the problems that confront him. Auditing in the various types of industries. Numerous practical problems and audits of books of going concerns. Lectures and laboratory. Given alternate years with course 20c.

21. ELEMENTS OF BUSINESS LAW
Three credits (three hours per week) — Second semester

Open to those who have completed course 1.

The principles of law governing ordinary commercial transactions. 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. Assigned readings, lectures, and quizzes.

22. MATERIALS OF COMMERCE — MR. COULTER
Three credits (three hours per week) — Second semester

Open to juniors and seniors who have completed course 2a.

A study of the principal wares of commerce with reference to sources, uses and industrial processes. Text with collateral reading, lectures and visits of inspection.

23. ECONOMICS OF FORESTRY AND IRRIGATION — MR. COULTER
Three credits (three hours per week) — First semester

Open to juniors and seniors who have completed course 1 or course 2.

Preliminary survey of forest controls and forest influences. In this connection, special attention to the progress of the national irrigation works in relation to economic development, land laws, and land tenure. Location and value of the extant forest resources of the United States. Intensive study of the forest industry, covering: (1) history and processes, (2) employees, (3) division into stages (logging, sawing, etc.), (4) internal organization of each, (5) transportation and marketing, (6) economic relations to other industries, (8) share of forest products in foreign commerce, (9) economic necessity of a scientific system of forestry. Lectures, assigned reading, and reports.

24a. HISTORY AND LITERATURE OF AGRICULTURAL INDUSTRIES — MR. COULTER
Three credits (three hours per week) — First semester

Open to juniors and seniors who have completed course 1 or 2.

Historic development of, and attitude toward, agriculture in ancient, mediaeval and modern times, and comparison of systems with reference to stage of economic development and geographic conditions. A more detailed study of the history of agriculture in the United States. Lectures, assigned readings, reports on special topics, quiz.

24b. ECONOMICS OF AGRICULTURAL INDUSTRIES — MR. COULTER
Three credits (three hours per week) — Second semester

Open to juniors and seniors who have completed course 24a, and others by special permission.

Economic principles which underlie farm and estate management, land values, and prices of farm produce; preparations of produce for market, market and transportation problems. The size, ownership, organization and labor system of farms

as bearing on economic efficiency and social and political conditions. Farm organizations and co-operation. Lectures, assigned readings, reports on special topics, quiz.

25a. INVESTMENT AND SPECULATION — MR. MITCHELL
Three credits (three hours per week) — First semester
Open to juniors and seniors who have completed course 5a.

The social significance of the processes of saving and investing. Private property as the basis of investment. Funds, credit instruments and other machinery of investment. Investment markets. Historic investment opportunities, transition periods, and effect of economic progress. Laws of investment values and causes affecting values. Special studies in the various classes of investments, real estate, loans, general business, stocks and bonds. Organization and working of stock and produce exchanges. Wall Street. Investment vs. Speculation vs. Gambling.

Lectures, assigned readings and exercises in the interpretation of quotations, financial articles and market reports.

Given alternate years with course 25b.

25b. THE MATHEMATICS AND ACCOUNTANCY OF INVESTMENT — MR. MITCHELL
Three credits (three hours per week) — First semester
Open to juniors and seniors who have completed Mathematics 3 and Economics 1.

A study of the mathematical principles underlying computations in foreign exchange, banking, statistical investigation, insurance, building and loan associations, trust company business, bond issues, sinking funds etc. The development of the formulas and tables used in such computations and numerous practical problems. The accountancy of earnings, interest, depreciation and fluctuating values as under the above. The use of short cuts, tables and mechanical aids. Lectures, laboratory practice and problems. Given alternate years with course 25a.

26a. PERSONAL INSURANCE (Life and Accident) — MR. MITCHELL
Three credits (three hours per week) — Second semester
Open to juniors and seniors who have completed course 1.

The general theory and practice of life and accident insurance. History and evolution of life insurance and the modern life policy. The social functions of insurance and its importance in the business world. Development of the science of insurance explaining the different types of policy and the technical meaning of premium, reserve, dividend, surplus, expectation of life, annuities, surrender values, extentions, loans, paid up insurance etc. The personal insurance problem and its solution. Types of insurance organizations and companies. Public regulation. Lectures and assigned readings. Given alternate years with course 26b.

26b. PROPERTY INSURANCE — MR. MITCHELL
Three credits (three hours per week) — Second semester
Open to juniors and seniors who have completed course 1.

The basic theory of fire insurance. The historic development, peculiarities and practice of various forms of property insurance, including storm, boiler, marine, fire and miscellaneous. A technical study of an insurance company of each type. Critical examination of policy contracts, exemptions, forfeitures, abandonments, co-insurance, adjustments, and other questions of procedure under insurance contracts. Lectures and assigned readings. Given alternate years with course 26a.

27. COMMERCIAL CREDIT — MR. MITCHELL
Three credits (three hours per week) — Second semester
Open to juniors and seniors who have completed courses 1 and 22

The forms and uses of credit. Its importance in the business world and its dangers. The work of the credit man. Commercial agencies and other safeguards. Credit institutions in their relation to business. Credit in individual success and failure, in social prosperity and crises. Given alternate years with course 28.

28. ADVERTISING — MR. MITCHELL
Three credits (three hours per week) — Second semester
Open to juniors and seniors who have completed courses 1 and 19.

The use of advertising in modern business. Various types of advertising and of advertising methods. Advertisement writing. Methods of following up and checking results. Examples of advertising campaigns and their results. Given alternate years with course 27.

ADVANCED AND GRADUATE COURSES

29. THEORY AND PRACTICE OF STATISTICS — MR. MITCHELL
Two credits (two hours per week) — First semester
Open to those who have completed six credits in economics.

A study of statistical method and the work of the statistician. General critical survey of present day statistical information. Correct principles of collection, tabulation, classification and interpretation of statistical material. A first hand investigation into some practical problem by the class. Lectures, assigned readings and seminary work on the special problem.

30a. HISTORY OF ECONOMIC THOUGHT — MR. ROBINSON
Two credits (two hours per week) — First semester
Open to those who have completed six credits in economics.

A survey of economic thought covering ancient, medieval and modern times, with emphasis on the period since 1850. Assigned readings, and reports on special topics, which will furnish the basis of class discussions. The work will be conducted in an informal manner, approaching somewhat the seminar plan.

30b. METHODS OF INVESTIGATION AND INSTRUCTION IN ECONOMICS — MR. ROBINSON
Two credits (two hours per week) — Second semester
Open to those who have six credits in economics.

The scope and logical methods of economics; relation of economics to the other social sciences and to ethics; methods of carrying on investigations and of giving instruction in economics.

Assigned readings and reports on special topics, which will furnish the basis of class discussions. The work will be conducted in an informal manner, approaching somewhat the seminar plan.

31. SEMINAR IN ECONOMICS, — MESSRS. GRAY, ROBINSON, MITCHELL, GEROULD, PHELAN AND COULTER
Six credits (three hours per week) — Both semesters

Open to graduate students and to seniors who have completed at least twelve credits in economics and are capable of making original investigations; both semesters must be completed before credit is given for the first semester.

A course in research and in methods of investigation. The course will be conducted jointly by all the instructors, each striving to be of special service to students who choose topics within the field of his special interests.

POLITICAL SCIENCE

Courses

Introductory Course

No.	Title	Semester	Credits	Offered to	Prerequisites
1.	Am. Govt.	1 or 2	3	Soph., Jr., Sr.,	None

General Courses.

2.	Comp. Govt.	1	3	Jr., Sr.	course 1
3.	El. of Jurisprudence	1	3	Jr., Sr.	" 1
7.	Mun. Administration	2	3	Soph., Jr., Sr.	" 8
9.	Political Parties	1	2	Jr., Sr.	" 1 and 2
10.	*Diplomacy	2	2	Soph,. Jr., Sr.	" 1
12.	Colonial Administration	1	3	Jr., Sr.	" 1 and 15
15.	State and Local Admin.	2	3	Soph., Jr., Sr.	" 1
17.	Modern Pol. Thought	1	2	Jr., Sr.	" 1
18.	*Comp. Fed. Govt.	2	3	Jr., Sr.	" 1 & 2 or 12
20.	*Comp. Latin Am. Govt.	1	3	Jr., Sr.	" 1

Special Courses.

6.	(Engineers) Com. Law	1	2	Sr.	None
13.	Teacher's Govt.	2	1	Jr., Sr.	" 1 and 2
16.	(Engineers) Am. Govt.	2	2	Jr.	None

Advanced and Graduate Courses.

4.	*Const. Law	1, 2	6	Jr., Sr.	" 1, 2 & 8 or 17
5.	*Inter. Law	1, 2	6	Jr., Sr.	" 1 and 2
8.	Theory of the State	2	3	Jr., Sr.	" 1& 2 or 15
11.	Seminar	1, 2	6	Sr., Grads	" 1 and 2
14.	Adm. Law	2	2	Jr., Sr.	" 1 & 2 or 15
19.	*Roman Law	1	3	Jr., Sr.	" 1 and 2

*Starred courses are not given every year.

1. American Government — Messrs. Schaper and Allin

Three credits (three hours per week) — Each semester

Open to sophomores, juniors and seniors.

An elementary course in American Government intended as a preparation for the advanced courses in political science, for teaching in secondary schools, and for good citizenship; a study of the organization and actual workings of the national and local governments; a series of lectures on the nature and origin of the American governmental system precedes a study of the text and assigned topics; special attention will be given to important statutes on naturalization,organization of the judiciary, and of executive departments, interstate commerce, trusts, etc. Text, lectures, and special topics.

2. Comparative Government — Mr. Allin

Three credits (three hours per week) — First semester

Open to those who have completed course 1.

A comparative study of the organization and working of the governments of the great European powers of today, especially of France, Germany, Great Britain, and Italy. Text, with lectures and assigned readings.

3. THE ELEMENTS OF JURISPRUDENCE — MR. SCHAPER
Three credits (three hours per week) — First semester
Open to those who have completed course 1.

A study of those human relations requiring legal regulation considered from the American point of view; the nature and source of law, status, rights and wrongs, partnership, corporations, etc. The course is intended for active citizenship and for the study of law. The student will practice looking up cases and summarizing leading principles. The course is based on a text, with lectures and assigned reading.

4. AMERICAN CONSTITUTIONAL LAW — MR. SCHAPER
Six credits (three hours per week) — Both semesters
Open to those who have completed courses 1, 2, and 8 or 17; both semesters must be completed before credit is given for the first semester; given in alternate years; offered in 1909-10.

This is an advanced course in the study of the principles of our constitutional law based on important Supreme Court decisions and standard works.

5. INTERNATIONAL LAW — MR. ALLIN
Six credits (three hours per week) — Both semesters
Open to those who have completed courses 1 and 2.

This course treats of the nature, sources, and sanction of international law; of the general principles as developed by positive agreement, common usage, and judicial decisions, in particular of the status of nations, the rules of peace, neutrality, and war, and the arbitration movement. Text, lectures, and supplementary reading. Given in alternate years. Not offered in 1909-10.

6. COMMERCIAL LAW — MR. ALLIN
Two credits (two hours per week) — First semester
Intended primarily for seniors in the College of Engineering.

7. MUNICIPAL ADMINISTRATION — MR. SCHAPER
Three credits (three hours per week) — Second semester
Open to those who have completed course 1.

A comparative study of modern city charters and methods of administration, the relation of the city to the state, the delimitation of its sphere of activity, its liability for tort, and an investigation into the causes of municipal corruption and merits of proposed reforms. A text, lectures, and special topics.

8. THEORY OF THE STATE — MR. SCHAPER
Three credits (three hours per week) — Second semester
Open to those who have completed courses 1 and 2 or 15.

A study of the theory of the state, the origin, nature, purpose and justification of the state, population and territory. Leading theories, like the divine, contract, modern socialistic, individualistic, and social welfare, are considered; also the question of state interference and state management of industries. This course includes a study of classification of law, governments, and states. A text-book, with lectures and topical readings.

9. POLITICAL PARTIES — MR. SCHAPER
Two credits (two hours per week) — First semester
Open to those who have taken courses 1 and 2.

An advanced course in political parties, their origin, development, and function. Such topics as methods of making nominations, securing minority representation, the recall, the initiative and referendum are taken up. Text, lectures, and special topics.

10. DIPLOMACY — MR. ALLIN
Two credits (two hours per week) — Second semester
Open to those who have completed course 1.

The object of this course is to outline the growth of international relations, the mode of conducting foreign affairs, the relation of the treaty-making power to legislation, the duties and immunities of diplomats, the consular service, the framing, interpretation, and termination of treaties and compacts, and the character and procedure of courts of arbitration. Considerable attention will be given to concrete illustrations of the principles of international practice as exemplified in such matters as the fisheries question, the Geneva arbitration, the Caroline incident, etc. Text, lectures, and supplementary reading.

11. SEMINAR IN POLITICAL SCIENCE — MESSRS. SCHAPER AND ALLIN
Six credits (three hours per week) — Both semesters
Open to graduate students and seniors of suitable preparation.

A seminar for research in the field of political science. A feature of the seminar is the discussion of current problems in politics and administration.

12. COLONIAL ADMINISTRATION — MR. ALLIN
Three credits (three hours per week) — First semester
Open to those who have completed courses 1 and 15. Forms with course 13 in economics a year course in colonization.

This course embraces a discussion of the principal classes of colonies, the causes of colonization, the social, economic, and political tendencies of colonial development, imperial relations, preferential trade, and independence. A study is made of the political systems of modern colonial governments, of the organization and administration of the Spanish, English, French, Dutch, German, and American colonies. Lectures, assigned readings, and special topics. Given in alternate years. Offered in 1909-10.

13. TEACHER'S COURSE IN GOVERNMENT
One credit (one hour per week) — Second semester
Open to students of suitable preparation who intend to teach American government in the secondary schools.

Lectures and the examination of text-books, maps, and other materials useful to teachers.

14. ADMINISTRATIVE LAW — MR. SCHAPER
Two credits (two hours per week) — Second semester
Open to those who have completed courses 1, 2 or 15.

A course dealing with administration as a science, its origin and development, the law of officers under the national government, the merit system, and the growth of special administrative tribunals. Text, lectures, and cases.

15. STATE AND LOCAL ADMINISTRATION — MR. SCHAPER
Three credits (three hours per week) — Second semester
Open to those who have completed course 1.

A special course in the problems of our state and local governments; a comparative study of new experiments in legislation and administration, the workings of our courts, the jury system, and the new state police. Lectures, cases, and special topics.

16. AMERICAN GOVERNMENT
Two credits (two hours per week) — First semester
Intended for students in the college of Engineering.

17. MODERN POLITICAL THOUGHT — PROF. SCHAPER
Two credits (two hours per week) — First semester
Open to those who have taken course 1.
A study of democracy, the reform movements, the decline of individualism, the extension of the sphere of governmental activity and American political ideals and theories. Lectures, and assigned readings.

18. COMPARATIVE FEDERAL GOVERNMENT — MR. ALLIN
Three credits (three hours per week) — Second semester
Open to those who have taken courses 1 and 2 or 12.
A comparative study of ancient and modern confederations and federal unions. Special attention will be given to the description and analysis of the federal constitutions of the United States, Switzerland, Canada, Australia, and the proposals for the South African Union and Imperial federation. The nationalizing tendencies of the federal system, and the influence of political parties and commercial policies upon federal organization will be carefully considered. Lectures, reports and assigned reading. Given in alternate years. Offered in 1909-10.

*19. ROMAN LAW
Three credits (three hours per week) — First semester
Open to those who have taken courses 1. and 3.
A study of the growth of the Roman Law and its influence on the development of the Continental, English and American Law. Text and assigned reading.

*20 COMPARATIVE LATIN AMERICAN GOVERNMENTS
Three credits (three hours per week) — First semester
Open to those who have taken course 1.
A study of the governments and political conditions of Brazil, Argentine, Chile and Mexico. Text, lectures and assigned reading.

EDUCATION

GEORGE F. JAMES, Professor, Head of Department of Education
ALBERT W. RANKIN, Professor
FLETCHER H. SWIFT, Professor

REQUIREMENTS OF THE DEPARTMENT

FOR A MINOR, twelve credits.

FOR A MAJOR, eighteen credits, together with reinforcing subjects (thirty credits) selected from history, philosophy, economics, politics, sciences and languages according to special aim of the individual.

COURSES

No.	Title	Semester	Credits	Offered to	Prereq. courses
1.	Hist. of Educ. to Reformation	1	3	Jr., Sr.	None
2.	Hist. of Mod. Education.....	2	3	Jr., Sr.	1
3.	Educational Psych.....	2	3	Soph., Jr., Sr.	Philosophy 1
4.	Secondary Education.....	1	3	Jr., Sr.	1 and 2
5.	Prin. and Org. of El. Teaching	2	3	Sr.	1, 2, and Philosophy 1
6.	Prin. and Org. of Sec. Teaching.....	2	3	Jr., Sr.	1 and 2

COURSES (Continued)

No.	Title	Semester	Credits	Offered to	Prereq. courses
7.	Theory of Education	1	3	Jr., Sr.	Philosophy 1
8.	School Administrntion	1	3	Sr.	1 and 2
9.	School Supervision	2	3	Sr.	See statement
10.	Comp. Study of Sch. System	2	3	Sr.	1 and 2
11.	Modern Educ. Theories	2	3	Sr.	1 and 2, and Philosophy 1
12.	Current Prob. in Elem. Teaching	1	2	Sr. Grad.	5
13.	Educational Classics	1	2	Sr.	1 and 2
14.	Current Prob. in Sec. Teaching	2	2	Sr. Grad.	6
15.	Probl. in Sch. Administration	2	2	Sr. Grad.	1 and 2
16.	School Sanitation	1	2	Sr. Grad.	None
17.	Organization of Higher Education	2	1	Sr. Grad.	1 and 2

1. HISTORY OF EDUCATION TO THE REFORMATION — MR. SWIFT
Three credits (three hours per week) — First semester
Open to juniors and seniors.

An introductory study in the history of education, conducted by means of lectures, assigned readings, discussions, and reports. The purpose of the course is to arouse an interest in educational problems, to secure some perspective for use in current investigation, with some command of the facts of educational history, and some ease in the methods of historical study. An attempt is made to bring out education as one phase of civlization and to show the connection of schools with other social institutions. Attention will be given especially to the schools of Greece and of Rome, the education of the early Christian centuries, the development of different types of schools in medieval times, the rise of the university, and of the humanistic schools of the Renaissance.

2. HISTORY OF MODERN EDUCATION — MR. SWIFT
Three credits (three hours per week) — Second semester
Open to juniors and seniors who have completed course 1.

A somewhat intensive study of the periods in the history of modern education, with special reference to the development of the various national systems of public instruction. Different types of educational theory are considered in connection with a study of the men who first advanced them, and of the schools in which they were first put into effect. This course is a direct preparation for an understanding of the educational systems, theories, and practices of the present.

3. EDUCATIONAL PSYCHOLOGY — MESSRS. MINER AND HAYNES
Three credits (three hours per week) — Second semester
Open to sophomores and juniors who have completed philosophy 1.

Identical with philosophy 3. The study of mental development in its relation to heredity and training. Lectures and student reports on the facts and theories of childhood and adolescence with special reference to their bearing on education.

4. SECONDARY EDUCATION — MR. JAMES
Three credits — First semester
Open to seniors who have completed courses 1 and 2.

A study of secondary education in the United States, with such references to

the secondary schools of other countries as will lead to a clearer understanding of the place and function of the high school, its curriculum, the problems of present-day importance, and the relation of the high school to other parts of the system of public instruction. The course will be conducted by lectures, reports and discussions.

5. PRINCIPLES AND ORGANIZATION OF ELEMENTARY TEACHING — MR. RANKIN
Three credits — First semester
Open to seniors who have completed courses 1. and 2 and philosophy 1.

This course includes a consideration of the course of study of the elementary school and of the best methods of instruction. It is conducted by means of lectures, assigned readings, discussions and reports. It is planned for all students who expect to teach in the high schools or to be principals or superintendents. No credit is given in this course to graduates of normal schools, who have received one year's credit at the university.

6. PRINCIPLES AND ORGANIZATION OF SECONDARY TEACHING — MR. RANKIN
Three credits — Second semester
Open to seniors who have completed courses 1 and 2.

This course includes lectures on the general methods of secondary teaching, assigned readings, reports, and discussions. It is planned more particularly for those who expect to teach in high schools.

7. THE THEORY OF EDUCATION — MR. JAMES
Three credits — First semester
Open to juniors and seniors who have completed philosophy 1.

An introductory course in educational theory, including a somewhat detailed study of the principles on which is based the present practice in teaching. No credit is given in this course to graduates of normal schools who have received one year's credit at the university.

8. SCHOOL ADMINISTRATION — MR. RANKIN
Three credits — First semester
Open to seniors who have completed courses 1 and 2.

An introductory study of school administration, conducted by lectures, reports, and discussions; the organization of school systems, the work of school boards, superintendents, principals and teachers, school buildings, and hygiene. This course is planned for students without any teaching experience, who hope later to do work in supervision.

9. SCHOOL SUPERVISION — MR. RANKIN
Three credits — Second semester
Open to seniors; intended only for students with experience in teaching.

An advanced course treating of the duties of school principals and superintendents. Credit will not be given both for course 8 and for course 9.

10. COMPARATIVE STUDY OF SCHOOL SYSTEMS — MR. JAMES
Three credits — Second semester
Open to seniors who have completed courses 1 and 2.

This course deals with the school systems of Germany, France, England and the United States, with special reference to principles and methods of administration. Elementary, secondary and higher institutions are examined with emphasis varying in successive years. The course is conducted partly by lectures and partly by assigned readings, reports and discussions.

11. MODERN EDUCATIONAL THEORIES — MR. JAMES
Three credits — Second semester
Open to students who have completed courses 1 and 2 and philosophy 1.

12. CURRENT PROBLEMS IN ELEMENTARY TEACHING — MR. RANKIN
Two credits (two hours per week) — First semester
Open to seniors and graduate students who have completed course 5.
This is a seminar course, involving a general discussion of some current problems in elementary education, one or two of which are worked out practically by the stuffent under the direction of the instructor through readings, the visiting of schools, and through class discussions.

13. EDUCATIONAL CLASSICS — MR. JAMES
Two credits (two hours per week) — First semester
Open to seniors who have completed courses 1 and 2, and to graduate students.
A seminar course for the reading of selected educational classics and for detailed study of corresponding periods in educational history.

14. CURRENT PROBLEMS IN SECONDARY TEACHING — MR. RANKIN
Two credits (two hours per week) — Second semester
Open to seniors and graduate students who have completed course 6.
This is a seminar course for advanced students, preferably with teaching experience, who wish to pursue a theoretical and a practical study of some current problems in connection with secondary teaching. The course will be conducted by lectures, class discussions, readings, and by the visiting of schools.

15. PROBLEMS IN SCHOOL ADMINISTRATION — MR. JAMES
Two credits (two hours per week) — Second semester
Open to seniors and graduate students who have completed courses 1 and 2.
A research course for advanced students, preferably with teaching experience, who desire to take up the investigation of some question of educational administration. The course will be conducted by lectures, class discussions, assigned readings, and, when possible, by a study of actual school conditions falling within the proposed field.

16. SCHOOL SANITATION — MR. RANKIN
Two credits (two hours per week) — First semester
Open to seniors and graduate students.
This course will be conducted by text, by lectures, and by investigations into problems of school lighting, heating, ventilation, and other questions of school architecture and management connected with the physical wellbeing of the pupils.

17. ORGANIZATION OF HIGHER EDUCATION — MR. JAMES
One credit (one hour per week) — Second semester
Open to seniors and graduate students who have completed courses 1 and 2.
This course is intended for students who are interested in the general problems of educational administration and who look forward later to college teaching. It includes an historical sketch of the development of the American university, with discussions of modes of organization and administration, problems of departmental teaching, and questions of class instruction.

20. HISTORY OF RELIGIOUS EDUCATION — MR. SWIFT
One credit (one hour per week) — First semester
Open to juniors, seniors, and graduate students.
An introductory study of the development of the religious consciousness and of the aim, means, and methods of religious instruction among certain types selected from ancient and modern civilizations.

21. PRINCIPLES OF RELIGIOUS EDUCATION — MR. SWIFT
One credit (one hour per week) — Second semester
Open to juniors, seniors, and graduate students.
A study of the most important principles of education viewed from the standpoint of their relation and application to religious activities and institutions and also to the means, methods, and materials of religious instruction.

ENGLISH

RICHARD BURTON, Professor, Head of Department of English
FREDERICK KLAEBER, Professor
FRANCES SQUIRE POTTER, Professor
JOSEPH W. BEACH, Assistant Professor
MARY GRAY PECK, Assistant Professor
ELEANOR SHELDON, Assistant

REQUIREMENTS OF THE DEPARTMENT

FOR A MINOR, twelve credits, not counting courses 1 and 2, and including course 19 or 22.

FOR A MAJOR, courses 3, 6, 7, 14, 15 and 22, together with reinforcing subjects (thirty credits) selected from comparative philology, rhetoric (courses 2, 3 and 4), advanced modern language, ancient language, philosophy, history and additional English.

FOR B. A. WITH DISTINCTION, the general requirements (page 46), course 3 in rhetoric, and nine credits in English (six of which shall be in old English) in addition to the requirements for a major.

FOR A TEACHER'S CERTIFICATE, courses 3 (first semester), 6, 7, 14, 15, 18 and 22, six additional credits and course 2 in rhetoric.

COURSES

No.	Title	Semester	Credits	Offered to	Prereq. courses
1.	Outline Eng. Lit.	1	3†‡	All	See statement
2.	Outline Am. Lit.	2	3‡†	All	See statement
3.	Old Eng.	1, 2	6	Soph., Jr., Sr.	None
4.	Middle Eng.	1	2	Soph., Jr., Sr.	See statement
5.	Piers the Plowman	1	2	Soph., Jr., Sr.	See statement
6.	Chaucer	1	3	Soph.	None
7.	Spenser	2	3	Soph.	None
8.a	Outline 18 Cent. Lit.	1	3	Jr., Sr.	Six credits
8b.	The English Humorists	1	3	Jr., Sr.	Six credits
9.	Outline 19 Cent. Lit.	2	3	Jr., Sr.	Six credits
12.	Eng. Novel	1	3	Jr., Sr.	Six credits
13.	Bible as Lit.	2	3	Jr., Sr.	None
14.	Milton	1	3	Jr.	6 and 7, or six credits
15.	Shakespeare	2	3	Jr.	6, 7 and 14, or nine credits
16.	Mod. Drama	1, 2	6*	Sr.	15 or nine credits
18.	Teacher's Course	1, 2	2*	Sr.	6, 7, 14 and 15
19.	Hist. Lit. Crit.	1, 2	2*	Jr., Sr.	None
20.	Eng. Prose	1	3	Jr. Sr.,	Six credits

COURSES (Continued)

No.	Title	Semester	Credits	Offered to	Prereq. courser
21.	Browning-Tennyson	2	3	Jr., Sr.	Six credits
22.	Hist. Eng. Lang.	2	1	Soph., Jr., Sr.	3 (1st. sem.)
23.	Trags and Romances of Shaks.	1	3	Jr., Sr.	Six credits
24.	Sen. Seminar	1, 2	2	Sr., Grad.	See statement
25.	Anglo-Saxon	1	..	Grad.	Major in Eng.
26.	Beowulf	2	..	Grad.	Major in Eng.
27.	Shakespeare	1, 2	..	Grad.	Major in Eng.
28.	Prose Fiction	1, 2	..	Grad.	Major in Eng.
29.	Drama	1, 2	..	Grad.	Major in Eng.

‡Juniors and seniors are allowed only half credit, not credited toward a minor.

†Courses 1 and 2 must be completed before credit is allowed for either.

*Both semesters must be completed before credit is allowed for the first semester.

1. OUTLINE OF ENGLISH LITERATURE — MISS PECK AND MR. BEACH

Three credits (three hours per week) — First semester

Open to sophomores, and to freshmen who have passed, with a grade of good or excellent, part 2 of the entrance examination in English. Juniors and seniors are allowed only half credit; freshmen must also complete course 2 before credits will be allowed for this course; not credited toward a major in English.

An outline sketch of the main personalities of English literature from the earliest times to the present. The intention is to enable the student later to approach more specific aspects of the study with a general notion of the subject.

2. OUTLINE OF AMERICAN LITERATURE — MR. BURTON AND MISS PECK

Three credits (three hours per week) — Second semester

Open to freshmen who have completed course 1, and to sophomores; half credit to juniors and seniors; not credited toward a major in English.

A study of the salient figures of our native literary development. Special attention is given to contemporary writers.

3. OLD ENGLISH — MESSRS. KLAEBER AND BEACH

Six credits (three hours per week) — Both semesters

Open to sophomores, juniors and seniors; required of all who take a major or obtain a teacher's certificate.

A study of the language and reading of representative selections of old English prose and poetry. The relation to the modern English will be particularly emphasized.

4. INTRODUCTION TO MIDDLE ENGLISH LANGUAGE AND LITERATURE, MR. KLAEBER

Two credits (two hours per week) — First semester

Open to sophomores, juniors and seniors, who have taken the first semester of course 3; alternates with course 5.

An outline of middle English grammar including the interpretation of selected texts.

5. PIERS THE PLOWMAN — MR. KLAEBER

Two credits (two hours per week) — First semester

Open to sophomores, juniors and seniors, who have taken the first semester of course 3; alternates with course 4; not given in 1908–9.

A critical study of *Piers the Plowman*

6. CHAUCER — MISS PECK, MR. BEACH AND MR. FIRKINS
Three credits (three hours per week) — First semester
Open to sophomores.
A study of the grammar and literary forms of fourteenth century English with selected readings from Chaucer's works. Special attention is given to the *Canterbury Tales*.

7. SPENSER — MISS PECK, MR. BEACH AND MR. FIRKINS
Three credits (three hours per week) — Second semester
Open to sophomores.
A course in the forms and literary influences in the Elizabethan period which are illustrated in the poetry of Edmund Spenser, with selected readings from the minor poems and three books entire of the *Faery Queen*.

8a. OUTLINE OF EIGHTEENTH CENTURY LITERATURE — MR. BEACH
Three credits (three hours per week) — First semester
Open to juniors and seniors who have completed one year of work in English.
An outline study of the main personalities and literary forms of the eighteenth century. Particular attention to Defoe, Addison and Steele, Swift, Pope, Gray, and Johnson, with a sketch of the minor poets and novelists. Reports required on the reading of representative works. Not given in 1909-10.

8b. THE ENGLISH HUMORISTS — MR. BEACH
Three credits (three hours per week) — First semester
Open to juniors and seniors who have completed one year in English.
Courses 8a and 8b will be given in alternate years.

9. OUTLINE OF NINETEENTH CENTURY LITERATURE — MR. BEACH
Three credits (three hours per week) — Second semester
Open to juniors and seniors who have completed one year of work in English.
An outline study of the main literary forms in the nineteenth century, with some consideration of all the major writers in poetry, the novel and the essay. Reports required on the reading of representative works.

12. THE ENGLISH NOVEL — MRS. POTTER
Three credits (three hours per week) — First semester
Open to juniors and seniors who have completed one year of work in English.
A study of the history and development of the English novel.

13. THE BIBLE AS LITERATURE — MRS. POTTER
Three credits (three hours per week) — Second semester
Open to juniors and seniors.
A literary study of the Old Testament with special attention to forms and the critical study of selected readings.

14. MILTON — MRS. POTTER
Three credits (three hours per week) — First semester
Open to juniors who have completed courses 6 and 7, or one year of work in English; courses 6 and 7 are the most suitable preparation; required of all who take their major or obtain a teacher's certificate in English.
A critical study of the early poems, six books of *Paradise Lost* and *Samson Agonistes*.

15. SHAKESPERE
Three credits (three hours per week) — MRS. POTTER
Second semester
Open to juniors who have taken course 6, course 7, course 14 or a year and a

half of English; courses 6, 7 and 14 are the most suitable preparation. Required of all who take their major or obtain a teacher's certificate in English.

An outline study of the Shakespere plays, with a critical study of selected comedies, tragedies, and historical plays.

16. CONSTRUCTION AND DEVELOPMENT OF THE MODERN DRAMA — MISS PECK
Six credits (three hours per week) — Both semesters
Open to seniors who have completed two years of work in English, which must include course 15.

First semester: a study of the theory of the drama, with the history of English drama to the middle of the nineteenth century. Second semester: a study of the inter-relation of the English with the continental drama in the late nineteenth century with special emphasis upon Ibsen.

18. TEACHER'S COURSE IN ENGLISH — MRS. POTTER
Two credits (one hour per week) — Both semesters
Open to seniors who have completed courses 6, 7, 14, and 15; both semesters must be completed before credit is allowed for the first semester.

A survey of English literature with emphasis on methods of interpretation and teaching in the secondary schools.

19. HISTORY OF LITERARY CRITICISM — MR. BURTON
Two credits (one hour per week) — Both semesters
Open to juniors and seniors; both semesters must be completed before credit is given for the first semester.

This course traces the rise, growth and present condition of the principles of criticism as applied to literature.

20. ENGLISH IDIOM — MR. BURTON
Three credits (three hours per week) — First semester
Open to juniors and seniors who have completed one year of work in English.

A discussion of current idiom with the purpose of relating it to the underlying principles of historical development.

21 BROWNING AND TENNYSON — MR. BURTON
Three credits (three hours per week) — Second semester
Open to juniors and seniors who have completed one year of work in English.

This course involves a reading of the representative work of the two major poets of the Victorian era, in order to show their quality and contrasted power.

22. HISTORY OF THE ENGLISH LANGUAGE — MR. KLAEBER
One credit (one hour per week) — Second semester
Open to sophomores, juniors, and seniors who have completed the first semester of course 3; required of all who take their major or obtain a teacher's recommendation in English.

23. THE LATEST TRAGEDIES AND ROMANCES OF SHAKESPERE — MR. BURTON
Three credits (three hours per week) — First semester
Open to juniors and seniors who have gained six credits in the department.

24. SENIOR AND GRADUATE SEMINAR IN ENGLISH — MISS PECK
Two credits (one hour per week) — Both semesters
Open to seniors and graduates who have taken courses 3 and 4 or any of the following courses: 6, 19, 20, 22.

Hakluyt's Voyages will be studied. The work will consist of an inquiry

into the vivid and dramatic sources of the language and literature found in this "prose epic" of the Elizabethan seamen.

25. ANGLO-SAXON — MR. KLAEBER
First semester

Open to graduate students who have taken an undergraduate major in English; other arrangements may be ascertained upon application to the department.

26. BEOWULF — MR. KLAEBER
Second semester

Open to graduate students who have taken an undergraduate major in English; other arrangements may be ascertained upon application to the department.

27. SHAKESPERE — MRS. POTTER

Open to graduate students who have taken an undergraduate major in English; other arrangements may be ascertained upon application to the department.

28. THE DRAMA AS A LITERARY FORM — MR. BURTON
Both semesters

Open in alternate years to graduate students who have taken an undergraduate major in English; other arrangements may be ascertained upon application to the department.

29. FICTION AS A LITERARY FORM — MR. BURTON
Both semesters

Open in alternate years to graduate students who have taken an undergraduate major in English; other arrangements may be ascertained upon application to the department.

GEOLOGY AND MINERALOGY

CHRISTOPHER W. HALL, Professor, Head of Department of Geology and Mineralogy
EDWARD M. LEHNERTS, Assistant Professor
FREDERIC W. SARDESON, Assistant Professor
FRANK F. GROUT, Instructor
———————, Instructor.
A. ALFRED JOHNSON, Assistant

REQUIREMENTS OF THE DEPARTMENT

FOR A MINOR, twelve credits.

FOR A MAJOR, eighteen credits, together with reinforcing subjects (thirty credits) selected from animal biology, botany, chemistry, mathematics, physics, topographic drawing, advanced modern languages and additional geology and mineralogy.

FOR B. A. WITH DISTINCTION, the general requirements (page 46) and six credits in addition to the requirements for a major.

FOR A TEACHER'S CERTIFICATE, the same as for a major.

Courses

GEOLOGY

No.	Title	Semester	Credits	Offered to	Prereq. courses
1.	General Geology	1	3	Jr., Sr.	None
2.	Essentials Phys. Geog.	1	3	Jr., Sr.	None
3.	Indust. Geography	2	3	Jr., Sr.	1 or 2
4.	Elements of Meteorology	2	3	Jr., Sr.	1 or 2
5.	Geog. and Geol. of Minn.	2	3	Jr., Sr.	1
6.	Historical Geology	2	3	Jr., Sr.	1, 7, or 8
7.	Elements of Paleontol.	1	3	Jr., Sr.	See statement
8.	Paleontology	1, 2	6	Jr., Sr.	See statement
9.	Paleontologic Practice	1, 2	6	Jr., Sr.	See statement
10.	Elements of Rock Study	1	3	Jr., Sr.	1
11.	Petrography	2	3	Jr., Sr.	10
12.	Applied Geology	1	3	Jr., Sr.	1
13.	Ore Deposits	1	3	Sr.	1
14.	Special Problems	2	2	Sr.	Geol. 1 and Min. 1
15.	Method and Material of Geog.	1, 2	2	Jr., Sr.	1 or 2
16.	Outline Study of Minerals and Rocks	1, 2	2	Sr.	None
17.	Regional Physiography	2	3	Jr., Sr.	1 or 2
18.	Climatology	1	3	Sr.	4
19.	Field and Lab. Practice	1, 2	2	Jr., Sr.	None
20.	Probs. in Indus. Geog.	1	3	Sr.	
21.	Petrographical Problems	1, 2	..	Grad.	See statement
22.	Keweenawan Eruptives	1, 2	..	Grad.	See statement
23.	Glacial Geology	1, 2	..	Grad.	See statement
24.	Paleontologic Geol.	...	3	Grad.	1, 6 and 8
25.	Advanced Paleontology	1, 2	6	Grad.	8

MINERALOGY

1.	Elements of Mineralogy	1	3	Soph., Jr., Sr.	None
2.	Descriptive Mineralogy	1, 2	6	Soph., Jr., Sr.	None
3.	Quantitative Mineralogy	2	3	Soph., Jr., Sr.	1
4.	Optical Mineralogy.	2	3	Sr.	1
5.	Morphology of Minerals	1	3	Jr., Sr.	
6.	Physico-Chem. Methods	2	3	Sr.	
7.	Outline of Mineralogy	1, 2	2	Jr., Sr.	None
8.	Original Problems	1, 2	..	Grad.	See statement
9.	Special Investigations	...	..	Grad.	See statement
10.	Occurrences and Association.	1, 2	..	Grad.	See statement

GEOLOGY

Students who desire to take double courses in geology may do so be electing any of the following combinations: First semester, 1 and 2, 1 and 7, 1 and 10, 6 and 8, 8 and 9, 10 and 12; second semester, 3 and 4, 3 and 5, 5 and 6, 8 and 9, 6 and 11. By vote of the faculty, credit will be given to students who satisfactorily complete any of the general field courses in geology offered in the joint announcement of various universities for the summer of 1909.

1. General Geology — Mr. Hall
Three credits (three hours per week) — First semester
Open to juniors and seniors.

Comprises: (1) geodynamics, in which are set forth the energies and phenomena of the atmosphere, water, heat, gravity, and plants and animals as geologic agents; (2) structural geology, wherein stratification, displacement and veining of rock masses are described; (3) physiographic geology, pointing out prominent earth features and inquiring into the causes producing them; (4) an outline of historical geology. Conferences and lectures illustrated by photographs, maps, profiles, and lantern-slides.

2. Essentials of Physical Geography — Mr. Lehnerts
Three credits (three hours per week) — First semester
Open to juniors and seniors.

Discussions of the principles of earth sculpture and description of the structural features of continents, with special reference to the ethnic movements and commercial activities of mankind.

3. Industrial Geography — Mr. Lehnerts
Three credits (three hours per week) — Second semester
Open to juniors and seniors who have completed course 1 or 2.

The structural features of the North American continent outlined as an introduction. Following this is a study of the types of soil and dominating climatic characters of the several agricultural regions of the continent; a discussion of the geography of industries as they have grown up within the past 100 years and their dependence upon physiographic conditions; a study of the geographic causes of local industries effected through excursions and reports. A brief survey of the geography of industries in other parts of the world parallels the more detailed study of North America. Throughout the course cause and effect are kept in view.

4. Elements of Meteorology — Mr. Lehnerts
Three credits (three hours per week) — Second semester
Open to juniors and seniors who have completed course 1 or 2.

The general principles of meteorology are treated, embracing the properties and phenomena of the atmosphere, including an explanation of the ordinary observations of pressure and temperature, together with a more extended study of the apparatus and practice of a weather bureau office. This is followed by a study of storms and climatic elements generally. The conditions of climatic changes are studied and the influence of physiographic conditions are discussed. Text-book, lectures, and reference reading.

5. Geography and Geology of Minnesota — Mr. Hall
Three credits (three hours per week) — Second semester
Open to juniors and seniors who have completed course 1.

(a) The physical geography of the state in its relations to geological history and industrial development. (b) A study of the principles and facts of pre-Cambrian geology as exemplified within the state and the extension of these into general application. (c) The present problems of the state in agriculture, drainage, water power, mining, quarrying, etc., are considered in some detail.

6. Historical Geology — Mr. Sardeson
Three credits (three hours per week) — Second semester
Open to juniors and seniors who have completed course 1, 7 or 8.

A course in historical geology, including a study of the more important types of fossils in their geological relations. The history of the North American continent in particular is considered. Lectures and demonstrations.

7. ELEMENTS OF PALEONTOLOGY — MR. SARDESON
Three credits (three hours per week) — First semester
Open to juniors and seniors who have taken courses in geology or biology.
This course includes an elementary study of fossil organisms and a discussion of the sources and interpretation of paleontologic evidence and the relation to it of theories of evolution. Lectures and demonstrations. Occasional excursions will be arranged.

8. PALEONTOLOGY — MR. SARDESON
Six credits (three hours per week) — Both semesters
Open to juniors and seniors who have taken or are taking courses in geology or biology.
The chief types of organisms as represented by fossils will be studied successively. The leading fossils and their phylogenetic history will be treated with considerable detail. Lectures and demonstrations.

9. PALEONTOLOGIC PRACTICE — MR. SARDESON
Six credits (three hours per week) — Both semesters
Open to juniors and seniors who have completed course 8; may be taken by students pursuing courses in geology and biology in conjunction with course 7.
The collection, preparation, and study of materials, examination of collections, and reading will be carried on with a view to more complete knowledge of the groups of fossil organisms as presented in course 7.

10. ELEMENTS OF ROCK STUDY — MR. GROUT
Three credits (three hours per week) — First semester
Open to juniors and seniors who have completed course 1.
The structures, textures, and mineral and chemical composition of rocks. A practical study of rock types with laboratory and field practice. The origin, occurrence, variation, and alteration of rocks are considered with a view to their accurate description. An introduction to the use of the microscope concludes the course. Text book, reference reading, and practice.

11. PETROGRAPHY — MR. GROUT
Three credits (three hours per week) — Second semester
Open to juniors and seniors who have completed course 10.
The identification of rocks through the optical study of the component minerals, rock structures as seen under the microscope; alterations of rocks, and stratigraphic relations are studied. Preparation of material for study, its collection in the field, and an examination of some group of Minnesota crystalline rocks are features of the course. Laboratory, lectures, reference reading, and field work.

12. APPLIED GEOLOGY — MR. GROUT
Three credits (three hours per week) — First semester
Open to juniors and seniors who have completed course 1.
An outline of the economic relations of geology. The course comprises a discussion of the nature and distribution of non-metallic materials of economic value, including coal, mineral oil, and natural gas; phosphates and other natural fertilizers; soils; the geologic conditions of water supply; abrasive and fictile materials; natural and artificial building stones; mortars and cements; road-making materials; followed by a brief summary of the nature and distribution of ore deposits. Textbook and reference reading.

13. ORE DEPOSITS — MR. HALL
Three credits (three hours per week) — First semester
Open to seniors who have completed geology 1 and mineralogy 1.

History of mineral discovery and development in the Americas; a discussion of the origin and distribution of ore deposits, embracing the chemical processes involved in their formation and subsequent alterations; a description of the geology and mineralogy of ore bodies, particularly those yielding gold, silver, copper, iron, lead, and zinc.

14. SPECIAL PROBLEMS — MR. HALL
Two credits (two hours per week) — Second semester
Open to seniors who have completed courses 1 and 13.

The investigation by individual students of particular problems, involving the field work of an investigation of some particular formation and the laboratory investigation and reading incident to the study of the material collected. The methods of systematically recording and interpreting geological and mineralogical data as observed in the field, the keeping of note-books, and the preparation of geological maps, profiles, and sections will be taught.

15. THE METHOD AND MATERIAL OF GEOGRAPHY — MR. LEHNERTS
Two credits (one hour per week) — Both semesters
Open to juniors and seniors; designed espcially for teachers.

The earth as an object of study in the grades and in the high school; guiding principles; the course of study; text-books and their use; practical laboratory work; excursions; collection and preparation of illustrative materials; map drawing, chalk modeling, and relief work; organization of geographical subject matter for class-room instruction; and the method of the recitation.

16. OUTLINE STUDY OF MINERALS AND ROCKS — MESSRS. HALL AND GROUT
Two credits (one hour per week) — Both semesters
Open to seniors; designed specially for teachers.

This course treats of the leading physiographic facts and principles; the macroscopic characters of the common rocks and a discussion of the general principles of petrographical and stratigraphical geology. Lectures and reading, supplemented by excursions and practical problems.

17. REGIONAL PHYSIOGRAPHY — MR. LEHNERTS
Three credits (three hours per week) — Second semester
Open to juniors and seniors who have completed course 1 or 2.

An application of the principles of physical geography in a study of the continents and their physiographic provinces; the origin and geographic significance of their physical features; and the influence of these on the early settlement of countries and the subsequent industrial and political development of nations.

18. CLIMATOLOGY — MR. LEHNERTS
Three credits (three hours per week) — First semester
Open to seniors who have completed course 4.

An application of the principles of meteorology to a study of the climates of the world and the factors on which these climates depend; climatic influences on the distribution and characteristics of plants and animals, and on man's needs and occupations. Lectures, recitations and reference reading.

19. FIELD AND LABORATORY PRACTICE — MESSRS. HALL AND LEHNERTS
Two credits (one hour per week) — Both semesters
Open to juniors and seniors; designed specially for teachers.

A study of the geography and geology of Minneapolis, St. Paul, and adjacent territory, embracing the salient physiographic, stratigraphic, and economic features of this interesting region. Relief, topography, and map work will receive attention

in the laboratory as well as in the field. For teachers and others who wish to learn the methods of field geography and geology.

20 PROBLEMS IN INDUSTRIAL GEOGRAPHY — MR. LEHNERTS
Three credits (three hours per week) — First semester
Open to seniors who have completed course 3.

The effects of coast-lines and harbors, navigable rivers, water powers, mountains and plains, rock formations and soils, ground and surface waters for municipal and farm supplies, upon the utilization and conservation of natural resources and mineral wealth. A series of special problems in Geography.

21. PETROGRAPHICAL PROBLEMS — MESSRS. HALL AND GROUT
Both semesters

Open to graduate students; other arrangements may be ascertained upon application to the department.

A study of rocks as geological bodies; the genesis of rocks and their chemical and dynamical alterations, illustrated in the gneisses and gabbro schists of the Minnesota river valley or the granites and basic eruptives of central Minnesota.

22. THE KEWEENAWAN ERUPTIVES — MESSRS. HALL AND GROUT
Both semesters

Open to graduate students; other arrangements may be ascertained upon application to the department.

This course treats first, eastern and northwestern Minnesota, their stratigraphic relations, textural and structural characters; second, other problems in the Keweenawan to be selected on consultation.

23. GLACIAL GEOLOGY — MR. HALL
Both semesters

Open to graduate students; other arrangements may be ascertained upon application to the department.

The local features of glacial phenomena. Field work will form the special feature of this course, embracing the formations at Minneapolis or some area accessible from it, as a survey of the glacial lakes in the vicinity, the gorge of the Falls of Saint Anthony, the Dalles of the Saint Croix, and other problems. The special field to be selected on consultation.

24. PALEONTOLOGIC GEOLOGY — MR. SARDESON
Three credits (three hours per week)
Open to graduate students who have completed courses 1, 6, and 8.

A study of the Ordovician fauna with special illustrations from the Ordovician of Minnesota and neighboring states.

25. ADVANCED PALEONTOLOGY — MR. SARDESON
Six credits (three hours per week) — Both semesters
Open to graduate students who have completed course 8.

A study of a selected group of fossils; a practical acquaintance with the forms and literature of the group is sought. The class work is to be supplemented by a thesis.

MINERALOGY

1. ELEMENTS OF MINERALOGY — MESSRS. HALL AND GROUT
Three credits (six hours per week) — First semester
Open to sophomores, juniors, and seniors; the laboratory fee is three dollars

(a) The morphology of minerals; the physical and chemical characters of minerals, with demonstrations; a study of the native elements and of economic minerals; the basis of classification. (b) Laboratory work; this consists of practice in the recognition of crystal forms, tests illustrating the range of minerals, and the application of chemical and blowpipe analysis to the identification of species.

2. DESCRIPTIVE MINERALOGY — MESSRS. HALL AND GROUT
Three credits (six hours per week) — Second semester
Open to sophomores, juniors, and seniors; the laboratory fee is three dollars.
(a) A study of the rock-forming minerals; the projection and construction of figures of crystals; the calculation of crystal-axes. Theses. (b) Laboratory work; includes quantitative blowpipe analysis, crystal measurement, the sight determination of minerals, and reference reading.

3. QUANTITATIVE MINERALOGY — MESSRS. APPLEBY AND CHRISTIANSON
(In the School of Mines)
Three credits (six hours per week) — Second semester
Open to sophomores, juniors, and seniors, who have completed course 1; the laboratory fee is five dollars.
Determination of the values of ores. Lectures, recitations, and laboratory work. Identical with metallurgy 1 in the School of Mines.

4. OPTICAL MINERALOGY — MR. GROUT
Three credits (six hours per week) — Second semester
Open to juniors and seniors who have completed course 1 in Mineralogy.
A study of the microscopic structure of crystals and crystal grains. An application of methods used in determining minerals by their optical properties; goniometric and stauroscopic practice, embracing the elements of lithology. Lectures and laboratory work.

5. THE MORPHOLOGY OF MINERALS — MR. GROUT
Three credits (three hours per week) — First semester
Open to juniors and seniors.
A study of crystallography, embracing projection and the geometric relations of crystal planes. The identification of minerals from crystal measurement and mathematical calculation. Crystal nomenclature.

6. PHYSICO-CHEMICAL METHODS WITH THEIR APPLICATIONS — MR. GROUT
Three credits (three hours per week) — Second semester
Open to seniors.
The methods of micro-chemical analysis are described and demonstrated; the leading elements found in minerals are determined through the aid of crystalline precipitates of known compounds. Special attention is given to the study and determination of the rock-making minerals.

7. AN OUTLINE OF MINERALOGY — MR. GROUT
Two credits (one hour per week) — Both semesters
Open to juniors and seniors.
A study of methods of identification of minerals, with their applications. Conferences, reading, and demonstrations.

8. ORIGINAL PROBLEMS IN MORPHOLOGICAL AND PHYSICAL MINERALOGY
MESSRS. HALL AND GROUT
Both semesters
Open to graduate students; individual arrangements may be ascertained upon application to the department.

Investigations in mathematical crystallography and its applications to crystal development and structure. Further applications than are made in course 4 of the optical characters of minerals in identification of mineral species.

9. SPECIAL INVESTIGATIONS IN CHEMICAL AND PHYSICAL MINERALOGY MR. GROUT

Open to graduate students; other arrangements may be ascertained upon application to the department.

Special attention is here given to tenacity and electrical properties and their relation to crystal form, cleavage, and fracture. Dimorphous compounds are investigated and the conditions governing their formation studied. The physical properties of artificial mineral compounds are compared with those of natural minerals.

10. MINERAL OCCURRENCES AND ASSOCIATION MESSRS. HALL AND GROUT
Both semesters

Open to graduate students; individual arrangements may be ascertained upon application to the department.

A discussion of genetic relationships. Field work in connection with different phases of the particular problem in hand.

GERMAN

JOHN G. MOORE, Professor, Head of Department of Germ n
CARL SCHLENKER, Professor
HANS JUERGENSEN, Assistant Professor
OSCAR BURKHARD, Assistant Professor
MATILDA J. WILKIN, Assistant Professor
RICHARD WISCHKAEMPER, Instructor
ALFRED E. KOENIG, Assistant
JAMES DAVIES, Assistant
LEON METZINGER, Assistant

REQUIREMENTS OF THE DEPARTMENT

FOR A MINOR, twelve credits, not including course 1.

FOR A MAJOR, eighteen credits, not including course 1, together with reinforcing subjects (thirty credits) selected from philology, Anglo-Saxon and old English, Icelandic, advanced Scandinavian, advanced English, Latin, Greek, and additional German.

FOR B. A. WITH DISTINCTION, the general requirements (page 46) and courses 8, 9 and 10 and any two of courses 12, 13, 14 and 17.

FOR A TEACHER'S CERTIFICATE, an average of at least good in courses 2 or 4, 6 or 7, 8, 9, 10 and 11.

m COURSES

No.	Title	Semester	Credits	Offered to	Prereq. courses
1a.	Beginning	1, 2	10*‡	All	None
1b.	Beginning	1, 2	6*‡	Engineers	None
2.	Intermediate	1, 2	6*	Soph., Jr., Sr.	1
3a.	Scientific Intermediate	1, 2	6*	Soph., Jr., Sr.	1
3b.	Scientific Intermediate	1, 2	6*	Soph. Eng.	1b

COURSES (Continued)

No.	Title	Semester	Credits	Offered to	Prereq. courses
4.	Prose and Poetry	1, 2	6*	All	Two yrs. prep. Ger.
5.	Conversation	1, 2	4*	All	See statement
6.	Drama	1, 2	6*	Soph., Jr., Sr.	1 and 2,or 4
7.	Adv. Sc. Reading	1, 2	6*	Soph., Jr., Sr.	2 or 3 or 4
8.	Adv. Conversation	1, 2	4*	Soph., Jr., Sr.	See statement
9.	Classic Period	1, 2	6*	Jr., Sr.	See statement
10.	Modern Authors	1, 2	6*	Jr., Sr.	9
11.	Teacher's Course	2	1	Sr.	9
12.	Reformation	1, 2	4*	Sr. Grad	9 or 10
13.	Middle High Ger	1, 2	4*	Sr. Grad.	9 or 10
14.	Old High Ger	1, 2	4*	Sr.	9 or 10
15.	Seminar on Drama	1, 2	..	Grad.	See statement
16.	Volkslied	1, 2	2*	Grad.	9 or 10
17.	Hist. of Ger. Lit	1, 2	4*	Sr. Grad.	9
18.	Sem. on Reading	1, 2	4*	Grad.	See statement

‡Juniors and seniors are allowed only half credit.

*Both semesters must be completed before credit is allowed for the first semester.

1a. BEGINNING — MR. SCHLENKER AND MRS. WILKIN, MESSRS. JUERGENSEN, WISCHKAEMPER AND EICHHOLZER

Ten credits (five hours per week) — Both semesters

Open to all, but juniors and seniors receive only half credit; both semesters must be completed before credit is given for the first semester.

Pronunciation, grammar, conversation, and composition; selected reading in easy prose and verse.

1b. BEGINNING — MR. BURKHARD

(In the College of Engineering.)

Six credits (three hours per week) — Both semesters

Open to engineering students only.

2. INTERMEDIATE — MESSRS. SCHLENKER, EICHHOLZER, WISCHKAEMPER AND MISS STAMM

Six credits (three hours per week) — Both semesters

Open to those who have completed course 1 or its equivalent; both semesters must be completed before credit is given for the first semester. This course may be supplemented by course 5. It should be followed by course 6 or course 7. Students who obtain credit for this course cannot receive credit also for either course 3 or course 4.

First semester, selections from modern narrative and descriptive prose; selected lyrics and ballads. Second semester, a drama of Lessing, Goethe, or Schiller.

3a. SCIENTIFIC INTERMEDIATE — MESSRS. JUERGENSEN AND WISCHKAEMPER

Six credits (three hours per week) — Both semesters

Open to all who have completed course 1. Not open to those who have obtained credit for course 2 or course 3b. Both semesters must be completed before credit is given for the first semester. This course may be supplemented by course 5.

Wait's German Science Reader (or equivalent). The course aims to give the student a reading knowledge of German for use in scientific studies.

3b. SCIENTIFIC INTERMEDIATE — MR. BURKHARD

(In the College of Engineering.)

Six credits (three hours per week) — Both semesters

Open only to students in College of Engineering who have completed course 1a or course 1b. Not open to those who have credit for course 2 or course 3a.

Merchel, Bilder aus der Ingenieurtechnik. This course is arranged to meet the peculiar needs of engineering students.

4. PROSE AND POETRY MR. MOORE, MRS. WILKIN, MESSRS. BURKHARD, WISCHKAEMPER AND MISS STAMM

Six credits (three hours per week) Both semesters

Open to all who enter the University with two years of German; not open to those who have obtained credit in course 2 or course 3; both semesters must be completed before credit is given for the first semester. This course may be supplemented by course 5.

Meissner's *Aus deutschen Landen*; *Goethe's Gedichte.* Heine's *Buch der Leider.* Geography, history and legend. Review of German grammer throughout the year.

5. ELEMENTARY CONVERSATION AND COMPOSITION MRS. WILKIN, MESSRS. JUERGESEN, BURKHARD, WISCHKAEMPER AND EICHHOLZER

Four credits (two hours per week) Both semesters

Open to those who are taking or have taken course 2 or 3, or 4; no credit to those who are taking, or have taken course 9 or course 10; both semesters must be completed before credit is given for the first semester.

Translation of short English selections; conversation on topics of everyday life; narrative and descriptive essays and letter writing.

6. THE DRAMA MR. SCHLENKER, MRS. WILKIN, MESSRS. JUERGENSEN AND BURKHARD

Six credits (three hours per week) Both semesters

Open to those who have taken courses 1 and 2, or course 4; both semesters must be completed before credit is given for first semester. This course may be supplemented by course 8.

First semester: Modern drama. Play of Hebbel, Hauptmann, or Sudermann. Study of the present-day drama in Germany. Assigned readings and reports. Second semestes: Classic drama. Play of Lessing, Goethe, or Schiller. Study of dramatic structure. History of the German drama in the eighteenth century.

7. ADVANCED SCIENTIFIC READING MR. JUERGENSEN

Six credits (three hours per week) Both semesters

Open to those who have taken course 2 or 3, or 4: not open to those who have credit for course 6; this course may be supplemented by course 8; both semesters must be completed before credit is given for the first semester.

Reading of monographs and periodicals.

8. ADVANCED CONVERSATION, GRAMMAR, AND COMPOSITION MR. SCHLENKER, MRS. WILKIN AND MR. BURKHARD

Four credits (two hours per week) Both semesters

Open to those who are taking or have taken course 6, 7 or 9; both semesters must be completed before credit is given for first semester; recommended that it be preceded by course 5; required of those who obtain a teacher's recommendation in German; intended as a preparation for course 11.

Essays on assigned subjects; oral exercises in German by means of discussions on everyday subjects; debates, narration, and the like.

9. GERMAN LITERATURE OF THE CLASSIC PERIOD MR. MOORE

Six credits (three hours per week) Both semesters

Open to those who have completed courses 1 and 2 (by special permission)

or 3 and 7, or 4 and 6; both semesters must be completed before credit is given for the first semester; required of those who obtain a teacher's recommendation in German.

First semester: Goethe's *Faust:* its genesis; the Faust legend; its treatment in literature before and since Goethe's time; plan of Goethe's *Faust:* solution of the Faust problem in Part II. Second. semester: Schiller's ballads and other representative poems of his period. German versification. Reading and discussion of Lessing's more important critiques, the *Laocoon* and *Dramaturgie*. Lectures and collateral reading; essays by the class.

10. MODERN AUTHORS — MR. MOORE
Six credits (three hours per week) — Both semesters
Open to those who have completed courses 1, 2, and 9 (by special permission), or 4, 6, and 9, or 3, 7, and 9; both semesters must be completed before credit is given for the first semester; required of those who obtain a teacher's recommendation in German.

First semester: Romantic school and *Junge Deutschland*. Second semester: German literature since 1848.

11. TEACHER'S COURSE — MR. MOORE
One credit (one hour per week) — Second semester
Open to those who have completed course 10; especially designed for students who expect to become teachers of German in high schools.

12. HISTORY AND LITERATURE OF THE REFORMATION — MR. MOORE
Four credits (two hours per week) — Both semesters
Open to seniors and graduates who have completed course 9 or course 10; both semesters must be completed before credit is given the first semester.

Brandt, Luther, Hutten, Sachs, Murner, and Fischart. Selections from Jansen and Egelhaaf.

13. MIDDLE HIGH GERMAN — MR. SCHLENKER
Four credits (two hours per week) — Both semesters
Open to seniors and graduates who have completed course 9; both semesters must be completed before credit is given for the first semester.

Study of the language and literature of the period. Paul's *Mittelhochdeutsche Grammatik*. Selected readings from *Armer Heinrich*, *Nibelungen Lied*, *Gudrun*, the poems of Walter von der Vogelweide, *Parsifal*, etc.

14. OLD HIGH GERMAN — MR. KLAEBER
Four credits (two hours per week) — Both semesters
Open to seniors who have taken course 9; both semesters must be completed before credit is given for the first semester.

This course is identical with comparative philology, course 11.

15. SEMINAR IN GERMAN DRAMA — MR. SCHLENKER
Two credits (one hour per week) — Both semesters
Open to graduates and, by permission of the department, to undergraduates but without credit.

An outline of the history of the German dramatic literature from its beginning to and including the so-called classic drama. Assigned readings, reports, and discussions.

16. THE GERMAN VOLKSLIED — MR. WILLIAMS
Two credits (two hours per week) — Both semesters
Open to graduate students who have completed course 9.

Outline of the history and development of the *Volkslied*. Study of selected

numbers in Uhland's *Volkslieder* with references to other general and special collections. Influence of the *Volkslied* upon lyric and ballad writers.

17. HISTORY OF GERMAN LITERATURE — MR. JUERGENSEN
Four credits (two hours per week) — Both semesters
Open to seniors and graduates who have completed course 9; both semesters must be completed before credit is given for the first semester.
Lectures in German on the history of German literature. Reviews and topical research on the part of the students.

18. SEMINAR IN SCIENTIFIC READING — MR. JUERGENSEN
Four credits (two hours per week) — Both semesters
Open to graduate students who have completed course 9 or 10, and (by permission of the department) to undergraduates who have completed course 7 or 9; both semesters must be completed before credit is given for the first semester.
1909-10 The literature of evolution (Haeckel, Reinke, et al.)
1910-11 Psychology and philosophy (Wundt, et al.)
For courses in Germanic philology see the statement of the department of comparative philology, pp. 52-53.

GREEK

JOHN CORRIN HUTCHINSON, Professor, Head of Department of Greek.
CHARLES ALBERT SAVAGE, Professor

REQUIREMENTS OF THE DEPARTMENT

FOR A MINOR, twelve credits.
FOR A MAJOR, eighteen credits, together with reinforcing subjects (thirty credits) selected from Latin, advanced German and French, philology, English, advanced rhetoric, ancient history and additional Greek.
FOR B. A. WITH DISTINCTION, the general requirements (page 46) and at least courses 4, 5, 6, 7, 8 or 9, 10 and two hours per week of seminar work throughout one year.

COURSES

No.	Title	Semester	Credits	Offered to	Prereq. courses
1.	First Year Greek	1, 2	10*	All	None
2.	History and Epic Poetry	1, 2	6*	Soph., Jr., Sr.	1
3.	Historical Prose	1, 2	6*	All	See statement
4.	Oratory	1	3	Soph., Jr., Sr.	2 or 3
5.	Philosophy	2	3	Soph., Jr., Sr.	2 or 3
6.	Lyrics	1	3	Jr., Sr.	4 or 5
7.	Tragedy	2	3	Jr., Sr.	5
8.	Philosophy (Advanced)	1	3	Jr., Sr.	5
9.	Oratory (Advanced)	1	3	Jr., Sr.	4
10.	Epic Poetry (Advanced)	2	3	Jr., Sr.	7
11.	Archæology	1, 2	6	Jr., Sr.	None
12.	Dramatic Poetry	1, 2	4	Soph., Jr., Sr.	See statement
13.	Composition	1, 2	2*	Jr., Sr.	4 and 5
14.	Greek Literature and Life	2	2	Jr., Sr.	None
15.	Greek Mythology	1, 2	2	Jr., Sr.	None
16.	Later Greek	1, 2	6	Jr., Sr.	5

COURSES (Continued)

No.	Title	Semester	Credits	Offered to	Prereq. courses
17.	Seminar	1	1	Jr., Sr.	4 or 5
18.	Seminar	1	1	Jr., Sr.	5
29.	Epic Poetry (Advanced)	...	..	Grad.	
20.	Dramatic Poetry (Advanced)	...	..	Grad.	
21.	Oratory (Advanced)	...	..	Grad.	
22.	Later Greek	...	..	Grad.	

*Both semesters must be completed before credit is allowed for the first semester.

1. FIRST YEAR IN GREEK — MR. HUTCHINSON

Ten credits (five hours per week) — Both semesters

Open to all; both semesters must be completed before credit is given for the first semester. Students are advised to take this course in their freshman year, especially such as intend to fit themselves for teaching Latin. Those also who expect to do intensive work in ancient history or philosophy, or who expect to study theology, or who intend to devote themselves to literature, should take this course in the freshman year.

The work of the first semester is based upon Brook's *Introduction to Attic Greek*, and has for its object the mastery of the declensions and conjugations, and the simpler rules of syntax, together with the ability to read readily simple sentences based on the vocabulary of the first chapter of the *Anabasis*, which is learned by heart, and to translate into Greek idiomatic English sentences based upon the same text.

In the second semester the *Anabasis* itself is used as the reading book; an amount equivalent to about a book and a half is read. Hadley's *Greek Grammar* is studied systematically. Etymology is reviewed and syntax is studied sufficiently to enable the student to proceed confidently in the translation of the text. The translation from English into Greek is continued.

2. HISTORY AND EPIC POETRY: *Anabasis* and *Iliad* — MR. SAVAGE

Six credits (three hours per week) — Both semesters

Open to sophomores, juniors, and seniors, who have completed course 1; credits allowed only when both semesters are taken. The course is designed for students who have begun Greek in the University. Students who have begun Greek before coming to the University may, with the consent of the department, take Homer during the second semester.

Books 2, 3, and 4 of Xenophon's *Anabasis* are read during the first semester; particular attention is given to syntax and irregular verbs. Selections from Homer's *Iliad* are read during the second semester; special attention is given to prosody, and to poetical forms and usages.

3. HISTORICAL PROSE; Xenophon and Herodotus — MR. SAVAGE

Six credits (three hours per week) — Both semesters

Open to freshmen, sophomores, juniors, and seniors, who offer two years of Greek for admission to the University, or have completed course 1, and in the judgment of the department are qualified for the work; both semesters must be completed before credit is allowed for the first semester.

Selections from Xenophon's *Cyropaedia* are read during the first semester, and special attention is given to syntax and irregular verbs. Selections from Herodotus are read during the second semester, and particular attention is paid to peculiarities of dialect and style. The work is supplemented by lectures on Greek historiography.

4. ORATORY: Lysias and Demosthenes — MR. SAVAGE
Three credits (three hours per week) — Second semester
Open to those who have completed course 2 or course 3.

The course consists chiefly of readings from the orations of Lysias and Demosthenes; selections from Isocrates may also be read. This work is supplemented by lectures on Greek oratory. At this stage of the student's development less attention is given to syntax, and more attention is paid to matters of literary interest.

5. PHILOSOPHY: Plato's *Apology*, and Xenophon's *Memorabilia* — MR. SAVAGE
Three credits (three hours per week) — First semester
Open to those who have completed course 2 or course 3.

The course consists chiefly in the reading of Plato's *Apology*, together with selections from Xenophon's *Memorabilia*. The reading of texts is supplemented by lectures on Greek philosophy.

6. LYRICS — MR. BROOKS
Three credits (three hours per week) — First semester
Open to juniors and seniors who have completed course 4 or course 5.

7. TRAGEDY; Aeschylus and Sophocles — MR. BROOKS
Three credits (three hours per week) — Second semester
Open to juniors and seniors who have completed course 5.

8. PHILOSOPHY (Advanced): Plato's *Republic* — MR. HUTCHINSON
Three credits (three hours per week) — First semester
Open to juniors and seniors who have completed course 5; alternates with course 9; not offered in 1909-10.

The Republic of Plato is read, not primarily for its philosophic interest but as one of the masterpieces of Greek literature. The study is, therefore, in the main, a study of literary style.

9. ORATORY (Advanced): Demosthenes' *De Corona* — MR. HUTCHINSON
Three credits (three hours per week) — First semester
Open to juniors and seniors who have completed course 4.
This course is intended to secure a careful study of the development of oratorical style among the Greeks, and its culmination in this acknowledged masterpiece.

10. EPIC POETRY (Advanced): The *Odyssey* — MR. HUTCHINSON
Three credits (three hours per week) — Second semester
Open to juniors and seniors who have completed course 7.
The object of this course is to secure as intimate an acquaintance as possible, at first hand, with Homer. The Homeric Question is given but scanty attention; its place is in the graduate work (course 19.) Literary values receive chief attention and that these may be realized by the student as much of the text is read as is consistent with careful work.

11. ARCHAEOLOGY — MR. BROOKS
Six credits (three hours per week) — Both semesters
Open to juniors and seniors; a knowledge of the Greek language is not required.
A study of the monuments or remains of Greek art, illustrating Greek customs, civilization, and life. Laboratory methods and theses are largely employed.

12. DRAMATIC POETRY: Euripides and Aristophanes — MR. SAVAGE
Four credits (two hours per week) — Both semesters

Open in the first semester to those who have completed course 2 or 3, and in the second to those who have completed the first semester of course 7.

During the first semester, either the *Alcestis* or the *Medea* of Euripides is read; during the second semester the *Frogs of* Aristophanes is studied. Special attention is given to metre, literary style, and mythology, and the work is supplemented by lectures on the authors studied.

13. GREEK COMPOSITION — MR. HUTCHINSON
Two credits (one hour per week) — Both semesters

Open to juniors and seniors who have completed courses 4 and 5. Both semesters must be completed before credit is given for the first semester; recommended to those who expect to teach Greek.

The course consists of a systematic review of Greek syntax and the retranslation into Greek of passages translated from various classic authors, illustrative of various styles.

14. GREEK LITERATURE AND LIFE — MR. SAVAGE
Two credits (two hours per week) — Second semester

Open to juniors and seniors; a knowledge of Greek is not required. This course may not be counted toward a major or a minor.

The course is intended primarily for students who have not had an opportunity to study Greek. It consists of lectures, text book work, and illustrative readings; and, from time to time, special lectures illustrated by stereopticon views will be given. The course is especially recommended to students who are intending to teach Greek, Latin, English, or ancient history.

15. GREEK MYTHOLOGY — MR. SAVAGE
Two credits (one hour per week) — Both semesters

Open to seniors and juniors; no knowledge of Greek is required. This course will not be counted toward a major or a minor.

The course will consist chiefly of lectures, which will be supplemented by assigned readings, and by occasional stereopticon illustrations. The course is recommended particularly to students who are specializing in languages or philosophy.

16. LATER GREEK — MR. HUTCHINSON
Six credits (three hours per week) — Both semesters

Open to juniors and seniors who have completed course 5.

The course consists chiefly of selected readings from the Septuagint and the New Testament. Credit will be given for either half of the course.

17. SEMINAR IN ORATORY OR PHILOSOPHY — MR. HUTCHINSON
One credit (one hour per week) — First semester

Open to juniors and seniors who have completed course 4 or course 5.

In 1909-10 the work will be in connection with Demosthenes *De Corona*.

18. SEMINAR IN GREEK TRAGEDY — MR. BROOKS
One credit (one hour per week) — Second semester

Open to juniors and seniors who have completed course 5.

19. ADVANCED COURSE IN EPIC POETRY — MR. HUTCHINSON
Open to graduate students only.*

20. ADVANCED COURSE IN GREEK DRAMATIC POETRY — MR. BROOKS
Open to graduate students only.*

21. ADVANCED COURSE IN GREEK ORATORY — MR. SAVAGE
Open to graduate students only.*

22. LATER GREEK (322 B. C. to 200 A. D.) — MR. HUTCHINSON
Open to graduate students only.*

*For further information students are requested to confer with the professor in charge of the subject.

HISTORY

WILLIS M. WEST, Professor, Head of Department of History
FRANK M. ANDERSON, Professor
ALBERT B. WHITE, Professor
WILLIAM STEARNS DAVIS, Professor
WALLACE NOTESTEIN, Instructor

REQUIREMENTS OF THE DEPARTMENT

FOR A MINOR, twelve credits, not including course 1.

FOR A MAJOR, eighteen credits, not including course 1, together with reinforcing subjects (thirty credits) selected from economics and political science, sociology, biological sciences, languages according to individual needs, and additional history.

FOR A B. A. WITH DISTINCTION, the general requirements (page), thirty-six credits in history (nine of which shall be in "intensive courses") and at least twelve credits in economics, political science, sociology and anthropology.

FOR A TEACHER'S CERTIFICATE, twenty-four credits, including 4 or 5, 16, and at least six credits in "intensive courses", At least the elements of the other social sciences are recommended.

The department of Economics and Political Science, History, and Sociology 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 the departments of the social science group ought to be familiar at least with 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. To students who are interested in the work of these departments, but who do not care to elect their major before the end of the sophomore year, the departments unite in the following recommendations for the freshman and sophomore years:

RECOMMENDATIONS FOR FRESMAN AND SOPHOMORES

1. The student should take the elementary work of each department within the group as early as possible. Accordingly the following courses are recommended:

Freshman year: history 2 (English constitutional); sophomore year: history 5 (American); economics 1, first or second semester; political science 1, first or second semester.

2. The student is advised to take in these years his required minor in science from the departments of Botany or Animal Biology, and his required minor in language from the French or German, unless he has a reading knowledge of both these languages at entrance.

Courses

No.	Title	Semester	Credits	Offered to	Prereq. courses
1.	Europe 31 B.C.-1500 A.D. . .	1, 2	6†	All	None
2.	English Constitution	1, 2	6	All	Two yrs.prep hist
3.	Renaissance and Reform. . .	1	3	Soph., Jr., Sr.	1 or 2
4.	Europe since 1789.	1, 2	6	Soph., Jr., Sr.	1 or 2
5.	American to 1840.	1, 2	6	Soph., Jr., Sr.	2
6.	American since 1840.	1	3	Jr., Sr.	5
7.	Making of Constitution.	1, 2	6*	Jr., Sr., Grad.	See statement
8.	American Constit'l Law. . . .	1, 2	6*	Sr., Grad.	6
9.	American Statesmen.	2	3	Jr., Sr., Grad.	5
10.	Historical Masterpieces	1	3	Jr., Sr., Grad.	See statement
11.	American Diplomacy	1	3	Jr., Sr., Grad. .	5
12.	Europe Diplomacy.	2	3	Jr., Sr., Grad.	4
13.	Colonial Expansion.	2	3	Jr., Sr., Grad.	4 or 5
14.	Authorities for N. E.	1, 2	4*	Sr., Grad.	See statement
15.	Hitorical Method.	2	2	Soph., Jr., Sr.	1 or 2
16.	Teacher's Course.	2	1	Sr., Grad.	See statement
17.	English Parliament.	2	3	Jr., Sr., Grad.	2 and six credits
18.	English Judiciary.	2	3	Jr., Sr., Grad.	2 and six credits
19.	Eng. Institutions 17th Cent.	2	3	Jr., Sr., Grad.	2 and six credits
20.	England Since 1815.	1	3	Soph., Jr., Sr. Grad.	2
21.	History of Greece.	1	3	Soph., Jr., Sr.	1 or 2
22.	Greek Political Inst's.	2	3	Jr., Sr., Grad.	See statement
23.	Roman Imp. Organization. .	2	3	Jr., Sr., Grad.	Twelve credits

†Juniors and seniors receive only half credit; not counted toward a minor in history.

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

INTRODUCTORY COURSES

Freshmen who have taken two years of history in the preparatory school may omit course 1 and begin with course 2. Course 1 admits directly to courses 2, 3, 4, 15, and 21. Course 2 is required as a prerequisite for all courses in American history (5 to 9 inclusive, 11, 13 and 14) and for courses 17 to 20 in English history, while it admits also to 3, 4 and 15. Students who intend to specialize in history or in any social science should elect course 2 in the freshman year.

1. European History from the Establishment of the Roman Empire to the Reformation. 31 B. C.-1500 A. D. Mr. Davis
Six credits (three hours per week) Both semesters.

Open to all, but juniors and seniors receive only half credit; especially designed for freshmen who have had less than two years of history in the preparatory school; not credited toward a minor in history.

The course will show how modern institutions are largely derived from Roman imperial institutions. The leading topics will be the gathering up of the contributions of the older world by Rome, the imperial organization of the first "political people" the Germanic invasions, the growth of the Frankish state and Charlemagne's premature attempt at organization, the medieval church, the feudal system, the crusades, the rise of the towns, and the development of modern nations. This last topic will be studied mainly as it is illustrated in the history of Germany and of France from 814 to 1500. A definite portion of the course (about one-third) will go to the careful use of source material.

2. English Constitutional History to the Accession of George I
Mr. White and Mr. Notestein
Six credits (three hours per week) Both semesters.
Open to all who have had two years of history in the preparatory school or who have completed course 1.

While the general narrative of English history is not neglected, the making and testing of the English government are the main themes of the course. Much time is spent upon the study of documents which illustrate the origin and development of important institutions.

GENERAL COURSES

3. The Renaissance and Reformation Mr. White
Three credits (three hours per week) First semester
Open to those who have completed course 1 or course 2.

The Renaissance and Reformation will be studied as general European movements, with the emphasis upon the work of individual men and upon ideas rather than upon politics and institutions. The purpose of the course will be to show how the medieval world became the modern world.

4. Europe Since 1789 Mr. Anderson
Six credits (three hours per week) Both semesters
Open to those who have completed course 1 or course 2.

The history of France occupies the most prominent place in the course, that of other countries being grouped about it, as far as possible. Much attention is given to international affairs, the principal territorial changes being illustrated with a series of wall maps prepared for the course under the direction of the instructor. A special effort is made to put the students into a position to understand the present governments and politics of the leading European states. The entire class meets twice each week for lectures or reciations. The third exercise is devoted to the study of important historical documents, drawn principally from Anderson's *Constitutions and other select Documents Illustrative of the History of France* 1789-1901. This work is done in small groups which meet in the European history seminar room.

5. American Constitutional History to 1840 Mr. West
Six credits (three hours per week) Both semesters
Open to those who have completed course 2; required for courses 6 to 9 inclusive 11, 13, 14, and 19, and therefore to students who intend to specialize in history recommended for the sophomore year.

The aim is to make this a "practice course"; the work is done partly by cooperative topical reports, and students are expected to consult primary sources to a greater degree than is possible in most undergraduate courses. During part of the year the class will meet once a week in small sections for the study of documents.

15. Historical Method and Bibliography Mr. White
Two credits (two hours per week) Second semester
Open to those who have completed course 1 or course 2, but designed only for those who intend to specialize in history.

This course aims to make clear to the student the genesis of the modern historical method and to introduce him in a practical way to the use of the best tools in historical study. The work divides naturally as follows:

1. Exercises in historical criticism and interpretation. One or more important historical sources will be studied intensively by the class.
2. History of historical writings:especially the work of Ranke and his followers

and the origin of the seminar system. Some account will be taken of present methods and advantages of study in Germany and France.

3. Bibliography. Purpose, to gain a working knowledge of existing helps to historical study, such as standard bibliographies, historical magazines, source material, etc.

While the knowledge of Latin or the modern languages is an advantage, it is not a necessity in this course.

16. TEACHER'S COURSE — MR. WEST
One credit (one hour per week) — Second semester
Open to seniors and graduates who have, including courses in progress, twenty-four credits in history; required for those who obtain a teacher's recommendation in history.

This course is designed to assist those who expect to teach history in high schools. Professor West will be aided by other members of the department.

20. ENGLAND SINCE 1815 — MR. ANDERSON
Three credits (three hours per week) — Second semester
Open to those who have completed course 2; may be taken to advantage in connection with course 4.

The course opens with a rapid survey from the point where course 1 stops down to 1815. From there on the work is more intensive. Through topics and assigned readings an opportunity is afforded to become acquainted with the principal British reviews and with two or three of the leading British newspapers.

21. HISTORY OF GREECE — MR. DAVIS
Three credits (three hours per week) — First semester
Open to those who have completed course 1 or course 2.

The course is general in its nature and will cover the political and social development of the Greek states to the time of their incorporation into the Roman Empire, with particular emphasis upon the later part of the period. Especial attention will be given to the permanent influence of Greek civilization.

ADVANCED OR INTENSIVE COURSES

6. AMERICAN CONSTITUTIONAL HISTORY, 1841-1885 — MR. ANDERSON
Three credits (three hours per week) — First semester
Open to those who have completed course 2 and at least the first semester of course 5; given in 1908-09, and in alternate years thereafter.

Special attention is given to the development of the slavery issue in politics, the political history of the civil war, and reconstruction.

7. THE MAKING OF THE CONSTITUTION — MR. WEST
Six credits (three hours per week) — Both semesters
Open to juniors, seniors, and graduates who have completed course 5, but only on approval of the instructor; both semesters must be completed before credit is given for the first semester.

Each member of the class studies in detail the transition in one of the original American colonies to commonwealth government, with the constitution of his chosen state. The work of the Philadelphia convention is then taken up and the accounts of later writers are compared with the sources. "We the people," the "compact" theory, and the province of the Supreme Court as "final arbiter," are topics especially investigated, with such further aids as the writings of the day and the discussions of the ratifying state conventions afford. Besides the class work each student will present a written report upon the history of some important bill providing for the

admission of a state, and some constitutional question in connection with congressional legislation.

8. AMERICAN HISTORY SINCE 1789 AS SHOWN IN THE DEVELOPMENT OF CONSTITUTIONAL LAW — MR. WEST
Three credits (three hours per week) — First semester
Open to seniors and graduate students who have completed courses 2, 5, 6 and 7; not given in 1909-10.

This course is not designed to be a systematic treatment of either history or constitutional law. It consists of a careful analysis of cases selected from *Thayer's Cases on Constitutional Law*, studied in their historical setting and with reference to the course of development.

9. STUDIES IN AMERICAN STATESMEN — MR. ANDERSON
Three credits (three hours per week) — Second semester
Open to juniors, seniors, and graduate students, who have completed courses 2 and at least the first semester of course 5.

A research course. Each member of the class makes a study of some prominent American statesman who has left a considerable body of materials valuable for information upon his own career and the general history of the United States. The greater part of the work consists in the sifting of these materials and the preparation of brief reports in regard to points assigned for investigation. The class exercises are chiefly devoted to the criticism of these reports and the synthesis of the results thus obtained. Only a limited period is traversed. In the work will be confined to the period of the Federalist supremacy, 1789-1801.

10. A CRITICAL STUDY OF A HISTORICAL MASTERPIECE — MR. ANDERSON
Three credits (three hours per week) — First semester
Open to those who have completed course 5.

The object of this course is to develop the habit of reading history critically. Each year a masterpiece of historical literature will be minutely and critically studied. Each student will be required to read critically the entire work studied and, in addition, to analyze and report upon assigned portions of it. These reports will be made the basis of the class work, which will consist mainly of discussing carried on by the students under the direction of the instructor. In 1909-10, Rhode's *History of the United States from the Compromise of* 1850 *to the Restoration of Home Rule in the south in* 1877 will be read.

11. THE HISTORY OF AMERICAN DIPLOMACY — MR. ANDERSON
Three credits (three hours per week) — First semester
Open to seniors and graduates who have completed course 5.

A research course dealing principally with the more important features of American foreign policy during the earlier years of the federal government.

12. THE HISTORY OF EUROPEAN DIPLOMACY SINCE 1789 — MR. ANDERSON
Open to seniors and graduates who have completed or are taking course 4; ability to read easy French is required.

This course centers about the critical reading of the principal treaties and numerous state papers dealing with international relations.

13. COLONIAL EXPANSION AND ADMINISTRATION — MR. WEST
Three credits (three hours per week) — Second semester
Open to seniors and graduate who have completed course 4 or course 5; given in alternate years; not offered in 1909-10.

The history of the colonial acquisitions of the great nations will be surveyed

rapidly and colonial institution and governments will be studied and compared in detail.

14. A Critical Study of Authorities for Early New England History
Mr. West
Four credits (two hours per week) Both semesters
Open to seniors and graduates who have completed eighteen credits, including course 5;both semesters must be completed before credit is given for the first semester; given in alternate years.

This is primarily a course in historical criticism, based on a minute study of Winthrop's *History of New England*. Each member of the seminar has a group of secondary authorities assigned him which he is to criticise in the light of the original sources. The study involves also a careful comparison of the chief sources with one another, and incidedtally it leads to a minute treatment of political, social, and economic development in early New England. The number admitted to the course is limited to seven.

17. Beginnings of Parliament Mr. White
Three credits (three hours per week Second semester
Open to juniors, seniors and graduates, who have completed twelve credits including course 2. Students should have a reading knowledge of Latin. Latin 9 gives a good preparation for this period.

This course will be given in alternate years with course 18, not given in 1909-10.

18. Origin of the English Judicial System Mr. White
Three credits (three hours per week) Second semester
Open to juniors, seniors and graduates who have completed six credits, including course 2, and who obtain the permission of the instructor; students should be able to read Latin, and Latin 9 is recommended to give this preparation.

The work will consist of detailed study in the sources of the twelfth and thirteenth centuries, and will aim to show how the king's court, from which the present judicial system has grown, superseded the older communal and private courts, the development of the primitive king's court into a system of courts, and the growth in it of a new procedure. In this last connection the critical stages in the early history of the jury will receive special attention. This course will be given in alternate years with 17. Given in 1909-10.

19. English Institutional Development in the Seventeenth Century
Mr. Notestein
Three credits (three hours per week) Second semester
Open to juniors, seniors and graduates who have completed twelve credits in history, including course 2.

22. Greek Political Institutions Mr. Davis
Three credits (three hours per week) Second semester
Open to juniors, seniors, and graduates, who have completed courses 1 or 2, 21 and six additional credits.

A study of the development of Greek political forms and of their operation as seen in typical oligarchic, democratic, federal, and monarchic states.

23. Roman Imperial Organization Mr. Davis
Three credits (three hours per week) Second semester
Open to juniors, seniors and graduates, who have completed twelve credits.

This course will survey the development and organization of the imperial system from the beginning of Roman expansion outside of Italy to the time of the Germanic invasion. Special attention will be given to the administration of the municipa ties and provinces under the Empire and to the development of despotism

LATIN

JOSEPH B. PIKE, Professor, Head of Department of Latin
JOHN S. CLARK, Professor
JOHN E. GRANRUD, Professor

REQUIREMENTS OF THE DEPARTMENT

FOR A MINOR, courses 1, 2, 3 and 4.

FOR A MAJOR, courses 1, 2, 3 and 4, together with six additional credits selected from courses 6 and 14 inclusive, and reinforcing subjects (thirty credits) selected from Greek, advanced modern language, English (course 3, 4, 5, 6, 24 and 25) philology, history (courses 1, 15, 21, 17, 18 22 and 23) philosophy (course 9), political science (course 19) and additional Latin courses.

FOR B. A. WITH DISTINCTION, the general requirements (page 46) and twelve credits in addition to the requirements for a major, course 10 being compulsory.

FOR A TEACHER'S CERTIFICATE, course 1, 2, 3, 4, 6, and 7 with an average of at least good.

		Courses			
No.	Title	Semester	Credits	Offered to	Prereq. courses
1.	Livy	1	3	Fresh.	4 yrs. prep Latin
2.	Plautus and Terence	2	3	Fresh.	1
3.	Horace	1	3	Soph., Jr., Sr.	1 and 2
4.	Roman Lit	2	3	Soph., Jr., Sr.	1-3
5.	Ovid	1, 2*	2	Soph., Jr., Sr.	1 and 2
6.	Adv. Cæsar	1	3	Jr., Sr.	1-4
7.	Adv. Virgil	2	3	Jr., Sr.	1-4
8.	Pliny's Letters	1	2	Jr., Sr.	1-4
9.	Med. Latin	1	1	Jr., Sr.	1-4
10.	Composition	2	2	Jr., Sr.	1-4
11.	Elegiac Poetry	1	3	Jr., Sr.	1-4
12.	Corresp. of Cicero	1	2	Jr., Sr.	1-4
13.	Satire	2	3	Jr., Sr.	1-4
14.	Drama	2	2	Jr., Sr.	1-4
15.	Arch. and Public Life	1	2	Jr., Sr.	None
16.	Private Pife	2	2	Jr., Sr.	None
17.	Lucretius	1, 2	2	Grad.	
18.	Seneca	1, 2	2	Grad.	
19.	Roman Elooquence	1, 2	2	Grad.	

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

1. LIVY: BOOKS I, II, XXI, XXII. Selections MESSRS. PIKE, CLARK AND GRANRUD
Three credits (three hours per week) First semester

Open to freshmen who have completed four years of Latin in preparatory schools; course 2 must also be completed before credit is given for this course.

The course consists of (a) a correct translation of Latin into idomatic English with a study of the difference between the idioms of the two languages; (b) Latin composition and review of the principles of Latin syntax.

2. PLAUTUS AND TERENCE, Selections MESSRS. PIKE, CLARK AND GRANRUD
Three credits (three hours per week) Second semester

Open to freshmen who have completed course 1.

The course comprises the translations of selected plays of Plautus and Terence with an outline study of the beginnings of the Roman drama and also of Roman political institutions.

3. HORACE — MESSRS. PIKE AND GRANRUD
Three credits (three hours per week) — First semester

Open to those who have taken course 1 and 2; course 4 must also be taken before credit is given for this course.

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

4. ROMAN LITERATURE — MESSRS. PIKE AND GRANRUD
Three credits (three hours per week) — Second semester

Open to those who have taken courses 1, 2 and 3.

A brief history of Roman literature with illustrative readings from the most important writers.

5. OVID — MR. CLARK
Two credits (one hour per week) — Both semesters

Open to those who have taken courses 1 and 2; both semesters must be completed before credit is given for the first semester.

Translations from Ovid's *Fasti*, with a study of the religion and religious ceremonials of the Romans.

6. ADVANCED COURSE IN CÆSAR — MR. PIKE
Three credits (three hours per week) — First semester

Open to those who have completed courses 1 to 4 inclusive; required for a teacher's recommendation in Latin.

Selections from books five to seven of the Gallic War and from the Civil War. Thorough study of the principles of indirect discourse. Intermediate Latin composition. An amount of time approximately equal to one hour for one-half semester will be spent upon the technical portions of the work, e. g., class drill work and discussion of various problems connected with secondary school work in Latin.

7. ADVANCED COURSE in VIRGIL — MR. PIKE
Three credits (three hours per week) — Second semester

Open to those who have completed courses 1 to 4 inclusive; required for a teacher's recommendation in Latin.

An interpretation of selections from books seven to twelve of the Aeneid; a study of the quantitative method of pronouncing Latin verse; practice in the metrical rendering of selected passages. An amount of time approximately equal to one hour for one-half semester will be spent upon the strictly technical portions of the subject.

8. PLINY'S LETTERS — MR. PIKE
Two credits (two hours per week) — First semester

Open to those who have completed courses 1 to 4 inclusive.

Selections from the correspondence of Pliny the Younger with a study of his times.

9. MEDIEVAL LATIN — MR. PIKE
One credit (one hour per week) — First semester

Open to those who have completed courses 1 to 4 inclusive.

A course intended primarily to assist the student in rendering Latin historical documents of the middle ages. The work consists principally in the reading of selec

ted documents of the middle ages with an outline of the main peculiarities of medieval Latin.

10. LATIN COMPOSITION — MR. PIKE
Two credits (two hours per week) — Second semester
Open to those who have completed course 1 to 4 inclusive; required for degree with distinction.
A course in advanced Latin composition and a study of Latin prose style.

11. ROMAN ELEGIAC POETRY — MR. CLARK
Three credits (three hours per week) — First semester
Open to those who have completed courses 1 to 4 inclusive.
Selections from Catullus, Tibullus, Propertius, and Ovid, with a study of the rise, development and characteristics of Roman elegiac poetry.

12. CORRESPONDENCE OF CICERO — MR. CLARK
Two credits (two hours per week) — First semester
Open to those who have completed courses 1 to 4 inclusive.
Selections from the letters of Cicero, with a study of his life and the history of his times.

13. ROMAN SATIRE — MR. CLARK
Three credits (three hours per week) — Second semester
Open to those who have completed courses 1 to 4 inclusive.
Selections from Juvenal, Persius, Horace, and from early satire, with a study of the rise, development, and characteristics of Roman satire.

14. ROMAN DRAMA — MR. CLARK
Two credits (two hours per week) — Second semester
Selections from Seneca's tragedies and from the comedies of Plautus and Terence, with a study of the rise and development of the drama at Rome.

15. ROMAN ARCHÆOLOGY AND PUBLIC LIFE — MR. GRANRUD
Two credits (two hours per week) — First semester
Open to juniors and seniors; no knowledge of Latin required.
A study of the city of Rome; the forums; Roman architecture, sculpture, and painting; the Roman assemblies, senate, and magistracies. Lectures with stereopticon views and collateral reading. Not credited toward a major or minor.

16. ROMAN PRIVATE LIFE — MR. GRANRUD
Two credits (two hours per week) — Second semester
Open to juniors and seniors; no knowledge of Latin is required.
The Roman house, family, dress, food, education, and amusements are studied. Lectures with stereopticon views and collateral reading. Not credited toward a major or minor.

17. LUCRETIUS — MR. CLARK
Two credits (two hours per week) — Both semesters
Open to graduate students; other arrangements may be ascertained upon application to the department.
The course consists of the reading and interpretation of the text of Lucretius with a study of his philosophy and its sources.

18. SENECA — MR. PIKE
Two credits (two hours per week) — Both semesters

Open to graduate students; other arrangements may be ascertained upon application to the department.

Reading, interpretation and annotation of the *de Beneficiis* of Seneca with a study of Stoicism at Rome.

19. THE THEORY OF ROMAN ELOQUENCE — MR. GRANRUD
Two credits (two hours per week) — Both semesters

Open to graduate students; other arrangements may be ascertained upon application to the department.

Cicero's *De Oratore* will form the basis of the work.

MATHEMATICS

JOHN F. DOWNEY, Professor, Head of Department of Mathematics
GEORGE N. BAUER, Professor
WILLIAM H. BUSSEY, Assistant Professor
ANTHONY L. UNDERHILL, Assistant Professor
GEORGE P. PAINE, Assistant Professor
ROYAL R. SHUMWAY, Instructor
JAMES S. MIKESH, Instructor.

REQUIREMENTS OF THE DEPARTMENT

FOR A MINOR, twelve credits, not including courses 1 and 2.

FOR A MAJOR, eighteen credits, including course 9, but not including courses 1 and 2, together with reinforcing subjects (thirty credits) selected from astronomy, physics, mechanics, logic, advanced modern language and additional mathematics.

FOR B. A. WITH DISTINCTION, the general requirements (page 46) and one year of pure mathematics in addition to the requirements for a major.

FOR A TEACHER'S CERTIFICATE, an average of at least good in courses 6, 7, 8 and 9. Course 13 is also recommended.

COURSES

No.	Title	Semesters	Credits	Offered to	Prereq. courses
1.	Higher Alg. PartI.....	1	5	Fresh.	El. Alg.
2.	Alg. cont. and Pl. Trig.....	2	5	Fresh.	1
3.	Higher Alg. Part II.....	1	3*†	Fresh., Soph.	1
4.	Trigonometry.....	2	3*†	Fresh., Soph.	3
5.	Hgr. Alg. Parts II & III and Trig.	1, 2	10	Fresh.	1
6.	Higher Alg. Part III	1	3	Soph., Jr., Sr.	2 or 3
7.	Analyt. Geom.....	2	3	Soph., Jr., Sr.	6
8.	Differential Calculus	1	3	Jr., Sr.	7
9.	Integral Calculus.....	2	3	Jr., Sr.	8
10.	Adv. Plane Anal. Geom.....	1	3	Jr., Sr.	7
11.	Solid Anal. Geom.....	2	3	Jr., Sr.	10
12.	Differential Equations.....	1	3	Sr.	9
13.	Mathematical Pedagogy....	2	1	Sr.	7
14.	Method of Least Squares....	2	2	Sr.	9
15.	Theoretical Mechanics.....	1, 2	10	Sr.	9
16.	Advanced Calculus.....	1, 2		Grad.	9
17	Modern Geometry.....	1, 2		Grad.	9 and 11

COURSES (Continued)

No.	Title	Semester	Credits	Offered to	Prereq. courses
18.	Theory of Numbers.....	1, 2		Grad.	9
19.	Funcs. of a Cplx. Var.....	1, 2		Grad.	12
20.	Projective Geometry.....	1, 2		Grad.	9, 10, 11
21.	Elliptic Integrals.....	1, 2		Grad.	12

*Juniors and seniors are allowed only half credit.

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

1. HIGHER ALGEBRA, Part I — MESSRS. BAUER, BUSSEY, UNDERHILL, PAINE AND MIKESH

Five credits (five hours per week) — First semester

Required of freshmen who have not an entrance credit in the subject; must be followed by course 2; not open to those who have taken the subject in the preparatory school; not credited toward a minor in mathematics.

The fundamentals rules, factoring, highest common divisor, lowest common multiple, fractions, involution, evolution, surds, imaginaries, simple equations with one, two or more unknown quantities, ratio, proportion, variation and progressions.

The examples and problems are more difficult than those under the same subjects in elementary algebra and demonstrations are an important part of the work.

2. ALGEBRA CONTINUED AND PLANE TRIGONOMETRY — MESSRS. BAUER, BUSSEY, UNDERHILL, PAINE AND MIKESH

Five credits (five hours per week) — Second semester

Required of freshmen who have not an entrance credit in course 1.

This is a continuation of course 1 and consists of algebra through logarithms and plane trigonometry.

3. HIGHER ALGEBRA, PART II. — MESSRS. BAUER, BUSSEY, UNDERHILL AND PAINE

Three credits (three hours per week) — First semester

Open to those who have completed course 1; must be followed by course 4.

Variation, quadratic equations, special higher equations, simultaneous equations of the second degree, maxima and minima of algebraic functions, differentiation of algebraic functions, development of functions, logarithms, theory of equations and solution of numerical higher equations.

4. TRIGONOMETRY — MESSRS. BUSSEY AND PAINE

Three credits (three hours per week) — Second semester

Open to those who have completed course 3.

Text, tables, and numerous problems.

5. HIGHER ALGEBRA, Parts II and III, AND TRIGONOMETRY — MESSRS. BUSSEY, PAINE AND MIKESH

Ten credits (five hours per week) — Both semesters

Required of freshmen who have an entrance credit in course 1, but not in solid geometry, and of freshmen in the School of Chemistry.

6. HIGHER ALGEBRA, PART III — MESSRS. BUSSEY AND PAINE

Three credits (three hours per week) — First semester

Open to those who have completed course 2 or 4.

Maxima and minima of functions, indeterminate forms, discussion of functions and problems, indeterminate equations, theory of equations and solution of numerical higher eqations, series, interlopation, permutations and combinations, and determinants.

7. ANALYTICAL GEOMETRY MESSRS. BUSSEY, UNDERHILL AND PAINE
Three credits (three hours per week) First semester
Open to those who have completed course 6.
Rectilinear and polar co-ordinates, producing equations of loci whose law of development is known, constructing and discussing such equations, transformation of co-ordinates, properties of the straight line, the conic sections and higher plane curves by means of their eqations.

8. DIFFERENTIAL CALCULUS MESSRS. DOWNEY AND UNDERHILL
Three credits (three hours per week) First semester
Open to those who have completed course 7.
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. Not given in 1909-10.

9. INTEGRAL CALCULUS MESSRS. DOWNEY AND UNDERHILL
Three credits (three hours per week) Second semester (first semester in 1909-10).
Open to those who have completed course 8.
Integration of the various forms, integration as summation, rectification of curves, quadrature of plane and curved surfaces, cubature of volumes, equations of loci by means of the calculus, successive integration with applications to moment of inertia, areas and volumes.

10. ADVANCED COURSE IN PLANE ANALYTICAL GEOMETRY MR. BAUER
Three credits (three hours per week) First semester
Open to those who have completed course 7.
Supplementary to course 7, treating more fully of the subjects of that course and taking up additional subjects.

11. SOLID ANALYTICAL GEOMETRY MR. BAUER
Three credits (three hours per week) Second semester
Open to those who have completed course 10.
Elementary theorems of projection, co-ordinates, the plane, the line in space, quadric surfaces, transformation of co-ordinates, tangents, poles and polars, the general equation of the second degree. Numerous examples are assigned to illustrate the theory.

12. DIFFERENTIAL EQUATIONS MR. DOWNEY
Three credits (three hours per week) First semester (second semester in 1909-10).
Open to those who have completed course 9.
Text and lectures.

13. MATHEMATICAL PEDAGOGY MR. BAUER
One credit (one hour per week) Second semester
Open to those who have completed course 7
A lecture course, in which special attention is paid to the fundamental principles of algebra and geometry.

14. METHOD OF LEAST SQUARES MR. LEAVENWORTH
Two credits (two hours per week) Second semester
Open to those who have completed course 9.

A study of the combination and adjustment of observations and the discussion of their precision as applied especially to engineering, physics and astronomy.

15. THEORETICAL MECHANICS (In College of Engineering)
Ten credits (five hours per week) Both semesters
Open to those who have completed course 10.
Recitations and lectures.

16. ADVANCED DIFFERENTIAL AND INTEGRAL CALCULUS MR. DOWNEY
Open to graduate students who have completed course 9. Both semesters
This course goes farther into some of the subjects treated in courses 8 and 9, and takes up some important subjects not included in those courses.

17. MODERN GEOMETRY MR. BAUER
Both semesters
Open to graduate students who have completed courses 9 and 11.

18. THEORY OF NUMBERS MR. BUSSEY
Open to graduate students who have completed course 9. Both semesters

19. THEORY OF FUNCTIONS OF A COMPLEX VARIABLE MR. UNDERHILL
Open to graduate students who have completed course 12. Both semesters
Lectures, readings and problems.

20. PROJECTIVE GEOMETRY MR. BUSSEY
Both semesters
Open to graduate students who have completed courses, 9, 10 and 11.

21. ELLIPTIC INTEGRALS MR. BROOKE
(In the College of Engineering).
Open to graduate students who have completed course 12. Both semesters

MILITARY SCIENCE AND TACTICS

EDWARD SIGERFOOS, Professor, Head of Department of Military Science and Tactics
BERT ROSE, Instructor of Band

MILITARY SCIENCE AND TACTICS

1. MILITARY DRILL MR. SIGERFOOS
(Three hours per week) First and second semester
Drill is required of all men in the freshman and sophomore classes.
Freshman—Practical instruction in schools of the soldier, company and battalion; signals, ceremonies; schools of the cannoneer and battery.
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.
For the instruction in military drill and administration the students are organized into a corps of cadets, consisting of three battalions of infantry, a band and a platoon of artillery.
A uniform of prescribed pattern is worn by all cadets during drill.

The uniform consists of blouse, trousers and cap, modelled after the U. S. Military Academy cadet uniform, and costs in Minneapolis about $15.

Military drill may be taken voluntarily by others outside of the freshman and sophomore classes; and to encourage this, as it is considered beneficial,not only to the individual student, but to the State generally, a year's drill is allowed to count as a two-hour credit for one semester, but no credit will be allowed for such drill for less than one year.

2. MILITARY SCIENCE — MR. SIGERFOOS
(Two hours per week) — Second semester
Optional with juniors and seniors.

Theoretical instruction—Advance and rear guards, outposts, reconnaissance, camping, duties of company commander, articles of war, records.

This work when satisfactorily completed taken in connection with the year's drill will give a four-hour credit for the semester.

Miltary instruction is intended to be so conducted as to develop a soldier-like bearing and foster a spirit of gentlemanly courtesy, soldierly honor and obedience to lawful authority, as well as to familiarize students with company, battalion and regimental manœuvres, guards and the theoretical and practical use of firearms.

On graduation of each class the Commandant will report to the Adjutant General of the Army the names of the graduates who may have shown special aptitude for the military service and furnish a copy thereof to the Adjutant General of the State.

The officers and non-commissioned officers are required to be good students in the other departments, soldier-like in the performance of their duties, exemplary in their general deportment and able to pass a creditable examination in drill regulations. In general, the officers are selected from the senior class; the sergeants from the junior class; and the corporals from the sophomore class.

THE ROSTER OF THE CORPS OF CADETS

CADET COLONEL

Chester S. Wilson.

CADET MAJORS

Wilbur D. Shaw.
J. Russell Smith.
John W. Haw.

BAND

B. A. Rose, Instructor of Music.
R. T. Glyer, Cadet Chief Musician.
W. W. Norton, Cadet Principal Musician.

CADET CAPTAINS

Lawrence W. King, Company E.
Lewis S. Diamond, Company A.
Robert W. Foulke, Company C.
Willis Shippam, Company G.
S. G. Mooney, Company F.
Maurice V. Jenness, Company B.
L. V. Crandall, Company I.
Robert A. Pratt, Company D.

Robert Nelson, Regimental Quartermaster.
Allan B. Stork, Company H.
Chas. T. Haas, Regimental Commissary.
Warner G. Workman, Regimental Adjutant.
A. R. Blackburn, Company K.
V. L. Lenz, Company L.
Max Brownell, Company M.
V. Chase, Company N.

CADET FIRST LIEUTENANTS

J. R. Buffington, Adjutant First Battalion.
G. M. Briggs, Adjutant Third Battalion.
W. D. Timperly, Commanding Battery.
Oscar V. Anderson, Company F.
Harry W. Dahleen, Company G.
Thomas A. Peppard, Adjutant Second Battalion.
Donald R. Brewster, Company I.
Porteus B. Palmer, Company E.
Howard R. Hush, Company B.
H. R. Bicknell, Company C.
Allan J. Wash, Company D.
C. P. Robb, Quartermaster Third Battalion.
C. Arthur Carlson, Company A.
Cyrus H. Fiske, Company H.
E. Hoffman, Company K.
L. E. Mark, Company L.
M. D. Clark, Company M.

CADET SECOND LIEUTENANTS

George P. Gurley, Company A.
Lewis H. Merrill, Quartermaster First Battalion.
Sheldon H. Smith, Battery.
C. Hugo Nelson, Company F.
C. T. Ekman, Company G.
C. W. Bowen, Company I.
W. F. Cantwell, Company H.
Paul Johnson, Company G.
J. E. Dorsey, Company B.
R. W. Whittier, Quartermaster Second Battalion.
Howard Williams, Company C.
C. M. Jesperson, Company E.
R. D. Newhall, Company D.
Harold Munck, Company A.
P. A. Anderson, Assistant Adjutant Third Battalion.
R. V. Smith, Company K.
D. Holbrook, Company L.
Geo. Workman, Company M.
H. C. Huntly, Company N.

MUSIC

CARLYLE SCOTT, Professor, Head of Department of Music

REQUIREMENTS OF THE DEPARTMENT

FOR A MINOR, twelve credits, not including courses 4, 6 and 7.

A MAJOR is not offered.

Students entering the University for the express purpose of studying music must register for courses 1 and 4 and two other three-hour subjects outside of the Department of Music.

With practical aim of the theoretical courses is to acquaint the student with the laws underlying musical composition, enabling him, at the same time, through critical analysis, to arrive at the keenest perception and appreciation of master works in music; and, finally, to stimulate latent talent to self-expression of musical thoughts in correct form. A certificate of proficiency in music will be granted to students who, having completed the theoretical courses and two year of pianoforte, are able to play one of the standard concertos and, in addition, show marked musical ability.

Courses

No.	Title	Semester	Credits	Offered to	Prerep. courses
1.	Harmony	1, 2	4	Jr., Sr.	None
2.	Counterpoint	1, 2	4	Jr., Sr.	See statement
3.	Form and Composition	2	2	Sr.	See statement
4.	Pianoforte	1, 2	3 or 6	Jr., Sr.	See statement
5.	Pinoforte, second course	1, 2	3 or 6	Jr., Sr.	See statement
6.	Choral culture	1, 2	1 or 4	Jr., Sr.	See statement
8.	History of Music	1, 2	2	Jr., Sr.	None

1. HARMONY — MR. SCOTT

Four credits (two hours per week) — Both semesters

Open to juniors and seniors. The fee is four dollars per semester.

The study of chords, their construction, relations, and progressions. The work consists of written exercises on basses, the harmonization of given melodies. Foote and Spaulding's *Modern Harmony* is used as text book.

2. COUNTERPOINT — MR. SCOTT

Four credits (two hours per week) — Both semesters

Open to juniors and seniors who have a thorough knowledge of harmony. The fee is four dollars per semester.

The work includes the harmonization of melodies in two, three, and four voices in the different orders of counterpoint. Spaulding's *Tonal Counterpoint* is used as a text book.

3. MUSICAL FORM AND FREE COMPOSITION — MR. SCOTT

Two credits (two hours per week) — Second semester

Open to seniors who have completed courses 1 and the first semester of course 2; for those specializing in music and can be taken only with the consent of the instructor. The fee is four dollars per semester.

At the close of the year a program of original composition will be given.

4. PIANOFORTE — MR. SCOTT

Three or six credits (one and a half or three hours per week) — Both semesters

Open to juniors and seniors, who have mastered technical difficulties of the

degree of Czerny's *School of Velocity* and the easier Haydn and Mozart sonatas, for those who intend to pursue the higher branches of the pianoforte, the art of playing, or to fit themselves for piano teachers. The fee is thirty-two or sixty-four dollars per semester.

5. PIANOFORTE, second course — MR. SCOTT
Three or six credits (one and a half or three hours per week) — Both semesters
Open to seniors who have completed course 4. The fee is thirty-two or sixty-four dollars per semester.

6. CHORAL CULTURE — MR. SCOTT
Two credits (one hour per week) — Both semesters
Open to juniors and seniors. The fee is two dollars per semester. A single credit may be secured for chorus work. Students may pursue the chorus work without credit, by paying the required fee and securing consent of the director.

A popular course in choral practice for four-part mixed voices, with occasional selections for male voices and female voices separately; features: sight singing with hints on proper tone-production, correct breathing, vocalization and solfeggio; the art-forms in choral compositions will be studied and analyzed. (Chorus a capella, motet, cantata, oratorio.)

8. HISTORY OF MUSIC — MR. SCOTT
Two credits (one hour per week) — Both semesters
Open to juniors and seniors. The fee is four dollars per semester.

A literary course. Lectures are given on the development of music from the time of Palestrina to the present day.

PHILOSOPHY AND PSYCHOLOGY

NORMAN WILDE, Professor, Head of Department of Philosophy and Psychology
DAVID F. SWENSON, Assistant Professor
JAMES B. MINER, Assistant Professor
ROWLAND HAYNES, Assistant Professor
HERBERT H. WOODROW, Instructor

REQUIREMENTS OF THE DEPARTMENT

FOR A MINOR, twelve credits.

FOR A MAJOR, eighteen credits, together with reinforcing subjects (thirty credits) selected as follows: in philosophy, Greek, Latin, mathematics, physics, sociology, political science, English and additional philosophy and psychology; in psychology, biology, physics, education and additional philosophy and psychology.

FOR B. A. WITH DISTINCTION, the general requirements (page 46) and six credits in addition to the requirements for a major, at least six of twenty-four credits in the department being from intensive courses.

The courses offered by the department fall into three groups.

1. *Introductory courses;* 1 and 2. Course 1 is required for all advanced work in psychology, and either 1 or 2 for all work in philosophy, but students are advised to take both.

2. *General courses.*

3. *Advanced intensive courses.* These courses are open only to graduates and properly qualified seniors. All will not be offered each year but a selection will be made to meet the qualifications of the students presenting themselves.

The courses may also be grouped according to their purpose as follows:

1. Of special value for education: 1, 2, 3 and 11.
2. Fundamental courses in psychology: 1, 3, 4, 5, 16, and 21.
3. Fundamental courses in philosophy: 1, 2, 9, 10, 11 and 14.

Courses

No.	Title	Semester	Credits	Offered to	Prereq.-courses
1.	Introductory Psych.....	1 or 2	3	Soph., Jr., Sr.	None
2.	Logic.....	1 or 2	3	Soph., Jr., Sr.	None
3.	Educational Psych.....	1 or 2	3	Soph., Jr., Sr.	1
4.	Exp. Psych.: The Senses....	1	3	Jr., Sr.	1
5.	Exp. Psych.: Higher Mental Processes.....	2	3	Jr., Sr.	1 and 4
7.	Psychological Interpretation	1	3	Jr., Sr.	1
8.	Aesthetics.....	2	3	Jr., Sr.	1
9.	Ancient and Med. Philos....	1	3	Jr., Sr.	1 or 2
10.	Modern Philosophy.....	2	3	Jr., Sr.	1 or 2
11.	Principles of Ethics.....	1	3	Jr., Sr.	1 or 2
12.	Phil. of Religion.....	2	3	Jr., Sr.	1 or 2
13.	Psychol. of Moral and Relig. Develop.....	1	3	Jr., Sr.	3
14.	Logic of Science.....	2	3	Jr., Sr.	2
15.	Mental Retardation.....	2	3	Jr., Sr., Grad.	3
16.	Psychological Problems.....	1, 2	..	Sr. Grad.....	1, 4 and 5
17.	Research in Psych.....	1, 2	6†	Grad.	16
18.	*Descartes, Spinoza, Leibnitz	1, 2	6†	Sr. Grad.	9 and 10
19.	*Kant.....	1, 2	6†	Sr. Grad.	9 and 10
20.	*Hume.....	1, 2	6†	Sr. Grad.	9 and 10
21.	Psychol. Principles.....	1	3	Jr., Sr., Grad.	1 and 2
*22	.Metaphysics.....	1, 2	6†	Sr. Grad.	9 and 10 or 11
*23.	Systematic Ethics.....	1, 2	6†	Sr Grad.	9, 10 and 11
*24.	Hist. of Ethics.....	1, 2	6†	Sr. Grad.	9, 10 and 11
*25.	German Idealism.....	1, 2	6†	Grad.	9, 10 and 19
*26.	The Nervous System and Mental Life.....	2	3	Jr., Sr., Grad.	1

†Both semesters must be completed before credit is given for the first semester.
*Open to students only upon approval of the department.

INTRODUCTORY COURSES

1. INTRODUCTORY PSYCHOLOGY — MESSRS. MINER, SWENSON AND HAYNES
Three credits (three hours per week) — Each semester

Open to sophomores, juniors and seniors; required for all advanced work in psychology and for the teacher's certificate; it also serves as an introduction to the courses in philosophy.

The purpose of the course is to acquaint the student with the general characteristics and laws of mental life and with the aims and methods of modern psychology. In connection with the work several lectures and demonstrations on the nature of the nervous system will be given in the neurological laboratory of the College of Medicine and Surgery. Text book, essays, and discussions.

2. LOGIC — MESSRS. WILDE, SWENSON AND HAYNES
Three credits (three hours per week) — Each semester

Open to sophomores, juniors, and seniors.

A study of the nature of knowledge, the laws of reasoning, and the principles and methods of scientific proof. The aim of the course is to produce accuracy of thought as well as to familiarize the student with the logical grounds of modern science Text book, lectures, and reports.

GENERAL COURSES

3. EDUCATIONAL PSYCHOLOGY — MESSRS. MINER AND HAYNES
Three credits (three hours per week) — Each semester
Open to those who have completed course 1.
The study of mental development in its relation to heredity and training. Lectures and student reports on the facts and theories of childhood and adolescence with special reference to their bearing on education.

4. EXPERIMENTAL PSYCHOLOGY: The Senses — MESSRS. MINER AND HAYNES
Three credits (three hours per week) — First semester
Open to juniors and seniors who have completed course 1. As the number in each laboratory section will be limited, students should arrange with the instructor for their section before registration.
This course, together with course 5, is designed to give a general survey of experimental methods and results as well as a training for laboratory research in psychology. The work involves typical experiments on sensation and movement. One hour of class discussion and two double hour laboratory periods are required.

5. EXPERIMENTAL PSYCHOLOGY: Higher Mental Processes — MR. MINER
Three credits (three hours per week) — Second semester
Open to juniors and seniors who have completed courses 1 and 4.
A continuation of course 4 with experiments on affection, memory, attention, and such other processes as can be studied by laboratory methods. The quantitative phase of experimental psychology is taken up for special discussion.

6. OUTLINE OF EXPERIMENTAL PSYCHOLOGY — MR. MINER
Three credits (three hours per week) — Second semester
Open to juniors and seniors who have completed course 1; not given in 1909-10.
A study of the methods and accredited results of experimental investigation in psychology. Class-room demonstrations, lectures and discussion.

7. PSYCHOLOGICAL INTERPRETATION — MR. MINER
Three credits (three hours per week) — First semester
Open to juniors and seniors who have completed course 1.
Unusual and pathological mental states are studied for the light they throw upon normal mental life. The student is given drill in the detecting of mental defects and in the psychological explanation of characters in history and literature. The subconscious, dreams, suggestibility, telepathy, nervous disorders, insanity, secondary personalities, and the crowd are among the topics treated.

8. AESTHETICS — MR. SWENSON
Three credits (three hours per week) — Second semester
Open to juniors and seniors who have completed course 1.
An introduction to the history and theory of aesthetics, including a psychological analysis of the consciousness of beauty and of the asthetic impulse and some consideration of the main historic theories of beauty.

9. ANCIENT AND MEDIAEVAL PHILOSOPHY — MR. WILDE
Three credits (three hours per week) — First semester

Open to juniors and seniors who have completed course 1 or course 2.

This and the following course are designed to give such an outline of the history of thought as is desirable in a general education. Emphasis is placed upon the human significance of philosophy rather than upon its purely technical aspect. In this first semester the main work will be upon the philosophies of Plato and Aristotle, but the later development will be traced as far as the Renaissance.

10. MODERN PHILOSOPHY — MR. WILDE
Three credits (three hours per week) — Second semester
Open to juniors and seniors who have completed course 1 or course 2.

Lectures on the representative systems of modern philosophy from the Renaissance to our own day, the purpose of the course being to prepare the student to understand the philosophical tendencies of the present. The work will include a study of Bacon, Descartes, Spinoza, Leibnitz, Locke, Berkeley, Hume, Kant, Mill, Schopenhauer.

11. PRINCIPLES OF ETHICS — MR. WILDE
Three credits (three hours per week) — First semester
Open to juniors and seniors who have completed course 1 or course 2.

An introductory course, comprising a study of the distinction between moral and non-moral phenomena, an analysis of voluntary conduct, and a discussion of the nature of conscience, the meaning of right and wrong, the purpose of life, human responsibility, and the authority of moral law.

12. PHILOSOPHY OF RELIGION — MR. WILDE
Three credits (three hours per week) — Second semester
Open to juniors and seniors who have completed course 1 or course 2.

A study of the religious consciousness, its origin, development and significance; an analysis of the conception of God and a discussion of the place and function of religion in modern life.

13. PSYCHOLOGY OF MORAL AND RELIGIOUS DEVELOPMENT — MR. HAYNES
Three credits (three hours per week) — First semester
Open to juniors and seniors who have completed course 3.

The purposes of this course are (1) to give a psychological analysis of moral and religious experience, (2) to trace the usual course of development in the individual of these forms of experience, and (3) to suggest the application of these facts to moral and religious education.

ADVANCED INTENSIVE COURSES

14. LOGIC OF SCIENCE — MR. SWENSON
Three credits (three hours per week) — Second semester
Open to juniors and seniors who have completed course 2.

This course serves as 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 relations of their fundamental principles.

15. MENTAL RETARDATION — MR.
Three credits (three hours per week) — Second semester

Open to juniors, seniors and graduates who have completed course 3. A study of the nature and conditions of retarded and perverted development in children with a view to the detection of mental defects and the devising of special methods for the training of backward children. The course is specially designed for those contemplating teaching or social work. The observation of backward children will be part of the work required.

16. PSYCHOLOGICAL PROBLEMS — MR. MINER
Both semesters

Open to seniors and graduate students who have completed courses, 1, 4 and 5; other arrangements may be ascertained upon application to the department.

Original work on special topics.

17. RESEARCH IN PSYCHOLOGY — MR. MINER
Six credits (three hours per week) — Both semesters

Open to graduate students who have completed course 17; both semesters must be taken before credit is given for the first semester.

Minor or major research in experimental, educational, analytic, genetic, or comparative psychology.

18. THE PHILOSOPHY OF DESCARTES, SPINOZA AND LEIBNITZ — MR. SWENSON
Six credits (three hours per week) — Both semesters

Open to seniors and graduates who have completed courses 1, 2, 9, and 10; both semesters must be completed before credit is given for the first semester.

A study of the pre-critical period of modern philosophy. The work will center in the discussion of the *Ethics* of Spinoza and *Monadology* of Leibnitz.

19. THE PHILOSOPHY OF KANT — MR. SWENSON
Six credits (three hours per week) — Both semesters

Open to seniors and graduate students who have completed courses 1, 2, 9, and 10; both semester must be completed before credit is given for the first semester.

A critical reading of the three Critiques; the relation of Kant to the development of modern philosophy.

20. THE PHILOSOPHY OF HUME — MR. SWENSON
Six credits (three hours per week) — Both semesters

Open to seniors and graduates who have completed courses 1, 2, 9 and 10; both semester must be completed before credit is given for the first semester.

A critical reading of Hume's philosophical works; the position of Hume in the development of English philosophy.

21. PSYCHOLOGICAL PRINCIPLES — MR. SWENSON
Three credits (three hours per week) — First semester

Open to juniors and seniors who have completed courses 1 and 2.

An advanced course, treating in detail some of the more important theoretical problems connected with psychology. The discussions will center about the methods and aim of the science, its fundamental principles, and its relations to other sciences, regard being had to the general outlines of historical development in these respects.

22. METAPHYSICS — MR. SWENSON
Six credits (three hours per week) — Both semesters

Open to seniors and graduate students who have completed course 9 and course 10 or 11; both semester must be completed before credit is given for the first semester.

A critical and constructive discussion of theories of knowledge and reality.

23. SYSTEMATIC ETHICS — MR. WILDE
Six credits (three hours per week) — Both semesters

Open to seniors and graduate students who have completed courses 9, 10 and 11; both semesters must be completed before credit is given for the first semester.

A detailed study of the principles of conduct and the basis of moral obligation.

24. History of Ethics — Mr. Wilde
Six credits (three hours per week) — Both semesters
Open to seniors and graduate students who have completed courses 9, 10 and 11; both semesters must be completed before credit is given for the first semester.

A critical study of the development of Greek, English and German ethical thought. Chief attention will be paid to the work of Plato and Aristotle in ancient times, and to the relation between utilitarianism and idealism in modern philosophy.

25. German Idealism — Mr. Wilde
Six credits (three hours per week) — Both semesters
Open to graduate students who have completed course 9, 10, and 19; both semesters must be completed before credit is given for the first semester; a knowledge of German is required.

A study of the development of German philosophy after Kant, especially as found in the writings of Fichte and Hegel.

26. The Nervous System and Mental Life — Mr. Johnston
Three credits (three hours per week) — Second semester
Open to juniors, seniors and graduates by consent of the instructor.

This course is given in the neurological laboratory of the College of Medicine and Surgery and is recommended for advanced students in psychology and education.

The course will include an analysis of nervous mechanisms on the basis of function, followed by a study of the mechanisms of correlation, the growth and education of the nervous system, cerebral functions and localization, and the neural basis of elementary phenomena of consciousness.

PHYSICAL TRAINING

For Men

Louis J. Cooke, Director
William K. Foster, Assistant Director

A well-equipped gymnasium in charge of a professional medical director is open for the young men. The training and exercise is under the immediate oversight and authority of the medical director and is wholly with a view to the healthful physical development of the whole student body.

All young men are required to be examined by the medical director of physical culture upon registration and during the course as often as the indications of the physical conditions may require.

The decision of the director will be either:

1. Advisory, indicating what course of hygiene and exercise will best sustain and improve the health of the student, or

2. Mandatory requiring the students to pursue the course of hygiene and physical exercise necessary for the proper care of health and the discharge of their duties as students.

Gymnasium work is required of all men in the freshman class, one hour per week (in two half-hour periods, if the director so decides) throughout the year. The required work includes a course on personal hygiene during the first semester.

For Women

Anna M. Butner, Director
Jessie A. Matson, Assistant

The course in physical culture is offered to the women of the University as

a regular part of their work in the freshman year, and may be taken in any of the following years. A full year of work, in addition to the work required in this department, counts as a two-hour credit in the second semester of the senior year. The work consists of systematic exercises for the development of all parts of the body. Women pursuing this course are required to provide themselves with a gymnasium suit, consisting of a blouse waist and bloomers, with the regulation shoes. All suits must be of black material.

It is a common observation that students often enter the University with an imperfect physical development because of an excessive use of some muscles, while others are weakened through disuse. This occasions attitudes and movements that are unseemly in appearance and unhealthful in their general effect. The purpose of this course, therefore, is to develop a strong and symmetrical physique with a graceful and easy carriage. A physical examination is made of each student and physical measurements are taken in the fall and again in the spring.

In addition to the regular class work, sports and pastimes are open to all women of the University. These include basket ball, indoor base ball, archery, tennis, and also the use of the running track and swimming pool.

PHYSICS

JOHN ZELENY, Professor, Head of Department of Physics
ANTHONY ZELENY, Professor
HENRY S. ERIKSON, Assistant Professor
ALOIS F. KOVARIK, Instructor
WILLIAM F. HOLMAN, Instructor.
————————, Instructor
LOUIS W. MCKEEHAN, Assistant
FRANZ AUST, Assistant

FOR A MINOR, twelve credits, not including courses 1, 2, 3 and 4.

FOR A MAJOR, eighteen credits, not including courses 1, 2 3 and 4, together with reinforcing subjects (thirty credits) selected from mathematics, mechanics, astronomy, advanced modern language, and additional physics.

FOR B. A. WITH DISTINCTION, the general requirements (page 46) and courses 5, 6, 7 and 8, and four other courses open to juniors and seniors, together with mathematics 9 and 10.

FOR A TEACHER'S CERTIFICATE, courses 5, 6, 7, 8 and 22, and six credits in chemistry.

Students should begin the study of physics with course 5. Courses 1 and 3 are elementary in character and do not prepare the student for any other courses in the department except courses 2 and 4.

COURSES

No.	Title	Semester	Credits	Offered to	Prereq. Courses
1.	Gen. Physics	1	3	Soph., Jr., Sr.	Math. 4 or 2
2.	Gen. Lab. Practice	1	1	Soph., Jr., Sr.	See statement
3.	Gen. Physics	2	3	Soph., Jr., Sr.	1
4.	Gen. Lab. Practice	2	1	Soph., Jr., Sr.	See Statement
5.	Mechanics of Solids and Fluids	1	4	Soph., Jr., Sr.	Math. 4 or 2
6.	Heat, Magnetism and Electrostatics	2	4	Soph., Jr., Sr.	5

COURSES (Continued)

No.	Title	Semester	Credits	Offered to	Prereq. courses
7.	Electrokinetics	1	4	Jr., Sr.	6
8.	Sound and Light	2	4	Jr., Sr.	5
9.	Advanced Electrical Measurements	2	1	Jr., Sr.	7
10.	Physical Manip. and Lab. Technique	2	3	Jr., Sr.	5 and 6
11.	Dynamics	1	3	Jr., Sr.	5 and Math. 9-10
12.	Adv. Physical Measurements	1	3	Sr. Grad.	5, 6, 7 and 8
13.	Adv. Physical Measurements	1	6	Sr. Grad.	5, 6, 7 and 8
14.	Theory of Light	2	3	Grad.	8 and Math. 9-10
15.	Elect. Meas. of Precision	2	3	Sr.	7
16.	Radioactivity	2	3	Grad.	5, 6, 7 and 8
17.	Adv. Phys. Measurements	2	3	Sr. Grad.	5, 6, 7 and 8
18.	Adv. Phys. Measurements	2	6	Sr. Grad.	5. 6. 7 and 8
19.	Kinetic Theory of Gases	2	3	Sr. Grad	5, 6, 7 and 8
20.	Discharge of Elect. thru Gases	1	3	Grad.	6 and 7 and Math. 9 and 10
21.	Math. Theory of Elect. and Magnetism	2	3	Grad.	6 and 7, and Math. 9 and 10
22.	Teachers' Course	2	1	Sr.	5-8 incl.

1. GENERAL PHYSICS — MR. JOHN ZELENY
Three credits (three hours per week) — First semester
Open to sophomores, juniors and seniors who have completed mathematics 4 or 2; may be taken separately or in conjunction with course 2.

Mechanics of solids and fluids, heat and sound. This is the first part of an elementary course in physics, designed for those who do not intend to pursue the subject longer than one year. The course is experimental rather than mathematical and gives the student a general knowledge of the fundamental principles of the subject. There will be one experimental lecture and two recitations each week.

2. GENERAL LABORATORY PRACTICE — MR. KOVARIK
One credit (two hours per week) — First semester
Open to sophomores, juniors and seniors, who have completed or are taking course 1. The laboratory fee is three dollars.

Physical measurements in the mechanics of solids and fluids, and in heat and sound, giving the student a knowledge of experimental methods.

3. GENERAL PHYSICS — MR. JOHN ZELENY
Three credits (three hours per week) — Second semester
Open to sophomores, juniors and seniors, who have completed course 1; may be taken separately or in conjunction with course 4.

Light, electricity and magnetism. This is the second part of the elementary course began under course 1. The treatment is experimental and the fundamental principles of the subjects, including those of radioactivity, ionization, X radiation, and the electrical constitution of matter, are discussed and illustrated. There will be one experimental lecture and two recitations each week.

4. GENERAL LABORATORY PRACTICE — MR. KOVARIK
One credit (two hours per week) — Second semester

Open to sophomores, juniors and seniors, who have completed or are taking course 3. The laboratory fee is three dollars.

Physical measurements in light, electricity and magnetism, giving the student a knowledge of experimental methods.

5. MECHANICS OF SOLIDS AND FLUIDS MESSRS. JONES, J. ZELENY, A. ZELENY ERIKSON AND KOVARIK
First semester

Four credits, (three recitations and one lecture or two hours laboratory)

Open to sophomores, juniors and seniors who have completed mathematics 4 or 2 (Trigonometry)

The laboratory fee is two dollars.

The course consists of a thorough drill in the elementary principles of mechanics. Numerous simple problems are taken up to illustrate the principles. Laboratory work will continue through the first part of the semester and will then be replaced by experimental lectures.

6. HEAT, MAGNETISM AND ELECTROSTATICS MESSRS. JONES, J. ZELENY A. ZELENY, ERIKSON AND KOVARIK
Four credits (one lecture, two recitations and two hours laboratory)
Second semester

Open to those who have completed course 5.

The laboratory fee is three dollars.

The fundamental principles of the subjects are studied mainly from the experimental side. The laboratory work consists of the measurements of the most important quantities involved, and the lectures aim to illustrate the various phenomena which are studied.

7. ELECTROKINETICS MESSRS. JONES, J. ZELENY, A. ZELENY, ERIKSON AND KOVARIK
Four credits (one lecture, two recitations and two hours laboratory)
First semester

Open to those who have completed course 6. The laboratory fee is three dollars.

A study is made of the phenomena accompanying the passage of electricity through solids, liquids and gases, and of the various laws which govern such discharges, Not only are the basic principles of electrical engineering taken up, but a brief study is made of ionization, the X-rays, radioactivity, electric waves and wireless telegraphy. Measurements of the various electrical quantities are made in the laboratory.

8. SOUND AND LIGHT MESSRS. JONES, J. ZELENY, ERIKSON AND KOVARIK
Four credits, (one lecture, two recitations and two hours laboratory)
Second semester

Open to those who have completed course 5. The laboratory fee is three dollars.

The course consists of a study of wave motion and the various phenomena of sound and light. The lectures are profusely illustrated with experiments showing the various effects studied. The laboratory work is aimed to aid the student to a better insight into some of the relations which obtain in the subjects.

9. ADVANCED ELECTRICAL MEASUREMENTS MR. A. ZELENY
One credit (two hours per week) Second semester

Open to those who have completed course 7.

The laboratory fee is three dollars.

This course is devoted mainly to the study and measurements of capacity, inductance and magnetic induction, and gives a thorough knowledge of the accurate determination of these quantities.

10. PHYSICAL MANIPULATION AND LABORATORY TECHNIQUE MR. JOHN ZELENY
Three credits (six hours per week) Second semester.

Open to juniors and seniors who have completed courses 5 and 6. The laboratory fee is three dollars This course is especially useful to those who intend to teach the science or to specialize in it.

The object of the course is to give the student a knowledge of the essential physical manipulations (such as the cleaning and distilling of mercury, soldering, glass blowing, glass cutting, glass grinding, making of quartz fibers, etc.), and to acquaint him with the use of some instruments of precision (such as the cathetometer, the dividing engine, the balance, mercury air pumps and guages, etc.)

11. DYNAMICS MR. JONES
Three credits (three hours per week) First semester

Open to juniors and seniors who have completed courses 5 and 6, and mathematics 9 and 10 (calculus).

A discussion of some problems in dynamics which are important in the study of advanced physics.

12. ADVANCED PHYSICAL MEASUREMENTS MR. JOHN ZELENY
Three credits (six hours per week) First or second semester

Open to juniors, seniors and graduate students who have completed courses 5 and 6. The laboratory fee is three dollars.

The course consists of individual work in the laboratory on topics specially chosen to serve best the needs and capacity of each student. The course is intended to introduce the student to some of the more intricate physical measurements and to teach him self-reliance.

13. ADVANCED PHYSICAL MEASUREMENTS MR. JOHN ZELENY
Six credits (twelve hours per week) First or second semester

Open to juniors, seniors and graduate students who have completed courses 5 and 6. The laboratory fee is five dollars.

The same as course 10 except that twice as much time is devoted to the subject.

14. THE THEORY OF LIGHT MR. JONES
Three credits (three hours per week) Second semester

Open to graduate students who have completed course 8 and mathematics 9 and 10 (calculus).

A study of the important optical phenomena. Preston's *Theory of Light* is used as a text.

15. ELECTRICAL MEASUREMENTS OF PRECISION MR. ANTHONY ZELENY
Three credits (six hours per week) Second semester

Open to seniors and graduate students who have completed course 7. The laboratory fee is three dollars. The course is intended for electrical engineering and scientific students who desire to specialize in electrical work of the highest precision.

The course is chiefly experimental and includes the following: making of standard cells; calibration of Wheatstone box bridge; adjustment of resistances, ammeters, and voltmeters; use of the potentiometer in measurements of highest precision; experimental problems involving capacity, inductance, and magnetic flux; measurement of temperatures by electrical methods.

16. RADIO-ACTIVITY MR. KOVARIK
Three credits (three hours per week) Second semester
Open to graduate students who have completed courses 5, 6, 7 and 8.

The course consists entirely of lectures, experimental and descriptive. The various theories and the methods of investigation are fully considered.

17. ADVANCED PHYSICAL MEASUREMENTS — MR. JOHN ZELENY
Three credits (six hours per week) — Second semester
Open to seniors and graduate students who have completed courses 5 and 6; the laboratory fee is three dollars.
The course is the experimental study of some physical phenomena, the nature or laws of which are not yet understood.

18. ADVANCED PHYSICAL MEASUREMENTS — MR. JOHN ZELENY
Six credits (twelve hours per week) — Second semester
Open to seniors and graduate students who have completed courses 5 and 6; the laboratory fee is five dollars.
The same as course 17, except that twice as much time is devoted to the subject.

19. THE KINETIC THEORY OF GASES — MR. ERIKSON
Three credits (three hours per week) — Second semester
Open to graduate students who have completed courses 6 and 7, and mathematics 9 and 10 (calculus).
This course is a study of Meyer's *Kinetic Theory of Gases.*

20. DISCHARGE OF ELECTRICITY THROUGH GASES — MR. JOHN ZELENY
Three credits (three hours per week) — First semester
Open to graduate students who have completed courses 6 and 7, and mathematics 9 and 10 (calculus).
The course consists of lectures, with experimental illustrations, on the conduction of electricity through gases. A study is made of the conductivity imparted to gases by the action of X rays, ultra-violet light, radio-active substances, and glowing metals; of the discharge of electricity from points and in vacuum tubes; and of the spark and arc discharges. The methods of measuring the velocity of the ions and the charges carried by them are studied in detail.

21. THE MATHEMATICAL THEORY OF ELECTRICITY AND MAGNETISM — MR. JOHN ZELENY
Three credits (three hours per week) — Second semester
Open to graduate students who have completed courses 6 and 7, and mathematics 9 and 10 (calculus).
This course consists in the study of J. J. Thomson's *Elements of the Mathematical Theory of Electricity and Magnetism.*

22. TEACHER'S COURSE — MR. JONES
One credit (one hour per week) — Second semester
Open to seniors who have completed courses 5 to 8 inclusive.
No subject matter is discussed, but methods of presentation and the selection of lecture and laboratory experiments are considered. The work is conducted by the students under the direct supervision of the instructor.

RHETORIC AND PUBLIC SPEAKING

JOSEPH M. THOMAS, Professor, Head of Department of Rhetoric and Public Speaking
ADA L. COMSTOCK, Professor

FRANK M. RARIG, Assistant Professor
OSCAR W. FIRKINS, Assistant Professor
——————, Assistant Professor
CHARLES W. NICHOLS, Instructor
WILFORD O. CLURE, Instructor
HALDOR GISLASON, Instructor
ANNA H. PHELAN, Instructor
NELLIE A. WHITNEY, Instructor
THOMAS CAHILL, Assistant

REQUIREMENTS OF THE DEPARTMENT

FOR A MINOR, twelve credits not including course 1.

FOR A MAJOR, eighteen credits, not including courses 1, together with reinforcing subjects (thirty credits) selected from English (courses 3, 16, 21 and 22), philology, philosophy, Latin, advanced modern languarge and additional rhetoric.

FOR B. A. WITH DISTINCTION, the general requirements (page 46) and six credits in the department in addition to the requirements for a major.

FOR A TEACHER'S CERTIFICATE, an average of at least good in courses 1, 2, 3 5 and 6, and two additional courses in argumentation and elocution or public speaking.

HONORS IN PUBLIC SPEAKING

Students who have been on the debating teams in their freshman and sophomore years, or have won places in the oratorical contests of those years, and have taken part in intersociety and intercollegiate debates, winning at least one intercollegiate contest, or have won places in the Pillsbury oratorical contest, may, if the department deems them worthy, receive honors in public speaking.

COURSES

No.	Title	Semesters	Credits	Offered to	Prereq. courses
1.	Composition and Rhetoric...	1, 2	6	Fresh.	None
2.	Advanced Comp. and Rhet..	1, 2	6	Soph., Jr., Sr.	1
3.	Advanced Rhetoric.....	1, 2	6	Jr., Sr.	1 and 2
4.	Argumentative Writing.....	1	3	Jr., Sr.	1 and 2
5.	Short Story Writing.....	2	3	Jr., Sr.	1 and 2
6.	Seminar.....	1, 2	4	Sr., Grad.	Statement
10.	Public Speaking.....	1, 2	6	Soph., Jr., Sr.	1 or Eng. 1 and 2
11.	Interpretative Reading.....	1, 2	6	Jr., Sr.	1 or Eng. 1 and 2 and 10
12.	Argumentation and Debate..	1, 2	6	Jr., Sr.	Same as 11
13.	Oratorical Composition.....	1, 2	6	Jr., Sr.	Same as 11

RHETORIC

1. COMPOSITION AND RHETORIC — MESSRS. THOMAS, FIRKINS, CLURE AND MISS COMSTOCK, MISS WHITNEY, AND MRS. PHELAN

Six credits (three hours per week) — Both semesters

Required of freshmen who have not passed , with a grade of good or excellent, part 2 of the entrance examination in English.

The aim of this course is to give practical training in the art of writing. In connection with the written work the student will be required to study the principles of structure and to analyze specimens of good prose.

2. ADVANCED COMPOSITION AND RHETORIC — MESSRS. THOMAS, FIRKINS AND CLURE, MISS WHITNEY AND MRS. PHELAN
Six credits (three hours per week) — Both semestersn
Open to those who have completed course 1, or English 1 and 2.
This course is intended to give the student practice in writing in the four type-forms of discourse. Description and narration will be studied in the first semester, exposition and argument in the second. Fortnightly themes and short exercises will be accompanied by lectures on theory and the analysis of models.

3. ADVANCED RHETORIC — MISS COMSTOCK
Six credits (three hours per week) — Both semesters
Open to juniors and seniors who have taken courses 1 and 2.
Structure and style, theoretically and practically considered, are subjects of study in this course. Some time is given to the oral presentation of topics. In the composition work the student is allowed to select his own subjects and methods of treatment.

4. ARGUMENTATIVE WRITING — MR. THOMAS
Three credits (three hours per week) — First semester
Open to those who have completed courses 1 and 2.
A study of the principles which underlie argument. Special attention will be paid to the brief and relative value of various forms of proof. The course will include lectures, recitations and weekly essays.

5. SHORT STORY WRITING — MR. THOMAS
Three credits (three hours per week) — Second semester
Open to those who have shown exceptional proficiency in course 2.
Analytical studies in the technique of the short story will be accompanied by constructive work in story writing.

6. SEMINAR — MR. THOMAS
Four credits (two hours per week) — Both semesters
Open to seniors and graduates who have taken courses 1 and 2 and at least one other course.
This is intended for those who are specializing in Rhetoric and Composition. In 1909–10 the course will be devoted to lectures, reports and thesis on the history of rhetorical theory.

PUBLIC SPEAKING

10. A GENERAL COURSE IN PUBLIC SPEAKING — MESSRS. RARIG AND GISLASON
Six credits (three hours per week) — Both semesters
Open to those who have had Rhetoric 1, or English 1 and 2.
The work of the first semester consists of the study and practice of the principles of breathing, voice production, articulation and gesture. During the second semester students make short speeches of their own composition and deliver extracts from the works of well known writers and speakers.

11. INTERPRETATIVE READING — MR. RARIG
Six credits (three hours per week) — Both semesters
Open to those who have had Rhetoric 1, or English 1 and 2, and Rhetoric 10.

This course aims to develop intelligent, suggestive, sympathetic reading. The text used is Shakespeare's plays.

12. ARGUMENTATION AND DEBATE — MR. GISLASON
Six credits (three hours per week) — Both semesters

Open to those who have had Rhetoric 1, or English 1 and 2, and Rhetoric 10.

This course furnishes instruction in the science of organization and in the art of debate. The work consists of the study of the laws and processes of reasoning and their application to written and spoken argument. Argumentative writings and speeches by eminent men are analyzed and briefed. Practical exercises in debate and forensics form an important part of the work. Students receive individual training in delivery.

13. INTER-COLLEGIATE DEBATING — MR. RARIG
Three credits (three hours per week) — First semester

Only men who have been awarded places on the inter-collegiate debating teams and the alternates will register for this course. The question for inter-collegiate debate will be studied and briefed, and frequent practice debates will be held.

14. ORATORICAL COMPOSITION — MR. RARIG
Six credits (three hours per week) — Both semesters

Open to those who have had Rhetoric 1, or English 1 and 2, and Rhetoric 10.

Masterpieces of oratory are read and analyzed. Students write orations with special reference to the occasion, the timeliness of the material used, and the nature of the audience.

ROMANCE LANGUAGES

CHARLES W. BENTON, Professor, Head of Department of Romance Languages
CHARLES M. ANDRIST, Professor
JULIUS T. FRELIN, Assistant Professor
CARL M. MELOM, Instructor
EMMA BERTIN, Instructor
RENE M. DELAMARE, Assistant

REQUIREMENTS OF THE DEPARTMENT

FOR A MINOR, in French, course 2 or 3 and course 5; in Spanish, twelve credits.

FOR A MAJOR, in French, courses 2 or 3, 5 and 7, together with reinforcing subjects (thirty credits) selected from philology, Latin, Italian, Spanish, English, philosophy, history, and additional French; in Spanish, eighteen credits, together with reinforcing subjects (thirty credits) selected from French, philology, Latin, Italian, English, and history.

FOR B. A. WITH DISTINCTION (in French only), the general requirements (page 46) and courses 8 and 9 or 10 in addition to the requirements for a major.

FOR A TEACHER'S CERTIFICATE, an average of at least good in courses 2 or 3, 4, 5 6, 7 and 8.

COURSES

No.	Title	Semesters	Credits	Offered to	Prereq. courses
1.	Begin. French	1, 2	10†*	All	None
2.	Intermediate French	1, 2	6†	Soph., Jr., Sr.	1
3.	Adv. Fr. G. and Comp	1, 2	6*	All	None
4.	Begin. Fr. Conversation	1, 2	4*	Soph., Jr., Sr.	See statement
5.	Classic Fr. Lit	1, 2	6*	Soph., Jr., Sr.	2 or 3
6.	Adv. Fr. Conversation	1, 2	4*	Soph., Jr., Sr.	2 or 3
7.	Fr. Lit. of 19 Cent	1, 2	6*	Soph., Jr., Sr.	2 or 3
8.	Teachers Fr	1, 2	2*	Jr., Sr.	5
9.	Romance Phil	1, 2	2*	Jr., Sr.	5
10.	Italian Lit	1, 2	2*	Jr., Sr.	5
11.	Begin. Spanish	1, 2	10*	Soph., Jr., Sr.	Two years prep.
12.	Intermediate Span	1, 2	6*	Soph., Jr., Sr.	11
13.	Adv. Span	1, 2	6*	Jr., Sr.	12
14.	Old French	1, 2	4	Grad.	
15.	Hist. of Fr. Lit	1. 2	6*	Grad.	
16.	Ital. Lit	1, 2	2*	Grad.	5

*Both semesters must be completed before credit is given for the first semester.
†Juniors and seniors receive only half credit.

1. BEGINNING FRENCH — MESSRS. ANDRIST AND FRELIN AND MADAM BERTIN

Ten credits (five hours per week) — Both semesters

Open to all, but juniors and seniors receive only half credit; both semesters must be completed before credit is given for the first semester; not credited toward a minor in French.

Fraser and Squair's *French Grammar and Reader:* modern texts.

2. INTERMEDIATE FRENCH — MESSRS. ANDRIST AND FRELIN AND MADAM BERTIN

Six credits (three hours per week) — Both semesters

Open to sophomores, juniors and seniors who have completed course 1; both semesters must be completed before credit is given for the first semester.

Francois *Advanced French Prose Composition:* modern texts will be read, including some of the works of Coppee, Merimee, Daudet, Scribe, et al.

3. ADVANCED FRENCH GRAMMAR AND COMPOSITION — MESSRS. ANDRIST AND FRELIN

Six credits (three hours per week) — Both semesters

Open to all who enter the University with two years of French; both semesters must be completed before credit is given for the first semester.

Francois' *Introduction to French Composition:* readings from modern authors, including selections from Coppee, Feuillet, and Sandeau.

4. BEGINNING FRENCH CONVERSATION — MESSRS. ANDRIST AND FRELIN AND MADAM BERTIN

Four credits (two hours per week) — Both semesters

Open to those who have completed or who are taking course 2 or course 3; both semesters must be completed before credit is given for the first semester.

Conversation based on modern French life.

5. THE CLASSICAL PERIOD OF FRENCH LITERATURE — MR. BENTON

Six credits (three hours per week) — Both semesters

Open to those who have completed course 2 or course 3; both semesters must be completed before credit is given for the first semester.

The reading of works and selections produced during the classical period of French literature and conversations in French concerning the same. The works of Corneille, Racine, Moliere, La Fontaine, et al. Compositions.

6. ADVANCED FRENCH CONVERSATION — MR. BENTON
Four credits (two hours per week) — Both semester
Open to those who have completed course 2 or course 3; both semesters must be completed before credit is given for the first semester.
Conversations on French history, literature, the drama, etc.

7. FRENCH LITERATURE OF THE NINETEENTH CENTURY — MR BENTON
Six credits(three hours per week) — Both semesters
Open to those who have completed course 2 or course 3 and course 5; both semesters must be completed before credit is given for the first semester.
Lectures in French on the history of modern literature. Select works of some of the authors read and discussed. Compositions and essays.

8. TEACHER'S COURSE IN FRENCH — MR. BENTON
Two credits (one hour per week) — Both semesters
Open to those who have completed course five; both semesters must be completed before credit is given for the first semester.
Special practice in pronunciation. Discussion in French of methods of teaching the French language and literature.

9. ROMANCE PHILOLOGY — MR. BENTON
Two credits (one hour per week) — Both semesters
Open to those who have completed course 5; both semesters must be completed before credit is given for the first semesters.
Lectures on the phonetical development of the French and other Romance language from popular Latin. Reading of old French texts.

10. ITALIAN LITERATURE — MR. BENTON
Two credits (one hour per week) — Both semesters
Open to those who have completed course 5; both semesters must be completed before credit is given for the first semester.
Edgren's *Italian Grammar*, Dante's *Divine Comedy*.

11. BEGINNING SPANISH — MR. MELOM
Ten credits (five hours per week) — Both semesters
Open to sophomores, juniors and seniors. Both semesters must be completed before credit is given for the first semester.
Monsanto and Languellier's *Spanish Course-Josselyn*. Worman's *First Spanish Book*. Bransby's *Spanish Reader*.

12. INTERMEDIATE SPANISH — MR. MELOM
Six credits (three hours per week) — Both semesters
Open to those who have completed course 11; both semesters must be complete before credit is given for the first semester.
First semester: Umphrey, *Spanish Composition:* Brownel, *El Pajaro Verde*. Second semester: Grays's *Fortuna:* Alarcon's *El Capitan Veneno*.

13. ADVANCED SPANISH — MR. MELOM
Six credits (three hours per week) — Both semesters
Open to those who have completed course 11 and 12; both semesters must be completed before credit is given for the first semester.

F. Solderilla, *Compendio de la Literatura Espanola:* Alarcon's *El Sombrero de Tres Picos.* Lectures and collateral readings of representative Spanish authors.

14. ROMANCE LANGUAGES OLD FRENCH — MR. BENTON
Four credits (two hours per week) — Both semesters
Open to graduate students; other arrangements may be ascertained upon application to the department.
Comparative phonetics and grammar of French and other Romance languages. Some of the oldest monuments of the French language are studied and the phonetic changes compared with modern French and English· Special attention is given to the period when French words came into the English language.

15. HISTORY OF FRENCH LITERATURE — MR. BENTON
Two credits (one hour per week) — Both semesters
Open to graduate students; both semesters must be completed before credit is given for the first semester.
A discussion of the evolution of the various schools and doctrines in French literature.

16. ITALIAN LITERATURE — MR. BENTON
Two credits (one hour per week) — Both semesters
Open only to graduate students who have completed course 5; both semesters must be completed before credit is given for the first semester.
History of Italian Literature, special: *The Divine Comedy.*

SCANDINAVIAN

GISLE BOTHNE, Professor, Head of Department of Scandinavian Languages
ANDREW A. STOMBERG, Professor

REQUIREMENTS OF THE DEPARTMENT

FOR A MINOR, twelve credits, not including course 1 and 3.
FOR A MAJOR, eighteen credits, not including courses 1 and 3, together with reinforcing subjects (thirty credits) selected from philology, advanced German, Anglo-Saxon and old English, Latin, Greek, advanced English and additional Scandinavian.
FOR B. A. WITH DISTINCTION, the general requirements (page 46) and one year of Scandinavian in addition to what is required for a major.

COURSES

No.	Title	Semester	Credits	Offered to	Prereq. courses
1.	Elem. Norwegian	1, 2	10*†	All	None
2.	Adv. Norwegian	1, 2	6*	Soph., Jr., Sr.	1
3.	Elem. Swedish	1, 2	10*†	All	None
4.	Adv. Swedish	1, 2	6*	Soph., Jr., Sr.	3
5.	Old Norse (Icelandic)	1, 2	4	Jr., Sr., Grad.	1 and 2, or 3 & 4.
6.	Modern Norwegian Lit.	1, 2	6*	Jr., Sr., Grad.	1 and 2
7.	Swedish Literature	1, 2	6*	Jr., Sr., Grad.	3 and 4
8.	Henrik Ibsen	1	2*	Jr., Sr., Grad.	See statement
9.	History of Northern Europe	1, 2,	6	Jr., Sr.	None
10.	Early Nor. Lit.	1	2	Jr., Sr.	See statement
11.	Mod. Danish Lit.	2	2	Jr., Sr.	See statement

COURSES (Continued)

No.	Title	Semester	Credits	Offered to	Prereq. courses
12.	Swedish Lang. and Lit.....			Grad.	
13.	Hist. Scand. Lang.....	1, 2	2	Grad.	
14.	Adv. Old Norse.....	1, 2	4	Grad.	

*Boths semester must be completed before credit is given for the first semester.
†Juniors and seniors received only half credit.

1. ELEMENTARY NORWEGIAN — MR. BOTHNE
Ten credits (five hours per week) — Both semesters
Open to all, but juniors and seniors receive only half credit; both semesters must be completed before credit is given for the first semester.
Elementary study of the language, grammar, composition, select reading in easy prose and poetry.

2. ADVANCED NORWEGIAN — MR. BOTHNE
Six credits (three hours per week) — Both semesters
Open to those who have completed course 1 and to others with the permission of the department; both semesters must be completed before credit is given for the first semester.
Grammar, composition, conversation, elementary history of literature, and select works of modern authors.

3. ELEMENTARY SWEDISH — MR. STOMBERG
Ten credits (five hours per week) — Both semesters
Open to all, but juniors and seniors receive only half credit; both semesters must be completed before credit is given for the first semester.
Grammar and composition; select reading in easy prose and verse.

4. ADVANCED SWEDISH — MR. STOMBERG
Six credits (three hours per week) — Both semesters
Open to those who have completed course 3 and to others with the permission of the department; both semesters must be completed before credit is given for the first semester.
First semester: grammar and composition. Modern prose texts will be read. Second semester: an elementary history of the literature of Sweden and reading of Tegner's *Frühjofs Saga* and Runeberg's *Fanrik Stals Sagner.*

5. OLD NORSE (Icelandic) — MR. BOTHNE
Four credits (two hours per week) — Both semesters
Open to those who have completed courses 1 and 2, or 3 and 4, and to other qualified students with the approval of the department. Not given in 1909-10.
Grammar and reading. *Gunnlaugs Saga Ormstungu.*

6. MODERN NORWEGIAN LITERATURE — MR. BOTHNE
Six credits (three hours per week) — Both semesters
Open to those who have completed courses 1 and 2; both semesters must be completed before credit is given for the first semester.
History of Norwegian literature from 1814 to the present day.

7. SWEDISH LITERATURE — MR. STOMBERG
Six credits (three hours per week) — Both semesters
Open to qualified students upon the approval of the department; both semesters must be completed before credit is given for the first semester.

History of the literature and study of modern authors, including Selma Lagerlof, Geijerstam, Strindberg.

8. IBSEN — MR. BOTHNE
Two credits (two hours per week) — Second semester
Open to qualified students upon the approval of the department.
Lectures, reading and interpretation.

9. HISTORY OF NORTHERN EUROPE — MR. STOMBERG
Six credits (three hours per week) — Both semesters
Open to juniors and seniors; no knowledge of the Scandinavian languages is required.
The course includes the history of the Scandinavian countries from the earliest period to recent times.

10. EARLY NORWEGIAN LITERATURE — MR. BOTHNE
Two credits (two hours per week) — First semester
Open to qualified students upon approval of the department.

11. MODERN DANISH LITERATURE — Mr. BOTHNE.
Two credits (two hours per week) — Second semester

FOR GRADUATES

12. MODERN SWEDISH LANGUAGE AND LITERATURE — MR. STOMBERG

13. HISTORY OF THE SCANDINAVIAN LANGUAGES — MR. BOTHNE
Two credits (one hour per week) — Both semesters
For courses in Scandinavian philology, see statement of the department of comparative philology. Not given in 1909-10.

14. OLD NORSE (advanced course THE ELDER EDDA — MR. BOTHNE
Four credits (two hours per week). Not given in 1909-10. — Both semesters

SEMITIC LANGUAGES

SAMUEL N. DEINARD, Assistant Professor

COURSES

No.	Title	Semester	Credits	Offered to	Prereq. courses
1.	Elem. Hebrew	1, 2	6*	Soph., Jr., Sr.	None
2.	Elem. Arabic	1, 2	6*	Jr., Sr.	Course 1
3.	Elem. Aramaic	2	3	Jr., Sr.	Course 1
4.	Hist. Hebrews	1, 2	6	Jr., Sr.	None

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

1. ELEMENTARY HEBREW — MR. DEINARD
Six credits (three hours per week) — Both semesters
Open to sophomores, juniors, and seniors; both semesters must be completed before credit is given for the first semester.
First semester, Harper's *Elements of Hebrew* and reading of easy prose passages from the Old Testament; second semester, critical readings of some books of the Old Testament and a review of Hebrew grammar.

2. ELEMENTARY ARABIC — MR. DEINARD
Six credits (three hours per week) — Both semesters
Open to those who have completed course 1; both semesters must be completed before credit is given for the first semester.

First semester, Socin's *Arabic Grammar* and the reading of the prose sections contained in it; second semester, selected suras from the Koran and a review of Arabic grammar.

3. ELEMENTARY ARAMAIC OR SYRIAC — MR. DEINARD
Three credits (three hours per week) — Second semester
Open to those who have completed course 1.

The course is based upon Strach's *Grammatik des Biblischen Aramaisch* or Brockleman's *Syrische Grammatik*.

4. HISTORY OF THE HEBREWS TO THE CLOSE OF THE PERSIAN PERIOD — MR. DEINARD
Six credits (three hours per week) — Both semesters
Open to sophomores, juniors, and seniors; no knowledge of any Semitic language is required.

A survey of the political, social, and religious life of the Hebrews. The English Bible will be used as a text-book, a careful study of the Palestinian, Egyptian, and Assyro-Babylonian inscriptions will be made, and the works of some modern writers on Hebrew history will be consulted.

SOCIOLOGY AND ANTHROPOLOGY

SAMUEL G. SMITH, Professor, Head of Department of Sociology and Anthropology
ALBERT ERNEST JENKS, Professor
SAMUEL N. REEP, Assistant Professor

REQUIREMENTS OF THE DEPARTMENT

FOR A MINOR, twelve credits.

FOR A MAJOR, eighteen credits, together with reinforcing subjects (thirty credits) selected from economics and politics, history, animal biology, geology, psychology and additional sociology and anthropology.

FOR B. A. WITH DISTINCTION, the general requirements (page 46) and six credits in addition to the requirements for a major, with the provision that six credits shall be from advanced courses and one course shall be accompanied by individual work under the special direction of the department.

FOR A TEACHER'S CERTIFICATE, an average of at least good in four courses, one of which must be course 2.

FOR RECOMMENDATION FOR SOCIAL WORK, an average of at least good in not ess than three courses, two of which must be courses 3 and 12.

COURSES

No.	Title	Semester	Credits	Offered to	Prereq-courses
1.	Descrip. Sociology.....	1	3	Jr., Sr.	None
2.	Elements of Sociology.....	1, 2	3	Jr., Sr.	None
3.	Social Pathology.....	1	3	Jr., Sr.	None
4.	Social Theory.....	2	3	Jr., Sr., Grad.	2, 7 or 13
5.	Social Groups.....	2	3	Jr., Sr., Grad.	None
6.	Institutions.....	1	3	Jr., Sr.	None

COURSES (Continued)

No.	Title	Semester	Credits	Offered to	Prereq. courses
7.	Anthropology	1	3	Jr., Sr.	None
8.	Ethnology	2	3	Jr., Sr., Grad.	1, 2 or 7
9.	Philippine People	2	3	Jr., Sr., Grad.	1, 7 or 8
10.	Physical Anthropology	2	3	Jr., Sr., Grad.	7 or 8 or An. Biol
11.	American Negro Race	2	3	Jr., Sr., Grad.	None
12.	American People	1	3	Jr., Sr., Grad.	None
13.	Biblical Sociology	1	3	Jr., Sr., Grad.	None
14.	Modern Social Institutions	1	3	Jr., Sr., Grad.	None
15.	Social Psychology	1	3	Jr., Sr., Grad.	None

1. DESCRIPTIVE SOCIOLOGY — MR. JENKS
Three credits (three hours per week) — First semester
Open to juniors and seniors.

This is a preliminary course designed as the first work of students in the department. It presents concrete data concerning human association, showing groups of peoples living in the four grades of culture called savagery, barbarism, civilzation, and enlightenment; and it discovers the activities and institutions natural and peculiar to the several groups studied. Text-book, lectures, assigned readings, and thesis.

2. ELEMENTS OF SOCIOLOGY — MR. REEP
Three credits (three hours per week) — Each semester
Open to juniors and seniors.

This course is designed to give a general knowledge of the field of modern sociology, the attempt being to prepare students for such special sociological investigations as they may wish to make. Text-book, lectures, assigned readings, and thesis.

3. SOCIAL PATHOLOGY — MR. SMITH
Three credits (three hours per week) — First semester
Open to juniors and seniors.

This course covers the field of charities and corrections, dealing especially with problems of poverty, crime, insanity and social degeneration. It also presents a discussion of the child problem and methods of social amelioration.

4. SOCIAL THEORY — MR. REEP
Three credits (three hours per week) — Second semester
Open to juniors, seniors and graduate students.

This course includes a study of the leading American, English, French and German writers to discover their methods of approach to the science and the leading results they have secured.

5. SOCIAL GROUPS — MR. REEP
Three credits (three hours per week) — Second semester
Open to juniors, seniors and graduate students.

An examination of the clan and the village in primitive life, a study of demography to discover the effect of environment upon social organization, and a comparison with the nature of and reasons for the modern city.

6. THE STUDY OF INSTITUTIONS — MR. SMITH
Three credits (three hours per week) — First semester
Open to those who have completed course 1.

The genesis of custom and the beginnings of law with the geographical and race influence in the growth of states will be studied as well as the various forms of the family and their relation to forms of civilization.

7. ANTHROPOLOGY — MR. JENKS
Three credits (three hours per week) — First semester
Open to juniors and seniors.

This is an elementary course studying the essential characteristics of mankind and the general features of the several races of men. It primarily investigates the origin and development of the series of activities and various institutions which have had their beginnings in primitive society. Text books, lectures, assigned readings, and thesis.

8. ETHNOLOGY — MR. JENKS
Three credits (three hours per week) — Second semester
Open to juniors and seniors who have completed course 1, 2 or 7, and to graduate students.

This is a study of the different races of men natural to America, Europe, Asia, Africa, and Oceania; the various historical classifications of men into races are presented; the causes of the origin and distribution of several races and subraces are sought, and from historical perspective and present indications an attempt is made to judge of the future development of races; ethnological problems are also presented. Text-books, lectures, assigned readings, and thesis.

9. THE PHILIPPINE PEOPLE — MR. JENKS
Three credits (three hours per week) — Second semester
Open to juniors and seniors who have completed course 1, 7 or 8, and graduate students.

This course presents the geography, natural resources, and ethnology of the Phillipine Islands. A careful comparative study of the four large ethnic and culture groups of people is made; tropical influences are noted; the present policy of the Insular Civil Government is outlined, so far as it tends to modify the natural characteristics and modern culture of the inhabitants, and to effect American home interests in the orient. This course aims to present a practical model for the investigator of human culture, and to introduce students to oriental race problems; it will also better fit students for government , business, or missionary service in the orient. Lectures illustrated lectures, assigned readings, and thesis.

10. PHYSICAL ANTHROPOLOGY — MR. JENKS
Three credits (three hours per week) — Second semester
Open to juniors and seniors who have completed course 7 or 8, or course 1 in Animal Biology, and to graduate students.

This course studies the physical variations in the human body. It pays special attention to those variations which distinguish one race or group of men from another; and it seeks the cause and significance of such variations. It also attempts to trace the physical evolution of the human body and to forecast its future, studying both its development and decline. Six lectures on the development and anatomy of the human brain are given by Dr. Charles A. Erdmann of the medical faculty. This course is of prime importance to advanced students preparing for the medical course. Lectures, laboratory work, assigned readings, and thesis.

11. THE AMERICAN NEGRO RACE — MR. JENKS
Three credits (three hours per week) — Second semester
Open to juniors, seniors, and graduate students; not given in 1909-10.

This course begins with a study of the negro's African tribal kinsmen, and

traces the rises and development of the American negro race from the birth of American slavery. The present characteristics, traits, and conditions of the negro are especially nsidered.co The developing tendencies of the negro are studied for the purpose of considering the probable future of the American negro race. Lectures, assigned readings, and thesis.

12. THE AMERICAN PEOPLE — MR. JENKS
Three credits (three hours per week) — First semester
Open to juniors, seniors, and graduate students.
This course presents the distribution in the United States of the different peoples of the world found here. It seeks the natural genius of the peculiar home development of these peoples, and notes the modifications of this development in America, thus portraying the ethnic contribution of each to American civilization. It aims to discover the dominant physical, mental, and moral characteristics of each people, and attempts to determine the relative ethnic and culture importance of each to the nation.

13. BIBLICAL SOCIOLOGY — MR. SMITH
Three credits(three hours per week) — First semester
Open to juniors, seniors, and graduate students.
This is a study of the development of Hebrew institutions, especially the church, the family and the state. It also presents a comparison of similar institutions among peoples of like conditions of culture.

14. MODERN SOCIAL INSTITUTIONS — MR. REEP
Three credits (three hours per week) — First semester
Open to juniors, seniors and graduate students.
The fundamental social institution, the family, will be studied, as also the development of modern industrial, political, educational, and ecclesiastical institutions in their relation to human progress.

15. SOCIAL PSYCHOLOGY — MR. REEP
Three credits (three hours per week) — First semester
Open to juniors, seniors and graduate students.
This is a study of the social mind, public opinion, impulsive and rational social action, fashion, convention and custom, the mob and the crowd. It is also an examination of the theories of Giddings, Tarde, Baldwin, Ross, Brinton and others

IX

Departments of Instruction

B

THE COLLEGE of ENGINEERING and THE MECHANIC ARTS

The Purposes of the College

The College of Engineering and the Mechanic Arts 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, electrical and municipal engineering, leading to the degrees of civil, mechanical or electrical engineer, the degree of Bachelor of Science being 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.

The College of Engineering and the Mechanic Arts

FACULTY.

CYRUS NORTHROP, LL.D., President.
FREDERICK S. JONES, M.A., Dean.

FREDERICK H. BASS, B.S. 429 Union St., S. E.
Assistant Professor Municipal and Sanitary Engineering (12 M.A.)

WILLIAM E. BROOKE, B.C.E., M.A. 405 Oak St., S. E.
Professor of Mathematics and Mechanics (21 M.A.)

CHARLES W. BENTON, M.A., Litt.D., 516 Ninth Ave., S.E.
Professor of French (201 F.H.)

FREDERICK E. CLEMENTS, PH.D. 800 Fourth St., S.E.
Professor of Botany (36 P.H.)

FRANK H. CONSTANT, C.E. 1801 University Ave.
Professor of Structural Engineering (22 M. A.)

ALVIN S. CUTLER, C.E. 529 Oak St., S. E.
Assistant Professor of Railway Engineering (12 M.A.)

HENRY T. EDDY, C.E., Ph.D., LL.D. 916 Sixth St., S. E.
Professor of Mathematics and Mechanics (11 M.E.)

HENRY A. ERIKSON, E.E., Ph. D. 220 Church St., S. E.
Assistant Professor in Physics (22 Ph.)

JOHN J. FLATHER, Ph.B., M.M.E. 315 Eleventh Ave., S. E.
Professor of Mechanical Engineering (12 M.E.)

GEORGE B. FRANKFORTER, M.A., Ph.D. 525 River Road, S. E.
Professor of Chemistry (5 Ch.)

EVERHART P. HARDING, M.S., Ph.D. 1316 Sixth St., S. E.
Assistant Professor of Chemistry (13 Ch.)

ARTHUR EDWIN HAYNES, M.S., M.Ph., S.D. 703 River Road S. E.
Professor of Engineering Mathematics (18 M.A.)

FREDERICK S. JONES, M.A. 712 Tenth Ave., S. E.
Professor of Physics (15 Ph.)

WILLIAM H. KAVANAUGH, M.E. 118 State St., S. E.
Professor of Experimental Engineering (9 M.A.)

WILLIAM H. KIRCHNER, B.S. 217 Beacon St., S. E.
Professor of Drawing and Descriptive Geometry (20 M.A.)

FRANCIS P. LEAVENWORTH, M.A. 317 Seventeenth Ave., S. E.
Professor of Astronomy (124 F.H.)

JOHN V. MARTENIS, M.E. 217 Harvard St., S. E.
Assistant Professor of Mechanical Engineering (21 M.E.)

JOHN G. MOORE, B.A. 2810 University Ave., S. E.
Professor of German (209 F.H.)

HENRY F. NACHTRIEB, B.S. 905 Sixth St., S. E.
Professor of Animal Biology (38 P.H.)

BURT L. NEWKIRK, Ph.D. 1016 29th Ave., N. E.
Assistant Professor of Mathematics and Mechanics (17 M.A.)

EDWARD E. NICHOLSON, M.A. 914 Seventh St., S. E.
Assistant Professor of Chemistry (9 Ch.)

EDWARD VAN DYKE ROBINSON, Ph.D. 1213 Seventh St., S. E.
Professor of Economics (18 Lib.)

WILLIAM T. RYAN, E.E. Oak St., S. E.
Assistant Professor of Electrical Engineering (14 E.E.)

MARIA L. SANFORD 1050 Thirteenth Av., S. E.
Professor of Rhetoric and Elecution (311 F.H.)

FREDERICK W. SARDESON, Ph.D. 414 Harvard St., S. E.
Assistant Professor of Geology (23 P.H.)

WILLIAM A. SCHAPER, M.A., Ph.D. 625 Fulton St., S. E.
Professor of Political Science (16 Lib.)

GEORGE D. SHEPARDSON, M.A., M.E. 717 River Road S. E.
Professor of Electrical Engineering (30 E.E.)

S. CARL SHIPLEY, B.S., M.E. 209 State St., S. E.
Superintendent of Shops (18 M.E.)

CHARLES F. SIDENER, B.S. 1320 Fifth St., S. E.
Professor of Chemistry (26 Ch.)

EDWARD SIGERFOOS, Captain 5th U. S. Infantry, Ph.B., LL.B.
Professor of Military Science 328 Tenth Ave. S. E.

FRANK W. SPRINGER, E.E. 1206 Fifth St., S. E.
Professor of Electrical Engineering (15 E.E.)

FRANK F. WESBROOK, M.A., M.D., C.M. 906 Fifth St., S. E.
Professor of Pathology and Bacteriology (I.P.H.)

ANTHONY ZELENY, M.S., Ph.D. 321 Church St., S. E.
Professor of Physics (32 Ph.)

JOHN ZELENY, B.A., Ph.D. 810 Sixth St., S. E.
Professor of Physics (20 Ph.)

INSTRUCTORS

EDWARD P. BURCH, E.E. 1729 James Ave., So.
Lecturer in Electric Railway Engineering (30 E.E.)

HOBART D. FRARY, M. E. 3108 Garfield Ave., S.
Instructor in Engineering Mathematics (17 M. A.)

CARL A. HERRICK, M.E. 3232 Irving Ave., S.
Instructor in Mechanical Engineering (22 M.E.)

ALOIS F. KOVARIK, B.A. 1523 Seventh St., S. E.
Instructor in Physics (17 Ph.)

O. B. NELSON, C. E. 1827 Fourteenth Ave., S.
Instructor in Civil Engineering and Drawing (M.A.)

WILLIAM B. NEWHALL, M.E. 2702 Humboldt Ave., S.
Instructor in Structural Engineering and Surveying (22 M.A.)

CHARLES W. NICHOLS, M.A. 313 8th Ave., S. E.
Instructor in English (311 F.H.)

PETER PETERSON, 710 Nineteenth Ave., S.
Instructor in Foundry Practice (M.E.)

EDWARD QUIGLEY, 2442 15th Ave., S.
Instructor in Forge Work (M.E.)

WILLIAM H. RICHARDS, 2555 Emerson Ave., S.
Instructor in Carpentry and Pattern Work (28 M.E.)

NORMAN W. ROSE, M.E. 412 Washington Ave., S. E.
Instructor in Drawing (M.A.)

FRANK B. ROWLEY, B.S., M.E. 311 Harvard S., S. E.
Instructor in Drawing and Descriptive Geometry (26 M.A.)

C. F. SHOOP, B. S. 1916 14th Ave., N.
Instructor in Experimental Engineering (9 M.A.)

HENRY UBRICH, 602 Buchanan St., N. E.
Instructor in Carpentry (M.E.)

ASSISTANTS

HARRY W. DIXON, Engineer 1800 4th St., S.E.

L. W. MCKEEHAN, B.S., Assistant in Physics 1306 7th St., S. E.

CHARLES P. CLARKE, B.S., Assistant in Drawing 209 State St., S. E.

FRED R. GRANT, Assistant in Electrical Engineering 614 E. 22nd St.

STANDING COMMITTEES

Enrollment—PROFESSORS CONSTANT, HAYNES, SPRINGER

Curriculum—PROFESSORS EDDY, FLATHER, CONSTANT, BASS, JONES, SHEPARDSON

Degrees—PROFESSORS JONES, FLATHER, SHEPARDSON

Catalogue—PROFESSOR KIRCHNER

Military Affairs and Athletics—PROFESSORS BROOKE, HAYNES, SIGERFOOS

Students' Work—PROFESSORS JONES, NEWKIRK, CUTLER, SHEPARDSON, KAVANAUGH, BROOKE

Graduate Studies and Degrees—PROFESSOR EDDY

Program—PROFESSORS KIRCHNER AND BASS

Non-Resident Lecturers

CIVIL ENGINEERING

Geo. L. Wilson, Engineer, T. C. R. T. Co., Minneapolis.
L. T. Blanchard, Statistician, U. S. Reclamation Service, Washington.
Frank Nay, General Auditor, C. R. I. & P. R. R., Chicago.
J. A. L. Waddell, Consulting Engineer, Kansas City.
J. T. Fanning, Consulting Engineer, Minneapolis.
D. C. Morgan, Engineer, State Railroad and Warehouse Commission, St. Paul.
L. R. Clausen, Superintendent, C. M. & St. P. Ry., Milwaukee.

ELECTRICAL ENGINEERING

Edward P. Burch, Consulting Engineer, Minneapolis. "Speed-torque Characteristics of Steam Locomotives." "Speed-torque Characteristics of Electric Locomotives." "Advantages and Problems of Electric Traction for Heavy Railway Service." "Cost of Steam and Water Power for Railway Service." "Power Plants and Transmission Lines." "Plans for complete Electrification of a Steam Railway."

Fred G. Dustin, City Electrical Inspector, Minneapolis. "Safety in Electrical Construction."

John H. Schumacher, Electrical Engineer, Minneapolis Electrical Equipment Co. "Modern Interior Electrical Construction and Estimation of Cost."

Admission

(For list and description of subjects accepted for admission see page 68 and 69 and 77 to 83.)

ENTRANCE EXAMINATIONS

Every applicant for admission to the freshman class, must either,

(a) present State High School Board certificates for each of the mathematical subjects required for admission, or

(b) take the entrance examinations in said subjects at the University.

Beginning with Sept. 1911, the certificate for either higher algebra or solid geometry must be dated within one year of the time of presentation at the University, and the other must be dated within two years of such time.

No applicant will be admitted who fails to obtain credit in all of the mathematical subjects required for admission.

Students proposing to enter this college should be thoroughly prepared in mathematics, since the prosecution of the work depends so largely upon the preliminary training in this subject.

EXAMINATION IN ENGLISH

Every person admitted to this college will be examined in reading, writing, spelling and composition, and all who fail to obtain a grade of seventy-five per cent are required to pursue a course of instruction to be provided. No person shall ever receive a diploma or other certificate of merit or proficiency until he has passed such examination and obtained the specified credit.

TIME AND PLACE OF EXAMINATION

Entrance examinations are held only at the beginning of the college year (Tuesday, Sept. 7th). Applicants should present themselves to the

registrar who will furnish them with application blanks and directions how to proceed with these examinations and registration. Students prevented from entering at the beginning of the year may be admitted at a subsequent date when circumstances are such as to justify the action. Such students are at a great disadvantage and all students expecting to enter the University are urged to be present at the beginning of the year. See page 3 for program of examinations.

ENTRANCE CONDITIONS

No applicant will be admitted who is deficient in more than one year credit. The deficiency becomes an entrance condition and must be made up before the student passes into the sophomore class. But no applicant will be admitted to the college with an entrance condition in mathematics.

Students are strongly advised to enter without entrance conditions if possible, since the work of the freshman year is arduous, requiring the full time and energy of the students to get the greatest benefit from it. It is very important that the candidate be fully prepared in the entrance requirement in chemistry.

MANUAL TRAINING

Credit for work done in manual training in the high schools is allowed under the following conditions:

(a) The course in drawing and shop work in the high schools must be approved by the corresponding departments in the college.

(b) The year credit must be that defined on page 15.

(c) Students presenting two or three year credits in wood-work from such courses will receive an advanced credit in one semester's work in carpentry.

(d) Students presenting three year credits from such courses in drawing will receive an advanced credit of the second semester freshman drawing.

(e) Students presenting four year credits from such courses in shop will receive an advanced credit in freshman carpentry and one semester sophomore machine shop.

(f) Students presenting four year credits from such courses in drawing will receive an advanced credit of the first and second semester freshman drawing, not including descriptive geometry.

ADVANCED STANDING

The University accepts records from other colleges for credit to advanced standing. Such records are accepted as far as they are equiva-

lent to the work done in this University, subject to the approval of the department concerned. In bringing certificates from other institutions, the records must be on the official blanks of the institution granting the certificates, and should show:

1. The subject studied and ground covered.
2. The time spent upon each subject.
3. In case of laboratory subjects a concise statement of work done.
4. The result. It is sufficient to state that the subject was creditably completed.

Students who desire to obtain advanced standing must present their applications and certificates to the enrollment committee who will consult departments concerned in determining the credit to be given.

UNCLASSED STUDENTS

Unclassed students are permitted to pursue, under the direction of the faculty, one or two lines of study, selected from some regular course. Such students must be persons of mature years and present preparation sufficient to admit them to the freshman class. Persons of mature years who shall give satisfactory evidence of ability to do with credit the work applied for, may be admitted by vote of the faculty.

GRADUATION

Students completing the course of study to the satisfaction of the faculty of the college are entitled to receive the professional degree. Any person may undergo, at suitable times, examination in any subject, and if such person pass in all the studies and exercises of the course, he is entitled to the appropriate degree; provided, however, that at least one full year must 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.

THESES

Every candidate for the degree of engineer is required to prepare a thesis on some subject particularly relating to his course. The thesis must embody the result of original research made by the student himself and be creditable from a literary as well as from a technical point of view.

Theses are to be written in a clear hand, or typewritten. The subject of the thesis is required to be reported to the head of the department in which the student is a candidate for a degree, and the work of preparation must be formally begun early in the year. During the second semester the student is expected to devote at least ten hours a week to the preparation of his thesis.

The subject of the thesis and 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 the thesis; because, more than any other work the undergraduate does, this certifies to his ability to undertake the difficult and responsible duties involved in the direction of engineering and industrial interests. The thesis must be completed and put into the hands of the faculty not later than Friday, June 3rd, upon a good quality of paper, 8½ by 11 inches, leaving a margin 1½ inches wide at the left for binding and a margin about 1¼ inches wide on the other sides.

The original drawings, tracings, negatives, etc., are to be placed in the department files. Clear prints therefrom are to accompany the manuscript. The thesis shall be bound in black cloth and leather and shall be deposited in the department library.

FACULTY REGULATIONS

REGISTRATION FOR WORK. Students will not receive credit for work done in classes for which they have not been registered.

EXAMINATION FOR CREDIT. Students who make up work out of class and wish to take examinations to gain credit in their University course, shall apply to the faculty for permission to take the examinations.

REPORTS. At the end of each semester each student shall receive a mark in each subject for which he is registered. The several marks shall be as follows: A, pass with honor; B, pass with credit; P, pass; C, conditioned; F, failed.

In determining the standing of any student in any subject, the result of his daily work in that subject shall be combined with the result of the final examination in the ratio of two to one.

SUBJECTS TO BE REPEATED. Any student in the College of Engineering whose average for the year is below passing grade will be required on reentering the University to pursue again all the subjects of the year in which he has not passed with credit.

Students who receive a condition or failure in work of either semester so as to make it impossible for them to continue the same line of work in the following semester, will not be allowed to elect an advanced subject in place of the one omitted, but shall be required to devote their full time to the remaining subjects of the course.

However, those students who attain an average grade of B in the remaining subjects pursued may elect an advanced subject in the place of the one omitted.

CONDITIONS AND FAILURES. No student will be allowed to omit any freshman work in order to make up entrance conditions.

No student with an entrance condition will be allowed to register for any sophomore subject, nor will any student with a freshman condition or failure be allowed to register for a junior subject, nor will any student with a sophomore condition or failure be allowed to register for any senior subject.

A condition not made up before the subject is offered again becomes a failure subject to rules governing failures.

Students conditioned in the work of the first semester are given an opportunity to remove their conditions at the beginning of the first semester of the following year. Students conditioned in the work of the second semester are given an opportunity to remove their conditions at the beginning or end of the first semester of the following year, at the date regularly set for the program for such examinations, but can take no subjects which require this work as a prerequisite, until the condition has been removed. It is provided that if a student attempts to remove a condition at the first examination he will not be allowed to try the following examination, but shall be required to take the work over in class. Failures must be taken over again in class.

Dropped from Rolls. Any student receiving conditions or failures in more than fifty per cent of his work in the first semester shall be dropped from the rolls, and will not be allowed to re-enter the University until the opening of the following year.

General Information

BUILDINGS AND EQUIPMENT

As an integral part of the University of Minnesota, the College of Engineering and the Mechanic Arts enjoys the advantages of the resources of the institution to the fullest extent. In addition to the University libraries and laboratories in which engineering students receive instruction, three buildings are devoted exclusively to the work of this college. The Mechanic Arts Building is occupied by the Departments of Mathematics and Drawing and also affords temporary quarters for the Departments of Civil, Municipal and Experimental Engineering. The Mechanical Engineering Department has an entire building devoted to its special work and the Electrical Engineering Department together with the University Light and Power Plant occupies a third building.

At the last session of the Legislature a bill was passed appropriating $700,000 for special University purposes. Of this, $450,000 was designated as purchase money for additional land and $250,000 for the erection of a main engineering building and laboratory. It is hoped that these buildings will be completed during the coming year.

For information concerning methods of work and the equipment of the various departments the following condensed statements are offered.

LIBRARIES AND READING ROOMS

The reference libraries of the several departments are well supplied with technical literature. The civil engineering library comprises over one thousand volumes; the library of the department of mathematics and mechanics numbers eighteen hundred volumes of choice mathematical and scientific works; the departments of mechanical engineering, electrical engineering and of physics have excellent collections of standard works which number over fourteen hundred volumes; the chemistry library contains over five hundred technical works; the drawing department has a collection of two hundred volumes relating to drawing, architecture and design. The above libraries comprising upwards of four thousand volumes and including many works which are the private property of professors, are accessible to the students.

In addition to the above are the libraries of the University, the City of Minneapolis, the City of St. Paul and others, containing many works of value to the engineering profession. Standard works bearing on special subjects are purchased as they appear and the more important scientific and technical periodicals are secured and placed in the reading rooms maintained in connection with the several departments of the college.

Journal clubs are organized, in most of the departments, for the discussion of current technical literature, relating to the best modern practice. The students are kept in touch with the developments along engineering lines and are taught how to use the technical press.

In addition to the foregoing, the college has many periodicals donated by the societies publishing them, and others loaned by members of the faculty, who place their periodicals and professional libraries at the disposition of the students.

THE UNIVERSITY LIGHT AND POWER PLANT

The light and power plant was designed for the purpose of instruction and also for furnishing electric light and power to the various buildings, shops and laboratories of the University. The plant is characterized by the variety of its equipment, as well as by its value in developing power economically.

The boiler plant contains a 130-h.p. Cahall (B. & W. type) water tube boiler designed to carry a working pressure of 250 pounds; a 60x16 foot multitubular boiler which carries 175 pounds pressure; a Sorge-Cochrane purifier of 300-h.p. capacity; and a large Sturtevant fan and direct-connected engine, to be used for overloads and for experiments with mechanical draft.

In addition to this apparatus a three-stage Foster super-heater has recently been installed. This is arranged to superheat simultaneously 3500 pounds of steam at 175 pounds pressure to 80 degrees of superheat, an equal quantity of high pressure cylinder exhaust at 20 pounds pressure to 60 degrees, and 4500 pounds turbine steam at 175 pounds pressure to 250 degrees of superheat. The piping from super-heater to the various engines has been designed to permit of great flexibility which affords a wide scope for experimental work, as well as allowing different methods in their operation best suited to the conditions.

In the engine room there is an Allfree automatic expansion 75-h.p. engine, connected by belting to a jack shaft equipped with roller bearings. There is also, a 150-h.p. cross-compound Corliss engine especially designed forthe mechanical engineering department. This engine is pro-

vided with a Wheeler surface-condenser, and is arranged so that it may be run simple or compound, condensing or non-condensing, as desired. It thus constitutes a valuable part of the equipment for experimental work.

The engine room also contains a 150-h.p. DeLaval steam turbine direct connected to 100 kw. electric generator. This steam turbine is equipped with a double set of nozzles and is connected with a jet condenser, so that it may be run condensing or non-condensing as desired.

A 100-h.p. gas producer located in an annex to the boiler room has recently been installed and furnishes gas for the operation of a 65-h.p. Munzel two-cylinder gas engine direct connected to a 35-kw. generator.

The University electric light and power circuits are maintained at 114 and 228 volts, the principal supply being direct current from the University plant, supplemented by alternating current from transformers connected with the circuits of the Minneapolis General Electric Company. Equality of pressure on the two sides of the system is maintained independently or jointly by the various supply units, including: a twin Sprague 125-125-volt 100-kilowatt turbo-generator, a Westinghouse 250-volt 40-kilowatt belt-driven generator with auxiliary slip rings and balancing coils, a pair of Electric Machinery 125-volt 40-kilowatt belt-driven generators, a 250-volt 30-kilowatt Electric Machinery generator directly connected to a gas engine and having a motor-generator balancing set, a double 320-amperehour Chloride storage battery with end cells and motor-driven double booster set, and two 30-kilowatt 2300/230-115-volt transformers. Two switchboards, of six and seven panels respectively, provide for convenient control of the various supply and distributing circuits.

ELECTRICAL ENGINEERING

The electrical engineering department and the University electric light and power plant are housed in a brick building of slow-burning mill construction. The part of the building devoted exclusively to the work of the electrical engineering department of instruction is eighty feet long by sixty feet wide with two stories and full basement. In the basement are electro-chemical laboratory, shop, battery room, toilet and stock rooms. On the first floor are the dynamo laboratory, high tension laboratory, research laboratories, instrument rooms and offices. On the second floor are laboratories for photometry, photography, meter and lamp testing; and rooms for recitations, draughting, library and office.

THE LABORATORY EQUIPMENT includes about forty dynamo electric machines of various types and sizes for direct and alternating currents, such as constant current and constant potential direct current generators and motors, single phase and polyphase alternators, commutating, induction and synchronous motors and rotary converters, each furnished with suitable regulating devices. A number of these machines have been

equipped with special devices for experimental purposes. Lamps, rheostats, batteries, fans, and brakes afford convenient and ample means, for taking up the energy of dynamos and motors. To facilitate testing there are a number of pairs of similar machines. A three-ton traveling crane facilitates handling the machines. Power is obtainable from a main shaft driven by the engines of the lighting plant, or by motors connected with the University power circuits, with a storage battery or with the circuits of The Minneapolis General Electric Company, which supplies direct current at 500 volts and alternating current at 115-115 volts. An excellent assortment of instruments of well known American and foreign makers is available for laboratory use. A well equipped standardizing laboratory furnished with certified standards for current electromotive force and resistance, allows the frequent checking of instruments, so that students may work to any desired degree of refinement. The meter and lamp testing laboratories are furnished with a wide variety of arc and incandescent lamps and meters with all necessary standards and other accessories. The electro-chemical laboratory provides facilities for the construction and testing of various cells, for electro-plating and other electrolytic processes. Alternators, rotary converters, transformers, lamps, condensers, oscillographs, special apparatus and suitable instruments afford facilities for the experimental study of alternating currents. Telephone transmitters, receivers and accessories provide for practice in assembling and testing the ordinary telephonic apparatus and circuits and for investigation. There is a variety of apparatus for special investigations. An electric car recently contributed by the Minneapolis Street Railway Company is being installed on a suitable testing rack and will provide facilities for investigating and demonstrating traction problems.

THE DEPARTMENT LIBRARY contains an excellent collection of electrical and allied works, including a full set of United States Patent Office Gazettes. New books and trade publications are being added continually. Files of twenty-two journals are nearly complete and others are being collected and bound. These, with the files in the general and other department libraries of the University, offer excellent facilities for research work. Free access is given to the private libraries and collections of the professors.

The reading room receives regularly the leading American and foreign periodicals devoted to electrical engineering and allied interests. A journal club meets for the discussion of current literature in mechanical and electrical engineering, keeping the students in touch with current progress and best modern practice, and teaching them the value of the technical press.

The collection of samples furnished by various manufacturers and dealers is a great help in exhibiting best modern practice and in teaching

young engineers to appreciate the merits of different products. Samples from repair shops and elsewhere are of special value in illustrating the treatment received by apparatus in commercial use and necessity of careful design and construction.

INSTRUCTION. The course aims to give the students a knowledge of phenomena and principles and the various applications of electricity, the methods and instruments used in measuring and transforming it, and practice in the design and operation of electrical apparatus. Practice and theory are taken together as far as possible. During the junior and senior years, students have daily work with electrical instruments and apparatus, and with commercial problems. Occasional inspection tours among the extensive and varied electrical interests in Minneapolis and St. Paul furnish excellent illustration. The University electric light and power plant, which is in the same building, affords opportunity to observe commercial conditions at close range.

All engineering students are strongly advised to spend their vacations in factories, repair shops, electric light and railway stations, etc., in order to obtain commercial experience, and appreciate the relations of their technical training and actual work.

It is the aim to train students to be independent and efficient workers, and to adopt the methods of professional engineers. Students are required to verify the formulas used in various calculations, and are encouraged to derive their own formulas for simplifying work in special cases. At the same time they are expected to use logarithms, slide rules, tables, curves, charts, and all legitimate means for obtaining accurate results with least amount of drudgery.

The regular instructing force is supplemented by competent non-resident lecturers.

LABORATORY WORK. In the more advanced work students are encouraged to determine for themselves as independent workers the best methods and conditions for accurate results. While the laboratory work is classified, the students are treated individually and are advanced as rapidly as their attainments warrant.

In fitting up the laboratory, care is taken to secure representative types of apparatus of commercial style and size, in order to acquaint the students with actual practice. In putting up new lines and in setting up apparatus, the students are required to work in accordance with standard practice. Each student is given a certain amount of practice in the construction of electrical apparatus.

DESIGN. The electrical engineers have drawing and design in common with the mechanical engineers in the first three years. A large number of numerical problems are given during the course. During the junior and senior years, electro-magnets and mechanism, dynamos and

motors, lines, switches, switchboards and plants are designed. Complete working drawings and specifications for some special problems are elaborated. A file of about six hundred blueprints and drawings in the department library in addition to those in other departments is available to the students.

EXPERIMENTAL ENGINEERING

THE LABORATORY, in which the experimental research of the college is conducted, has been considerably enlarged and its equipment greatly increased. Three universal testing machines of 50,000 pounds, 100,000 pounds and 200,000 pounds capacity, and five transverse and torsion testing machines are provided for determining strength, ductility, resilience and other characteristics of the various materials used in engineering work under the various stresses. Several forms of absorption and transmission dynamometers are available for determining the power generated by engines or other motors, or absorbed by shafting or machinery; coal and gas calorimeters for determining the heating value of fuels, and apparatus for the analysis of flue gases.

The laboratory is also provided with machines for determining the lubricating qualities of oils and the relative values of metals used for journals and bearings. There is in the laboratory a 35 horse-power boiler and a high pressure boiler capable of carrying a working pressure of 300 pounds, with the necessary gages, calorimeters, tanks and pyrometers for making complete duty trials; several automatic steam engines equipped with condensers, indicators, brakes, scales and thermometers, which are employed to determine the efficiency in the use of steam under various conditions assumed or found in actual practice, and for valve setting and indicator work.

The operation and economy of other heat engines are illustrated by an Otto gas engine of five horse-power, a White gasoline engine of eight horse-power, Rider and Ericsson hot air engines, a pulsometer, and several steam and power pumps. The laboratory also contains Pelton and Turk water motors, a water ram, injectors, weirs, nozzles, meters and other pieces of apparatus and instruments which an engineer is called upon to use in the course of his professional work.

In addition to the above, the equipment of the University power and lighting plant, described elsewhere, is available for the purposes of laboratory instruction.

A constantly increasing quantity of commercial testing is being done in connection with the regular work which brings the student into actual contact with the engineering world and affords him valuable experience and data for his future work.

MECHANICAL ENGINEERING

The plan of instruction in this course is intended to give the student a thorough training in mathematics and the physical sciences; and in the fundamental principles of engineering.

The work is planned to make him familiar with the various applications of these principles, and with the practical details of machine construction and design.

In the machine shops a three-ton crane covers a clear span of twelve feet, the entire length of the shop, thus giving ample space for erecting. This crane also serves some of the larger machine tools.

The foundry has been the subject of especial study and possesses many features of interest and value. In accordance with the best modern practice for light work the floor is of concrete, and the gangways, leading from the cupola and extending lengthwise of the room, are of heavy iron plates set in cement.

A light traveling crane is also provided for the foundry. This has a span of eighteen feet, and runs the entire length of the room.

The lighting, heating and ventilation of the building have received careful consideration. In the machine and pattern shops sixty per cent of the wall space above the benches is glass. In the foundry and forge shop less light is allowed, since an abundant supply of overhead light is obtained from windows placed in the lantern ventilator which extends over the roof. Pipe coils are employed in heating the building and these are placed partly on the side walls under the windows and partly overhead. Electric power is used for driving the machinery. The group system has been selected as the best adapted to the conditions, and a number of small motors are placed in the several departments; 220-volt continuous current motors are employed in connection with a three wire system of distribution, which is also used in the lighting circuit.

The machine shop contains representatives of the ordinary machine tools, gauges, and small tools usually found in a well-equipped modern plant.

The shop for pattern making and general wood work contains benches with vises and tools, lathes and lathe tools, an improved universal sawing machine, band saw, planer, jointer and other power tools, and all hand tools used in carpentry and pattern making.

The forge shop is equipped with stationary and portable forges, a blower and exhaust fan arranged on the down-draft system, a one-hundred pound drop hammer, and the necessary small tools used in blacksmithing.

The foundry contains a thirty-inch Whiting cupola, and two brass furnaces, which embody some novel features. There are two core ovens; one for ordinary work $3\frac{1}{2}$x$3\frac{1}{2}$x5 feet, and one $3\frac{1}{2}$x7x6 feet for special

cores which may be required. The feature of these core ovens is that the gases and products of combustion are caused to traverse suitable conduits under a plate floor and do not come into direct contact with the cores. The usual moulding tools, ladles, crucibles, and all of the tools and materials needed in moulding and casting iron, brass or white metal, are provided.

The shop work is intended, not so much to give the student skill in the manual operations of the respective crafts, as a knowledge of the methods and processes of practical construction.

The new engineering power plant is admirably equipped with apparatus which constitutes a valuable part of the equipment.

THE LIBRARY of the department contains a collection of historic and recent works, the best standard books being purchased as soon as issued. There are a number of complete files of the transactions of engineering societies and of the leading technical publications. The reading room is amply supplied with both the general mechanical and railway press.

RAILWAY MECHANICAL ENGINEERING. Courses have been arranged for students wishing to specialize in this subject. The various courses may be elected separately, subject to the requirements for previous preparation, to fill out the electives, or options in the post senior year of any department.

Students planning to elect these courses are encouraged to work, under special arrangements, in railway shops during the summer vacations. This has proved its value as preparatory to the special work of the senior year. In every possible way the methods of the department are intended to place the students in touch with the best railway work, keeping always in sight the limitations which railway experience has found financially and practically to exist.

The location of the University is particularly favorable, being between the cities of St. Paul and Minneapolis in proximity to the shops, yards and headquarters of the extensive railway systems of the Northwest, which offers exceptional facilities for the prosecution of this work.

VISITS OF INSPECTION. During the year numerous visits are made to the manufacturing plants of St. Paul and Minneapolis, which have proven to be of great value in supplementing the class room work.

MUNICIPAL AND SANITARY ENGINEERING

The department is provided with the usual equipment for giving instruction in class-room, laboratory, and field, including a collection of drawings, photographs and models. The Engineering Department of the State Board of Health is in a position to furnish records of existing practice in Minnesota, thus providing a means of comparing progress

in Minnesota and elsewhere; facilities are also offered for the prosecution of experimental work in sanitary lines under the direction of this board. Arrangements have been made with the Engineering Department of the State Highway Commission for co-operatiAə work.

The special course in Municipal engineering now offered has been replaced by a sequence in optional subjects in the new five year course. Optional work in the application of hydraulic principles to problems of water power, river and harbor improvement is offered.

RAILWAY ENGINEERING

The aim of this department is to give the student a thorough working knowledge of railroad work, especial emphasis being laid upon the execution of practical problems, both in the field and drafting room. The department is fully equipped with the instruments necessary for carrying on an extended railroad survey.

STRUCTURAL ENGINEERING

This department has a collection of drawings of representative structures; photographs of prominent bridges, buildings and roofs, in this country and abroad; a well selected library of the best books and specifications upon structural engineering; slide rules and calculating instruments for rapid and accurate computations; and such other instruments as will facilitate the work of design.

LABORATORIES. Students in civil engineering have access to the laboratories and shops of the several departments in which their work lies. The Experimental Engineering laboratory offers excellent facilities for experimental work with cement and its products. In this connection there is a large Olsen testing machine of two hundred thousand pounds capacity, with automatic and autographic attachments, extension head for columns ten feet long, and transverse arms for twenty foot beams. Additional space and equipment are provided for experimental and research work.

LIBRARY. The civil engineering library is located on the first floor of the Mechanic Arts building. It contains all of the more important books and American and foreign periodicals relating to civil engineering. There are complete sets of the leading technical journals, proceedings and transactions of the engineering societies, and federal and state reports.

INSPECTION TOURS. The professional work in the several departments in civil engineering is illustrated in a practical manner by frequent class visits to the many engineering works and plants in the vicinity of Minneapolis and St. Paul.

Courses of Study

Figures at the left indicate credit hours; figures at the right indicate the course number. Letters at the right are abbreviations for the various courses, as follows:

Animal Biology	A. B.
Astronomy	A.
Botany	B.
Chemistry	C.
Civil Engineering	C. E.
Drawing and Descriptive Geometry	D
Economics	Ec.
Electrical Engineering	E. E.
English	E.
Experimental Engineering	Ex. E.
French and Spanish	F.
Geology and Mineralogy	G. M.
German Language and Literature	G.
Mathematics and Mechanics	M.
Mechanical Engineering	M. E.
Military Science	M. S.
Pathology and Bacteriology	P. B.
Physics	P.
Political Science	P. S.

CIVIL, MECHANICAL AND ELECTRICAL ENGINEERING

FRESHMAN YEAR

5	Mathematics, M. 1, 2.	Professor Haynes, Assistant Professor Newkirk, Mr. Frary
4	English, E. 1.	Professor Sanford, Mr. Nichols
4	Drawing, D. 1, 3, 2, 4.	Professor Kirchner, Mr. Rowley, Mr. Rose Mr. Clark
3	Shop M. E. 1, 2.	Mr. Shipley, Mr. Richards, Mr. Quigley
3	Modern Language, G. 1 or 4 or F. 1, 3 or 11.	Professor Moore, Professor Benton
3	Drill, M. S. 1.	Captain Sigerfoos

CIVIL ENGINEERING

SOPHOMORE

4	Mathematics, M. 3, 4.	Professor Haynes, Professor Brooke
4	Physics, P. 5, 6.	Professor Jones, Professor J. Zeleny, Assistant Professor Erikson, Mr. Kovarik, Mr. McKeehan

3	Chemistry, C. 3.	Assistant Professor Nicholson, Mr. Frary
3	Drawing, D. 5.	Professor Kirchner, Mr. Rowley, Mr. Rose
3	Modern Language, G. 3 or 7; F. 2, 5 or 12.	Professor Moore, Professor Benton
3	Animal Biology or Botany, A. B. 1 or B. 1.	Professor Nachtrieb, Professor Clements
3	Drill, M. S. 1.	Captain Sigerfoos

JUNIOR YEAR

First Semester

3	Mathematics, M. 5.	Professor Haynes, Professor Brooke, Assistant Professor Newkirk
4	Physics, P. 7.	Professor Jones, Professor J. Zeleny, Assistant Professor Erikson, Mr. Kovarik
3	Chemistry, C. 4.	Professor Sidener
3	Surveying, C. E. 1.	Assistant Professor Bass, Mr. Cutler
3	Economics, Ec. 1.	Professor Robinson, Assistant Professor Rastall, Mr. Coulter
3	Architecture, D. 6.	Professor Kirchner

Second Semester

3	Mathematics, M. 6.	Professor Haynes, Professor Brooke, Assistant Professor Newkirk
4	Physics, P. 8.	Professor Jones, Professor J. Zeleny, Professor A. Zeleny, Assistant Professor Erikson, Mr. Kovarik
3	Surveying, C. E. 2.	Assistant Professor Bass, Mr. Cutler
3	Astronomy, A. 1.	Professor Leavenworth
3	Transportation, Ec. 8.	Professor Robinson
3	Highways, C. E. 7.	Assistant Professor Bass

SENIOR YEAR

First Semester

4	Mechanics, M. 7.	Professor Eddy, Professor Brooke, Assistant Professor Newkirk
3	Stresses, C. E. 20.	Professor Constant, Mr. Newhall
4	Surveying, C. E. 3.	Assistant Professor Bass, Mr. Cutler, Mr. Nelson
2	American Government, P. S. 16.	Professor Schaper, Mr. Allin
2	Experimental Laboratory, Ex. E. 1.	Professor Kavanaugh, Mr. Shoop
3	Geology, G. M. 1.	Assistant Professor Sardeson

Second Semester

4	Mechanics, M. 8.	Professor Eddy, Professor Brooke, Assistant Professor Newkirk
3	Stresses, C. E. 21.	Professor Constant, Mr. Newhall
4	Railway Engineering, C. E. 9.	Mr. Cutler
2	Engineering Law, P. S. 6.	Mr. Allin
2	Hydraulic Laboratory, Ex. E. 3.	Professor Kavanaugh, Mr. Shoop
3	Electric Power, E. E. 4.	Mr. Ryan

POST SENIOR YEAR

First Semester

5	Structural Design, C. E. 22.	Professor Constant, Mr. Newhall
4	Hydraulic Engineering, C. E. 5.	Assistant Professor Bass, Mr. Newhall
5	Masonry, C. E. 25.	Professor Constant
4	Railway Engineering, C. E. 10.	Mr.Cutler
3	Experimental Laboratory, Ex. E. 8	Professor Kavanaugh
	or	
3	Water Analysis, C. 6.	Professor Frankforter
	or	
3	Railway Structures, C. E. 11.	Mr. Cutler

Second Semester

5	Structural Design, C.E. 23.	Professor Constant
4	Municipal Engineering, C. E. 6.	Assistant Professor Bass
3	Reinforced Concrete, C. E. 26.	Professor Constant
5	Thesis.	
4	Swing Bridges, C. E. 24.	Professor Constant
	or	
4	Bacteriology, P. B. 1.	Professor Wesbrook
	or	
4	Railway Economics, C. E. 12.	Mr. Cutler

MECHANICAL ENGINEERING

SOPHOMORE YEAR

4	Mathematics, M. 3, 4.	Professor Haynes, Professor Brooke
4	Physics, P. 5, 6.	Professor Jones, Professor J. Zeleny, Professor A. Zeleny, Assistant Professor Erikson, Mr. Kovarik
3	Chemistry, C. 3.	Assistant Professor Nicholson, Mr. Frary
3	Drawing, D. 5.	Professor Kirchner, Mr. Rowley, Mr. Rose
3	Modern Language G. 3 or 7; or F. 2, 5 or 12.	Professor Moore, Professor Benton
3	Shop, M. E. 3, 4.	Mr. Shipley, Mr. Peterson
3	Drill, M. S. 1.	Captain Sigerfoos

JUNIOR YEAR

3	Mathematics, M. 5, 6.	Professor Haynes, Professor Brooke, Assistant Professor Newkirk
4	Physics, P. 7, 8.	Professor Jones, Professor J. Zeleny, Professor A. Zeleny, Assistant Professor Erikson, Mr. Kovarik
3	Chemistry, C. 4, 7.	Professor Sidener, Assistant Professor Harding
3	Economics, Ec. 1, 8.	Professor Robinson, Assistant Professor Rastall, Mr. Phelan, Mr. Coulter
3	Mechanism and Kinematics, M. E. 11, 12.	Assistant Professor Martenis
4	Shop, M. E. 5, 6.	Mr. Shipley

SENIOR YEAR

First Semester

4	Mechanics, M. 7.	Professor Eddy, Professor Brooke, Assistant Professor Newkirk
2	Experimental Laboratory, Ex. E. 1.	Professor Kavanaugh, Mr. Shoop
2	American Government, P. S. 13.	Professor Schaper, Mr. Allin
3	Stresses, C. E. 20.	Professor Constant, Mr. Newhall
5	Machine Design, M. E. 13.	Professor Flather, Assistant Professor Martenis, Mr. Herrick
1	Boilers, M. E. 19.	Assistant Professor Martenis
3	Electric Power, E. E. 5.	Mr. Ryan

Second Semester

4	Mechanics, M. 8.	Professor Eddy, Professor Brooke, Assistant Professor Newkirk
3	Experimental Laboratory, Ex. E. 4.	Professor Kavanaugh, Mr. Shoop
2	Engineering Law, P. S. 6.	Mr. Allin
3	Steam Engines, M. E. 20.	Professor Flather
3	Machine Design, M. E. 14.	Professor Flather, Assistant Professor Martenis
2	Gas Engines, M. E. 21.	Mr. Herrick
3	Electric Power, E. E. 5.	Mr. Ryan

POST SENIOR YEAR

First Semester

3	Thermodynamics, M. 9.	Professor Eddy
3	Experimental Laboratory, Ex. E. 6.	Professor Kavanaugh
2	Mechanical Engineering, M. E. 22.	Professor Flather
4	Machine Design, M. E. 15.	Professor Flather, Mr. Herrick
	or	
4	Railway Design, M. E. 25.	Professor Flather
3	Heating and Ventilation, M. E. 23.	Assistant Professor Martenis
	or	
2	Railway Technology, M. E. 24.	Assistant Professor Martenis
2	Thesis	
	or	
2	Electrical Engineering, E. E. 10.	Professor Springer
3	Elective	

Second Semester

5	4 Turbines, M. 10, 11.	Professor Eddy
	1 Specifications, M. E. 28.	Professor Flather
	or	
5	3 Railway Problems and Administration, Ec. 9.	Professor Robinson
	2 Railway Mech. Eng., M. E. 26.	Professor Flather
4	Machine Design, M. E. 16.	Professor Flather and Mr. Herrick
	or	
4	Railway Design, M. E. 25.	Professor Flather, Assistant Professor Martenis

2	Mechanical Engineering, M. E. 22.	Professor Flather
	or	
2	Locomotive Testing, M. E. 27.	Professor Flather
3	Gas Engine Laboratory, Ex. E. 9.	Professor Kavanaugh
3	Elective.	
3	Thesis.	

ELECTRICAL ENGINEERING

SOPHOMORE YEAR

4	Mathematics, M. 3, 4.	Professor Haynes, Professor Brooke
4	Physics, P. 5, 6.	Professor Jones, Professor J. Zeleny, Professor A. Zeleny, Assistant Professor Erikson, Mr. Kovarik
3	Chemistry, C. 3.	Assistant Professor Nicholson, Mr. Frary
3	Drawing, D. 5.	Professor Kirchner, Mr. Rowley, Mr. Rose
3	Modern Language G. 3 or 7; or F. 2, 5 or 12.	Professor Moore, Professor Benton
3	Shop, M. E. 3, 4.	Mr. Shipley, Mr. Peterson
3	Drill, M. S. 1.	Captain Sigerfoos

JUNIOR YEAR

First Semester

3	Mathematics, M. 5.	Professor Haynes, Professor Brooke, Assistant Professor Newkirk
4	Physics, P. 7.	Professor Jones, Professor J. Zeleny, Professor A. Zeleny, Assistant Professor Erikson, Mr. Kovarik
3	Kinematics and Mechanism, M. E. 11.	Assistant Professor Martenis
3	Economics, Ec. 1.	Professor Robinson, Assistant Professor Rastall, Mr. Phelan, Mr. Coulter
3	Chemistry, C. 4.	Professor Sidener
4	Shop, M. E. 5.	Mr. Shipley

Second Semester

3	Mathematics, M. 6.	Professor Haynes, Professor Brooke, Assistant Professor Newkirk
5	Physics, P. 8, 9.	Professor Jones, Professor J. Zeleny, Assistant Professor A. Zeleny, Assistant Professor Erikson, Mr. Kovarik
3	Kinematics and Mechanism, M. E. 12.	Assistant Professor Martenis
3	Economics, Ec. 9A.	Professor Robinson, Assistant Professor Rastall, Mr. Phelan, Mr. Coulter
3	Applied Electricity, E. E. 1.	Professor Shepardson
3	Shop, M. E. 6.	Mr. Shipley

SENIOR YEAR

First Semester

4	Mechanics, M. 7.	Professor Eddy, Professor Brooke, Assistant Professor Newkirk

2	American Government, P. S. 16.	Professor Schaper, Mr. Allin
3	Electrical Machinery, E. E. 2.	Professor Springer
3	Electrical Laboratory, E. E. 17.	Professor Springer
2	Experimental Laboratory, Ex. E. 1.	Professor Kavanaugh, Mr. Shoop
5	Machine Design, M. E. 13.	Professor Flather, Assistant Professor Martenis
1	Steam Boilers, M. E. 19.	Assistant Professor Martenis

Second Semester

4	Mechanics, M. 8.	Professor Eddy, Professor Brooke, Assistant Professor Newkirk
2	Engineering Law, P. S. 6.	Mr. Allin
3	Stresses, C. E. 20.	Professor Constant, Mr. Newhall
3	Steam Engines, M. E. 20.	Professor Flather
3	Electrical Machinery, E. E. 2.	Professor Springer
3	Electrical Laboratory, E. E. 17.	Professor Springer
2	Experimental Laboratory, Ex. E. 2.	Professor Kavanaugh, Mr. Shoop

POST SENIOR YEAR

First Semester

2	Alternating Currents, E. E. 6.	Professor Shepardson
3	Thermodynamics, M. 9.	Professor Eddy
2	Electrical Engineering Practice, E. E. 7, 8 or 9,	Professor Shepardson, Mr. Ryan
3	Electrical Laboratory, E. E. 18.	Professor Springer
3	Electrical Design, E. E. 14.	Mr. Ryan
2	Experimental Laboratory, Ex. E. 7.	Professor Kavanaugh
2	Thesis.	Professor Shepardson
3	Elective.	

Second Semester

3	Alternating Currents, E. E. 6.	Professor Shepardson
3	Electrical Engineering Practice, E. E. 8, 10, 11, 12.	Professor Shepardson, Professor Springer, Mr. Ryan
3	Electrical Laboratory, E. E. 18.	Professor Springer
3	Electrical Design, E. E. 15.	Mr. Ryan
2	Telephony, E. E. 12.	Professor Shepardson
	or	
2	Water Turbines, M. 10.	Professor Eddy
3	Thesis.	Professor Shepardson
3	Elective.	

Students desiring to specialize in electro-chemistry will be allowed to make certain substitutions in the senior and post senior years by approval of the faculty.

ORDER OF STUDIES FOR CLASSES GRADUATING 1910 AND 1911

CIVIL ENGINEERING

JUNIOR YEAR

First Semester

5	Mechanics, M. 7′	Professor Eddy

3	Elective.	
2	Experimental Laboratory, Ex. E. 1.	Professor Kavanaugh, Mr.Shoop
4½	Curves and Earthworks, C. E. 9.	Mr. Cutler
3	Field Work, C. E. 10.	Mr. Cutler
3	Stresses, C. E. 20.	Professor Constant, Mr. Newhall

Second Semester

5	Mechanics, M. 8′.	Professor Eddy
3	Structural Details, C. E. 21.	Mr. Constant
3	Stresses, C. E. 20, 21.	Professor Constant, Mr. Newhall
5	Railway Engineering, C. E. 9, 10.	Mr. Cutler
3	Geology, G. M. 1.	Assistant Professor Sardeson
2	Hydraulic Laboratory, Ex. E. 3.	Professor Kavanaugh, Mr. Shoop

SENIOR YEAR

First Semester

5	Masonry, C. E. 25.	Professor Constant
2	Experimental Laboratory, Ex. E. 8.	Professor Kavanaugh
	or	
2	Railway Economics, C. E. 11.	Mr. Cutler
3	Electric Power, E.E. 4.	Mr. Ryan
5	Structural Design, C. E. 22.	Professor Constant
2	Political Science, P. S. 16.	Professor Schaper
4	Hydraulic Engineering, C E. 5.	Assistant Professor Bass
	Thesis.	

Second Semester

5	Structural Design, C. E. 23.	Professor Constant
3	Reinforced Concrete, C.E. 26.	Professor Constant
2	Transportation, Ec. 8.	Professor Robinson
3	Sanitary Engineering, C. E. 6.	Assistant Professor Bass
2	Contracts and Specifications, M. E. 28.	Professor Flather
5	Thesis.	

ORDER OF STUDIES FOR CLASSES GRADUATING 1910 AND 1911

MECHANICAL ENGINEERING

JUNIOR YEAR

First Semester

5	Mechanics, M. 7a′.	Professor Eddy, Assistant Professor Newkirk
3	Physics, P. 2.	Professor A. Zeleny
3	Stresses, C. E.20.	Professor Constant
4	Machine Design, M. E. 13.	Professor Flather, Assistant Professor Martenis, Mr.Herrick
2	Experimental Lab., Ex. E. 1.	Professor Kavanaugh, Mr. Shoop
2½	Shop, M. E. 5.	Mr. Shipley
3	Electric Power, E. E. 5.	Mr.Ryan

Second Semester

5	Mechanics, M. 8′.	Professor Eddy, Assistant Professor Newkirk
3	Steam Engines, M. E. 20.	Professor Flather
4	Machine Design, M. E. 14.	Professor Flather, Assistant Professor Martenis
2	Gas Engines and Producers, M. E. 21.	Mr. Herrick
3	Experimental Lab. Ex. E. 2, 3.	Professor Kavanaugh, Mr. Shoop
1	Steam Boilers, M. E. 19.	Assistant Professor Martenis
3	Electric Power, E. E. 5.	Mr. Ryan

SENIOR YEAR

First Semester

3	Thermodynamics, M. 9′.	Professor Eddy
2	Water Turbines, M. 10*.	Professor Eddy
	or	
2	Railway Mech. Eng., M. E. 24.	Assistant Professor Martenis
2	Mechanical Engineering, M. E. 22.	Professor Flather
4	Steam Engine Design, M. E. 15.	Professor Flather
	or	
4	Gas Engine Design, M. E. 15.	Professor Flather, Mr. Herrick
3	Fuel and Gas Analysis, C. 7.	Assistant Professor Harding
2	Political Science, P. S. 16.	Professor Schaper
3	Experimental Lab., Ex.E. 6.	Professor Kavanaugh
	0 to 2 Elective. Subject to approval of department.	
	Thesis.	

Second Semester

2	Steam Turbines, M. 11′.	Professor Eddy
	or	
2	Railway Engineering, M. E. 25.	Professor Flather
	or	
2	Power Plant Design, M. E. 18.	Professor Flather
2	Contracts and Spec., M. E. 28.	Professor Flather
2	Transportation, Ec. 8.	Professor Robinson
4	Machine Design, M. E. 16.	Professor Flather, Mr. Herrick
	or	
4	Railway Design, M. E. 25	Professor Flather
4	Gas Engine Lab., Ex.E. 9.	Professor Kavanaugh
	2 to 4 Elective.	(As approved by Department)
3	Thesis.	

*This course in the Water Turbines is a prerequisite to the course in Steam Turbines in the second semester, and all students desiring to take the latter course should not omit Water Turbines in the first semester. Senior Mechanical Engineers wishing to take Railway Mechanical Engineering may be allowed to substitute Railway Technology for Water Turbines but may, nevertheless, elect Water Turbines in preparation for Steam Turbines as an elective in the second semester. Senior Electrical Engineers may elect Water Turbines as preparation for Steam Turbines in the second semester if they desire to take Steam Turbines as an elective.

ORDER OF STUDIES FOR CLASSES GRADUATING 1910 AND 1911

ELECTRICAL ENGINEERING

JUNIOR YEAR

First Semester

5	Mechanics, M. 7a′.	Professor Brooke
3	Physics, P. 2.	Professor A. Zeleny
3	Stresses, C. E. 20.	Professor Constant
2	Electrical Machinery, E. E. 2.	Professor Springer
1	Electrical Laboratory, E. E. 17.	Professor Springer
1	Steam Boilers, M. E. 19.	Assistant Professor Martenis
4	Machine Design, M. E. 13.	Professor Flather, Assistant Professor Martenis, Mr. Herrick
2	Experimental Laboratory, Ex. E. 1	Professor Kavanaugh, Mr. Shoop

Second Semester

5	Mechanics, M. 8′.	Professor Brooke
3	Electrical Machinery, E. E. 2.	Professor Springer
3	Steam Engines, M. E. 20.	Professor Flather
2	Machine Design, M. E. 13.	Professor Flather, Assistant Professor Martenis, Mr. Herrick
2	Electrical Design, E. E. 14.	Mr. Ryan
4	Electrical Laboratory, E. E. 17.	Professor Springer
2	Experimental Laboratory, Ex. E. 2.	Professor Kavanaugh, Mr. Shoop

SENIOR YEAR

First Semester

3	Thermodynamics, M. 9′.	Professor Eddy
3	Alternating Currents, E. E. 6.	Professor Shepardson
2	Electrical Engineering Practice, E. E. 7 to 12.	Professor Shepardson, Mr. Ryan
2	Political Science, P. S. 16.	Professor Schaper
4	Electrical Laboratory, E. E. 18.	Professor Springer
3	Experimental Laboratory, Ex. E. 7.	Professor Kavanaugh
3	Elective.*	
	Thesis.	

Second Semester

3	Alternating Currents, E. E. 6.	Professor Shepardson
2	Electrical Engineering Practice, E. E. 7 to 12.	Professor Shepardson, Professor Springer Mr. Ryan, Mr. Burch
2	Contracts and Spec., M. E. 28.	Professor Flather
2	Transportation, Ec. 8.	Professor Robinson
3	Electrical Design, E. E. 15.	Mr. Ryan
5	Electrical Laboratory, E.E 18.	Professor Springer
3	Elective.*	
3	Thesis.	

MUNICIPAL ENGINEERING

JUNIOR YEAR

First Semester

5	Mechanics, M. 7′.	Professor Eddy
3	Physics, P. 2 or Elective	
2½	Curves and Earthwork, C. E. 9.	Mr. Cutler
2½	Water Analysis, C. 6.	Professor Frankforter
2	Experimental Lab., Ex. E. 1.	Professor Kavanaugh, Mr. Shoop
3	Field Work, C. E. 10.	Mr. Cutler
3	Stresses, C. E. 20.	Professor Constant, Mr. Newhall

Second Semester

5	Mechanics, M. 8′.	Professor Eddy
3	Structural Details, C. E. 20, 21.	Professor Constant, Mr. Newhall
3	Stresses, C. E. 21.	Professor Constant, Mr. Newhall
5	Railway Engineering, C. E. 9, 10.	Mr. Cutler
3	Geology, G. M. 1.	Professor Sardeson
2	Hydraulic Lab., Ex. E. 3.	Professor Kavanaugh, Mr. Shoop

SENIOR YEAR

First Semester

5	Masonry, C. E. 25.	Professor Constant
2	Experimental Lab., Ex. E. 8.	Professor Kavanaugh
3	Electric Power, E. E. 4.	Mr. Ryan
5	Structural Design, C. E. 22.	Professor Constant
2	Political Science, P. S. 16.	Professor Schaper
4	Hydraulic Engineering, C. E. 5.	Assistant Professor Bass

Second Semester

3	Biology, B. 13.	Assistant Professor Tilden
4	Bacteriology, P. B. 1.	Professor Wesbrook
5	Sanitary Engineering, C. E. 6.	Assistant Professor Bass
2	Transportation, Ec. 8.	Professor Robinson
2	Contracts and Spec., M. E. 28.	Professor Flather
3	Thesis.	

COURSE IN SCIENCE AND TECHNOLOGY

JUNIOR YEAR

First Semester

5	Mechanics, M. 7′.	Professor Eddy
3	Physics, P. 2.	Professor Zeleny
3	Drawing, D. 5.	Professor Kirchner
4	Technical Work.	
4	Elective Work.	

Second Semester

5	Mechanics, M. 8′.	Professor Eddy
3	Drawing, D. 5.	Professor Kirchner
5	Technical Work.	
7	Elective Work.	

SENIOR YEAR

12	Elective.
8	Technical Work.

Courses of Instruction

ANIMAL BIOLOGY

PROFESSOR NACHTRIEB, PROFESSOR SIGERFOOS, ASSISTANT PROFESSOR BROWN, ASSISTANT PROFESSOR DOWNEY

1. GENERAL ZOOLOGY — PROFESSOR SIGERFOOS, ASSISTANT PROFESSOR BROWN, ASSISTANT PROFESSOR DOWNEY

Six credits (four hours laboratory, two lectures per week) — First and second semesters

Open to sophomores, C. E. course.

This course is a comprehensive study of the principles of structure, physiology and development in animals. In the laboratory a brief study of insects and the dissection of the frog are used as a practical introduction to the course. Then follows a study of cell structure and cell division, a systematic study of representatives of the chief phyla or branches of the animal kingdom; and a study of the elements of embryology as illustrated by the development of the starfish and chick. Lectures, quizzes and laboratory work. Text-book required, Hertwig's Manual of Zoology.

ASTRONOMY

PROFESSOR LEAVENWORTH, MR. BURNS

1. GENERAL ASTRONOMY — PROFESSOR LEAVENWORTH

Three credits (three hours per week) — Second semester

Open to juniors, C. E. course. Preparation: course M 4.

A study of the general principles of astronomy illustrated by lantern slides and telescopic observations. Lectures, recitations, problems in practical astronomy.

BOTANY

PROFESSOR CLEMENTS, ASSISTANT PROFESSOR TILDEN, ASSISTANT PROFESSOR ROSENDAHL, MR. HUFF

1. GENERAL BOTANY — PROFESSOR CLEMENTS, ASSISTANT PROFESSORS TILDEN AND ROSENDAHL

Six credits (four hours laboratory, two lectures per week)

Open to sophomores, C. E. course. — First and second semesters

A general survey of the subject, comprising laboratory study of the evolution and relationships of plants, greenhouse study of their behavior and structure, and field work in the identification and distribution of flowering plants. Lectures and quizzes, laboratory, greenhouse and field work.

11. INDUSTRIAL BOTANY — ASSISTANT PROFESSOR TILDEN

Six credits (six hours per week) — Both semesters

Open to technical students who have completed course 1.

A study of the origin, distribution and cultivation of plants yielding products of economic value, the nature and use of these products, and the processes by which they are obtained from the plants. Lectures, demonstrations, topics and laboratory work.

13. WATER SUPPLY BOTANY — ASSISTANT PROFESSOR TILDEN
Three credits (six hours per week) — Second semester
Open to those who have completed course 1.

A technical course for municipal, sanitary and reclamation engineers involving the determination of the forms prevalent in storage waters and in water supplies, and their abundance, together with methods of control or prevention. Lectures and references, laboratory and field work.

14. TIMBER AND TIMBER DISEASES — MR. HUFF
Three credits (six hours per week) — First semester
Open to those who have completed course 1.

A study of the source and structure of the important timbers with particular reference to their mechanical properties, together with a study of timber diseases, and methods of timber preservation. Lectures, laboratory work, and references.

CHEMISTRY

PROFESSOR FRANKFORTER, PROFESSOR SIDENER, ASSISTANT PROFESSOR NICHOLSON, ASSISTANT PROFESSOR HARDING

3. QUALITATIVE ANALYSIS — ASSISTANT PROFESSOR NICHOLSON
Six credits (six hours per week) — First and second semesters
Required of all sophomores.

The course includes general reactions of the metals and their qualitative separation; reaction and identification of acids, followed by practical problems in qualitative analysis. Lectures and laboratory work.

4. CHEMISTRY OF MATERIALS OF ENGINEERING — PROFESSOR SIDENER
Three credits (one lecture or recitation and four hours laboratory per week) — First semester
Required of all juniors. Preparation: course 3.

Includes technical analysis of materials of engineering, with special references to iron and steel. Lectures and laboratory work.

5. VOLUMETRIC ANALYSIS — PROFESSOR SIDENER
First semester
Three credits. Preparation: course 3.

6. WATER ANALYSIS — PROFESSOR FRANKFORTER
Three credits — First semester
Optional, post senior year C. E. course.

Sanitary chemical analysis of water. Samples collected by the students tested for nitrogen in its several conditions, chlorine, color, turbidity, hardness.

7. FUEL AND GAS ANALYSIS — ASSISTANT PROFESSOR HARDING
The work includes an exhaustive chemical examination of fuels and the common gases, with a determination of their light and heat efficiencies. Lectures and laboratory work

CIVIL ENGINEERING

HYDRAULIC, MUNICIPAL AND SANITARY ENGINEERING; SURVEYING

ASSISTANT PROFESSOR BASS, MR. CUTLER, MR. NELSON

1. SURVEYING — ASSISTANT PROFESSOR BASS, MR. CUTLER
Three credits, (six hours per week) — First semester
Required of juniors, C. E. course.
Recitations, lectures and illustrative problems relating to chaining, field problems employing chain; methods of keeping field notes; determination of area—D. M. D. and rectangular coördinate method. Methods of laying out and dividing land, including the public land surveys of the United States. The care, proper use and adjustment of all instruments used are treated in field exercises. Chain, compass and transit surveys are made and circuits of level-lines run by each party. All surveys made in the field are platted and areas computed. Solution of problems and usual office reduction of all field notes.

2. SURVEYING AND TOPOGRAPHY — MR. CUTLER, MR. NEWHALL
Three credits, (six hours per week) — Second semester
Required of seniors, C. E. course.
Hydrographic, mining and municipal surveying. Use of plane-table, barometers: aneroid and mercurial. Determination of meridian by solar observation. Computation of earthwork.

3. TOPOGRAPHY — ASSISTANT PROFESSOR BASS, MR. NEWHALL, MR. NELSON
Four credits, (eight hours) — Second semester
Junior C. E. course. Preparation: course 1.
A complete topographical survey is made and platted. The survey consists of a triangulation, followed by stadia and sketching.

4. SURVEYING — ASSISTANT PROFESSOR BASS
One credit, (one to two hours per week)
Elective, open to students in mechanical and electrical engineering courses.
A short course in the use, care and adjustment of surveying instruments.

5. HYDRAULIC ENGINEERING — ASSISTANT PROFESSOR BASS
Four credits, (eight hours per week) — First semester
Post senior C. E. course.
Lectures and recitations followed by field problems in municipal water supply. Water power, irrigation, land drainage and river and harbor improvements.

6. MUNICIPAL ENGINEERING — ASSISTANT PROFESSOR BASS
Four credits, (eight hours per week) — Second semester
Post senior C. E. course.
A continuation of course 5 in municipal water supply and sewerage. Adaptation of various structures to the solution of problems of hydraulics and public hygiene. Maintenance and operation by municipal governments. House drainage, garbage disposal, heating and ventilating of public buildings, are also reviewed.

7. HIGHWAYS AND PAVEMENTS — ASSISTANT PROFESSOR BASS
Three credits, (four to five hours per week) — Second semester
Required of juniors, C. E. course.
Lectures, recitations and field work relating to the economics, location, construction and maintenance of public highways and pavements.

THESIS — ASSISTANT PROFESSOR BASS
Five credits, (ten hours per week) — Second semester
Post senior year.
Excellent opportunities are offered for experimental work through the connection of the department with the State Board of Health.

RAILWAY ENGINEERING

MR. CUTLER, MR. NELSON

9. RAILWAY ENGINEERING — MR. CUTLER, MR. NELSON
Four credits, (eight hours per week) — Second semester
Required of seniors, C. E. course.
Study of mathematics of curves and earthwork, with application to problems in location and construction. Especial emphasis is laid upon the execution in the field of practical problems. Text book required—Railroad Curves and Earthwork, Allen.

10. RAILWAY ENGINEERING — MR. CUTLER, MR. NELSON
Four credits (eight hours per week) — First semester
Post senior, C. E. course.
A continuation of course 9 with application to problems of the railroad spiral, switches, turnouts, overhaul, etc. A preliminary and final location survey is made of about four miles of relocation, including profiles, maps, mass diagrams, descriptions of right-of-way, and estimate of cost. Text-books,—Railroad Curves and Earthwork, Allen; Railroad Spiral, Searles.

11. RAILWAY STRUCTURES — MR. CUTLER
Three credits, (six hours per week) — First semester
Post senior C. E. course. Optional.
Recitations and drawing room work relating to the design and construction of railroad buildings and structures, such as wooden trestles, coaling stations, water stations, engine houses, etc. The object is to make the student familiar with all the principal structures which come under the supervision of the maintenance-of-way department of a modern railroad. Text-book—Track and Track Work, Tratman.

12. RAILWAY ECONOMICS — MR. CUTLER
Four credits, (four hours per week) — Second semester
Post senior, C. E. course. Optional.
Recitations and lectures covering the following subjects: economics of railroad location with a critical study of train resistance, influence of grade, curvature, distance, rise and fall, signaling, yards and stations, valuation of railroad property. Text-book, —Economics of Railroad Construction, Webb.

STRUCTURAL ENGINEERING

PROFESSOR CONSTANT, MR. NEWHALL

20. STRESSES IN FRAMED STRUCTURES — PROFESSOR CONSTANT, MR. NEWHALL
Three credits, (three hours per week) — First or second semester
Open to senior students pursuing the course in mechanics of materials.
Stresses in simple structures by graphic and algebraic methods. Mill building specifications and proportioning of parts. Design of roof trusses, simple beams, girders and roof truss bents. Recitations, problems and plates. Ketchum's Steel Mill Buildings. Handbooks of Steel Manufacturers.

21. STRESSES IN FRAMED STRUCTURES — PROFESSOR CONSTANT, MR. NEWHALL
Three credits, (three hours per week) — Second semester
Continuation of course 20, with special reference to stresses in bridge trusses under moving loads. Recitations, problems and plates. Burr and Falk's "Influence Lines"

22. STRUCTURAL DESIGN — PROFESSOR CONSTANT
Five credits, (ten hours per week) — First semester
Post senior. Open to students who have completed courses 20 and 21
Theory and design of steel structures, including mill buildings, railway and highway bridges, standpipes and towers and other problems of structural interest. Lectures, problems and design. Merriman and Jacoby's Roofs and Bridges, Part III. Standard specifications.

23. STRUCTURAL DESIGN — PROFESSOR CONSTANT
Five credits, (ten hours per week) — Second semester
Post senior.
Continuation of course 22. With special reference to the design of steel railway bridges and the theory and design of steel arch bridges. Lectures, problems and designs. Merriman and Jacoby's Roofs and Bridges, Part IV.

24. SWING BRIDGES — PROFESSOR CONSTANT
Four credits, (eight hours per week) — Second semester
Post senior, C. E. course. Optional.
Theory and design of swing and bascule bridges, with special attention to the design of the operating machinery. Moving structures. Lectures, problems and design. Merriman and Jacoby's Roofs and Bridges, Part IV. Reference works on machine design. Students intending to take this course are advised to elect machine design, M. E. 13, first semester, senior year.

25. MASONRY CONSTRUCTION — PROFESSOR CONSTANT
Five credits, (eight hours per week) — First semester
Post senior. Preparation: course 20.
Foundations, design and use of cribs, cofferdams and pneumatic caissons, pressure of earth, design of retaining walls, piers, abutments, dams and chimneys. Properties of stones, bricks, cement and concrete. Recitations and lectures, two hours per week; drawing room work, six hours per week. Fowler's Deep Foundations; Taylor and Thompson's Concrete and Reinforced Concrete; Howe's Retaining Walls for Earth; and current periodical engineering literature.

26. REINFORCED CONCRETE — PROFESSOR CONSTANT
Three credits, (six hours per week) — Second semester
Post senior. Preparation: course 25.
Theory and design of reinforced concrete beams, slabs and columns; application of reinforced concrete to buildings, dams, retaining walls and arches. Lectures, problems and design. Turneaure and Maurer's Principles of Reinforced Concrete.

DRAWING AND DESCRIPTIVE GEOMETRY

PROFESSOR KIRCHNER, MR. ROWLEY, MR. ROSE, MR. CLARK, MR. NELSON

1. DRAWING — MR. ROSE, MR. CLARK, MR. NELSON
Three credits, (six hours per week) — First semester
Required of all freshmen, in conjunction with course 3.

The elements of general drafting. Mechanical drawing as a language. Lines, views, dimensions, standards, signs, abbreviations and explanatory notes.

Sketching, lettering, tracing and blue printing. Representation of details of machines and structures, and the interpretation of working-drawings.

2. DRAWING — MR. ROSE, MR. CLARK, MR. NELSON
Two credits, (four hours per week) — Second semester
Required of all freshmen. Preparation: courses 1, 3.
Continuation of course 1.

3. DESCRIPTIVE GEOMETRY — PROFESSOR KIRCHNER
One credit, (one hour per week) — First semester
Required of all freshmen. Open to students pursuing course 1.

Central projection and special cases; principles and applications. Representation of lines, planes and solids, and of their relations; tangencies, intersections and developments.

Recitations, lectures and the solution of problems.

4. DESCRIPTIVE GEOMETRY — PROFESSOR KIRCHNER, MR. ROWLEY, MR. ROSE
Two credits, (two hours per week) — Second semester
Required of all freshmen.
Preparation, courses 1, 3.
Continuation of course 3.

5. DRAFTING — PROFESSOR KIRCHNER, MR. ROWLEY, MR. ROSE
Six credits, (six hours per week) — First and second semesters
Required of all sophomores. Preparation: courses 2, 4.

Graphics, machine drafting, structural drafting, and topography. Instruction in drafting room methods.

(a) Civil engineering course.
(b) Mechanical and electrical engineering courses.

6. ELEMENTS OF ARCHITECTURE — PROFESSOR KIRCHNER
Three credits — First semester
Required of juniors, C. E. course. Preparation: course 5.

The orders and other fundamental forms; principles of design, the analysis of the characteristics of style, application of the elements in design.

7. TECHNICAL DRAWING — PROFESSOR KIRCHNER, MR. NELSON
Six credits (six hours per week) — First and second semesters
Required of freshmen, analytical chemistry course.

Theoretical and practical graphics, the reading and making of working plans. Projection, sketching, lettering, conventions, renderings and translations.

FOR GRADUATES

10. DESCRIPTIVE GEOMETRY AND APPLICATIONS
11. PROJECTIVE GEOMETRY
12. PERSPECTIVE

ECONOMICS

PROFESSOR GRAY, PROFESSOR ROBINSON, ASSISTANT PROFESSOR RASTALL, MR. PHELAN, MR. COULTER

1. ELEMENTS OF ECONOMICS — PROFESSOR ROBINSON, ASSISTANT PROFESSOR RASTALL, MR. PHELAN, MR. COULTER

Three credits, (three hours per week) First or second semester

A thorough course in the elements of economic theory, with special reference to present day economic and social problems.

McVey's Outline and a text-book, supplemented by lectures and problems, with a weekly quiz.

8. ECONOMICS OF TRANSPORTATION AND COMMUNICATION PROFESSOR ROBINSON

Three credits, (three hours per week) Second semester

Required of juniors. Preparation: course 1.

A general course on the history and theory of transportation and communication, with special reference to the United States. Early routes and methods of migration and commerce. Causes determining the location of railways. Effect of steam and electricity in the consolidation of industries and of nations.

Signal systems, the post, telegraph and telephone. Parcels post and express service. Economic functions and relations of highways, interurban electric lines, steam railways, inland waterways and ocean transportation. The organization of ocean commerce.

Lectures, assigned readings and discussions.

9. RAILWAY PROBLEMS AND ADMINISTRATION PROFESSOR ROBINSON

Three credits, (three hours per week) Second semester

Required, post senior year, railway M. E. course, preparation: course 9 A.

An advanced course devoted to the study of railway problems and administration, including: (1), conditions effecting economy of operation; (2), passenger and goods traffic; (3), economic principles underlying the making of railway rates; (4), competition in relation to rate wars, discrimination between persons, places, and commodities, pooling, and various forms of combination; (5), the great railway systems of the United States; (6), regulation by the states and the federal government; (7), government ownership and operation of railways in Europe and Australasia. Lectures, assigned readings and special topics.

ELECTRICAL ENGINEERING

PROFESSOR SHEPARDSON, PROFESSOR SPRINGER, MR. RYAN, MR BURCH, MR. GRANT

1. APPLIED ELECTRICITY PROFESSOR SHEPARDSON

Three credits, (three hours per week) Second semester

Required of juniors E. E. course.

Preparation: course P. 5.

Outline of industrial uses of electricity; applications of Ohm's law; methods and calculation of wiring.

2. ELECTRICAL MACHINERY PROFESSOR SPRINGER

Six credits, (six hours per week) First and second semesters

Preparation: courses E. E. 1, P. 5, 6, and M. 5, 6.

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.

4. ELECTRIC POWER MR. RYAN

Three credits, (four hours per week) First or second semester

Required of seniors, C.E. course and School of Mines. Preparation: courses P. 5, 6.

Elements of theory and practice of electrical measurements, wiring, dynamos, motors and electric lighting. Twenty-four lectures and recitations and forty-eight

hours laboratory. Text-book: Norris, Introduction to the Study of Electrical Engineering.

5. ELECTRIC POWER — MR. RYAN
Six credits, (four hours per week) — First and second semesters
Required of seniors, M. E. and Chemical courses. Preparation: courses P. 5, 6.

An elementary study of the electrical problems involved in the generation, distribution, measurement and utilization of power. Lectures, recitations and laboratory work, supplemented by numerous practical problems. Text-book: Franklin and Estey, Elements of Electrical Engineering Practice.

6. ALTERNATING CURRENTS — PROFESSOR SHEPARDSON
Four and six credits, (two or three hours per week) — First and second semesters
Post senior year. Preparation: courses 1, 2.

Phenomena, measurement and use of alternating currents; theory of line, transformer, generator and motor; types of apparatus.

Text-book: Steinmetz, Alternating Current Phenomena.

7. ELECTRICAL ENGINEERING PRACTICE. Batteries — MR. RYAN
One credit, (one hour per week) — First semester
Post senior year. Preparation: course 2.

General theory of primary and secondary cells; types and methods of construction; commercial applications; operation of battery plants; construction and test of cells by students; test of a commercial plant. Text-book: Lyndon, Storage Battery Engineering.

8. ELECTRICAL ENGINEERING PRACTICE. Lighting — PROFESSOR SHEPARDSON
One credit, (one hour per week) — First semester
Post senior year. Preparation: course 2.

Comparison of different sources of light; photometry; physics of the arc; history, design and regulation of arc lamps; adaptation to constant current, constant potential and A. C. circuits; carbons; history, manufacture and economy of incandescent lamps; distribution of light.

9. ELECTRICAL ENGINEERING PRACTICE. Central Stations — MR. RYAN
Two credits, (two hours per week) — First or second semester
Post senior year. Preparation: courses 2, 6.

Preliminary surveys; choice of electrical systems; load diagrams; best units of power; comparison of steam, gas and water power; location, design and erection of station buildings; boilers, engines, dynamos, storage batteries, switch board and lines; operation and regulation; maintenance of plant; emergencies; examination of stations in Minneapolis and St. Paul.

10. ELECTRICAL ENGINEERING PRACTICE. Railways — MR. BURCH
One credit, (one hour per week) — Second semester
Post senior year. Preparation: course 2 or 4.

History and development; different systems of distribution; location and calculation of feeders; line and track construction; choice of motors, trucks, generators and engines; operation and repairs Text-book: Gotshall, Electric Railway Economics.

11. ELECTRICAL ENGINEERING PRACTICE. Transmission — PROFESSOR SHEPARDSON
One credit, (one hour per week) — Second semester
Post senior year. Preparation: courses 1, 2, 5.

Utilization of natural forces; various methods of transmission; theory of electric motor; power distribution with constant current; constant potential and alternating systems; design of line; study of particular plants.

12. ELECTRICAL ENGINEERING PRACTICE. Telegraph and telephone
PROFESSOR SHEPARDSON
One or two credits, (one or two hours per week) Second semester
Post senior year. Preparation: courses 1, 5.
Various systems and instruments used in local and long distance telegraph and telephony; design and construction of switchboards and lines; protection from inductive and other disturbances; police, fire alarm and district messenger systems.

13. ELECTROCHEMISTRY PROFESSOR SHEPARDSON
One or two credits (one or two hours per week) First or second semester
Post senior year.
Theoretical and experimental study of electrolytic and electrothermal processes.

14. ELECTRICAL DESIGN MR. RYAN
Three credits, (six hours per week) First semester
Post senior year. Preparation: courses P. 1, 2, E. E. 1, 2, and M. E. 13.
Problems in designing circuits, electro-magnets and dynamos; complete working drawings and specifications to accompany each design.

15. ELECTRICAL DESIGN MR. RYAN
Three credits, (six hours per week) Second semester
Post senior year. Preparation: courses 6, 14.
Design of a transformer, switchboard and other problems.

16. ELECTRICAL DESIGN MR. RYAN
Two credits, (four hours per week) Second semester
Post senior year. Preparation: courses 8, 14.
Designs, specifications and estimates for an electric light or power plant.

17. ELECTRICAL LABORATORY PROFESSOR SPRINGER
Six credits, (six hours per week) First and second semesters
Senior year. Preparation: courses P. 5, 6, and E. E. 1, 2.
Tracing circuits and locating faults; electrical engineering measurements; calibration of instruments; operation and characteristic curves of generators and motors. Lectures and practice.

18. ELECTRICAL LABORATORY PROFESSOR SPRINGER
Six credits, (six hours per week) First and second semesters
Post senior year.
Experimental study of alternating currents; regulation and efficiency tests of alternators, transformers, motors and rotaries; photometric tests of incandescent and arc lamps. Lectures and practice.

19. ELECTRICAL LABORATORY PROFESSOR SHEPARDSON, PROFESSOR SPRINGER
One or two credits, (two or four hours per week) First or second semester
Post senior year. Efficiency tests and special problems.

20. ELECTRICAL ENGINEERING MEASUREMENTS PROFESSOR SPRINGER
Application of measurements to electrical engineering practice.
Lectures and laboratory.

21. POWER PLANT OPERATION — ASSISTANT PROFESSOR RYAN, ASSISTANT PROFESSOR MARTENIS, MR. DIXON

One or two credits, (equivalent to two or four hours per week) — First or second semester

Post senior year, elective.

Practice in operation and care of gas producer, gas engine, boilers, engines, turbines, dynamos, battery, switchboards and auxiliary apparatus of the University lighting plant.

22. JOURNAL READING — PROFESSOR SHEPARDSON

Two credits — First and second semesters

Post senior year.

Weekly discussion of current electrical periodicals. The class meets monthly with the Minnesota Section of the American Institute of Electrical Engineers.

23. PRECISE ELECTRICAL ENGINEERING MEASUREMENTS — PROFESSOR SPRINGER

Preparation: course 19.

Lectures and laboratory work. Precise measurements of resistance, voltage, current, self-induction and capacity; standardization of measuring instruments. Open to limited number subject to approval.

24. ILLUMINATING ENGINEERING — PROFESSOR SHEPARDSON

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.

25. TELEPHONE ENGINEERING — PROFESSOR SHEPARDSON, PROFESSOR EDDY

Lectures and laboratory work. Theoretical and experimental study of telephonic apparatus; lines and line phenomena, including induction, transposition, loading coils, etc.

26. ALTERNATING CURRENT PHENOMENA — PROFESSOR SHEPARDSON

Lectures and laboratory work. Study of wave forms, transient phenomena, oscillographic investigations; tests of apparatus.

Candidates for the degree of electrical engineer are required to take courses 1, 2, 6, 14, 15, 17, 18, also 68 hours class room work selected from courses 7 to 13.

NOTE—Electives may be chosen from any courses given in the academic or engineering colleges for which the student has sufficient preparation. Attention is called to the following as desirable for electrical engineers.

Botany—Timber and timber diseases.

Chemistry—Quantitative analysis, fuel and gas analysis, electro-chemical analysis.

Civil engineering—Short course in surveying for seniors; masonry and construction, structural details; hydraulic engineering; railway economics.

Drawing—Advanced work.

Electrical engineering—Any courses not taken as required work (except 3, 4, and 5)

Geology—Mineralogy.

Language—English, French, German, Spanish.

Mathematics—Theory of turbines, hydraulic motors and wind engines; circular hyperbolic and elliptic functions; wave theories of light, heat and electricity; directional calculus, vector analysis, differential equations, least squares.

Mechanical engineering—Measurement of power, air compressors and motors,

shop work, heating and ventilation, machine design, railway technology, experimental laboratory, gas engines and producers.

Military science.

Physics—Advanced work on special problems.

Political science and economics—Money and banking, corporation finance, public finance, accounting, industrial problems.

ENGLISH

PROFESSOR SANFORD, MR. NICHOLS

1. ENGLISH — PROFESSOR SANFORD, MR. NICHOLS
Eight credits, (four hours per week) — First and second semesters
Required of all freshmen.

This course is planned with special reference to the needs of engineering students. Two hours a week will be given to the study of English composition, and two hours to the study of a general survey of English literature. Essays will be required every week.

While in the study of literature one object will be the general broadening of the mind by an acquaintance with the masterpieces of English prose and poetry, especial attention will be given to the work of those writers who have handled scientific subjects with clearness and power.

EXPERIMENTAL ENGINEERING

PROFESSOR KAVANAUGH, MR. SHOOP

1. MATERIALS TESTING LABORATORY — PROFESSOR KAVANAUGH, MR. SHOOP
Two credits, (lecture and laboratory) — First semester
Required of seniors. Open to those pursuing course M. 7.

Investigation of the strength and physical qualities of iron, steel, brass, copper, wood, belting, ropes, chains and cement. Supplemented by lectures on the various materials of construction and standard methods of testing.

2. STEAM LABORATORY — PROFESSOR KAVANAUGH, MR. SHOOP
Two credits, (lecture and laboratory) — Second semester
Required of senior E. E. Open to those pursuing course M. E. 20.

Valve setting, indicator practice, calibration of gages, calorimetry, efficiency of screws, hoists and other machines.

3. HYDRAULIC LABORATORY — PROFESSOR KAVANAUGH, MR. SHOOP
Two credits, (lecture and laboratory) — Second semester
Required of senior C. E. Open to those pursuing course M. 8.

Hydraulic measurements, calibration of weirs, nozzles, orifices and meters. Tests of water motors, rams, pulsometers, steam and power pumps and other hydraulic apparatus.

4. EXPERIMENTAL LABORATORY — PROFESSOR KAVANAUGH, MR. SHOOP
Three credits — Second semester
Required of senior M. E. Open to those pursuing courses M. 8 and M. E. 20.
Special modification of courses 2 and 3.

5 EXPERIMENTAL LABORATORY — PROFESSOR KAVANAUGH
Two credits — Second semester
Required of senior miners

Special modification of courses covering work in hydraulic measurements, gas and steam engine and boiler testing.

6. EXPERIMENTAL LABORATORY — PROFESSOR KAVANAUGH
Three credits — First semester
Required of post senior M. E. Preparation: course 4.
Calibration of dynamometers and measurement of power.
Testing lubricating value of oils. Tests of injectors and ejectors. Tests of of steam-turbines, steam-engines and boilers, and complete power and lighting plants.

7. EXPERIMENTAL LABORATORY — PROFESSOR KAVANAUGH
Two credits — First semester
Required of post senior E. E. Preparation: courses M. 8 and M. E. 20.
Hydraulic measurements. Tests of water motors, rams, steam and power pumps. Measurement of power. Tests of gas and steam engines, boilers and complete power and lighting plants.

8. EXPERIMENTAL LABORATORY — PROFESSOR KAVANAUGH
Three credits — First semester
Elective for post seniors. Preparation: course 1. Tests of the properties of cements, concrete and reinforced concrete. Strength of beams, columns, joints and framed structures.

9. GAS ENGINE LABORATORY — PROFESSOR KAVANAUGH
Three credits — Second semester
Required of post senior M. E. Preparation: courses M. E. 21 and Ex. E. 6. A continuation of course 6, also tests of gas, gasoline and hot-air engines; gas producers, air compressors, automobile and locomotive testing and special work.

10. EXPERIMENTAL LABORATORY — PROFESSOR KAVANAUGH
Two or four credits — Second semester
Elective for post seniors. Special research work and commercial tests.

FOR CLASSES GRADUATING IN 1910 AND 1911

1. MATERIALS TESTING LABORATORY; two credits. Required of juniors — First semester
2. STEAM LABORATORY; two credits. Required of juniors, E. E. and School of Mines. — Second semester
3. HYDRAULIC LABORATORY; two credits. Required of juniors, C. E.
4. EXPERIMENTAL LABORATORY; three credits. Required of juniors, M. E. — Second semester
5. EXPERIMENTAL LABORATORY; two credits. Required of seniors, School of Mines. — Second semester
6. EXPERIMENTAL LABORATORY; three credits. Required of seniors, M. E. — First semester
7. EXPERIMENTAL LABORATORY; three credits. Required of seniors, E. E. — First semester
8. EXPERIMENTAL LABORATORY; two credits; (elective) — First semester
9. GAS ENGINE LABORATORY; four credits, required of seniors, M.E. — Second semester
10. EXPERIMENTAL LABORATORY; two or four credits (elective) — Second semester

Description and prerequisites of the above courses as previously stated.

FRENCH AND SPANISH

PROFESSOR BENTON, PROFESSOR ANDRIST, ASSISTANT PROFESSOR FRELIN, MR. MELOM

1. BEGINNING — PROFESSOR ANDRIST, ASSISTANT PROFESSOR FRELIN

Six credits (three hours per week) — First and second semesters
Open to freshmen.
Fraiser and Squair's *French Grammar and Reader*, modern texts.

2. INTERMEDIATE FRENCH — PROFESSOR ANDRIST

Six credits (three hours per week) — First and second semesters
Prequisite, course 1.
Francois, *Advanced French Prose Composition:* modern texts will be read, including some of the works of Merimee, Daudet, Scribe, etc.

3. ADVANCED FRENCH GRAMMAR AND COMPOSITION — PROFESSOR ANDRIST

Six credits (three hours per week) — First and second semesters
Open to all who enter the University with two years of French.
Francois' *Introduction to French Composition:* readings from modern authors, including selections from Coppee, Feuillet, and Sandeau.

5. THE CLASSICAL PERIOD OF FRENCH LITERATURE — PROFESSOR BENTON

Six credits (three hours per week) — First and second semesters
Open to those who have completed course 2 or 3.
The reading of works and selections produced during the classical period of French literature, and conversations in French concerning the same. The works of Corneille, Racine, Moliere, La Fontaine, etc. Compositions.

11. BEGINNING SPANISH — MR. MELOM

Six credits (three hours per week) — First and second semesters
Monsanto and Languellier *Spanish Course-Josselyn.* Worman, First Spanish Book. Bransby's Spanish Reader.

12. INTERMEDIATE SPANISH — MR. MELOM

Six credits (three hours per week) — First and second semesters
Open to those who have completed F. 11.
First semester; Loiseaux, Spanish Composition. Brownell, *El Payaro Verde.*
Second semester: Gray's *Fortuna:* Alcaro's *El Captain Veneno.*

GEOLOGY AND MINERALOGY

PROFESSOR HALL, ASSISTANT PROFESSOR SARDESON

1 GEOLOGY — ASSISTANT PROFESSOR SARDESON

Three credits (three hours per week) — First semester
Required of seniors C. E. course.

A condensed course in physical and historic geology, for civil engineers. Geodynamics, structural geology, physiography, stratigraphic and historical geology are treated successively. Excursions to typical localities will supplement work done in the class room. Lectures and references.

GERMAN LANGUAGE AND LITERATURE

PROFESSOR MOORE, ASSISTANT PROFESSOR JUERGENSEN, ASSISTANT PROFESSOR BURKHARD, MR. WISCHKAEMPER

1. BEGINNING — ASSISTANT PROFESSORS JUERGENSEN AND BURKHARD, MR. WISCHKAEMPER

Six credits (three hours per week) — First and second semesters

Open to all.

Pronunciation, grammar, conversation and composition; selected reading in easy prose and verse.

3b. SCIENTIFIC INTERMEDIATE — ASSISTANT PROFESSORS JUERGENSEN AND BURKHARD, MR. WISCHKAEMPER

Six credits (three hours per week) — First and second semesters

Prerequisite, course 1.

This course is arranged to meet the peculiar needs of engineering students.

Text: Merckel's *Bilder aus der Ingenieurtechnik.*

4. PROSE AND POETRY — PROFESSOR MOORE, ASSISTANT PROFESSORS JUERGENSEN AND BURKHARD, MR. WISCHKAEMPER

Six credits (three hours per week) — First and second semesters

Open to all who enter the University with two years of German.

Meissner's *Aus deutschen Landen:* Goethe's *Gedichte:* Heine's *Buch der Lieder.* Geography, history and legend. Review of German grammar throughout the year This course may be supplemented.

7. ADVANCED SCIENTIFIC READING — ASSISTANT PROFESSORS JUERGENSEN AND BURKHARD

Six credits (three hours per week) — First and second semesters

Open to all who have taken course 3 or 4. Reading of scientific monographs and periodicals.

8. SEMINAR IN SCIENTIFIC READING — ASSISTANT PROFESSOR JUERGENSEN

Two credits (two hours per week)

Open to graduate students, and by permission of the department, to undergraduates who have completed course 7 or 9.

1909–10, the literature of evolution (Haeckel, Reinke et al).

1910–11, Psychology and philosophy (Windt etc).

MATHEMATICS AND MECHANICS

PROFESSOR EDDY, PROFESSOR HAYNES, PROFESSOR BROOKE, ASSISTANT PROFESSOR NEWKIRK, MR. FRARY

The ability to understand and apply mathematical processes readily is regarded as essential to the engineer. The aim of these courses is to cultivate this ability so far as possible. To this end special emphasis is laid upon two things: elucidation of principles and drill upon their applications, as furnishing the only sure basis for a thorough technical and professional training Courses 1 to 8 inclusive must be taken in the order indicated, and in order to enter upon the work of any year the student must have attained a passing mark on all the required courses in preceding years.

1. HIGHER ALGEBRA AND ANALYTICAL TRIGONOMETRY PROFESSOR HAYNES, ASSISTANT PROFESSOR NEWKIRK, MR FRARY

Five credits (five hours per week) First semester

Required of all freshmen. Theory of exponents, series, undetermined coefficients, determinants, theory of equations, graphs, logarithms, trigonometric transformations.

2. PLANE AND SPHERICAL TRIGONOMETRY AND ANALYTICAL GEOMETRY TO CONIC SECTIONS PROFESSOR HAYNES, ASSISTANT PROFESSOR NEWKIRK, MR. FRARY

Five credits (five hours per week) Second semester

Required of all freshmen. Properties of plane triangles and their solution by logarithmic tables and the slide rule; general properties and solution of spherical triangles; introduction to analytical geometry, transformation of co-ordinates, the right line and circle.

3. ANALYTICAL GEOMETRY OF TWO AND THREE DIMENSIONS PROFESSOR HAYNES, PROFESSOR BROOKE

Four credits (four hours per week) First semester

Required of all sophomores. Conic sections and other loci; the point, line, plane and quadric.

4. DIFFERENTIAL AND INTEGRAL CALCULUS PROFESSOR HAYNES, PROFESSOR BROOKE

Four credits (four hours per week) Second semester

Required of all sophomores. Differentiation and integration, expansion in series, maxima and minima, differential properties of curves and surfaces, indeterminate forms, evolutes and envelopes, curve tracing.

5. CALCULUS AND MECHANICS PROFESSOR HAYNES, PROFESSOR BROOKE, ASSISTANT PROFESSOR NEWKIRK

Three credits (three hours per week) First semester

Required of all juniors. Integration; rectification, quadrature, cubature, mean value, center of pressure, center of gravity, moments of inertia, differential equations of motion, linear differential equations.

6. ANALYTICAL MECHANICS PROFESSOR HAYNES, PROFESSOR BROOKE, ASSISTANT PROFESSOR NEWKIRK

Three credits (three hours per week) Second semester

Required of all juniors. Before registration for this course the student must pass the required physics of sophomore year in addition to the required mathematics, courses 1 to 5 inclusive.

Statics and dynamics, rectilinear, circular and harmonic motion, and curvilinear motion in general, dynamics of rigid bodies, impact, work and energy.

7. STRENGTH AND RESISTANCE OF MATERIALS PROFESSOR EDDY, PROFESSOR BROOKE, ASSISTANT PROFESSOR NEWKIRK

Prerequisite, course 6.

Four credits (four times per week) First semester

Required of all seniors. Mechanical and elastic properties of materials of construction; beams, shafts, columns, reinforced concrete, hollow cylinders and spheres, rollers, plates; theory of internal stress.

8. HYDRAULICS AND PUMPING MACHINERY PROFESSOR EDDY, PROFESSOR BROOKE, ASSISTANT PROFESSOR NEWKIRK

Prerequisite, course 6.

Four credits (four times per week) Second semester

Required of all seniors. Laws of equilibrium, pressure and flow of liquids; theory of the action of pumps.

9. THERMODYNAMICS OF STEAM AND GAS ENGINES — PROFESSOR EDDY
Three credits (three times per week) — First semester
Required of all candidates for degrees in mechanical and electrical engineering. Prerequisite, course 8. The mechanical theory of heat as applied to steam, oil, gas and hot air engines and to compressors, including use of steam tables, entropy diagrams. etc.

10. WATER TURBINES — PROFESSOR EDDY
Two credits (two times per week) — Second semester
Required of all candidates for degrees in mechanical and electrical engineering except those who elect either railway engineering or telephony. Theory of the operation, construction and regulation of turbine wheels.

11. STEAM TURBINES — PROFESSOR EDDY
Two credits (two times per week) — Second semester
Open to all who have had course 9 and are pursuing course 10.
Various types of turbines, velocity, impulse, and reaction; nozzles, vanes, discs, bearings, governors, thermodynamic analysis and efficiency.

12. REFRIGERATING MACHINERY — PROFESSOR EDDY
Two credits (two hours per week) — Second semester
Open to those who have had course 10. The course will be given when a sufficient number apply.
Ammonia compression and absorption machines, compressed air, carbonic acid, etc.

FOR GRADUATES

Courses in the following related subjects in mathematics, mathematical physics and theoretical mechanics are open to those who have had sufficient preparation, but they are primarily intended for graduates.

13. Differential Equations.
14. Analytical Statics and Potential Functions
15. Spherical Harmonics
16. Theory of Electricity and Magnetism
17. Analytical Theory of the Conduction of Heat
18. Theory of Elasticity and Sound
19. Electro-magnetic Theory of Light
20. Hydrodynamics and Fluid Motion
21. Dynamics of Rigid Bodies
22. Elliptic Functions
23. Theory of Functions of the Complex Variable
24. Directional Calculus, Vector Analysis, Determinants
25. Kinetic Theory of Gases

FOR CLASSES GRADUATING 1910, 1911

7′. STRENGTH AND RESISTANCE OF MATERIALS — PROFESSOR EDDY
Five credits, (five hours per week) — First semester
Required of all juniors in the civil engineering course. Before registration for this course the student must pass the required physics of sophomore year in addition to the required mathematics of the two preceding years. Bars, beams, shafts,

columns, reinforced concrete, hollow cylinders and spheres, rollers and plates and the general theory of internal stress.

7a′. APPLIED MECHANICS PROFESSOR BROOKE, ASSISTANT PROFESSOR NEWKIRK
Five credits, (five hours per week) First semester
Required of all juniors in the mechanical and electrical engineering courses. Prerequisites the same as for course 7′. The principles of statics and dynamics, and the mechanics of the matherials of construction.

8′. HYDRAULICS AND PUMPING MACHINERY PROFESSOR EDDY, PROFESSOR BROOKE, ASSISTANT PROFESSOR NEWKIRK
Five credits, (five hours per week) Second semester
Required of all juniors. Prerequisite, course 7′ or 7a′. Laws of the equilibrium, pressure and flow of liquids; theory of the action of pumps, compression and flow of gases.

9′. THERMODYNAMICS OF STEAM AND GAS ENGINES PROFESSOR EDDY
Three credits, (three hours per week) First semester
Required of all candidates for degrees in mechanical and electrical engineering. Prerequisite, course 8′. 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.

10′. WATER TURBINES PROFESSOR EDDY
Two credits, (two hours per week) First semester
Required of all candidates for degrees in mechanical and electrical engineering, xcept those who elect either railway engineering or telephony. Theory of the operation, construction and regulation of turbine wheels.

11′. STEAM TURBINES PROFESSOR EDDY
Two credits, (two hours per week) Second semester
Open to all who have had courses 9′ and 10′. Various types of turbines, velocity, impulse and reaction; nozzles, vanes, discs, bearings, governors, thermodynamic analysis and efficiency.

12′. REFRIGERATING MACHINERY PROFESSOR EDDY
Two credits (two hours per week) Second semester
As previously stated.

MECHANICAL ENGINEERING

PROFESSOR FLATHER, ASSISTANT PROFESSOR MARTENIS, MR. SHIPLEY, MR. RICHARDS, MR. HERRICK, MR. PETERSON, MR. QUIGLEY, MR. UBRICH

SHOP WORK

1. CARPENTRY AND PATTERN MAKING MR. RICHARDS
Four credits (six hours per week, twenty-four weeks)
First and second semesters
Required of all freshmen.
Wood working, use of tools; lathe and bench work. Patterns for moulding, core boxes, flasks. Lectures and practice.

2. BLACKSMITHING MR. SHIPLEY AND MR. QUIGLEY
Two credits (six hours per week, twelve weeks) First and second semesters

Required of all freshmen.
Use of tools, forging, welding, tool dressing, tempering. Lectures and practice.

3. FOUNDRY PRACTICE — MR. PETERSON
Three credits (six hours per week) — First and second semesters
Required of all M. E. and E. E. sophomores.
Moulding, casting, mixing metals, brass work and core making.
Shop practice, recitations and lectures.

4. MACHINE AND BENCH WORK — MR. SHIPLEY
Three credits (six hours per week) — First and second semesters
Required of all M. E. and E. E. sophomores.
Chipping, filing, machine work. Lectures and practice.

5. TOOL CONSTRUCTION — MR. SHIPLEY
Four credits (eight hours per week) — First semester
Required of juniors, M. E. course. Preparation: course 5.
Tools, taps, reamers, cutters and other special work. Lectures and practice.

6. MACHINE CONSTRUCTION — MR. SHIPLEY
Four credits (eight hours per week) — Second semester
Required of juniors, M. E. course. Preparation: course 5.
Gear cutting, finishing, machine construction. Lectures and practice.

7. CARPENTRY, JOINERY AND WOOD CARVING — MR. RICHARDS
Four credits (eight hours per week) — First or second semester
Open to all students.
A course in wood working designed with special reference to the needs of teachers of manual training.

8. MACHINE CONSTRUCTION — MR. SHIPLEY
Four credits (eight hours per week) — First or second semester
Elective. Open to seniors.
Construction of patterns and machine work for special apparatus or machinery designed by the students.

9. SHOP ECONOMICS — PROFESSOR FLATHER
Two credits (two hours per week) — Second semester
Senior elective.
Shop and factory organization and management; cost systems.

10. POWER PLANT OPERATION — ASSISTANT PROFESSOR MARTENIS, ASSISTANT PROFESSOR RYAN, MR. DIXON
One credit (equivalent to two hours per week) — First or second semester
Elective, post senior year.
Operation and maintenance of gas producers, gas engines, boilers, engines, steam turbines and accessory apparatus. Smoke prevention.

MACHINE DESIGN

11. PRINCIPLES OF MECHANISM — ASSISTANT PROFESSOR MARTENIS
Three credits (three hours per week, lectures and recitations) — First semester
Required of juniors, M. E. and E. E. course. Preparation: course M. 4.
The transmission of motion without consideration of the strength of parts. Gear wheels, linkages, belts, screws, epicyclic trains, parallel motions, quick-return movements.

12. KINEMATICS AND ELEMENTARY MACHINE DESIGN
ASSISTANT PROFESSOR MARTENIS
Three credits (six hours per week) Second semester
Required of juniors, M. E. and E. E. courses. Preparation: course M 4.
Graphical diagrams of the paths, speeds and accelerations of important mechanisms; centroids, analysis of mechanisms; construction of cams; roulettes, tooth profiles; kinematic pairs; machine parts.

13. MACHINE DESIGN PROFESSOR FLATHER, ASSISTANT PROFESSOR MARTENIS
Five credits (ten hours per week) First semester
Required of seniors, M. E. and E. E. courses. Open only to students pursuing course M. 7.
Calculation and design of such machine parts as fastenings, bearings, rotating pieces, pulleys and spur gearing. Recitations, lectures and drawing-room practice.

14. MACHINE DESIGN PROFESSOR FLATHER, ASSISTANT PROFESSOR MARTENIS
Three credits (six hours per week) Second semester
Required of seniors, M. E. course. Open only to those pursuing course 20.
Continuation of course 13. Rope driving; bevel gears, spiral gears. Also application of graphical methods to the design of valve-gears and link motions. Zeuner diagrams, indicator cards. Lectures and drawing-room practice.

15. MACHINE DESIGN PROFESSOR FLATHER
Four credits (eight hours per week) First semester
Required, post senior year, M. E. course. Preparation: courses 14, 19.
Steam engine. Calculations and working drawings for a high speed automatic steam engine. Theoretical diagrams and determination of details.
Gas engine. An alternative course in gas engine design is offered those who have completed course 21.

16. MACHINE DESIGN PROFESSOR FLATHER
Four credits (eight hours per week) Second semester
Required, post senior year, M. E. course. Preparation: course 13.
Original designing, including machinery for changing size and form. Boiler design, cranes, pumping and transmission machinery and engineering appliances. Lectures, problems and drawing-room practice.

17. TOOL DESIGN PROFESSOR FLATHER
Two to four credits (four or eight hours per week) First or second semester
Post senior year, elective.
Preparation: courses 6, 13.
Design of special tools for manufacturing interchangeable parts; jigs and milling fixtures.

18. ENGINEERING DESIGN PROFESSOR FLATHER
Two or four credits (four or eight hours per week) First or second semester
Elective. Preparation: courses 19, 20.
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; water powers; power distribution, dynamos and motors; pumps, shafting, piping and accessory plant.

STEAM ENGINEERING AND PRIME MOVERS

19 STEAM BOILERS ASSISTANT PROFESSOR MARTENIS
One credit (one hour per week) First semester

Senior year. Open only to students pursuing course M. 7.

Application of theory and practice in the design and construction of steam boilers, chimneys, boiler settings, and accessories, smoke prevention, mechanical stokers; methods of operating boilers with safety and economy.

20. STEAM ENGINE — PROFESSOR FLATHER
Three credits, (three hours per week) — Second semester
Senior year. Preparation: course M. 7.

Mechanics of the steam engine. Work in the cylinder; effect of reciprocating parts; steam distribution. Mechanism of the steam engine. A study of the details of modern steam engines. Valves and valve gears. A study of the slide valve, link motions, and other reversing gear; automatic cut-off gears and the Zeuner diagram. The steam engine indicator. Principles and operation of the instrument, indicator rigging; indicator cards; compounding.

21. GAS ENGINES AND PRODUCERS — MR. HERRICK
Two credits, (two hours per week) — Second semester
Senior year.

Principles of operation of two cycle and four cycle engines; cylinder construction and arrangement; valve gears and starting mechanisms; system of speed control, ignition and cooling. Application of the indicator and consideration of indicator diagrams.

A study of the power-gas producer including suction and pressure types for various fuels; construction and operation of the generator and accessory apparatus. Application to various industrial purposes. Recitations and lectures.

22 MECHANICAL ENGINEERING — PROFESSOR FLATHER
(a) Two credits (two hours per week) — First semester
Post senior. Preparation: course M. 8.

Measurement of power. A study of the methods employed in measuring power. Dynamometers. Prony brakes; measurement of water power; water meters; weir measurement, flow of water in pipes; measurement of electric power, efficiency of motors, power required to drive machine tools and shafting. Recitations and lectures.

(b) Two credits (two hours per week) — Second semester
Elective, post-senior. Preparation: course M. 8.

Air compressors and motors, and the transmission of power by compressed air. Recitations and lectures.

23. MECHANICAL ENGINEERING — ASSISTANT PROFESSOR MARTENIS
Three credits (six hours per week) — First semester
Elective. Post senior year.

Heating and ventilation. Principles of heating and ventilation. Construction and operation of heating apparatus. Steam, hot water, exhaust, vacuum and fan systems. Lectures, recitations and design.

Seminar. Open to seniors and post seniors once a week.

RAILWAY MECHANICAL ENGINEERING

The following courses are available to students desiring to preparethemselves for special work in railway engineering.

24. RAILWAY TECHNOLOGY — ASSISTANT PROFESSOR MARTENIS
Two credits (four hours per week) — First semester
Post senior. Railway M. E. course.

The object of this course is to familiarize the student with the practical details

of construction of locomotives and consists in part of a systematic course of visits to the various railroad shops in the vicinity; lectures and recitations.

25. RAILWAY DESIGN PROFESSOR FLATHER, ASSISTANT PROFESSOR MARTENIS
Eight credits (eight hours per week) First and second semester
Post senior. Preparation: course 24.
(a) Of link and valve motions. Continuation of course 12, with special applications of the Stephenson link.
(b) Of locomotives and car details.
(c) Of the locomotive boiler.
(d) Of assembled parts.

26. LOCOMOTIVE CONSTRUCTION PROFESSOR FLATHER
Two credits (two hours per week) Second semester
Post senior. Preparation: course 24.
Lectures, reading and recitations on design and construction of locomotives, supplementing course 24. This treats,
(a) Of parts not involving the boiler and the use of steam; but including the carriage, as frames, springs and equalizing arrangements, running gear, brakes, trucks, lubrication.
(b) Of locomotive boilers and connected parts. Types, proportions, grates, flues, smoke-box arrangements and stacks, riveted joints, bracing and staying. Lagging, smoke prevention.
(c) Of the locomotive engine. Details, heat insulation, cylinder proportion for various types, weight on drivers, special service; crank effort diagrams with inertia of reciprocating parts, cylinder and receiver ratios for compound engines, starting valves for compounds.

27. LOCOMOTIVE ROAD TESTING PROFESSOR FLATHER
Post senior. Second semester

28. SPECIFICATIONS PROFESSOR FLATHER
One credit (one hour per week) Second semester
Post senior year, M. E. course.
A study of engineering specifications. Classes of specifications; essential features; clauses; details. Examples. Lectures, recitations and practice in writing specifications.

FOR GRADUATES

Courses offered in:
Engineering design.
Experimental investigation.
Railway engineering.

PHYSICS

PROFESSOR JONES, PROFESSOR J. ZELENY, PROFESSOR A. ZELENY, ASSISTANT PROFESSOR ERIKSON, MR. KOVARIK, MR. MCKEEHAN

5. MECHANICS OF SOLIDS AND FLUIDS PROFESSOR JONES, PROFESSOR J. ZELENY, PROFESSOR A. ZELENY, ASSISTANT PROFESSOR ERIKSON, MR. KOVARIK MR. MCKEEHAN
Four credits (three recitations, one lecture or two hours laboratory) First semester
Open to those who have completed courses M. 1, 2.

Required of sophomores.

The course consists of a thorough drill in the elementary principles of mechanics. Numerous simple problems are taken up to illustrate the principles. Laboratory work will continue through the first part of the semester and will then be replaced by experimental lectures.

6. HEAT, MAGNETISM AND ELECTROSTATICS — PROFESSOR JONES, PROFESSOR J. ZELENY, PROFESSOR A. ZELENY, ASSISTANT PROFESSOR ERIKSON, MR. KOVARIK

Four credits (one lecture, two recitations and two hours laboratory) — Second semester

Open to those who have completed course 5.

Required of sophomores.

The fundamental principles of the subjects are studied, mainly from the experimental side. The laboratory work consists of the measurement of the most important quantities involved, and the lectures aim to illustrate the various phenomena which are studied.

7. ELECTROKINETICS — PROFESSOR JONES, PROFESSOR J. ZELENY, PROFESSOR A. ZELENY, ASSISTANT PROFESSOR ERIKSON, MR. KOVARIK

Four credits (one lecture, two recitations and two hours laboratory) — First semester

Open to those who have completed course 6. Required of juniors.

A study is made of the phenomena accompanying the passage of electricity through solids, liquids and gases, and of the various laws which govern such discharges. Not only are the basic principles of electrical engineering taken up, but a brief study is made of ionization, the X-rays, radioactivity, electric waves and wireless telegraphy. Measurements of the various electrical quantities are made in the laboratory.

8. SOUND AND LIGHT — PROFESSOR JONES, PROFESSOR J. ZELENY, ASSISTANT PROFESSOR ERIKSON, MR. KOVARIK

Four credits (one lecture, two recitations and two hours laboratory) — Second Semester

Open to those who have completed course 5. Required of juniors.

The course consists of a study of wave motion and the various phenomena of sound and light. The lectures are profusely illustrated with experiments showing the various effects studied. The laboratory work is aimed to aid the student to a better insight of some of the relations which obtain in the subjects.

9. ADVANCED ELECTRICAL MEASUREMENTS — PROFESSOR A. ZELENY

One credit (two hours laboratory work) — Second semester

Open to those who have completed course 7.

Required of juniors, E. E. course.

This course is devoted mainly to the study and measurements of capacity, inductance and magnetic induction, and gives a thorough knowledge of the accurate determination of these quantities.

FOR CLASSES GRADUATING IN 1910–1911

The mathematics of the freshman year is required as preparation for all courses in this department.

2. ELECTRICAL MEASUREMENTS — PROFESSOR A. ZELENY

Three credits (one lecture or recitation and four hours laboratory per week)
First semester

ADVANCED LABORATORY WORK — PROFESSOR JOHN ZELENY
Open to those who have completed course 2.

MILITARY SCIENCE AND TACTICS

1. MILITARY DRILL — CAPTAIN SIGERFOOS
(Three hours per week) — First and second semesters

Drill is required of all men in the freshman and sophomore classes.

Freshman—Practical instruction in schools of the soldier, company and battalion; signals, ceremonies; schools of the cannoneer and battery.

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.

For instruction in military drill and administration the students are organized into a corps of cadets, consisting of four batallions of infantry, a band and a platoon of artillery.

A uniform of prescribed pattern is worn by all cadets during drill.

The uniform consists of blouse, trousers and cap, modelled after the U. S. Military Academy cadet uniform, and costs in Minneapolis about $15.

Millitary drill may be taken voluntarily by others outside of the freshman and sophomore classes: and to encourage this, as it is considered beneficial, not only to the individual student, but to the State generally, the extra work is encouraged by allowing a year's drill to count as a two-hour credit for one semester, but no credit will be allowed for such drill for less than one year.

2. MILLITARY SCIENCE — CAPTAIN SIGERFOOS
(Two hours per week) — Second semester
Optional with the seniors and juniors.

Junior, senior—Theoretical instruction—Advance and rear guards, outposts reconnaissance, camping, duties of company commander, articles of war, records.

This work when satisfactorily completed taken in connection with the year's drill will give a four-hour credit for the semester.

Military instruction is intended to be so conducted as to develop a soldier-like bearing and foster a spirit of gentlemanly courtesy, soldierly honor and obediance to lawful authority, as well as to familiarize students with company and battalion manoeuvers, guards and the theoretical and practical use of firearms.

On graduation of each class the Commandant will report to the Adjutant General of the Army the names of the graduates who have shown special aptitude for the millitary service and furnish a copy thereof to the Adjutant General of the State.

The officers and non-commissioned officers are required to be good students in the other departments, soldier-like in the performance of their duties, exemplary in their general deportment and able to pass a creditable examination in drill regulations. In general, the officers are selected from the senior class; the sergeants from the junior class and the corporals from the sophomore class.

PATHOLOGY AND BACTERIOLOGY

PROFESSOR WESBROOK, ASSISTANT PROFESSOR HILL

1. BACTERIOLOGY — PROFESSOR WESBROOK
(Four credits) — Second semester
Post senior C. E. course, optional.
Brief course in general bacteriology. Preparation of media and study of cultures, especially those of pathogenic bacteria found in water and sewage.

POLITICAL SCIENCE

PROFESSOR SCHAPER, MR. ALLIN

16. AMERICAN GOVERNMENT — PROFESSOR SCHAPER, MR. ALLIN
Two credits, (two hours per week) — First semester
Required of all seniors.
An introductory course in political science. It includes a study of the organization and present workings of our national, state and local government, and serves as an introduction to course 6.

6. ENGINEERING LAW — MR. ALLIN
Two credits (two hours per week) — Second semester
Required of all seniors. Preparation: course 16.
A course in the elements of law especially designed for engineering students. It includes a study of the system of federal and state courts, the jury system, the law of contracts, corporations, partnerships and limited partnerships, administrative law, the rights and duties of citizenship, and some leading features of the law of real and personal property and the law of riparian rights.

C

DEPT. OF AGRICULTURE

The College of Agriculture

The College of Agriculture

FACULTY

CYRUS NORTHROP, LL.D., President.
JOHN W. OLSEN, B.S., Dean.
SAMUEL B. GREEN, B.S., Professor of Horticulture and Forestry.
HARRY SNYDER, B.S., Professor of Soils.
T. L. HAECKER, Professor of Dairy Husbandry and Animal Nutrition.
M. H. REYNOLDS, B.S., M.D., D.V.M., Professor of Veterinary Medicine and Surgery.
ANDREW BOSS, Professor of Agriculture and Animal Husbandry.
FREDERICK L. WASHBURN, M.A., Professor of Entomology.
WILLIAM BOSS, Professor of Farm Structures and Farm Mechanics.
EDWARD SIGERFOOS, Ph.B., LL.B., Professor of Military Science and Tactics, Captain Fifth United States Infantry.
E. M. FREEMAN, Ph.D., Professor of Vegetable Pathology and Botany.
JOHN T. STEWART, B.S., Professor of Agricultural Engineering and Physics.
D. D. MAYNE, Professor of Agricultural Pedagogics, Principal of the School of Agriculture.
FANNIE C. BOUTELLE, Domestic Economics, Preceptress.

ASSISTANT PROFESSORS

C. P. BULL, B. Agr., Assistant Professor of Agriculture.
E. G. CHEYNEY, A.B., Assistant Professor of Forestry.
JOHN A. HUMMEL, B. Agr., Assistant Professor of Agricultural Chemistry.
D. A. GAUMNITZ, M.S. Agr., Assistant Professor of Animal Husbandry.
R. C. LANSING, M.A., Assistant Professor of English.
C. C. LIPP, D.V.M., Assistant Professor of Veterinary Medicine and Surgery.
EDW. K. SLATER, Assistant Professor of Dairy Husbandry.
J. P. WENTLING, M.A., Assistant Professor of Forestry.

INSTRUCTORS

L. B. Bassett, Agriculture.
Margaret J. Blair, Domestic Art.
A. M. Bull, Drawing.
Mary L. Bull, Domestic Science.
Le Roy Cady, B.S., Agr., Horticulture.
Henrietta Clopath, Freehand Drawing.
T. P. Cooper, B.S. Agr., Agriculture.
Josephine Craig, Agricultural Chemistry.
J. M. Drew, Registrar, Blacksmithing, Poultry.
J. L. Edmunds, B.S. Agr., Animal Husbandry.
Henry J. Franklin, Ph. D., Entomology.
W. H. Frazier, B.S., Soils.
G. P. Grout, B.S. Agr., Dairy Husbandry.
Avis C. Hall, Domestic Art.
W. F. Handschin, Animal Husbandry.
D. B. Howell, Animal Nutrition.
A. R. Kohler, B.S.A., Horticulture.
May McDonald, Domestic Science.
Karl A. Machetanz, B.A., Director of Gymnasium and Coach
Martha B. Moorhead, M.D., Lecturer in Domestic Science
J. L. Mowry, Farm Structures and Farm Mechanics.
W. S. Oswald, Botany.
C. A. Pyle, B.S., D.V.M., Verterinary Science.
H. B. Roe, B.S., Eng'r. Mathematics; Engineering.
A. G. Ruggles, M.A., Entomology.
Juniata L. Shepperd, M.A., Domestic Science.
Anna M. Smith, Librarian.
Edith Staples, Domestic Art.
H. J. Thom, Blacksmithing.
J. A. Vye, Farm Accounts.
H. B. White, B.S. Agr., Carpentry.
Grace B. Whitridge, Physical Training.
A. D. Wilhoit, M.A., Soils.

General Information

REQUIREMENTS FOR ADMISSION TO ALL COURSES IN THE COLLEGE OF AGRICULTURE

All applicants for admission to the undergraduate courses of the College of Agriculture are required to take an examination in writing, punctuation, spelling, and grammar. This rule applies to all applicants, whether with or without certificates from accredited schoools, and to those who seek entrance to advanced standing on credits from other colleges or normal schools. Those who fail to pass the examination will be required to study elementary English for an hour a week until the deficiency is removed.

The examination will be given in the Short Course room, Main Building, College of Agriculture, at 9 o'clock A. M., Wednesday, Sept. 15, 1909. Any who have passed the entrance examination in English given in May by the College of Science, Literature and the Arts will be excused from this test.

Graduates of the School of Agriculture, who have completed the studies prescribed in the intermediate course or fourth year, and **graduates of approved high and normal schools**, as approved by the committee on entrance requirements and course of study, are admitted to the freshman class in the courses in the College of Agriculture; the former to Division "A", and the latter to Division "B".

Agricultural students taking courses in the College of Science, Literaature and the Arts, or in other colleges of the University, are required to conform to rules published in the bulletins of the respective colleges.

Students from other colleges and universites: Graduates from other colleges and universities may be admitted upon presentation of certificates, and will receive credit from the several professors for all work satisfactorily completed of similar character and grade to that given in this college.

Special students: Graduates of the School of Agriculture mav be admitted as special students and be allowed to pursue such studies in the course offered in the College of Agriculture as are approved by the faculty.

All students in the College of Agriculture must advise with the dean or the committee on college and graduate work concerning all electives. No student is allowed to enter any course until such course is properly entered upon the student's registration card by the registrar of the Agricultural Department, and no credit shall be given for subjects in which the student has not been previously registered.

Registration of subjects. No student shall be permitted to register in any course for more than twenty-five credit hours, nor for less than fifteen credit hours, in any one semester, without permission of the Dean of the Department.

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 163 credit hours, students in the course in agriculture will be recommended for graduation with the degree of Bachelor of Science in Agriculture, students in the course of forestry with the degree of Bachelor of Science in Forestry, and students in Home economics with the degree of Bachelor of Science in Home Economics.

Diplomas of graduates of the College of Agriculture who have taken specified courses in the College of Education are valid as first-grade professional certificates for two years, and at the expiration of two years of successful teaching, such diplomas, properly endorsed, have the force of first-grade professional certificates for life.

The teachers' course offers two years of work in home economics, equivalent to 83 credit hours. This leads to a diploma, but not to a degree.

Diplomas issued to graduates of the teachers' course are valid as first-grade certificates for two years. At the expiration of two years of successful teaching, such certificates, properly endorsed, have all the force of first-grade certificates for life.

The elective studies designated as academic are to be chosen from the printed semester programs of work offered in the colleges of Science, Literature and the Arts; Law; Medicine; and Engineering; no student to take more than two semesters in either of the three last named collges. The elective studies designated as agricultural are to be chosen from the printed program of work offered in the College of Agriculture.

GRADUATE WORK

Special facilities are offered to graduate students from this and other agricultural colleges who wish to become familiar with methods employed in experment station work, and to pursue their collegiate studies further.

Courses for major and minor subjects may be arranged by consulting the professors in the different divisions. Students who enter for advanced degrees, register with the committee on registration of the College of Agriculture and also in the Graduate School. They must take their major subjects in the College of Agriculture, but they may take one or both of their two minor subjects in the College of Science, Literature and the Arts or in the College of Engineering and Mechanic Arts. Graduate students registered in the Graduate School may take one or both of their minor subjects in the College of Agriculture.

I. The degree of Master of Science in Agriculture will be conferred on a bachelor of this or any other agricultural college of equal grade who, not sooner than one year after graduation, if a resident graduate student at this agricultural college, shall pass an examination in certain prescribed lines of study and present a satisfactory thesis in accordance with the requirements of the Graduate School.

II. All general regulations of the Graduate School governing candidates for the master's degree, method of selecting work, amount of work required, degree of proficiency expected, and the time and manner of conducting the examinations, apply to candidates for master's degrees in the College of Agriculture.

III. The Degree of Doctor of Science will be conferred by the Graduate School for study in the College of Agriculture on bachelors of this or any other agricultural college of equal grade within not less than three years after graduation therefrom under conditions prescribed by the faculty of the Graduate School.

FEES

All students in the college, who are residents of the State of Minnesota, are charged an incidental fee of ten dollars a semester. Non-residents are charged double the fee required of residents of the state, or twenty dollars a semester. No reduction is made for late entrance or for leaving before the end of the semester. In addition to this fee, students who take work in laboratories are charged a sum sufficient to cover the cost of material and breakage. A Gymnasium Fee of twenty-five cents per semester will be collected of each student. This fee constitutes the athletic fund, which is used in procuring such apparatus as the school does not provide.

DAILY ROUTINE

The daily session is divided into eight recitation periods of forty-five minutes each, four in the morning and four in the afternoon. The morning session begins at 8:15 and closes at 11:30. A general assembly of the faculty and students is held at 11:40 o'clock. The noon hour extends

from 12:15 to 1:15 o'clock. The afternoon session begins at 1:15 o'clock and continues until 4:30. Work extends through six days of the week.

ORGANIZATIONS

Home Economics Club. The object of this club is the study of home economics in all its relations. It is open to students in the home economics course, and is especially helpful to its members.

Philomathian Literary Society is an organization of the students of the College of Agriculture, its object being to train its members in the art of public speaking, debating and parliamentary practice. The society meets once a week and presents a program including readings, recitations, debates, etc. Membership is limited to forty and is only for students in the College of Agriculture.

The Forestry Club was organized by the Forestry students for the promotion of good fellowship and mutual interests. The specific object of the club is to keep the members up to date on Forestry Literature and current affairs in forestry.

PUBLICATIONS

Forestry Publication.—The "Minnesota Forester" is the official organ of the Minnesota State Forestry Association. It is edited by the Forestry Department of the University and is devoted to the advancement of the forestry movement with special emphasis on farm forestry.

Minnesota Farm Review.—This paper is published and managed by the Alumni of the Alumni Association of the School of Agriculture. It is the official organ of the Alumni Association and the Farmer's Club. The **Review** is intended to be a medium through which former students may keep in touch with the Agricultural School and with one another. It also endeavors to bring the farmers of the State into closer touch with the school, the college, and the Experiment Station. To this end, the paper strives to present the latest progress in the experimental work of the various stations and to call attention to the most practical farm practices.

GIDEON MEMORIAL FUND

In honor of Peter M. Gideon, the pioneer in developing new fruit and the originator of the Wealthy apple, the Minnesota State Horticultural Society has raised a fund of five hundred dollars, which has been placed with the Board of Regent for investment. The income from this fund is to be expended by the Professor of Horticulture of the University of Minnesota for prize essays on some suitable horticultural subject. This prize money will be awarded at the close of each year.

ARMOUR SCHOLARSHIP

Through the exhibits of live stock at the International Exhibition in 1908, the College of Agriculture has been awarded one of the J. Ogden Armour Scholarships, amounting to $250.00, which is to be awarded to some worthy student in the Agricultural College. This scholarship will be available during the next college year.

LIBRARY

The Agricultural Library is well equipped for supplying the needs of both under-graduate and graduate students. It contains nearly 15,000 volumes of general and technical literature, Government reports, etc., besides 4,000 unbound pamphlets, bulletins and reports. The general subject and author card index and the index of publications of the State Experiment Stations are always at the disposal of students to aid them in locating the various sources of information which the Library affords.

There are complete sets of all standard encyclopaedia and dictionaries and files of over 225 popular and technical magazines and periodicals.

The Librarian and her assistants are always ready and glad to give whatever assistance they can, both to those interested in special research work and to those doing regular reference work in connection with their classes. All those wishing to read or study are made welcome and given whatever privileges the library can provide.

COURSE IN AGRICULTURE

The course in agriculture is designed to give the student a broad education in the sciences and arts relating to agriculture and to fit him for the work of the agricultural specialist. The physical and biological sciences are made prominent. The work in these subjects is begun in the first or second year and may be continued throughout the course. For the first two years, the lines of study are prescribed, the subjects being chosen with a view of giving a good foundation for the work which follows. For the last two years, some elective work is offered, giving the student an opportunity to take work along certain lines for which he has a special aptitude and liking.

Six months' practical farm experience is required of each cadidate for graduation. It is expected that the work be done on some accredited farm on which improved methods and appliances are in use. This work can be performed during the summer vacations under the guidance of the head of the division in which the student is specializing.

In the College of Agriculture a portion of the work is taken in the College of Science, Literature and the Arts. All academic electives and

the prescribed work in geology, German, French, botany, zoology, psychology, English literature, economics and education are taken in the College of Science, Literature and the Arts. The agricultural electives and the prescribed subjects not mentioned above are taken at University Farm.

The classes in the College of Agriculture begin with the opening of the regular University year (for which see calendar).

AGRICULTURE

Equipment. The equipment for instruction in agriculture consists of the following: Special laboratories and class rooms with modern apparatus for all courses, collections of classes and varieties of all field and weed seeds; herbariums of weeds and grasses indigenous to the state; a germinating room which affords opportunity for a study of the vitality and strength of seeds; charts and models of various details of crops together with bulletins on farm management, the cost of farm production, and other pertinent topics supplement the daily lectures; machinery used on University Farm and generously loaned by the firms of the Twin Cities afford valuable subjects for instruction work. The fields and plots of the Experiment grounds offer additional facilities and subjects for use in class work. The student's home and farm is at all times made the basis of his particular study.

The State Grain Inspection department, elevators, mills and adjoining farms of the Twin Cities and vicinity furnish a study for the merchandizing of grains and the planning of farms. An agricultural museum, now being equipped, will contain much material that will be instructive and historic, and serve to show the close relations of agriculture and the modern industries.

Standard references upon agriculture are provided for an exhaustive study of any branch of this subject and original research is a prominent factor of the agricultural course.

AGRICULTURAL CHEMISTRY

Nature of Courses. All students are required to take courses 1, 3 and 4. Students in the course of Home Economics also take courses 2, 5, 6 and 7. Course 6 is required of students in the agricultural course. This course can be taken either with or without the laboratory course No. 7. Course 5 is required of all students before taking any of the more advanced laboratory work.

Equipment. A special laboratory with modern apparatus for the analysis of foods and agricultural products is provided. The equipment contains a Berthelot-Atwater calorimeter for the determination of the caloric value of foods, vacuum ovens, apparatus for the chemical and

microscopical analysis of foods and the necessary facilities for human and animal food investigations. Special facilities are offered in testing wheat, flour and cereal products for commercial purposes. Nutrition investigations, including the digestibility of foods, the chemical changes which take place in cooking, and the losses in the preparation of foods form a part of the Experiment Station work. This offers an opportunity for students to study methods of investigation relating to human food problems. Laboratory practice is also offered to advanced students in the study of household problems in which chemistry is involved. Special classes are also formed for the study of dietarv problems. Standard reference books and journals, including Jahresbericht der Agricultur Chemie, Comptes Rendus, Biedermann's Centralblatt, Annales de la Science Agronomique and Versuchs-Stationen are provided for the advanced work in agricultural chemistry.

Fees. In all the laboratory courses in agricultural chemistry a fee is charged to cover the cost of material used, and breakage. In qualitative analysis the student pays the same fee as required of other students in the College of Science, Literature and the Arts. The student is assigned a certain amount of apparatus and material for which he gives a receipt, and deposits $3.00 with the accountant before beginning work. All apparatus returned in good condition at the close of the term is credited to the student's account upon settlement.

ANIMAL HUSBANDRY

Equipment. Representatives of some of the leading breeds of cattle, sheep and swine, are kept at University farm and herds of blooded stock near the institution and the annual show of live stock at the state fair serve for extended observation of breeds and methods of management. Each year a number of experiments are under way in the feeding of these classes of animals. Breeding experiments are also undertaken with sheep and swine, and theoretical experiments with the smaller animals. Experiments in summer feeding cattle, sheep and swine wholly or in part on pasture are carried on each year. The new live stock building affords excellent accommodations for class work in stock judging.

ANIMAL NUTRITION

The work in Animal Nutrition offered to students of the College of Agriculture is laid out as a four years' course leading to the dergee of Bachelor of Science in Agriculture.

The economic relation of foods to the kinds and character of energy expended by the animal body is a subject of vital importance to live stock owners. It is a subject which has received no small amount of time in ex-

periment work from the dairy division of this institution. The facilities in the way of laboratory equipment, as well as numerous animals for experiment purposes, are adequate for giving students a thorough scientific training in this subject. The dairy herd and some sixty head of nutrition steers are constantly kept for investigation work.

Great stress is laid on chemical, biological and physical phenomena affecting these problems, and to this end a thorough training in this science is given.

AGRICULTURAL ENGINEERING

This division does not offer a course that will make expert draftsmen or engineers as in an engineering college. Its object is to combine in each of the courses offered such features of engineering as will enable the student to perform the more simple engineering operations which may occur in the work of his chosen course, and will further prepare him to understand the principles underlying the more complicated problems of engineering, and thus enable him to properly interpret plans and specifications, and to carry on investigations in connection with engineers.

As this division is new, the equipment is somewhat limited; however, there are now available two plane transits, three levels, and a number of smaller instruments, with which it will be practical to solve such field problems as the time alloted for this work will permit. Charts and photographs are being gradually acquired by which the more advanced problems in physics, drainage and roads can be demonstrated.

DAIRY HUSBANDRY

Equipment. Students in the college course have the advantages of the equipment of the dairy school. The feeding and breeding experiment in the dairy divsion of the experiment station serves a most useful purpose in the collegiate instruction. The cordial relations existing between the department of agriculture and other state institutions are often advantageous to college students well advanced in dairy work.

Specimens of several breeds of cattle are kept for class use. Herds in the vicinity and those shown at the state fair are useful to sudents in this course.

This course is designed to meet the needs of those desiring a thorough knowledge of dairying. It will equip graduates for responsible positions as managers of large butter and cheese factories, stock farms, or for positions as instructors in dairy schools. Applicants must have had at least three months' experience in a creamery or cheese factory, for which three credit hours are allowed.

ENTOMOLOGY

Equipment. Well lighted laboratories with modern equipment are at the disposal of college students for both undergraduate and graduate work. Instruction is further aided by an excellent series of charts and lantern slides. The department is well equipped with museum specimens convenient to the lecture room, showing not only a large series of insects injurious and otherwise, over 10,000 specimens, but also birds and other animals which have a direct bearing upon agriculture. A good museum is also a valuable auxiliary in instruction and friends of the institution are urged to contribute specimens which illustrate the animal resources of the state. Excellent facilities for the installing and caring for specimens are offered.

In economic work the student is brought into direct contact with spraying apparatus and insecticides. Practical work in bee keeping is offered in our apiary, and experiments in insect life can be carried on by advanced students in the insectary at nearly all seasons of the year.

A course in Insects and Diseases is offered in view of the fact that of late years various insects or insect-like animals have been found to play a very important and hitherto unrealized part as carriers and transmitters of disease, and thus have a very important bearing upon the health of man.

Laboratory Fees: To cover cost of material, breakage, etc., a fee of three dolars is charged each student in the course in Forest Entomology, and two dollars in Economic Entomology, the amount of the fee being deposited with the accountant before beginning work.

FARM STRUCTURES AND FARM MECHANICS

Lectures and practicums are given in designing and in construction of farm houses, farm barns, silos, out-buildings and conveniences; cement floors, walls, troughs; farm water systems, wells, cisterns, tanks, house heating and plumbing systems, and in painting farm buildings.

Equipment. Students taking this subject have the advantage of many practical examples in designing and in construction of farm buildings.

The buildings on the campus, such as farm house, barns, dairy buildings, greenhouses, live stock pavilion, sheep barns, swine barns, and silos, and the water, sewer and heating systems are available for this work.

Many new residence buildings being erected in the vicinity of the campus afford excellent opportunities for special studies in modern home construction.

The aim is to fit the student to be able to design, estimate the cost of, and construct such buildings as are best adapted to most farm conditions.

FORESTRY

Graduate and under-graduate courses are offered in forestry. These prepare men to take charge of private forest property, for the Government Forest Service, or for positions as teachers.

The graduate course may be completed in two years, and requires college training for admission. Graduates of universities, colleges, or scientific institutions of high standing, are admitted to the graduate course upon presentation of their diplomas, provided they have had courses in elementary botany, general geology, inorganic chemistry, physics, mathematics through trigonometry, economics and modern languages. Those who complete the graduate course in forestry receive the degree of Master of Science in Forestry.

The under-graduate course requires four years for its completion, and leads to the degree of Bachelor of Science in Forestry.

Although it is a course leading to a technical degree in a specialized science, it is nevertheless based on broad enough lines to afford a good general scientific education. The forester in his lonely life in the woods is very frequently thrown largely upon his own resources and should be capable of obtaining pleasure and interest out of all his surroundings. For this reason an attempt is made to give the student in addition to a thorough training in technical forestry, a good working knowledge of all the sciences and other lines of study which touch upon his life in any way.

Special emphasis is laid on the value of field work and excursions. Every student is required before graduation to take four weeks' work in some lumber camp, so as to become familiar with common lumbering operations. There will also be excursions to nearby forests, to lumber camps, saw mills, wood manufacturing and paper mills; to the Boom Company's work on the Mississippi river; to nearby nurseries; and it is expected that arrangements will be made which will afford an opportunity for students to visit some of the forests of Montana, Idaho and Washington, at a very low rate.

Equipment. The vast lumbering operations in the northern part of Minnesota offer the best opportunities for a study of that branch. The establishment of the Chippewa Forest Reserve and its management by the Forest Service give opportunities which few other sections possess to study the best methods of forest management. The state has twenty-one thousand acres of timber to be used as a forest and game preserve, on which student help will be largely used. Itasca State Park, 22,000 acres in extent, is used by the Forest School as a demonstration forest and experiment station. Every student spends about twelve months in the park during his course and does practical work in all branches. The use of this park gives the Minnesota Forest School a forest equipment which is unsurpassed anywhere.

Throughout the year, special lectures will be given by the State Forestry Commissioner, the State Game Warden, the State Fish Commissioner and prominent lumbermen and lumber manufacturers of Minneapolis and St. Paul. This touch with the commercial side of the lumber business is very important and the situation of the school makes it possible to offer a great deal of it. Other special lectures will be offered as opportunity offers.

HORTICULTURE

Equipment. The work in the division of horticulture is mainly carried on at University Farm. About twenty acres is here used for the field work in this line. The horticulture building furnishes excellent facilities for class room and laboratory exercises. The special work in breeding and testing fruits is carried on at Zumbro Heights, Carver County, where eighty acres of land are devoted to this purpose and equipped with suitable greenhouse, storage cellar, barns, etc., affording excellent facilities for this line of investigation.

The campus of the School of Agriculture is planted out with a collection of trees, shrubs, and herbaceous plants suitable for this section, the specimens of which are labeled with their common and botanical names. The parks, greenhouses, orchards and nurseries of the near vicinity afford convenient and satisfactory illustrations of the best commercial methods and ornamental planting. Our facilities in this line are unexcelled, perhaps, by any other college in the country.

The greenhouses, laboratories and class rooms of the division of horticulture are well equipped with modern apparatus. The division library contains a large number of horticultural works and is further supplemented by a card index to all its literature.

HOME ECONOMICS

The work in home economics offered in the College of Agriculture is a four year course leading to the degree of Bachelor of Science in Home Economics, and is open to graduates from the School of Agriculture who have taken the work of the intermediate year, and to graduates of approved high and normal schools. It is intended to bring to the vocation of home making the same kind of help which the course in agriculture brings to the business of farming. Aside from the universal need of education of this character, there is a marked and increasing demand for trained women to fill institutional and administrative positions as competent supervisors of supplies and of hygiene where large numbers are cared for in collective housekeeping, as well as for special teachers in the several divisions of home economics.

Lectures at the University Training School for Nurses are open to seniors. The course opens during the second semester and consists of the elements of nursing, dietetics, etc. Due credit will be allowed for all work taken.

Graduates of other reputable colleges can here secure a Bachelor's Degree by devoting two years to the subject of Home Economics. The major work must be done in Home Economics, and one or both of two minors must be completed under the advice of the college committee in one of the other divisions of the College of Agriculture, or in the College of Science, Literature and the Arts. When approved by the dean and college committee, other subjects given in these colleges may be substituted for the prescribed subjects in the course in home economics.

Women who are sufficiently advanced may study music or art during the junior or senior years, provided that no student may receive more than two semesters' credit in music and art together.

TEACHERS' COURSE IN HOME ECONOMICS

In addition to the four year course, a two year teachers' course is offered in home economics, which includes all the special technical subjects given in the four year course in the College of Agriculture at the University Farm, but does not include all the required general cultural studies of this course.

Teachers' Certificate. Diplomas issued to graduates of the Teachers' Course are valid as first grade certificates for two years. At the expiration of two years of successful teaching, such certificates, when properly endorsed, have the force of first grade certificates for life.

SOILS

Nature of Courses. Students in the Agricultural course are advised to take courses 1 and 2. Course 3 is optional and can be taken either with or without course 2. Students who elect course 3 are required to have previously taken course 5 in Qualitative Analysis.

Equipment. The department is equipped with laboratories for elementary and advanced students. A large collection of soils from Minnesota and other states are available for purposes of study, including soils that have been under short and long periods of cultivation where different systems of farming have been practiced. Special facilities are offered for the study of the organic matter of the soil and its influence upon the chemical and physical properties of soils. The laboratory is provided with appartaus for the physical and chemical analysis of soils and for the study of special problems in relation to soil fertility. The library contains many of the standard periodicals and reference books upon

soils and fertilizers. As soil investigations and a study of the soil areas of the state form a feature of the Experiment Station work, opportunity is offered for practical experience in the study of soil problems in relation to crop production.

Fees. Students pay a laboratory fee of $3.00 for course 3; this is to cover cost of chemicals and materials used. Students also pay the cost of all breakage of apparatus intrusted to their care.

VEGETABLE PATHOLOGY AND BOTANY

Equipment. The work of this division is designed to assist the student in correlating the fundamental facts and theories of botany and the practical problems of agricultural and horticultural work. The laboratories, library, and demonstration material are well arranged and equipped to enable the student to accomplish this correlation. The greenhouse and the abundant facilities of observing plant life on the grounds and station farm furnish further excellent facilities. The plant and seed collections, including especially the plant diseases, are made useful to the student. A special field for diseases and weed investigation is maintained on the station farm. Problems of agricultural botany and plant disease work are features of the division.

VETERINARY MEDICINE AND SURGERY

Equipment. The veterinary building gives ample facilities for good work. The hospital furnishes cases for study and demonstration and the dissecting room affords material and opportunity for studying the digestive organs, anatomy of cow formation and type, and locomotor apparatus. A large and well stocked museum contains ample material for illustration.

Instruction is given by text books, lectures, collateral reading, and by practice work. The lectures are illustrated by means of stereopticon, skeletons, manikins, charts and by the living animal. Anatomy of locomotion, conformation, the digestive organs, and the higher physiology of digestion are given prominence.

Infectious diseases of domestic animals are studied with reference to causes, recognition, prevention and methods of control. Certain medicines which the intelligent stockman should understand are studied with reference to uses and methods of administration.

OUTLINE OF COURSE IN GENERAL AGRICULTURE

DIVISION "A"

GRADUATES OF SCHOOL OF AGRICULTURE

	Credit Hours	Lecture Hours	Laboratory Hours
Freshman Year			
First Semester			
General Botany or Zoology (1)	3	2	4
Beginning German or French (1)	3	5	
General Rhetoric (1)	3	3	
Elements of Economics (1)	3	3	
General Geology (1)	3	3	
Physical Geography (2)	3	3	
Total credits	18		
Second Semester			
General Botany or Zoology (1)	3	2	4
Beginning German or French (1)	3	5	
General Rhetoric (1)	3	3	
Trigonometry (1)	3	3	
General Chemistry (3)	3	3	3
Industrial Geography (Geol. 3)	3	3	
Total credits	18		

DIVISION "B"

NOT GRADUATES OF SCHOOL OF AGRICULTURE

Freshman Year.			
First Semester.			
General Botany or Zoology (1)	3	2	4
Beginning German or French (1)	3	5	
Soils and Fertilizers (1)	2	2	4
Agronomy (1)	2	3	
Study of Breeds and Types (An. Husb. 1)	2	2	2
Fruit Growing (Hort. 1)	1½	3	
Entomology (1) (First half Sem)	½	3	
Veterinary Work (1)	2	3	
Farm Mechanics (Farm Struc 1)	2		6
Military Drill			3
Total credits	18		
Second Semester.			
General Botany or Zoology (1)	3	2	4
Beginning German or French (1)	3	5	
Chemistry of Plant and Animal Life (1)	2	2	4
General Chemistry (3)	2	2	4
Trigonometry (1)	2	3	
Dairy Husbandry (10)	2	2	4
Poultry (An. Husb. 2) (First half Sem)	1	3	
Farm Mechanics (Farm Struc. 1)	2		6
Plant Propagation (3) (Last half Sem)	1	1	2
Military Drill			3
Total credits	18		

	Credit Hours	Lecture Hours	Laboratory Hours
Sophomore Year.			
First Semester.			
Advanced Botany (2)	3	2	4
General Zoology (1)	3	2	4
Scientific German (3)	3	3	
Qualitative Chemistry (4)	3	3	3
Advanced Rhetoric (2)	3	3	
Stock Judging (An. Husb. 4)	3		6
Economic Elective	3	3	
Military Drill			3
Total credits	21		
Second Semester.			
Advanced Botany (2)	3	2	4
General Zoology (1)	3	2	4
Scientific German (3)	3	3	
Qualitative Chemistry (4)	3	3	3
Advanced Rhetoric (2)	3	3	
Agricultural Physics (Ag. Eng. 1)	3	3	
Practicums (Agri. 8). (½ Sem)	1		4
Economic Elective	3	3	
Military Drill			3
Totals credits	22		
Junior Year.			
First Semester.			
Chemistry of Foods (6)	3	3	
Thremmatology (Agri. 4)	3	3	
Principles of Animal Nutrition (1)	3	3	
Plant Diseases (Veg. Path. 1)	3	3	3
Physiology and Ecology (Bot. 3)	3	2	4
Agricultural Elective	3	3	
General Elective	3	3	
Total credits	21		
Second Semester.			
Soil Fertility and Soil Management (2)	3	3	
Farm Structures (4)	3	3	
Agricultural Economics (Agri. 6)	3	3	
Physiology and Ecology (Bot. 3)	3	2	4
Live Stock Feeding and Management (7)	3	3	
Farm Engineering (Ag. Eng. 2)	3	3	
Agricultural Elective	3	3	
General Elective	3	3	
Total credits	24		

GENERAL AGRICULTURE

	Credit Hours	Lecture Hours	Laboratory Hours
Senior Year.			
Field Crops and Seeds (Agri. 3)	3	3	3
Farm Structures (7)	3	3	
Agricultural Elective	3	3	
Agriculture Elective	3	3	
Agriculture Elective	3	3	
General Elective	3	3	
General Elective	3	3	
Total Credits	21		
Second Semester.			
Systematic Pomology (Hort 8) or	3		6
Landscape Gardening (Hort. 5)	3	3	
Farm Management (Agri. 7)	3	3	
Agricultural Elective	3	3	
Agricultural Elective	3	3	
Veterinary Elective	3	3	
General Elective	3	3	
Total credits	18		

JUNIOR AND SENIOR ELECTIVES IN GENERAL AGRICULTURE

Agriculture (Courses 2, 5, 7, 10.)
Chemistry (Course 5)
Animal Husbandry (5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19)
Animal Nutrition (Courses 1, 2, 3, 4, 5)
Botany (Courses 4, 5, 6, 7, 8, 9, 11)
Dairy Husbandry (Courses 1, 3, 5, 6, 7, 8, 11)
Economics (Courses 10, 2, 3, 4, 5, 6, 7, 8, 22, 28)
Entomology (Courses 2, 4, 6, 7)
Farm Structures (Courses 5, 6)
Geology (Courses 3, 4, 5, 6)
German (Course 2)
Horticulture (2, 4, 5, 6, 7, 8)
Pedagogics (Courses 1, 2)
Political Science (Courses 1, 3)
Soils (Course 3)
Vegetable Pathology (Courses 3, 4, 5)
Veterinary (Courses 2, 3, 4, 5)
Zoology (Courses 2, 3, 4, 5)

OUTLINE OF COURSE IN ANIMAL HUSBANDRY

FRESHMAN AND SOPHOMORE YEARS AS IN GENERAL AGRICULTURE

	Credit Hours	Lecture Hours	Laboratory Hours
Junior Year.			
First Semester.			
Morphology of Invertebrates (Zoo 2)	3	2	4
Meats (Animal Husb. 10)	3	3	3
Thremmatology (Agri. 4)	3	3	
Factory Butter Making (Dairy H 3)	3	3	
Principles of Animal Nutrition (1)	3	3	
Economic Elective	3	3	
General Elective	3	3	
Total credits	21		
Second Semester.			
Morphology of Invertebrates (Zoo. 2)	3	2	4
Animal Breeding (An. Husb 6)	3	3	
Farm Structures (4)	3	3	
Agricultural Economics (Agri. 6)	3	3	
Live Stock Feeding and Management (7)	3	3	
Agricultural Elective	3	3	
General Elective	3	3	
Total credits	21		
Senior Year.			
First Semester.			
Farm Structures (7)	3	3	
General Physiology (Zoo 5)	3	2	4
Stock Judging (An. Husb. 5)	3		6
Nutrition Research (An. Nutri 2)	3	3	
Dairy Stock Feeding (Dairy H 8)	3	3	
Agricultural Elective	3	3	
General Elective	3	3	
Total credits	21		
Second Semester.			
Animal By-Products (An Husb 12)	3	3	
Stock Farm Management (An Husb 8)	3	3	
Animal Mechanics (An Husb 14)	3	3	
Agricultural Elective	3	3	
Veterinary Elective	3	3	
General Elective	3	3	
Total credits	18		

JUNIOR AND SENIOR ELECTIVES IN ANIMAL HUSBANDRY

Agriculture (Courses 3, 5)
Animal Husbandry (Courses 10, 11, 13, 15, 16)
Dairy Husbandry (Course 6)
Veterinary (Courses 2, 3, 4, 5)

OUTLINE OF COURSE IN ANIMAL NUTRITION

FRESHMAN AND SOPHOMORE YEARS AS IN GENERAL AGRICULTURE

	Credit Hours	Lecture Hours	Laboratory Hours
Junior Year.			
First Semester.			
Chemistry of Foods (6)	3	3	
Organic Chemistry (9)	3	3	3
Thremmatology (Agri 5)	3	3	
Principles of Animal Nutrition (1)	3	3	
Physiology and Ecology (Bot 3)	3	2	4
Plant Pathology (1)	3	3	3
Morphology of Invertebrates (Zoo 2)	3	2	4
Total credits	21		
Second Semester.			
Soil Fertility and Soil Management (Soils 2)	3	3	
Organic Chemistry (9)	3	3	3
Morphology of Invertebrates (Zoo 2)	3	2	4
Dairy Bacteriology (7) (½ Sem)	1½	3	
Live Stock Feeding and Management (An. Husb 9)	3	3	
Analysis of Foods (Ag Chem 7)	3	3	3
General Elective (½ Sem)	1½	3	
Physiology of Nutrition (Vet 3) (½ Sem)	1½	3	
Anatomy of Digestion (Vet 2) (½ Sem)	1½	3	
Total credits	21		
Senior Year.			
First Semester.			
Nutrition Research (An Husb 2) (½ Sem)	1½	3	
General Physiology (Zoo 5)	3	2	4
Stock Judging (5)	3		6
Dairy Stock Judging (1)	3		6
Statistics of Nutrition (3)	3	3	
Embryology and Histology (Zoo 3)	3	2	4
Dairy Stock Feeding (8)	3	3	
General Elective (½ Sem)	1½	3	
Total credits	21		
Second Semester.			
General Physiology (Zoo 5)	3	2	4
Nutrition Research (An Husb 11) (½ Sem)	1½	3	
Dairy Bacteriology (5)	3	3	3
Embryology and Histology (Zoo 3)	3	2	4
General Elective (½ Sem)	1½	3	
General Elective	3	3	
General Elective	3	3	
Total credits	18		

OUTLINE OF COURSE IN DAIRY HUSBANDRY

FRESHMAN, SOPHOMORE AND JUNIOR YEARS AS IN ANIMAL HUSBANDRY

	Credit Hours	Lecture Hours	Laboratory Hours
Senior Year.			
First Semester.			
Dairy Stock Judging (1)	3		6
Farm Structures (7)	3	3	
Factory Management (2)	3	3	
General Physiology (Zoo 5)	3	2	4
Cheesemaking (4)	3		6
Principles of Animial Nutrition (1)	3	3	
Nutrition Research (2) (½ Sem)	1½	3	
Dairy Stock Feeding (8)	3	3	
Total credits	22½		
Second Semester.			
Factory Butter Making (3)	3	3	3
Dairy Bacteriology (5)	5	3	3
Dairy Bacteriology (7) (½ Sem)	1½	3	3
Dairy Farm Management (6) (½ Sem)	1½	3	
Physiology of Nutrition (5)	3	3	
Animal Nutrition Research (4) (½ Sem)	1½	3	
Veterinary Elective (2, 3, 4, 5)	3	3	
Total credits	16½		

OUTLINE OF COURSE IN FORESTRY

Freshman Year.			
First Semester.			
Beginning German or French (1)	3	5	
General Botany (1)	3	2	4
General Rhetoric (1)	3	3	
General Geology (1)	3	3	
General Forestry (1)	3	3	
Mechanical Drawing (Farm Stru 2)	3		6
Elements of Economics (1)	3	3	
Military Drill			3
Total credits	21		
Second Semester.			
Beginning German of French (1)	3	5	
General Rhetoric (1)	3	3	
General Botany (1)	3	2	4
Meteorology (Geol 4)	3	3	
Trigonometry (1)	3	3	
General Chemistry (3)	3	3	3
Plant Propagation (Hort 3)	1	1	2
Military Drill			3
Total credits	22		

	Credit Hours	Lecture Hours	Laboratory Hours
Sophomore Year.			
First Semester.			
Scientific German (3)	3	3	
Advanced Rhetoric (2)	3	3	
Advanced Botany (2)	3	2	4
General Zoology (1)	3	2	4
Qualitative Chemistry (4)	3	3	3
Dendrology (2)	3	3	
Physiography (Geol 2)	3	3	
Military Drill			3
Total credits	21		
Second Semester.			
Scientific German (3)	3	3	
Advanced Rhetoric (2)	3	3	
Advanced Botany (2)	3	2	4
General Zoology (1)	3	2	4
Qualitative Chemistry (4)	3	3	3
Forest Engineering (1)	3	2	4
Dendrology (2) (First half Sem)	1½	3	
Anmial Diseases (Vet 5) (Last half Sem)	1½	3	
Military Drill			3
Total credits	21		
Junior Year.			
First Semester.			
Forest Entomology (16)	3	2	4
Tree Diseases (Veg Path 1)	3	2	4
Physiology and Ecology (Bot 3)	3	2	4
Wood Technology (Veg Path 2)	3	2	4
Sylviculture (3)	3	3	
Forest Protection (4)	3	3	
Elements of Mineralogy (Geol 6)	3	3	
Total credits	21		
Junior Year.			
Second Semester—First half.			
February 1st to April 15th.			
Forest Entomology (16)	2	2	4
Physiology and Ecology (Bot 3)	3	2	4
Sylviculture (3)	1½	3	
Forest Mechanics (Farm Stru 3)	3	1	8
Photography (20)	1		4
Second Semester—Second half.			
April 15th to September 1st.			
Silviculture (3)	1½		8
Forest Engineering (2)	3		16
Mensuration (5)	3		16
Forest Tree Diseases—Field Work	1		4
Total credits	19		

	Credit Hours	Lecture Hours	Laboratory Hours
Senior Year.			
First Semester.			
Lumbering (7)	3	3	
Management (8)	3	3	
Forest By-Products (9)	3	3	
Forest Economics (10)	3	3	
Advanced Sylviculture (Bot 8)	3	2	4
Wood Preservation (19)	3	2	4
Material Testing Laboratory (18)	2		4
Total credits	20		
Second Semester—First half.			
February 1st to April 15th.			
Lumber Manufacturing (12)	3	3	6
Forest Seminary (15)	3	5	
Advanced Sylvicuture (Bot 8)	3	2	4
Game and Fish (17)	1	2	
General Elective	3	3	
Second Semester—Second half.			
April 15th to June 1st.			
Working plans (14)	3		32
Foreign Forestry (13)	1	4	
Business Law (11)	1	4	
Packing (6)	1		4
Total credits	19		

OUTLINE OF GRADUATE COURSE IN FORESTRY

OPEN TO THOSE HAVING A BACHELOR'S DEGREE

Junior Year.			
First Semester.			
General Botany (1)	3	2	4
Advanced Botany (2)	3	2	4
Dendrology (2)	3	3	
Sylviculture (3)	3	3	
Forest Entomology (17)	3	2	4
Forest protection (4)	3	3	
General Forestry (1)	3	3	
Mechanical Drawing (Farm Stru 2)	3		6
Total credits	24		
Second Semester—First Half.			
February 1st to April 15th.			
General Botany (1)	3	2	4
Advanced Botany (2)	3	2	4
Dendrology (2)	1½	3	
Sylviculture (3)	1½	3	
Forest Entomology (17)	1½	2	4

	Credit Hours	Lecture Hours	Laboratory Hours
Wood Technology (Veg Path 2)	3	2	4
Forest Engineering (1)	3	2	4
Second Semester—Second half.			
April 15th to September 1st.			
Sylviculture (3)	1½		8
Forest Engineering (2)	3		16
Forest Mensuration (5)	3		16
Forest Tree Diseases—Field Work	1		4
Total credits	25		
Senior Year.			
First Semester.			
Lumbering (7)	3	3	
Forest Management (8)	3	3	
Forest Economics (10)	3	3	
Physiology and Ecology (3)	3	2	4
Forest By-Products (9)	3	3	
Tree Diseases (Veg Path 1)	3	2	4
Advanced Sylviculture (8)	3	2	4
Total credits	21		
Second Semester—First half.			
February 1st to April 15th.			
Lumber Manufacturing (12)	3	3	6
Forest Seminar (15)	3	5	
Physiology and Ecology (Bot 3)	3	2	4
Advanced Sylviculutre (Bot 8)	3	2	4
Game and Fish (18)	1	2	
Second Semester—Second half.			
April 15th to June 1st.			
Working Plans (14)	3		32
Foreign Forestry (13)	1	4	
Business Law (11)	1	4	
Packing (6)	1		4
Total credits	19		

OUTLINE OF COURSE IN HOME ECONOMICS

DIVISION "A"

Freshman Year.			
First Semester.			
General Botany (1)	3	2	4
General Geology (1)	3	3	
Beginning German or French (1)	3	5	
General Rhetoric (1)	3	3	
Elements of Economics (1)	3	3	
Physical Geography (Geol 2)	3	3	
Total credits	18		

	Credit Hours	Lecture Hours	Laboratory Hours
Second Semester.			
General Botany (1)	3	2	4
Beginning German or French (1)	3	5	
Industrial Geography (3)	3	3	
General Rhetoric (1)	3	3	
General Chemistry (3)	3	3	3
Economic Elective	3	3	
Total credits	18		

DIVISION "B"

Freshman Year.			
First Semester.			
Beginning German of French (1)	3	5	
General Botany (1)	3	2	4
Field Agriculture (9)	1	3	
Domestic Chemistry (2)	1	3	
Fruit Growing (Hort 1)	2	3	
Entomology (1) (First half Sem)	½	3	
Elements of Domestic Science (1)	2		4
Elementary Sewing (Dom Art 1)	1½		4
Designs in Drafting (Dom Art 2)	1½		4
General Rhetoric (1)	1	3	
The Family (Dom Eco 1)	1½		
Phyiscal Training			2
Total credits	18		
Second Semester.			
Beginning German or French (1)	3	5	
Agricultural Chemistry (1)	1½	3	3
General Chemistry (3)	1	3	
General Botany (1)	3	2	4
Vegetable Gardening (2) (First half Sem)	½	3	
Plant Propagation (3) (Last half Sem)	½	3	
Elements of Domestic Science (1) (First half)	1		4
Domestic Hygiene (Dom Eco 5) (Last half Sem)	1	3	
Poultry (An Husb 2) (First half Sem)	1	3	
Meats (An Husb 3) (Last half Sem)	½	1	1
Elementary Sewing (Dom Art 1)	1½		4
Designs in Drafting (Dom Art 2)	1½		4
Freehand Drawing (1) (Last half Sem)	1		4
General Rhetoric (1)	1	3	
Total credits	18		
Sophomore Year.			
First Semester.			
Advanced Botany (2)	3	2	4
General Zoology (1)	3	2	4
Advanced German of French (2, 3)	3	3	
Qualitative Chemistry (4)	3	3	3
Advanced Rhetoric (2)	3	3	

	Credit Hours	Lecture Hours	Laboratory Hours
Domestic Science (2)	2		4
The Home (Dom Eco 2)	3	3	
Principles of Teaching (Ped 1)	3	3	
Total credits	23		
Second Semester.			
Advanced Botany (2)	3	2	4
General Zoology (1)	3	2	4
Advanced German or French (1, 3)	3	3	
Qualitative Chemistry (4)	3	3	3
Advanced Rhetoric (2)	3	3	
Household Sanitation (Dom Sci 3)	2	2	
Bread Making (Dom Sci 7) (½ Sem)	1		2
General Bacteriology (Dairy h 9)	3	2	4
Total credits	21		
Junior Year.			
First Semester.			
Physiology and Ecology (Bot 3)	3	2	4
Position of Woman (Dom Eco 3)	3	3	
Advanced Designing (Dom Art 4)	3		6
Methods in Domestic Science (4)	2	4	
Industrial Education (Ped 2)	3	3	
Quantitative Chemistry (5)	3	1	6
Chemistry of Foods (6)	3	3	
Floriculture (Hort 5)	3	3	
General Elective	3	3	
Total credits	23		
Second Semester.			
Physiology and Ecology (Bot 3)	3	2	4
Domestic Art (4)	3		6
Domestic Science Practice Teaching (5)	2		4
Analysis of Foods (Ag Chem 7)	3		6
Farm Structures (6)	3	3	
Designing (Draw 2)	2		4
Textiles (Dom Art 3)	3	3	
General Elective	3	3	
Total credits	22		
Senior Year.			
First Semester.			
Domestic Service (Dom Eco 4)	3	3	
Household Art (Dom Art 5)	3	3	
Domestic Science Practice Teaching (5)	2		4
Farm Structures (7)	3	3	
Agricultural Elective	3	3	

	Credit Hours	Lecture Hours	Laboratory Hours
General Elective	3	3	
General Elective	3	3	
Total credits	20		

Second Semester			
Teachers Course (Dom Sci 6)	3	3	
Handicraft (Dom Art 6)	3	3	
Advanced Domestic Chemistry (8)	3	3	
General Elective	3	3	
General Elective	3	3	
General Elective	3	3	
Total credits	18		

JUNIOR AND SENIOR ELECTIVES IN HOME ECONOMICS

Agriculture (Coureses 1, 6, 7, 10)
Agricultural Engineering (Course 1)
Animal Nutrition (Course 1)
Botany (Courses 4, 5, 6, 7, 8, 9, 10)
Dairy Husbandry (Courses 5, 7)
Domestic Art (Course 4)
Domestic Science (Course 6)
Drawing and Designing (Courses 2, 3)
Economics (Courses 1B, 1C, 2, 3, 4, 5, 6, 7, 8, 22, 28)
Education (Courses 1, 2)
Entomology (Courses 2, 4, 5, 7)
Geology (Courses 4, 5, 6)
Horticulture (Courses 6, 7, 8)
Psychology (Courses 1, 2)
Political Science (Courses 1, 3)
Vegetable Pathology (Courses 1, 3, 4)

OUTLINE OF TEACHERS' COURSE IN HOME ECONOMICS

Entrance requirements are the same as for the Home Economics Course.

First Year.

First Semester.

Advanced Rhetoric (2)	3	3	
Principles of Teaching (Ped 1)	3	3	
Field Agriculture (9)	1	3	
Agricultural Chemistry (1)	2	3	3
Agricultural Botany (Plant Path 3)	1½	2	4
Entomology (1) (First half)	½	3	
Elements of Domestic Science (1)	2		4
Elementary Sewing (Dom Art 1)	2		4
Designs in Drafting (Dom Art 2)	2		4
The Family (Dom Eco 2)	1½	3	
Domestic Science (2)	2		4

	Credit Hours	Lecture Hours	Laboratory Hours
Position of Woman (Dom Eco 3)	1½	3	
Physical Training			2
Total credits	22		
Second Semester.			
Advanced Rhetoric (2)	3	3	
Domestic Chemistry (2)	3	3	3
Plant Propagation (Hort 3) (Last half)	½	1	2
Vegetable Gardening (Hort 2) (First half)	½	3	
Poultry (An Husb 2) (Last half)	½	3	
Meats (An Husb 3) (½ Sem)	½	1	1
Elements of Domestic Science (1) (½ Sem)	1		4
Elementary Sewing (Dom Art 1)	2		4
Designs in Drafting (Dom Art 2)	2		4
Freehand Drawing (1) (½ Sem)	1		4
General Bacteriology (Dairy H 9)	3		6
Domestic Hygene (Dom Eco 5) (½ Sem)	1	3	
Bread Making (Dom Sci 8) (½ Sem)	1	1	2
Physical Training			2
Total credits	19		
Second Year.			
First Semester.			
Domestic Science Practice Teaching (5)	2		4
The Home (Dom Eco 2)	1½	3	
Methods in Domestic Science (4)	2		4
Household Art (Dom Art 5)	2		4
Fruit Growing (Hort 1)	2	3	
Chemistry of Foods (6)	3	3	3
Industrial Education (Ped 2)	3	3	
Domestic Art (3)	1½	3	
Domestic Service (Dom Eco 4)	1½	3	
General Elective	1½	3	
Total credits	20		
Second Semester.			
Household Sanitation (Dom Sci 3)	2	2	
Methods of Domestic Science (5)	2		4
Textiles (Dom Art 3)	2		4
Domestic Science Practice Teaching (5)	2		4
Methods in Domestic Science (4)	2		4
Domestic Chemistry (8)	3	2	4
Floriculture (Hort 5)	3	3	
Nursing and Dietetics (Dom Sci 6) (½ Sem)	1		3
Drawing and Designing (2)	2		4
General Elective	3	3	
Total credits	22		

Courses of Study

AGRICULTURE

ANDREW BOSS, Professor of Agriculture
C. P. BULL, Assistant Professor of Agriculture
L. P. BASSETT, Instructor in Agriculture
T. P. COOPER, Instructor in Agriculture

1. AGRONOMY — PROFESSOR BOSS AND MR. BASSETT
Three credits (three hours per week) — First semester
Open to freshmen registered in Division B

An elementray course in the study of crop rotation; the production and care of manures; the relation of weeds to crop production and profits; the planting, cultivating, harvesting, storing, seed-selection and marketing of grains, roots, fiber, sugar, hay and other forage crops; meadows and pastures; plant selection and breeding methods.

2. FARM MACHINERY — MR. BASSETT
Two credits (four hours per week) — Second semester
Open to juniors and seniors. Elective

Practical suggestions and practice work are given in connection with the best methods of adjustment, handling and adaptation of the various kinde of machinery to the soils, weeds and seasons. Durability and convenience in manipulation are chief among the points considered.

3. FIELD CROPS AND SEEDS — ASSISTANT PROFESSOR BULL
Three credits (three hours per week) — First semester
Open to seniors.

Students registering for the course must have had at least one year's work in University botany. The course is outlined to occupy two lecture periods and two laboratory periods per week.

(a) SEEDS: THEIR IDENTITY AND VALUE

In this course the students are made acquainted with the physical botany, the uses, identification, vitality, testing, grading and judging of all classes of field seeds. Special attention is given to the reproducing value of seeds of various grades of grains and to the importance of testing. A thesis upon some phase of the subject of seeds is required for full credit.

(b) FIELD CROPS: THEIR STRUCTURE AND USE.

In this course are considered the botany, cultivation and economic value of the various cereal, forage, root, fiber, sugar and miscellaneous crops. Special attention is given to the subjects of meadows,pastures, soilage crops, and to the production and preservation of all kinds of dry cured and ensilaged crops.

4. THREMMATOLOGY — ASSISTANT PROFESSOR BULL
Three credits (three hours per week) — First semester
Open to juniors. Given in alternate years. 1910-1911.

Heredity, variation, law of breeding, the art of breeding, improvement by nature and under scientific experimentation, securing foundation stocks, value of using very large numbers, immense value of the occasional individual which can transmit qualities of peculiar value, use of an ideal, use and misuse of the score card, both numerical and graphic, intrinsic qualities, fancy points and distinguishing marks, statistical methods in breeding pedigree records of efficiency fundamental principles underlying the arrangement of the record books, bibliography and terminology, study of literature of breeding.

5. PLANT BREEDING — ASSISTANT PROFESSOR BULL
Three credits (three hours per week) — First semester
Open to juniors. Elective. Given in alternate years. (1909-1910)

Botany of the reproductive organs of field crops, field crop nursery management, producing new qualities by hybridizing and by change of environment, hybridizing versus cross-breeding, in-breeding and self fertilization, originating varieties and improving standard varieties by selection and by hpbridizing, followed by selection, methods of disseminating new varieties, seed and plant introduction, experimentation in the theories relating to heredity, variation and practical breeding, seed growing as a farm business, seed merchandizing, and the breeding of each of the various field crops grown in Minnesota.

6. AGRICULTURAL ECONOMICS. (Economics 1 B) — MR. COOPER
Three credits (three hours per week) — Second semester
Open to juniors.

Elements of Economics (Course 1) prerequisite. The development of Agriculture; problems of rural life. Agricultural organization and methods. Agricultural finance and a special study of the various economic movements affecting Agriculture.

7. FARM MANAGEMENT — PROFESSOR BOSS
Three credits (three hours per week) — Second semester
Open to juniors.

This course is offered with a view to emphasizing the business side of farming including the systematic arrangement of crops in rotation; the adjustment of crops to location, markets and live stock; the effect of cropping systems on soil productivity and crop yields; the regular employment of capital and the employment and distribution of labor. Special attention is given to drafting and revising farm plans. Each student is required to draft a plan of a farm in which he is interested, where some specialized type of farming is followed, to submit a business statement of the fixed and operating capital employed together with the cost of operation, the revenue and the net profit.

8. AGRICULTURAL PRACTICUMS
One credit (four hours per week) — Last half second semester

Opportunities to gain practical experinece, to acquire greater manual dexterity in doing farm work, to secure practice in conducting experiments and to get experience in teaching agricultural subjects, are offered to college and graduate students when practicable. Students should arrange early in their course for this work, as the opportunities in plant breeding, in rural engineering, in field crops, in agricultural statistics, and in assisting instructors in the various courses are available only at irregular intervals and must be arranged for in advance.

9 FIELD AGRICULTURE PROFESSOR A. BOSS AND ASSISTANTS
(Three hours per week) First semester
Open to freshman girls in division B.

A study of the soil origin and types of soil as affecting crop production in Minnesota; soil conditions as affecting moisture and crop growth; planning of fields and farms in consideration of classes of field crops, and the relation of crops to each other and in rotation and the business of farming.

10. AGRICULTURAL ECONOMICS (Economics 1 C) MR. COOPER
Three credits (three hours per week) First semester
Open to seniors. Elective.

Agricultural Economics (Course 7) prerequisite. Development of agricultural laws as applied to drainage, water rights, irrigation, land contracts and leases. The fundamental principles underlying contracts; laws governing negotiable papers and their use; courts and their jurisdiction. The development of co-operation and co-operative societies, methods of organization and of operation of agricultural co-operative societies with a special study of their administration.

AGRICULTURAL AND GENERAL CHEMISTRY

HARRY SNYDER, Professor of Agricultural Chemistry
GEO. B. FRANKFORTER, Professor of General and Organic Chemistry
JOHN A. HUMMEL, Assistant Professor of Agricultural Chemistry
EDWARD E. NICHOLSON, Assistant Professor of Chemistry
A. D. WILHOIT, Instructor in Agricultural Chemistry
JOSEPHINE CRAIG, Instructor in Agricultural Chemistry

1 CHEMISTRY OF PLANT AND ANIMAL LIFE PROFESSOR ——AND ASSISTANTS
Two credits (five hours per week) Second semester
Open to freshmen registered in division B. Either High School chemistry or B year chemistry, School of Agriculture, a prerequisite.

Some of the topics studied are: the ash elements of plants and their function in plant nutrition, the nitrogenous and non-nitrogenous compounds of plants and animals, the chemistry of seeds and plant growth, the factors influencing the composition and value of crops and the composition and digestibility of foods. The chemical and allied changes which take place in the handling of milk and its manufacture into butter and cheese are also studied. Laboratory practice forms a prominent feature of the work.

2. DOMESTIC CHEMISTRY MISS CRAIG
Two credits (five hours per week) First semester
Open to freshmen in Household Economics course registered in division B. Either High School chemistry or B year chemistry, School of Agriculture, a prerequisite.

A study of human foods and their nutritive value and the chemical and allied changes which take place in the preparation of foods. Some of the subjects considered are: meats, vegetable foods, fruits, cereals, wheat flour, the chemistry of bread-making, baking powders, condiments, tea, coffee, chocolate, the household water supply, dietary studies, the cost of foods, and the rational feeding of man. Laboratory practice is given in testing the commercial value of foods and in the detection of adulterants.

3. General Chemistry — Professor Frankforter and Mr. Wilhoit
Three credits (three hours per week) — Second semester
Open to freshmen.

Recitations, lectures and laboratory practice. Particular attention is given to the study of the elements and compounds which are of the most importance in agriculture. The laws governing the combination of the elements by weight and volume are illustrated by numerous problems. The writing of equations, chemical nomenclature, and the periodic system of classifying the elements are prominent features of the work. In the laboratory experiments are performed illustrating the general laws of chemistry which have a bearing upon agricultural chemistry.

4. Qualitative Analysis — Assistant Professor Nicholson and Assistants
Three credits (seven hours per week) — First and second semesters
Open to sophomores.

This course is arranged to meet the wants of agricultural students. Six hours per week are given to the laboratory work and one period to a lecture and recitation. The writing of equations and the study of principles involved in the separation of the various groups and individual compounds of elements are characteristic features of this work. It is the object of this course to familiarize the student with the processes employed in qualitative analysis, so that he may be able to determine the composition of all ordinary substances, particularly of those that are of the most importance in agriculture.

5. Quantitative Analysis — Professor Frankforter and Mr. Wilhoit
Four credits (nine hours per week) — First semester
Open to juniors and seniors.

An elementary course in quantitative analysis. The principles involved in gravimetric and volumetric analysis are studied. Two periods per week are given to laboratory work and one period to a recitation and lecture. The work includes the gravimetric and volumetric determination of iron, acidimetry and alkalimetry, the gravimetric determination of phosphorus pentoxide, the volumetric determination of calcium oxide, and the determination of nitrogen and potassium oxide. The object of this course is to prepare the student for special work in agricultural chemistry, and is required of all students who elect either course 7 or course 3 in Soils.

6. The Chemistry of Foods — Professor————
Three credits (three hours per week) — First semester
Open to juniors.

Lectures. An advanced course treating of the composition, digestibility, and nutritive value of human and animal foods. The chemistry of plant growth, particularly the factors which influence their composition and nutritive value, forms an essential part of this course. The processes employed in the preparation of foods, as the milling of wheat and other cereals, the economic uses of human and animal foods, the comparative value of foods, and the chemical methods employed in human nutrition investigations, particularly in proteid and carbohydrate metabolism, and the losses of energy from the body, are studied. Dietray studies, including the cost of nutrients, and influence of different methods of preparation upon their nutritive value, are also included in the work. It is the object of this course to familiarize the student with the fundamental principles of nutritition and the use of literature upon the subject.

7. Analysis of Foods. — Professor———— and Assistants
Three credits (seven hours per week) — First and second semesters
Open to juniors and seniors. Elective.

(a) This work includes the determination of water, ash, starch, sugar, cellulose, pentosans, fats, proteids, and the different forms of nitrogen in food stuffs, the

use of the calorimeter, and the ploariscope in food analysis. Before completing the work, each student makes a complete proximate analysis of some food material. This course is planned to meet the wants of those who desire to become familiar with the methods employed in the analysis of foods and in nutrition investigations. One hour per week is devoted to a lecture and recitation.

(b) A second semester's work can be taken in the analysis of dairy and animal products, as fodders, milk, butter, cheese, and animal feces. Special features of the course are the determinations of volatile fatty acids, iodin absorption, specific gravity and the sponification equivalent of fats. The object of this course is to meet the wants of those who desire to become familiar with the methods of investigations employed in research in dairy chemistry.

8. Advanced Domestic Chemistry and Dietetics — Miss Craig
Three credits. — Second semester
Open to seniors.
Lectures and recitations. Advanced course. Courses 6 and 7a required as preliminary preparation.

9. Organic Chemistry — Professor Frankforter
Three credits (six hours per week) — First and second semesters
Open to juniors.
Lectures and laboratory work. The course includes the aliphatic series with a preparation of the more important compounds, supplemented by Levy's Anleitung fur Darstellung Organischer Preparate. Also the aromatic series with a preparation of some of the more important compounds supplemented by Fischer's Organischer Preparate.

AGRICULTURAL ENGINEERING AND PHYSICS

John T. Stewart, Professor of Agricultural Engineering and Physics
H. B. Roe, Assistant in Engineering

1. Agricultural Physics — Professor Stewart
Three credits (six hours per week) — Second semester
Open to sophomores.
This work is carried on by lectures, class demonstrations, reference work, discussions and note book records. Among the subjects treated are: method of keeping original records, molecular nature of matter, the laws of specific gravity, heat, evaporation, water pressure, explosives and their use on the farm, the physical properties and manufacture of cement, drain tile and sewer pipe. Temperature, rainfall, runoff and their effect on agricultural production. Soils as related to roads and drainage.

2. Farm Engineering — Professor Stewart
Three credits (six hours per week) — Second semester
Open to juniors and seniors who have had Agricultural Physics. Methods of making U. S. land surveys, and the principles of resurveying, the improvement of farm lands by open ditches, under drainage, levees, outflow culverts, and pumps. A brief summary of irrigation methods in the arid, semi-arid and humid regions; roads and road construction in agricultural districts. Methods and cost of farm fencing, practical work in mensuration, and elementary surveying.

Forest Engineering — Professor Stewart
Three credits (six hours per week) — Second semester
Open to sophomores who have had trigonometry, and have a knowledge

of the principles of mechanical drawing and lettering. Should have had not less than one semester in mechanical drawing.

Method of making the original land surveys, and the principles of retracing lines and relocating corners, method of representing and arranging field data on plats, a study of topographic symbols and the elements of topographic drawing, including tracing, and blue printing, lectures and demonstration on man, horse and canoe packing, camp equipment and camp discipline.

2. FOREST ENGINEERING — PROFESSOR STEWART
Three credits (one hundred eighty hours) — (In Itasca Park)
Open to those who have completed the above course in forest engineering

Field practice in mensuration, surveying, pacing, and rapid methods of field topography, use of transit, level, and plane table, preparing report of field work which will include finished plats, and maps of survey notes.

NOTE:—Students taking any of the above courses must provide themselves with the necessary drafting instruments, regulation note books, drawing paper, etc.

At the beginning of the courses in agricultural and forestry engineering there will be some duplication of lecture work. A student taking both courses will be given extra work in lieu of that which is duplicated in the other course.

ANIMAL HUSBANDRY

ANDREW BOSS, Professor of Animal Husbandry
D. A. GAUMNITZ, Assistant Professor of Animal Husbandry
W. F. HANDSCHIN, Instructor in Animal Husbandry
J. L. EDMUNDS, Instructor in Animal Husbandry
J. M. DREW, Instructor in Poultry

1. STUDY OF BREEDS AND TYPES — MR. EDMONDS
Two credits (three hours per week) — First semester
Open to freshmen registered in division B.

The market classes of horses, cattle, sheep and swine are taken up briefly to bring out the form, quality, and condition desirable and common to the different classes. This is followed in each class of stock with most common and valuable breeds for the state. These are studied carefully as regards their origin and characteristics, and as to their adaptability to the different Minnesota conditions. This work is illustrated with stock from herds and flocks maintained at the University Farm for this purpose. Work in stock judging is combined with studies of the breeds and types.

2. POULTRY — MR. DREW
One credit (three hours per week) — First half second semester
Open to freshmen registered in division B.

The instruction in this subject will include the following topics: history and characteristics of the leading breeds of poultry; breeding, rearing and management of fowls for eggs and for the market; planting, building and arrangement of poultry houses; managing incubators and brooders. A model poultry house, containing pens of the most improved breeds, incubator cellar, work-room, etc., has been provided, where experimental work and practical instruction are carried on.

3. MEATS — ASSISTANT PROFESSOR GAUMNITZ
One-half credit (one hour per week) — Second half second semester
Open to freshmen girls registered in division B.

The instruction given to the students in home economics in the subject of meats pertains to the selection and value of different classes of meats and to the best methods of curing and preserving.

4. STOCK JUDGING — ASSISTANT PROFESSOR GAUMNITZ
Three credits (six hours per week) — First semester
Open to sophomores

This course is calculated to meet the needs of students desiring to become expert stock judges and of those who wish to study animal form with a view of becoming breeders of superior animals.

Score card work in combination with the presence of living specimens is a feature of this course. Students are drilled in judging from the standpoint of breed, type, form, stamina, quality, breeding capacity, suitability for feeding and for general and specific production.

5. STOCK JUDGING — PROFESSOR BOSS AND ASSISTANT PROFESSOR GAUMNITZ
Three credits (six hours per week) — First semester
Open to seniors.

An advanced course consisting of practice in judging market classes of fat stock and special work with breeding stock. Trips of inspection to neighboring stock farms will be made and work given in county fair judging where suitable arrangements can be made.

6. ANIMAL BREEDING — PROFESSOR BOSS
Three credits (three hours per week) — Second semester
Open to juniors.

A study of the physiology of the reproductive organs of animals and of the processes of reproduction; the causes and forms of variation; the laws of transmission and heredity; the application of these principles to the practical methods of breeding; a review of the practices of breeders famous for the improvement of live stock; outlines of methods for individual breeding operations, and for co-operative operations including plans for a community co-operative breeding project.

7. LIVE STOCK FEEDING AND MANAGEMENT — ASSISTANT PROFESSOR GAUMNITZ
Three credits (three hours per week) — Second semester
Open to juniors.

The principles of feeding as applied to economical production; feeding rations, feed stuffs, methods of feeding, care and management of breeding and fattening stock, management of animals during pasture, yard and stall feeding for the block, and stable management suitable for the various classes of live stock. The work is based on the investigations of the experiment stations, and a careful review of station bulletins and publications will be made.

8. STOCK FARM MANAGEMENT — PROFESSOR BOSS
Three credits (three hours per week) — Second semester
Open to juniors.

In this course special attention is given to the crops and rotations that fit in with live stock farming, economy of feeds and pasture production; to be taken with course 6, Agriculture.

9. NUTRITION RESEARCH — PROFESSOR BOSS AND ASSISTANT PROFESSOR GAUMNITZ
One and one-half credits (three hours per week) — First half second semester
For outline of work see course (4) Animal Nutrition.

10. MEATS — ASSISTANT PROFESSOR GAUMNITZ
Three credits (three hours per week) — First semester
Open to juniors.

A continuation of studies in meats as outlined in the school course. Supplemented by dissection and studies of muscular structure of various kinds of meat.

This course is designed especially for studying meat making animals and their products. Under general guidance each student makes up rings of animals which he studies in detail, at every step from the live state until the different parts are cooked and tested at the table. Full records and conclusions, as well as illustrations are required in thesis form.

11. LIVE STOCK RECORDS AND RESEARCH — PROFESSOR BOSS
Three credits (six hours per week) — Second semester
Open to seniors. Elective.

This course will consist of reviewing literature upon different phases of stock production. The Experiment Station records and other sources of information will be used largely. This together with original work will form the basis of extended compilation of material on live stock husbandry, and a thorough study of systems of keeping and compiling stock records upon stock farms and at expermient stations. Sufficient actual practice will be required to become familiar with live stock records and herd books.

12. ANIMAL BY-PRODUCTS — ASSISTANT PROFESSOR GAUMNITZ AND MR. PATERSON
Three credits (three hours per week) — Second semester
Open to seniors.

Individual study of the by-products manufactured at the large packing houses will be required of each student. The value and place that each has in economc uses is considered.

13. ADVANCED MEATS AND JUDGING — ASSISTANT PROFESSOR GAUMNITZ
Three credits (six hours per week) — Second semester
Open to juniors and seniors. Elective.

Work along this line is a continuation of that begun in course 12. More attention is given the more important details concerning meat, and a minute study of its physical and chemical composition is required.

14. ANIMAL MECHANICS — PROFESSOR REYNOLDS AND ASSISTANT PROFESSOR GAUMNITZ
Three credits (three hours per week)
Open to seniors.

A study of the mechanical effects of different relationships of bone and muscle in the animal body. This applies particularly to horses. The entire feet and legs as well as the body will be studied and made clear by apparatus and original illustrations.

15. LIVE STOCK PRACTICUMS — MR. EDMUNDS
Two credits (four hours per week) — Second semester

Feeding and stable management of cattle, horses, sheep and swine; recording and caluclating amounts of pasturage obtained from different forage crops, keeping herd records, writing pedigrees and recording animals, calculating feeding records and cost of production, mechanical analysis of carcasses of animals to determine total amount of meat and proportionate amounts of fat and lean, determinations of fat and lean meat with specially designed apparatus; calculating percentage of different parts of the carcass.

16. ANATOMY OF DIGESTION (Vet 1) PROFESSOR REYNOLDS AND DR. PYLE
One and one-half credits (three hours per week) First half second semester
Open to juniors and seniors. Elective.
Given in alternate years. 1909-1910.

Comparative anatomy of the digestive organs, dissection, collateral reading and recitation. Chauveau's Comparative Anatomy is used for reference and comparison.

17. PHYSIOLOGY OF NUTRITION (Vet 3) ASSISTANT PROFESSOR LIPP
One and one-half credits (three hours per week) Last half second semester
Open to juniors and seniors. Elective. Given in alternate years 1909-1910.

This is an advanced study of the veterinary physiology of digestion, taking up the digestive fluids, nervous mechanism of digestion, absorption and digestion of grains and fodders. It also includes a study of body nutrition, body income and expenditure, sources of heat supply and heat loss, and metabolism. Veterinarv Physiology, by F. Smith, is used as a text and guide for this work, but students are required to do collateral reading.

18. ANATOMY OF LOCOMOTION AND CONFORMATION (Vet. 4) VETERINARY DR. PYLE
One and one-half credits (three hours per week) First half second semester
Open to juniors and seniors. Elective. Given in alternate years 1910-1911.
This course deals with the anatomy of locomotion and conformation.

The bones, articulations and muscles involved in locomotion and conformation are studied by text-book, dissection and collateral reading. Shoeing, diagnosis and treatment of common forms of lameness may be included in course 3. Strangeway's Veterinary Anatomy is used as a text-book and Chauveau's for reference.

19. COMMON DISEASES (Vet. 5) PROFESSOR REYNOLDS
One and one-half credits (three hours per week) Last half second semester
Open to juniors and seniors.

This course covers causes, prevention, and deals with common and serious diseases of domestic animals.

ANIMAL NUTRITION

T. L. HAECKER, Professor of Animal Nutrition
ANDREW BOSS, Professor of Animal Husbandry
DR. REYNOLDS, Professor of Veterinary Medicine and Surgery
D. A. GAUMNITZ, Assistant Professor of Animal Husbandry
DR. LIPP, Assistant Professor of Veterinary Medicine and Surgery

1. PRINCIPLES OF ANIMAL NUTRITION PROFESSOR HAECKER
Three credits (three hours per week) First semester
Open to juniors.

Lectures and class room work. The principles of animal nutrition, their relation to the economic production of animal and animal products, and the relation of the constituents in nutriment consumed to amount and character of products produced from the basis of this course. Accompanying this course there will be assignments carrying out some phase of animal production or the production of some animal product, tracing the disposition made of the nutrients in the feed. Practice work is given in formulating and compounding rations, in the study of comparative value of food stuffs and other problems relating to feeding.

2. NUTRITION RESEARCH — PROFESSOR HAECKER

One and one-half credits (three hours per week) — First semester

Open to seniors.

Seminar and laboratory work in the study of animal nutrition problems. This course is open to advanced students and is offered during the last half of the first semester. The student is required to become familiar with the literature of some phase of animal nutrition, outline and conduct an investigation under the supervision of the instructors of the department, and prepare a suitable report of the investigation. For carrying out this work animals will be provided for feeding operations and laboratory facilities afforded for analytical work. The object of this course is to familiarize the student with the methods employed in the study of animal nutrition problems.

3. STATISTICS OF NUTRITION — PROFESSOR HAECKER AND ASSISTENTS

Three hours. — Second semester

Open to juniors and seniors. Elective.

This includes a thorough study of experiments made on income and expenditure of matter and the income and expenditure of energy, the relation of food consumed to kinds and character of energy expended.

4. NUTRITION RESEARCH (Animal Husbandry 11) — PROFESSOR BOSS AND ASSISTANT PROFESSOR GAUMNITZ

One and one-half credits (three hours per week) — First half second semester

Open to seniors.

This course is open to advanced students and is offered during the first half of the second semester. The student is required to become familiar with the literature of some phase of animal production, outline and conduct an investigation under the supervision of the instructors of the department, and prepare a suitable report of the investigation. For carrying out this sort of work animals will be provided for slaughter tests. The object of this course is to familiarize the student with the methods employed in the study of problems relating to animal production.

5. PHYSIOLOGY OF NUTRITION — 1909–1910. ASSISTANT PROFESSOR LIPP

One and one-half credits (three hours per week) — Last half second semester

Open to juniors and seniors.

This is an advanced study of the veterinary physiology of digestion, taking up the digestive fluids, nervous mechanism of digestion, absorption and digestion of grains and fodders. It also includes a study of body nutrition, body income and expenditures, source of heat supply and heat loss, and metabolism. Veterinary Physiology, by F. Smith, is used as a text and guide for this work, but students are required to do collateral reading.

6. DAIRY STOCK FEEDING (Dairy Husbandry 8) — PROFESSOR HAECKER

Three credits (three hours per week) — First semester

Open to juniors and seniors.

Lectures on the characteristics, composition and nutrition value of feed stuffs; the economical production of dairy stock and dairy products. A study of the production value of feeds or the relation of feeds to product. Practice work in formulating rations.

BOTANY

FREDERICK E. CLEMENTS, Professor of Botany
JOSEPHINE E. TILDEN, Assistant Professor of Botany
CARL O. ROSENDAHL, Assistant Professor of Botany
W. L. HUFF, Instructor in Botany
FREDERICK K. BUTTERS, Instructor in Botany

1. GENERAL BOTANY — PROFESSOR CLEMENTS, ASSISTANT PROFESSORS TILDEN AND ROSENDAHL, MESSRS. HUFF AND BUTTERS

Six credits (six hours per week) — First and second semesters

Open to freshmen.

Greenhouse study of the behavior and structure of flowering plants, following the life cycle from germination to seed production; laboratory study of the evolution of the plant kingdom and the underlying principles of plant life; laboratory and greenhouse work in the indentification and relationship of flowering plants, together with field work on the plants of forest and grassland; practical papers on selected topics, viz., bacteria, plant growth, evolution, etc.

2. ADVANCED BOTANY — PROFESSORS CLEMENTS, ASSISTANT PROFESSORS TILDEN AND ROSENDAHL

Six credits (six hours per week) — First and second semesters

Open to sophomores.

Systematic work in the naming and classification of plants, chiefly of the groups of economic importance, i. e., flowering plants, fungi and algae, with emphasis on the common plants of Minnesota; ecological study in the greenhouse of the structure and meaning of the adaptations of root, stem and leaf, and in the field of the principles of plant distribution, migration and grouping; cytological study of growth, production of pollen and egg-cells, fertilization, hybridizarion, and seed formation; one practical paper each semester, cytology of plant breeding and the botany of a group of economic plants for horticultural students; plant adaptations and the life history of a forest for forestry students.

3. PHYSIOLOGY AND ECOLOGY — PROFESSOR CLEMENTS AND MR. HUFF

Six credits (six hours per week) — First and second semesters

Open to juniors.

Study of the factors which make the plant's home, viz., water, light, heat, soil, etc.; response of the plant to its home, absorption, transport, water-loss, food-making, storage, growth, fertilization, and reproduction; adaptation of plants to their various homes, and the origin of new forms by selection, adaptation, mutation and hybridization; structure and development of vegetation, i. e., grouping, migration, competition, acclimatization, invasion, succession, zonation, etc., of plants; one practical paper each semester on selected topics, e. g., acclimatization, adaptation, origin of new forms, vegetation of Minnesota, of North America, etc.

4. ALGAE — ASSISTANT PROFESSOR TILDEN

Six credits (six hours per week) — Both semesters

Open to those who have completed courses 1 and 2; the laboratory fee is three dollars per semester.

A detailed comparative study of the structure and classification of the algae; the blue-green and the yellow-green algae together with a systematic examination of forms in the Minneapolis water supply, occupy the first semester, and the brown and the red marine algae the second semester. Lectures, laboratory and reference work.

5. FUNGI — PROFESSOR CLEMENTS
Six credits (six hours per week) — Both semesters
Open to those who have completed courses 1 and 2; the laboratory fee is three dollars per semester.

The classification and life-history of the various groups of fungi, based on identification, cultures and field work, with particular reference to forms which cause plant and animal diseases. Lectures and discussions, laboratory, greenhouse and field work.

6. MOSSES AND FERNS — ASSISTANT PROFESSOR ROSENDAHL AND HR. HUFF
Six credits (six hours per week) — Both semesters
Open to those who have completed courses 1 and 2; the laboratory fee is three dollars per semester.

The course is designed for students who wish to pay special attention to the morphology and taxonomy of liverworts, mosses and ferns. Lectures, laboratory and field work.

7. FLOWERING PLANTS — ASSISTANT PROFESSOR ROSENDAHL
Six credits (six hours per week) — Both semesters
Open to those who have completed courses 1 and 2; the laboratory fee is three dollars per semester.

The course is designed to afford the student an opportunity to become proficient in the determination of plant species and plant types, as well as to show the genetic development and relationships of the flowering plants. Lectures, reference reading, laboratory, greenhouse and herbarium work, together with field work in the fall and spring.

8. ECOLOGY — PROFESSOR CLEMENTS
Six credits (six hours per week) — Both semesters
Open to those who have completed courses 1, 2 and 3; the laboratory fee is three dollars per semester.

A critical study of plant habitats by means of instruments, and the adaptations produced by water and by light, together with a careful examination of the causes and reactions of plant formations. Class discussions and quizzes, field and greenhouse work.

9. PLANT PHYSIOLOGY — PROFESSOR CLEMENTS
Six credits (six hours per week) — Both semesters
Open to those who have completed courses 1, 2 and 3; the laboratory fee is three dollars per semester; alternates with course 8.

A 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.

11. INDUSTRIAL BOTANY — ASSISTANT PROFESSOR TILDEN
Six credits (six hours per week) — Both semesters
Open to technical students who have completed course 1 and to acaedmic students who have completed courses 1 and 2; the laboratory fee is three dollars per semester.

A study of the origin, distribution and cultivation of plants, yielding products of economic value, the nature and use of these products, and the processes by which they are obtained from the plants. Lectures, demonstrations, topics and laboratory work.

DAIRY HUSBANDRY

T. L. HAECKER, Professor of Dairy Husbandry
EDW. K. SLATER, Assistant Professor of Dairy Husbandry
G. P. GROUT, Instructor in Dairy Husbandry and Bacteriology

1. DAIRY STOCK JUDGING — MR. GROUT
Three credits (three hours per week) — First semester
Open to juniors and seniors.

The gross anatomy of the dairy cow is studied, showing the relation of form to function. Complete life record of many cows is at the students' disposal, giving not only the total yield of each cow, but their economic production as well, placing the work on a scientific basis. A brief history of the dairy breeds is given and practical drill in breed characteristics. Many pure bred herds in the vicinity of the Twin Cities are visited after laying a foundation by working on cows whose economic habits are known. The last six weeks of the semester are devoted to a systematic study of pedigrees.

2. FACTORY MANAGEMENT — ASSISTANT PROFESSOR SLATER
Three credits. — First semester
Open to juniors and seniors.

Includes a study of the organization of creamery associations essential for success in operating creameries, the construction and equipment of whole milk and hand separator factories, and lectures on calculating dividends, sinking funds, percentage of yield, over-run, etc.

3. FACTORY BUTTERMAKING — ASSISTANT PROFESSOR SLATER
Three credits (six hours per week) — First semester
Open to juniors and seniors.

Includes lectures on the composition of dairy products, separation of milk cream ripening, preparation of pure culture starter, pasteurization, churning and working, controlling moisture content of butter, preparing the butter for market, a study of market requirements, the examination and scoring of butter and cheese, and practical demonstrations in the college creamery.

4. CHEESEMAKING
Three credits (Given during factory course Nov. 16—Dec 18) First semester
Open to juniors and seniors.

Includes lectures and practical work in making common and fancy cheese, as Brick, Swiss, Sage, Stilton, Pineapple and Gouda; also advanced work in the study of the importance of the quality and composition of the milk in manufacturing Cheddar cheese; the principles involved in cutting, heating, milling, salting and pressing the curd, curing and marketing cheese, and the construction and ventilation of factories and curing rooms.

5. DAIRY BACTERIOLOGY — MR. GROUT
Three credits (six hours per week) — Second semester
Open to juniors and seniors.
Required in the Dairy and elective in the other courses.

Instruction is given in the preparation of culture media and the cultivation bacteria. During the semester a general study is made of bacteria, their function nd activities, together with a study of the milk flora and of commercial cultures.

6. DAIRY FARM MANAGEMENT — PROFESSOR HAECKER AND MR. GROUT
One and one-half credits (three hours per week) — Last half second semester
Open to juniors and seniors.

Lectures covering the fundamental principles of breeding for developing the highest efficiency in the mature animal. Forage crops will be considered and the arrangements of pasture and field for the most economical feeding of stock. One dairy barn plan will be required.

7. DAIRY BACTERIOLOGY — MR. GROUT
One and one-half credits (three hours per week) — First half second semester
Open to juniors and seniors.

Lectures on the morphology, classification, physiology and cultivation of bacteria; their relation to sanitary milk production and to scientific dairying.

8. DAIRY STOCK FEEDING — PROFESSOR HAECKER
Three credits (three hours per week) — First semester
Open to juniors and seniors.

Lectures on the characteristics, composition and nutritive value of feed stuffs; economical production of dairy stock and dairy products. A study of the production value of feeds, or the relation of feed products. Practice work in formulating rations.

9. GENERAL BACTERIOLOGY — MR. GROUT
Three credits (six hours per week) — First semester
Open to freshmen. Elective.

Text, lecture and laboratory work covering the subject in a general way. Intended to train the student in laboratory methods for investigation along special lines offered later in the college course. Text Muir and Ritchie.

10. DAIRY HUSBANDRY — PROFESSOR HAECKER AND ASSISTANTS
Two credits (six hours per week) — Second semester
Open to freshmen registered in Division B.

Lectures giving instruction in the care of milk, the running of farm separators, and the manufacture of butter. Lectures on the characteristics of the different dairy breeds and points desirable in animals intended for the dairy; the relation of form to production being the basis of instruction in dairy stock selection. Lectures are also given covering the practical phases of feeding. Along with these lectures, practice work is given in cream ripening, churning, working and packing butter, in the use of cream separators, and in milk testing.

DOMESTIC ART

MARGARET J. BLAIR,
EDITH STAPLES, Assistant
AVIS C. HALL, Assistant

1. ELEMENTARY SEWING — MRS. BLAIR
Four credits (four hours per week) — Both semesters
Open to freshmen registered in Division B.

Instruction is given in hand-sewing, including the different stitches, hems, seams, gussetts, plackets, fastenings and the various kinds of darning and patching, taking up the practical application of each. Talks are given on the use and care of the work basket, touching upon the history of its implements, and upon the textiles cotton, wool, silk and linen.

2. DESIGNING AND DRAFTING — MRS. BLAIR
Four credits (four hours per week) — Both semesters
Open to freshmen and sophomores.
Each student is given instruction in designing, drafting, cutting and making of children's garments, also underwear for adults. The drafting is taught by a simple method in which only a tape line and square are used. Lecture work deals with the selection of suitable material and the care of the underwear.

3. TEXTILES — MRS. BLAIR
Three credits (three hours per week) — Second semester
Open to juniors.
A course in textiles is given the second semester. This includes the study of cotton, linen, flax and wool, the manufacture of the different materials. The student is required to make a note-book containing sample of each material as it is studied.

4. ADVANCED DESIGNING, DRAFTING, ETC. — MRS. BLAIR
Six credits (six hours per week) — Both semesters
Open to seniors.
Instruction is given in designing, drafting, fitting and finishing a gown; also a color study from nature in reference to harmony of color in dress. Lectures are given upon proper dress, its style, neatness and suitability to the wearer. Practice teaching.

5. HOUSEHOLD ART — MRS. BLAIR
Three credits (three hours per week) — First semester
Open to juniors.
Household art lectures are given upon house and grounds, noting the distinctive character of the country home; the sanitary conditions involved in the selection of the site of the house; also the influence of the outlook; an elementary study of architecture in connection with planning a house; instruction in the fundamental value of color, form and design; training the taste and emphasizing the laws of hygiene that should influence the selection of materials and styles in the finishing and furnishings of the house.

6. HANDICRAFT — MRS. BLAIR
Three credits (six hours per week) — Second semester
Open to seniors.
Pottery, basketry, leather work, weaving, crocheting and knitting are taken up in this course and studied in their simpler forms.

DOMESTIC ECONOMICS

FANNIE C. BOUTELLE
MARTHA B. MOORHEAD, M.D., Lecturer in Domestic Hygiene

1. THE FAMILY — MRS. BOUTELLE
Three credit hours. — First semester
Open to freshmen.
History of the family as an institution. The economic function of the family with regard to industry, prosperty, education and population. The psychology of family life. Lectures, problems and recitations.

2. THE HOME — MRS. BOUTELLE
Three credit hours — First semester
Open to sophomores.

The evolution of the modern home from primitive conditions Evolution of the social, industrial, religious and economic conditions in the home, and their relation to civic life. Influence of the standard of living. Administration, organization and maintenance of the home. Lectures, problems and recitations.

3. LEGAL AND ECONOMIC POSITION OF WOMAN — MRS. BOUTELLE
Three credit hours. — First semester
Open to juniors.
Women as wage earners and the effect from an economic standpoint. Co-operation, with special reference to womans work. Investments. Lectures, problems and recitations.

4. DOMESTIC SERVICE — MRS. BOUTELLE
Three credits hours — First semester
Open to seniors.
History of domestic service in America. Economic phases of domestic service. Disadvantages of domestic service, from both the standpoint of employer and employee. Doubtful remedies for present conditions. General principles of possible remedies. Lectures, problems and recitations.

5. DOMESTIC HYGIENE — DR. MOORHEAD
One credit. — First half second semester
Open to freshmen registered in division B.
Several lectures will be given upon maidenhood, maternity and infancy. These special lectures will be supplemented by the regular lectures which consider the health of the family as dependent upon pure food, pure water, personal cleanliness and proper habits as well as upon heredity. The aim is to impress the truth that a knowledge and observance of the laws of hygiene are essential to the preservation as well as the restoration of health.

DOMESTIC SCIENCE

JUNIATA L. SHEPPERD
MARY L. BULL, Assistant
MAY MACDONALD, Assistant

1. ELEMENTARY DOMESTIC SCIENCE — MISS SHEPPERD
Three credits (four hours per week) — First and first half second semester
Open to freshmen registered in division B.
Fuels.—Composition, source and available power for household use are considered together with various appliances used in the culinary art.
Cooking.—The composition, digestibility, food and money value of vegetables, cereals, breads, are carefully studied, and possible losses in preparing and cooking are elaborated by the use of suitable laboratory exercises. The cooking of vegetables, cereals, breads, etc., are special topics considered. Research work is directed largely toward acquiring reliable data regarding the composition, digestibility, comparative food and money values of such materials as are used in the bi-weekly laboratory practice.
Laundering.—During the first half of the second semester the principles of laundering are taken up; removing stains, dyeing, bleaching, etc., as well as the right use of chemicals and machinery in the laundry receive due attention. The comparative value of starches and bluings is studied. The use of hand and commercial laundry machinery is taught by means of demonstration, observation and reading. Textbooks, lectures, assigned readings and recitations.

2. DOMESTIC SCIENCE — MISS SHEPPERD
Two credits (four hours per week) — First semester
Open to sophomores.

During the year special attention is given to fruit dishes, the preservation of fruit by means of canning, preserving, pickling, jelly making, etc., followed by such other work as conditions and prices of materials warrant.

3. DOMESTIC SCIENCE—HOUSEHOLD SANITATION — MISS SHEPPERD
Two credits (two hours per week) — Second semester
Open to sophomores.

Instruction consists of discussions in regard to the conditions necessary to healthfulness; the general application of sanitary principles in relation to food, air and water; care of plumbing, heating, lighting and ventilating apparatus; disposal of kitchen waste, etc.

4. METHODS IN DOMESTIC SCIENCE — MISS SHEPPERD
Four credits (four hours per week) — Both semesters
Open to juniors.

The object of this course is to acquaint the students with approved methods of conducting laboratory work that they may acquire ability to teach successfully under varied conditions; to give such efficiency as will insure pupils working rapidly, harmoniously and successfully from the first. General information concerning their class work in practice teaching is required in the form of an itemized account; i. e., kind and amount of materials used, number of students present, cost of lessons, etc., followed by syllabi of certain topics, as water, air, etc., and laboratory practice.

5. DOMESTIC SCIENCE PRACTICE TEACHING — MISS SHEPPERD
Four credits (four hours per week) — Both semesters
Open to seniors.

The dining room in its different phases of equipment, care, etc.; labor saving devices and the possible application of business methods in housekeeping receive due consideration. Independent teaching with as much practice as possible in selecting food materials at the market, preparing and serving with limited means, is required. Class-room discussions, laboratory practice, etc.

This is the culmination of the student's school work and each is expected to show her ability to use knowledge by preparing floor plans showing equipment, with details for construction and tentative cost of a laboratory kitchen as well as to make lesson outlines, practice their use and revise and perfect them as far as possible.

6. DOMESTIC SCIENCE—NURSERY AND DIETETICS — DR. RICHARD BAIRD
Second semester

Open to juniors and seniors. Elective.

The University Training School for Nurses is, primarily, a school for nurses; but arrangements have been made whereby seniors in Domestic Science will be permitted to take advantage of the lectures, which will cover elementary nursing, dietetics, emergency work, etc. Due credit will be allowed for all work taken.

7. BREAD MAKING — MISS SHEPPERD
One credit (two hours per week) — Second half second semester
Open to sophomores.

Yeast breads. Lectures, library research, practice and classroom discussions

DRAWING AND DESIGNING

FREEHAND

MISS CLOPATH, Instructor in Freehand Drawing and Designing

1. FREEHAND DRAWING — MISS CLOPATH
One credit (four hours per week) — One-half second semester
Study of proportion and form, including drawing from plants and from objects. The study of perspective in rectangular and cylindrical objects. Out-of-door architecture and interior drawing.

2. DESIGNING — MISS CLOPATH
Four credits (four hours per week) Elective — Both semesters
History of the principles of designing with exercises, using alphabet, animal and plant motives. Adaptation of these designs to articles of household use. The theory of color with exercises in hue, value and intensity in relation to color harmony. Exercises in lettering.

3. ADVANCED DESIGNING — MISS CLOPATH
Four credits (four hours per week) — Both semesters
Course 2 prerequisite. Elective.
Advanced work along same lines as Course 2.

ECONOMICS

PROFESSOR GRAY
PROFESSOR GREEN, PROFESSOR ROBINSON
PROFESSOR PHELAN, MR. COULTER AND MR. COOPER

1. ELEMENTS OF ECONOMICS — PROFESSOR ROBINSON, DR. PHELAN AND MR. COULTER
Three credits (three hours per week) — Repeated each semester
Open to sophomores, juniors and seniors; designed for those who desire a general knowledge of economics and as an introduction to the more advanced courses offered in the department.

1a. FOREST ECONOMICS AND FOREST LAW — PROFESSOR GREEN
Three credits (three hours per week) — First semester
Open to juniors. Course 1 prerequisite.
The development of forestry in the United States and foreign countries, the forest conditions here and abroad and their effect upon the lumber industry; forest policies of different governments. Lectures, collateral reading and reports.

1b AGRICULTURAL ECONOMICS — MR. COOPER
Three credits (three hours per week) — Second semester
Open to juniors. Course 1 prerequisite.
The development of Agriculture; problems of rural life. Agricultural organization and methods. Agricultural finance and a special study of the various economic movements affecting Agriculture.

1c. ARGICULTURAL ECONOMICS — MR. COOPER
Three credits (three hours per week) — First semester
Open to seniors. Course 1b prerequisite.

Development of agricultural laws as applied to drainage, water rights, irrigation, land contracts and leases. The fundamental features underlying contracts; laws governing negotiable papers and their uses; courts and their jurisdiction. The development of co-operation and co-operative societies, methods of organization and of operation of agricultural co-operative societies with a special study of their administration.

2. ECONOMIC GOEGRAPHY — PROFESSOR ROBINSON
Three credits (three hours per week) — First semester
Open to sophomores, juniors and seniors.

A study of the economic basis of modern civilization. The course embraces (1) a brief survey of the history of commerce prior to the modern period; (2) an analysis of the causes, both in nature and man, which control the development and the localization of industry and commerce; (3) a summary view of the development of transportation in relation to commerce; (4) some mention of the principal materials of commerce; and (5) a more detailed consideration of the natural resources, chief industries, commercial products, and commercial relations of the leading countries. Special attention is given to the United States and to international trade routes, both by land and sea. Text-book, supplemented by lectures, reports on special topics, and quiz.

3. MODERN INDUSTRIAL AND COMMERCIAL HISTORY — PROFESSOR GRAY
Three credits (three hours per week) — Both semesters
Open to sophomores, juniors and seniors; may be taken in conjunction with course 1 or course 2; both semesters must be completed before credit is given for the first semester.

The industrial and commercial history of western Europe and America since the middle of the eighteenth century. The effects of modern inventions and political changes on industry and trade. Lectures with prescribed topical readings. One written report of considerable length will be required each semester.

4. ADVANCED ECONOMICS — PROFESSOR GRAY
Three credits (three hours per week) — Second semester
Open to those who have completed course 1; required for a major in economics.

An advanced course in general economics, devoted largelv to a study of recent theories of distribution. Assigned readings, reports and discussions.

5. MONEY AND BANKING — DR. PHELAN
Three credits (three hours per week) — Repeated each semester
Open to those who have completed course 1.

The history and theory of money; nature and uses of credit; functions of banks, trust companies and other financial institutions; foreign exchange and the settlement of international balances. Lectures, text-book, assigned readings and discussions.

6. PUBLIC FINANCE — PROFESSOR ROBINSON
Three credits (three hours per week) — First semester
Open to those who have completed course 1.

The development of the state as an economic organism. Public expenditures from the viewpoint of public wants. Budget system of the leading countries, with special emphasis on the United States. Public revenues from public domains and industries. Principles, incidence and administration of taxation. The theory of public debts. Text-books, supplemented by lectures and assigned readings.

7. PROBLEMS IN TAXATION — PROFESSOR ROBINSON
Three credits (three hours per week) — Second semester
Open to those who have completed course 6.

Study of tax systems, tax reforms, and special forms of taxation, such as the mortgage, corporation and inheritance taxes. Based on Seligman, Essays in Taxation, and reports of state tax commissions with lectures and reports on special topics.

8. ECONOMICS OF TRANSPORTATION AND COMMUNICATION — PROFESSOR ROBINSON
Three credits (three hours per week) — Second semester
Open to those who have completed course 1 and to students in the technical colleges.

A general course on the history and theory of transportation and communication, with special reference to the United States; early routes and methods of migration and commerce; causes determining the location of railways; effect of steam and electricity in the consolidation of industries and of nations; signal systems, the post, telegraph and telephone; parcels post and express service; economic functions and relations of highways.

22. MATERIALS OF COMMERCE — MR. COULTER
Three credits (three hours per week) — Second semester
Open to juniors and seniors who have completed course 2.

A study of the principal wares of commerce with reference to sources, uses and industrial processes. Text-books with collateral reading, lectures and visits of inspection.

28. FINANCIAL HISTORY OF THE UNITED STATES — DR. PHELAN
Three credits (three hours per week) — Second semester
Open to those who have completed courses 1 and 5.

The main lines of our financial development, including our monetary and banking history, are traced by means of lectures. Readings in the literature of the subject and topics for investigation are assigned. Lectures, text-book, assigned readings, and discussions.

EDUCATION

Course 1 in philosophy and courses 1 and 2 in education are specified as necessary for the University Teacher's Certificate. One other three-hour course for a half year is required for this certificate, and is elective from the courses in education.

1. HISTORY OF EDUCATION TO THE REFORMATION — ASSISTANT PROFESSOR SWIFT
Three credits (three hours per week) — First semester
Open to juniors and seniors.

An introductory study in the history of education conducted by means of lectures, assigned readings, discussions and reports. The purpose of the course is to arouse an interest in educational problems, to secure some perspective for use in current investigation, with some command of the facts of educational history, and some ease in the methods of historical study. An attempt is made to bring out education as one phase of civilization and to show the connection of schools with other social institutions. Attention will be given especially to an examination of the schools of Greece and of Rome, the education of the early Christian centuries, the development of different types of schools in Medieval times, the rise of the University and of the humanistic schools of the Renaissance.

2. HISTORY OF MODERN EDUCATION — ASSISTANT PROFESSOR SWIFT
Three credits (three hours per week) — Second semester
Open to juniors and seniors who have taken course 1 in education.

A somewhat intensive study of the periods in the history of modern education, with special reference to the development of the various national systems of public instruction. Different types of educational theory are considered in connection with a study of the men who first advanced them, and of the schools in which they were first put into effect. This course is a direct preparation for an understanding of the educational systems, theories, and practices of the present.

ENTOMOLOGY

FREDERICK L. WASHBURN, Professor of Entomology
A. G. RUGGLES, Instructor in Entomology
HENRY J. FRANKLIN, Instructor in Entomolgy

1. GENERAL ENTOMOLOGY — PROFESSOR WASHBURN
Three hours per week. — First half first semester
Required of freshmen registered in division B.
The structure and classification of insects. Study of the orders.

2. ECONOMIC ENTOMOLOGY — PROFESSOR WASHBURN, MR. RUGGLES, DR. FRANKLIN
Three credits (three hours per week) — First semester
Open to juniors and seniors. Elective.
Lectures upon injurious insects of Minnesota and best methods of combating the same. The use of insecticides and spraying machinery. Beneficial insects.

3. FOREST ENTOMOLOGY — DR. FRANKLIN AND MR. RUGGLES
Five credits (six hours per week) — Both semesters
Open to juniors in forestry.
This course aims to give the student a thorough, practical training in elementary entomology. They will be directed in a special study of insect affecting forest and shade trees, and will be encouraged in doing field work, collecting, identifying, and becoming familiar with the life history of forest insects.

4. COMPARATIVE ANATOMY AND HISTOLOGY OF INSECTS — MR. RUGGLES
Three credits (six hours per week)
Open to juniors and seniors. Elective.
A detailed study of structure of representatives of different orders of insects.

5. ELEMENTS OF BEE KEEPING — PROFESSOR WASHBURN
One credit (two hours per week) — Second half second semester
Open to juniors and seniors.
One lecture a week and work in apiary during spring term.
Offered to those qualified for the work.

6. SPECIAL PROBLEMS — PROFESSOR WASHBURN
Three credits (three hours per week) — First or second semester
Open to graduate students only. Elective.

7. INSECTS AND DISEASES — PROFESSOR WASHBURN
One credit — Second half second semester
Open to juniors and seniors.
Lectures upon insects and insect-like animals which are in any way carriers of disease, or which affect the general health of man or other animals. Such pests as the common house fly (and its relation to typhoid and other diseases), the malarial and yellow fever mosquitos, fever bearing ticks, bot flies, fleas, lice, poultry pests, mange and scab-producing animals will be discussed and studied.

8. GAME PROTECTION AND FISH CULTURE — PROFESSOR WASHBURN
One credit (two hours per week) — First half second semester
Open to juniors and seniors.

Relation of game and other birds, and of various four footed animals, to forest protection. Habits, range, usefulness or the contrary. The manner of protecting the important large and small game, fish and birds. Not given in 1909-10.

FARM STRUCTURES AND FARM MECHANICS

WILLIAM BOSS, Professor of Farm Structures and Mechanics
A. M. BULL, Instructor in Mechanical Drawing
H. B. WHITE, Instructor in Carpentry
J. M. DREW, Instructor in Blacksmithing
J. L. MOWRY, Instructor in Practicums
H. J. THOM, Assistant Instructor in Blacksmithing

1. FARM MECHANICS
Six credits (six hours per week) — First and second semesters
Open to freshmen registered in division B.
Subdivided as follows:

MECHANICAL DRAWING — MR. BULL
Three hours per week. — First semester

The student is taught the practical value of drawing for the purpose of designing and arranging buildings, machinery, etc. He makes drawings of the shop exercises, then works from his own drawings, thereby learning the application.

Designs are made for dwellings, barns, outbuildings, and machinery. As practical subjects for their designs, students are requested to bring from home data for plans of buildings needed on their farms. Estimates are made of the amount of material required and cost of construction.

CARPENTRY — MR. WHITE
Three hours per week. — First semester

Instruction is given by means of lectures on the care and use of the common carpenter tools, such as should be found on every farm; also on methods of farm building construction, framing, laying out rafters, stairways, estimating building material, painting, etc. In the carpenter shop, students are required to make such exercises as will give them some practice in using carpenter tools. They are required to make mortise joints, splices, drawing boards, hammer handlers, eveners, cupboards, etc.

Each student is required to file his own saws, sharpen his planes, chisels, etc., and to lay out rafters for buildings.

BLACKSMITHING — MR. DREW
Three hours per week. — Second semester

The students are instructed in the management of the forge and fire, and in bending, shaping and welding iron and steel. Particular attention is given to rapid and accurate welding and to the shaping and tempering of steel tools.

PRACTICUMS — MR MOWRY
Three hours per week. — Second semester

Lectures and practice work on steam and gasoline engines, wells, pumps, pipe fitting, soldering, belt lacing, cement and concrete work.

The practical work will be supplemented by lectures on the properties and strength of wood, steel and cement, quick methods of testing, the construction of camp buildings and bridges, and the comparative prices of materials.

2. MECHANICAL DRAWING — PROFESSOR BOSS AND MR. BULL
Three credits (six hours per week) — First semester
Open to freshmen in forestry.

The work in this course is designed to prepare the student for his work in Forest Engineering. Preliminary work in lettering and projecting. Designs in the location and arrangement of buildings and mills, machinery and shops, creosoting plants and testing laboratories. Water color and tinting. The laboratory work will be accompanied by lectures on practical application of the subject.

3. FOREST MECHANICS — PROFESSOR BOSS, MR. DREW AND MR. WHITE
Three credits (nine hours per week) — Second semester (Feb. 1—Apr. 15)
Open to juniors in forestry.

(a) Blacksmithing: Instruction and practice work in the handling of forge and anvil, the bending work, shaping and welding of iron and steel, the tempering of steel tools, the grinding and care of the axe, etc.

(b) Carpentry: Practice work in the use and care of the tools used in lumbering, saw filing, etc.

4. FARM STRUCTURES — PROFESSOR BOSS
Three credits (three hours per week) — Second semester
Open to juniors.

Lectures and practice work are given in laying out plans for farm buildings. The questions of location, size, convenience, methods of construction, materials, heating systems, water systems, ventilation, sewage disposal, painting, durability, cost, etc., are discussed.

5. FARM STRUCTURES — PROFESSOR BOSS
Three credits (three hours per week) — Second semester
Open to seniors.

Each student selects an imaginary or real farm and makes drawings showing location of buildings, drives, yards, fences, etc., paying particular attention to locating each building properly and planning them so as best to meet the requirements of each individual farm and the means at hand for erecting them. Specifications and estimates of cost of buildings are also made.

6. FARM STRUCTURES — PROFESSOR BOSS
Three credits (three hours per week) — Second semester
Open to juniors.

Lectures and practice work in drawing. Location of farm buildings, drives, yards, etc., architectural designing, the study of plans, fittings and equipment; heating systems, ventilation, floors and wood work, painting and decoration.

7. FARM STRUCTURES — PROFESSOR BOSS
Three credits (three hours per week) — First or second semester
Open to juniors and seniors.

The practical application of the principles outlined in course 3. Each student is required to lay out plans for an imaginary or real house, paying particular attention to location, sanitary conditions, heating, ventilating and general conveniences.

FORESTRY

SAMUEL B. GREEN, Professor of Forestry
E. G. CHEYNEY, Assistant Professor of Forestry
J. P. WENTLING, Assistant Professor of Forestry

1. GENERAL FORESTRY — ASSISTANT PROFESSOR CHEYNEY
Three credits — First semester

A brief history of the development of forestry in Europe and America, with the idea of explaining the possibilities of forestry work and the problems which must be solved in this country. The location and brief description of the forests of the world, and more detailed sectional descriptions of the forests of the United States. Lectures and collateral reading.

2. DENDROLOGY — ASSISTANT PROFESSOR WENTLING
Three credits — First semester and first half second semester
Open to sophomores.

A general and comprehensive study of the forest trees of the United States. Their classification, characteristics, range, etc., with special attention to prominent and constant characters as a means of ready identification. Special attention to the important timber trees of the United States. Lectures, assigned reading, special papers, field work.

3. SYLVICULTURE
Six credits — Both semesters
Open to juniors.

a. SYLVICS — ASSISTANT PROFESSOR WENTLING
Three hours per week — First half first semester

Study of the fundamental principles forming the basis of sylviculture, the life history of trees, the influence of environment on tree life in the forest. The origin and determination of forest types, their modification and treatment. Methods of sylvical research. Special attention to the sylvical characteristics of the important commercial species in the United States. Lectures and assigned work.

b. SYLVICULTURE — ASSISTANT PROFESSOR WENTLING
Three hours per week — Second half first semester
First half second semester

Theoretical discussion of the different sylvicultural systems of crop production and reproduction. The practice of sylviculture in the United States and abroad. Consideration of the methods of treatment of woodlands preliminary to the actual field practice of these methods in the forest. Lectures and reference work.

c. SEEDING AND PLANTING — ASSISTANT PROFESSOR WENTLING
Four hours per week — In Itasca Park.

Production, collecting, testing, vitality, storage and sowing of tree seeds. Location and preparation of nurseries and seed beds. Various methods of nursery practice and seeding. Planting. Examinations, report and planting plans. Each student must make a complete report and plan for a specified area. The course aims to give the student sufficient practice to enable him to carry on any work in forest planting. Field work with lectures.

d. IMPROVEMENT THINNINGS — ASSISTANT PROFESSOR WENTLING
Four hours per week — In Itasca Park

Practical field work in marking trees for thinning and reproduction cuttings and in making improvement cuttings. Field work.

4. FOREST PROTECTION — ASSISTANT PROFESSOR WENTLING
Three credits (three hours per week) — First semester
Open to juniors.

Consideration of practical measures for the protection of forests from fires, trespass, grazing, etc. State and Federal forest fire and trespass laws. Protection from forest insects and forest tree diseases will be considered in the particular courses for those subjects. Lectures, assigned reading and original papers.

5. FOREST MENSURATION — ASSISTANT PROFESSOR CHEYNEY
Three credits (180 hours) — In Itasca Park
Open to juniors.

The measurement of lumber and of logs by different units; the contents of individual felled trees. The height of a standing tree; the volume of individual standing trees and of whole forests. The rate of growth of individual trees and of whole stands. The formation of log rules, stand tables, volume tables, height tables, and yield tables. A study of cruising methods. Text book, lectures and field work.

6. PACKING
One credit (four hours per week) — In Itasca Park
Open to juniors.

Demonstration and practice under direction in the packing of wagons, boats, canoes, pack animals, and pack sacks. Field lectures and practice.

7. LUMBERING — ASSISTANT PROFESSOR CHEYNEY
Three credits (three hours per week) — First semester
Open to seniors.

History of logging in the United States. Different methods used in different parts of the country; cruising, location of camps, building of roads, felling trees, skidding and transportation of logs from woods to the mill. In connection with this course, the student is obliged to hand in a lumbering report based on data collected by him at some lumber camp. This requires an excursion of about two weeks. Lectures and collateral reading.

8. FOREST MANAGEMENT — ASSISTANT PROFESSOR CHEYNEY
Three credits (three hours per week) — First semester
Open to seniors.

Policy of forest owners: principles 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. The different methods of management and the principles underlying them. The outlines of a working plan. Lectures and collateral reading.

9. FOREST BY-PRODUCTS — PROFESSOR GREEN AND ASSISTANTS
Three credits (three hours per week) — First semester
Open to seniors.

In this course a special study is made of the products of the forest other than for timber and fuel. The products studied include cellulose for the manufacture of paper, sugar, tanning materials, turpentine, tar, oils, resin, waxes, gum, creosote, wood alcohol, acetic acid, acetone, essential oils, charcoal, camphor and medicinal products. The subjects of paints and the method for the preservation of wood are also taken up. At the beginning of the course a short time is devoted to a review

of organic chemistry, special attention being given to those compounds found in wood or closely related to it. A thesis on some subject relating to the chemistry of forest products is required in this course.

10. FOREST ECONOMICS AND FOREST LAW (Economics Course 1a) PROFESSOR GREEN
Three credits (three hours per week) First semester
Open to juniors.
The development of forestry in the United States and foreign countries; the forest conditions here and abroad and their effect upon the lumber industry; forest policies of different governments. Lectures, collateral reading and reports.

11. BUSINESS LAW PROFESSOR GREEN
One credit (four hours per week) In Itasca Park
Open to seniors.
The fundamental feature underlying contracts; laws governing negotiable papers and their uses; courts and their jurisdiction. The course will deal especially with the application of the subjects to forest conditions.

12. LUMBER MANUFACTURING ASSISTANT PROFESSOR CHEYNEY
Three credits (six hours per week) Second semester
Open to seniors.
SAW MILLS
Capital invested, machinery used, methods, cost of operation, and output of portable and stationary mills. Studies will be made of the up-to-date mills of Minneapolis.
LUMBER GRADING
The part which it plays in the lumber industry; methods and organization leading to uniformity. Study of the rules adopted by the Northern Pine Manufacturers' Association. Several excursions are made to the mills of Minneapolis to study grades and grading in the yards. Economic uses of wood by the various wood using industries.
THE LUMBER MARKET.
Conditions of the market at present and methods which would tend to its betterment and stability. The demands of the market and how they are supplied.

13. FOREIGN FORESTRY PROFESSOR GREEN
One credit (four hours per week) In Itasca Park
Open to seniors.
The development and presentstatus of forestry in foreign civilized countries. Lectures and collateral reading.

14. FOREST WORKING PLANS ASSISTANT PROFESSOR CHEYNEY
Three credits (180 hours) Second semester
Open to seniors.
This subject will be given in the woods. A course of lectures paralleling the field work will deal with the principles and methods involved. Each class will be obliged to work out a complete plan including surveys, sylvicultural plans, estimates, field tables, maps and systems of management. Lectures and field work.

15. FOREST SEMINAR ASSISTANT PROFESSORS CHEYNEY AND WENTLING
Three credits (five hours per week) Second semester
Open to seniors.
This is not, as the term generally implies, 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. Assigned questions and problems; discussions.

16. FOREST ENTOMOLOGY (Entomology 3) DR. FRANKLIN AND MR. RUGGLES
Five credits (six hours per week) Both semesters
Open to juniors and seniors.
This course aims to give the students a thorough, practical training in elementary entomology. They will also be directed in a special study of insects affecting forest and shade trees, and will be encouraged in doing field work, collecting, identifying and becoming familiar with the life history of forest insects.

17. GAME PROTECTION AND FISH CULTURE (Entomology 8) PROFESSOR WASHBURN
One credit (two hours per week) First half second semester
Open to juniors and seniors.
Relatian of game and other birds, and of various four-footed animals, to forest protection. Habits, range, usefulness or the contrary. The manner of protecting the important large and small game, fish and birds. Not given in 1909-10.

18. MATERIALS TESTING LABORATORY (Exp. Eng. 1) PROFESSOR KAVANAUGH AND MR. SHOOP
Two credits (four hours per week) First semester
Open to seniors as an elective.
Investigation of the strength and physical qualities of iron, steel, brass, copper, wood, belting, ropes, chains and cement. Supplemented by lectures on the various materials of construction and standard methods of testing.

19. WOOD PRESERVATION ASSISTANT PROFESSOR CHEYNEY
Three credits (six hours per week) First semester
Open to seniors. Plant Pathology (1) a prerequisite.
The course will consist largely of demonstration work at the plant on the State Fruit Farm. Experiments will be conducted to test the value of different methods of treating, special attention being given to post and pole treatment. The practical work will be supplemented by lectures and collateral reading upon the history of wood preservation, the development of the various methods and a study of the antiseptics used.

20. PHOTOGRAPHY MR. AYER
One credit (four hours per week) First semester
Open to juniors.
Practical work in taking pictures, developing and printing will be supplemented by lectures upon the selection of a lens, the mechanism and uses of the camera and kodak, enlarging and reducing, lantern slides and the mixing of solutions. It is advisable that students provide themselves with kodaks.

FRENCH

1. BEGINNING FRENCH ASSISTANT PROFESSORS ANDRIST AND FRELIN, MADAM BERTIN
Six credits (five hours per week) Both semesters
Open to all, but juniors and seniors receive only half credit; both semesters must be completed before credit is given for the first semester; not credited toward a minor in French. Fraser and Squair's French Grammar and Reader; modern texts.

2. INTERMEDIATE FRENCH ASSISTANT PROFESSOR FRELIN AND MADAM BERTIN
Six credits (three hours per week) Both semesters
Open to sophomores, juniors and seniors who have completed course 1; both semesters must be completed before credit is given for the first semester.
Francois Advanced French Prose Composition; modern texts will be read, including some of the works of Coppee, Merimee, Dandet, Scribe, etc

GEOLOGY

C. W. HALL, Professor of Geology
E. M. LEHNERTS, Assistant Professor of Geology
F. F. GROUT, Instructor in Geology

1. GENERAL GEOLOGY — PROFESSOR HALL
Three credits (three hours per week — First semester
Open to freshmen.

Comprises (1) geodynamics, in which are set forth the phenomena of the atmosphere, water, heat, gravity, and plants and animals as geologic agents; (2) structural geology, wherein stratification, displacement, and veining of rock masses are described; (3) physiographic geology, pointing out prominent earth features and inquiring into the causes producing them; (4) an outline of historical geology. Conferences and lectures illustrated by photographs, maps, profiles and lantern slides.

2. PHYSIOGRAPHY — ASSITANT PROFESSOR LEHNERTS
Three credits (three hours per week) — First semester
Open to freshmen.

Discussion of the principles of earth sculpture and description of the structural features of continents, with special reference to the ethnic movements and commercial activities of mankind.

3. INDUSTRIAL GEOGRAPHY — ASSISTANT PREFESSOR LEHNERTS
Three credits (three hours per week) — Second semester
Open to students who have completed course 1.

The structural features of the North American continent outlined as an introduction. Following this is a study of the types of soil and domination climatic characters of the several agricultural regions of the continent; a discussion of the geography of industries as they have grown up within the past 100 years and their dependence upon physiographic conditions; a study of local industries affected through excursions and reports. A brief survey of industries in other parts of the world parallels the more detailed study of North America. Throughout the course cause and effect are kept in view.

4. ELEMENTS OF METEOROLOGY — ASSISTANT PROFESSOR LEHNERTS
Three credits (three hours per week) — Second semester
Open to juniors and seniors who have completed courses 1 or 2.

The general principles of meteorology are treated, embracing the properties and phenomena of the atmosphere, including an explanation of the ordinary observations of pressure and temperature, together with a more extended study of the apparatus and practice of a weather bureau office. This is followed by a study of storms and climatic elements generally. The conditions of climatic changes are studied and the influence of physiographic conditions are discussed. Text-book, lectures, and reference reading.

5. GEOGRAPHY AND GEOLOGY OF MINNESOTA — PROFESSOR HALL
Three credits (three hours per week) — Second semester
Open to juniors and seniors who have completed course 1.

(a) The physical geography of the state in its relation to geological history and industrial development. (b) A study of the principles and facts of pre-Cambrian geology as exemplified within the state and the extension of these into general application. (c) The present problems of the state in agriculture, drainage, water power, mining, quarrying, etc., are considered in some detail.

6. ELEMENTS OF MINERALOGY — PROFESSOR HALL AND MR. GROUT
Three credits (six hours per week) — First semester
Open to sophomores, juniors and seniors; the laboratory fee is three dollars.

(a) The morphology of minerals; the physical and chemical characters of minerals, with demonstrations; a study of the native elements and of economic minerals; the basis of classification. (b) Laboratory work; this consists of practice in the recognition of crystal forms, tests illustrating the range of minerals, and the application of chemical and blowpipe analysis to the identification of species.

GERMAN

1. BEGINNING — PROFESSOR SCHLENKER, ASSISTANT PROFESSOR WILKIN AND JUERGENSEN, MR. BURKHARD, AND MR. WILLIAMS
Six credits (five hours per week) — Both semesters
Open to all, but juniors and seniors receive only half credit; both semesters must be completed before credit is given for the first semester.

Pronunciation, grammar, conversation, and composition; selected reading in easy prose and verse.

2. INTERMEDIATE — PROFESSOR SCHLENKER, MR. BURKHARD AND MR. WILLIAMS
Six credits (three hours per week) — First semester
Open to those who have completed course 1 or its equivalent; both semesters must be completed before credit is given for the first semester. This course may be supplemented by course 5. It should be followed by course 6 or course 7. Students who obtain credit for this course cannot receive credit also for either course 3 or course 4.

First semester, selections from modern narrative and descriptive prose; selected lyrics and ballads. Second semester, a drama of Lessing, Goethe, or Schiller.

3. SCIENTIFIC INTERMEDIATE — ASSISTANT PROFESSOR JUERGENSEN
Six credits (three hours per week) — Both semesters
Open to all who have completed course 1; both semesters must be completed before credit is given for the first semester.

First semester: Hodge's German Science Reader (or equivalent). Second semester: Brandt and Day's German Scientific Reading. This course aims to give the student a reading knowledge of German for use in scientific studies.

HORTICULTURE

SAMUEL B. GREEN, Professor of Horticulture
LEROY CADY, Instructor in Horticulture
A. R. KOHLER, Instructor in Horticulture

1. FRUIT GROWING — MR. CADY
One and one-half credits (three hours) — First semester
Open to freshmen registered in division B.

Geography of fruit growing, tilling, fertilizing and irrigation of lands; seed sowing; pollination; diseases and injurious insects and their prevention; storing, harvesting and marketing fruits. Lecture and text-book.

2. VEGETABLE GARDENING — MR. KOHLER
Three credit (three hours) — Second semester
Geography of vegetable growing, tilling, fertilizing and irrigation of lands; seed

sowing; vegetables under glass; pollination; diseases and their prevention; storing, harvesting and marketing of vegetables. Lectures and text-books.

3. PLANT PROPAGATION — MR. CADY
One credit (three hours per week) — Last half second semester
Open to freshmen.
Development of cultivated varieties of plants and seed testing; propagation of plants by seed, cutting, grafting and budding; the work of the class room is illustrated by orchards, nurseries, forest plantation, gardens and greenhouses on the grounds of the experiment station and by visits to commercial nurseries and greenhouses nearby.

4. NURSERY WORK — MR. CADY
Two credits (four hours per week) — First semester
Open to sophomores. Elective.
Seedage, layerage, cuttage, graftage, planting, pruning, thinning, storage of nursery stock; tillage of nursery lands; insects and diseases injurious to the nurseries and their prevention. Lectures and practice work.

5. GREENHOUSE MANAGEMENT AND FLORICULTURE — PROFESSOR GREEN AND MR. CADY
Three credits (three hours per week) — Second semester
Open to juniors and seniors. Elective.
Lectures and laboratory work. Greenhouse construction and management; temperature; soil; watering; benches; propagation; prevention of diseases and extermination of insects in greenhouses; rest and growth periods of plants; plants for greenhouse cultivation.

6. LANDSCAPE GARDENING — PROFESSOR GREEN AND MR. CADY
Three credits (three hours per week) — First semester
Open to juniors and seniors. Elective.
A general course in the practice and principles of landscape gardening, special attention being given to the planting of small grounds.

7. PLANT BREEDING — PROFESSOR GREEN
Three credits (six hours per week) — Second semester
Open to juniors and seniors. Elective.
Lectures and laboratory work. The fact and philosophy of variation; crossing of plants and origination of domestic variteies.

8. SYSTEMATIC POMOLOGY — MR. KOHLER
Three credits (six hours per week) — First semester
Open to juniors and seniors. Elective.
Description and classification of the varieties of the various fruits with special reference to those varieties adapted to Minnesota; the identification of varieties; judging of fruits; fruit sections of the country; and a brief study of the fruits not taken up in course 1 with their introduction, cultivation, propagation and distribution.

9. SPRAYING MATERIALS AND COMPOUNDS — MR. KOHLER
Two credits (one lecture and one three-hour laboratory period per week)
Open to juniors and seniors. — Second semester
A study of spraying materials, their preparation and use. Laboratory work consists in preparing a large number of different spraying mixtures, in studying different types of spraying apparatus, and in applying sprays. Students must provide themselves with overalls and jackets for this work.

MATHEMATICS

H. B. Roe, Instructor in Mathematics

1. Plane Trigonometry — Mr. Roe
Three credits (three hours per week) — Second semester
Open to those who have completed the algebra and plane geometry of the intermediate year of the School of Agriculture, or equivalent work in approved high schools.

The course includes a short, systematic review of the essentials of algebra and plane geumetry, in which all students must show proficiency, the thorough study of the theory and use of logarithms and of the functions of plane trigonometry, with numerous practical applications. No student who has not completed the subject of Higher Algebra, as given in accredited High Schools, will be admitted to the course.

PSYCHOLOGY

Professor Wilde
Assistant Professor Miner

1. Introductory Psychology — Professor Wilde and Assistants
Three credit hours. — First and second semesters
This course is required for all advance work in Psychology and for the teacher's certificate; it also serves an introduction to the courses in philosophy. The purpose of the course is to acquaint the student with the general characteristics and laws of mental life and with the aims and methods of modern psychology. The work involves text-books, lectures and essays.

2. Educational Psychology — Assistant Professor Miner
Three credit hours. — Second semester
Open only to sophomores, juniors and seniors who have completed course 1.
The study of mental development in its relation to heredity and training. Lectures and student reports on the facts and theories of childhood and adolescence, with special reference to their bearing on education.

PEDAGOGICS

D. D. Mayne, Professor of Agricultural Pedagogics

1. Priciples of Teaching — Professor Mayne
Three credits (three hours per week) — First semester
Open to sophomores in College and students in Normal Course.
This course includes a consideration of the elementary principles of teaching, a study of general methods, and a pecial study of methods of teaching industrial subjects. Lectures, assigned readings, discussions and reports.

2. Industrial Education — Professor Mayne
Three credits (three hours per week) — First semester
Open to juniors in College and students in Normal Course.
This course includes a short history of industrial education; the present status of industrial education in Europe and in the United States; the place of manual training and home arts in an educational system; the place of agricultural teaching in the public schools; trade and vocational schools.

POLITICAL SCIENCE

1. THE AMERICAN GOVERNMENT — PROFESSOR SCHAPER AND MR. ALLIN
Three credits (three hours per week) — Repeated each semester
Open to sophomores, juniors and seniors.

An elementary course in American government intended as a preparation for the advanced courses in political science, for teaching in secondary schools and for good citizenship; a study of the organization and actual working of the national and local governments; a series of lectures on the nature and origin of the American governmental system precedes a study of the text and assigned topics; special attention will be given to important statutes on naturalization, organization of the judiciary, and of executive departments, interstate commerce, trusts, etc. Text, lectures, and special topics.

3. THE ELEMENTS OF JURISPRUDENCE — PROFESSOR SCHAPER
Three credits (three hours per week) — First semester
Open to those who have completed course 1.

A study of those human relations requiring legal regulation considered from the American point of view; the nature and source of law, status, rights and wrongs, partnership, corporations, etc. The course is inteded for active citizenship and for the study of law. The student will practice looking up cases and summarizing leading principles. The course is based on a text, with lectures and assigned reading.

RHETORIC

R. C. LANSING, Assistant Professor of English

1. RHETORIC, GENERAL — ASSISTANT PROFESSOR LANSING
Three credits per semester (three hours per week) — First and second semesters
Open to freshmen.

The course includes theme writing with lectures and recitations on the principles of composition, and the analysis of good expository writing with reference to construction, sentence and diction.

2. RHETORIC, ADVANCED — ASSISTANT PROFESSOR LANSING
Three credits per semester (three hours per week) — First and second semeters
Open to students who have passed in Course 1.
First semester: Argumentation, briefing, and debate.
Second semester: Thesis writing and the form of public speaking are emphasized as training for the work in constructive English likely to be required in later professional life. Conference with the instructor is a part of the course. If a sufficient number of students desire it, a course in the short story will be given.

SOILS

HARRY SNYDER, Professor of Soils
W. H. FRAZIER, Instructor in Soils
A. D. WILHOIT, Instructor in Soils

1. SOILS AND FERTILIZERS — PROFESSOR SNYDER AND MR. FRAZIER
Two credits (five hours per week) — First semester
The object of this course is to familiarize the student with the elementary

principles of soil fertility. The soil is studied from physical, chemical, bacteriological and geological points of view. Some of the topics are: the physical properties of soils and their influence upon crop production and chemical change; the chemical composition of soils; the organic compounds of soils and their effect upon fertility; the essential elements of plant food, their occurrence in the soil and availability; the losses and gains of soil nitrogen; farm manures; commercial fertilizers; the draft of farm crops upon the soil; rotation of crops as affecting fertility; judging, rating and scaling of soils. Laboratory practice forms a feature of the work and each student is requested to bring samples of soils from his home farm for this purpose.

2. Soil Fertility and Soil Management — Professor Snyder
Two credits (two hours per week) — Second semester
Open to freshmen registered in division B.
Open to juniors and seniors. Course 1 Prerequisite.
Lectures:—This is an advanced course, treating of the relation of soil fertility to crop production. Some of the chief topics considered are: rock decay; soil types produced from different kinds of rocks; soil solutions; soil organisms and their products; soil faults and their correction; soil surveys; the permanent improvement of soils; influence of different types of farming upon soil fertility; soil management; causes of unproductiveness of soils and the general relationship of soils to plant life. The food requirements and physical condition of soils for the production of various farm crops, the development and conservation of the natural fertility of the soil and the commercial sources and forms of plant food with their economic uses are also studied.

3. The Analysis of Soils and Fertilizers. — Professor Snyder, Mr. Frazier and Mr. Wilhoit
Six credits (six hours per week) — Both semesters
Open to juniors and seniors. Elective.
Laboratory courses—(a) and (b) each one semester.
(a) The chemical analysis of soils.
Laboratory practice in the chemical analysis of soils and the study of the chemical methods employed in soil investigations. Particular attention is given to the study of the organic compounds of soils, and an opportunity is offered for the study of experimental soil work applied to field investigations.
(b) The physical analysis of soils.
Laboratory practice in the physical analysis of soils by means of elutraition and sedimentation methods as modified by the centrifuge. Course three is intended for students who desire to make a specialty of the subject of soils.

VEGETABLE PATHOLOGY AND BOTANY

E. M. Freeman, Professor of Vegetable Pathology and Botany
W. L. Oswald, Instructor in Vegetable Pathology

1. Plant Pathology — Professor Freeman
Three credits (six hours per week) — First semester
Open to juniors.
General outline of the diseases of plants due to fungus organisms; a special study of the life histories and classification of the most important plant diseases, particularly those affecting economic plants of Minnesota. Thesis work and specialization according to the interests of the students; for instance, for forestry students, diseases of forest trees; for agronomy students, diseases of cereal crops, etc. Special attention is paid to methods of prevention and cure. Lectures, reference reading, laboratory and thesis work.

2. WOOD TECHNOLOGY — PROFESSOR FREEMAN
Three credits (six hours per week) — Second semester
Open to sophomores in forestry course.

A comprehensive study of the structural features of types of the most important woods of commerce; special reference to the woods of the United States, and particularly to those of this state. Structural development in the life of the tree. Physical and mechanical characters as related to the structural features. A comparative study of a large number of woods with a view to identification and classification. Thesis work on the detailed studies in the histology of the woods.

3. AGRICULTURAL BOTANY — PROFESSOR FREEMAN
Three credits (six hours per week) — First semester
Open to all who have completed course 1, General Botany.

This course will include a study of weeds and weed seeds and methods of detection and eradication. Special study of impurities of Minnesota seeds will be made. It will also include a study of soil botany, particularly the economic phase of leguminous nodules and a life history study of agricultural crops.

4. ADVANCED PATHOLOGY — PROFESSOR FREEMAN
Six credits (six hours per week) — First and second semesters
Open to all who have completed Mycology or Course 1 in Plant Pathology. Elective.

Special cultural and laboratory methods in Plant Pathology. Special practical problems in plant diseases. Laboratory reference and lecture work.

5. ADVANCED PATHOLOGY — PROFESSOR FREEMAN
Graduate work. Open to those who have completed three years' work in Academic Botany and one years' work in Plant Pathology. Mycology is required as a prerequisite course. Special problems in the investigation and prevention of plant diseases. This course is designed for minor or major subject for candidates for advanced degree.

VETERINARY

M. H. REYNOLDS, Professor of Veterinary Medicine and Surgery
C. C. LIPP, Assistant Professor of Veterinary Medicine and Surgery
C. A. PYLE, Instructor in Veterinary Science

1. VETERINARY WORK — PROFESSOR REYNOLDS AND DR. PYLE
Two credits (three hours per week) — First semester
Open to freshmen registered in division B.

During the freshman year class B students take up a course of study in veterinary medicine, the purpose of which is to fit them for intelligent care of their farm stock. In this course the teaching is done by means of text-book, lectures, reviews and clinical work at the hospital maintained for this purpose. Lectures are illustrated by means of stereopticon, charts, manikin of horse, skeletons and various other appliances. The work covers the following subjects: elementary anatomy; elementary pathology; cause and prevention of diseases; diagnosis and treatment of common diseases; examination for soundness; and a final short course on common medicines, studying their effects, uses and doses. At the hospital of clinics students are enabled to learn the elements of diagnosis for common diseases and forms of lameness.

2. ANATOMY OF DIGESTION PROFESSOR REYNOLDS AND DR. PYLE
One and one-half credits (three hours per week) First half second semester
Open to juniors and seniors. Elective. Given in alternate years 1909–1910.
Comparative anatomy of the digestive organs, dissection, collateral reading and recitations. Chauveau's Comparative Anatomy is used for freference and comparison.

3. PHYSIOLOGY OF NUTRITION ASSISTANT PROFESSOR LIPP
One and one-half credits (three hours per week) Last half second semester
Open to juniors and seniors. Elective. Given in alternative years, 1909–1910.
This is an advanced study of the veterinary physiology of digestion, taking up the digestive fluids, nervous mechanism of digestion, absorption and digestion of grains and fodders. It also includes a study of body nutrition, body income and expenditures, source of heat supply and heat loss, and metabolism. Veterinary Physiology, by F. Smith, is used as a text and guide for this work, but students are required to do collateral reading.

4. ANATOMY OF LOCOMOTION AND CONFORMATION DR. PYLE
One and one-half credits (three hours per week) First half second semester
Open to juniors and seniors. Elective.
Given in alternate years, 1910–1911.
This course deals with the anatomy of locomotion. The bones, articulations and muscles involved in locomotion and conformation are studied by text-book, dissection and collateral reading. Shoeing, diagnosis and treatment of common forms of lameness may be included in course three. Strangeway's Veterinary Anatomy is used as a text-book and Chauveau for reference.

5. COMMON DISEASES PROFESSOR REYNOLDS
One and one-half credits (three hours per week) Last half second semester
Open to sophomores, juniors and seniors. Elective.
This course covers causes, prevention, and deals with common and serious diseases of domestic animals.

ZOOLOGY

HENRY F. NACHTRIEB, Professor of Animal Biology
CHARLES P. SIGERFOOS, Professor of Zoology
JOHN C. BROWN, Assistant Professor of Animal Biology
HAL. DOWNEY, Assistant Professor of Animal Biology
OSCAR W. OESTLUND, Assistant Professor of Animal Biology
CHARLES E. JOHNSON, Instructor in Animal Biology

1. GENERAL ZOOLOGY PROFESSOR SIGERFOOS, ASSISTANT PROFESSORS OESTLUND, BROWN, DOWNEY, AND MR. JOHNSON
Six credits (six hours per week) Both semesters
Open to all; the laboratory fee is three dollars per semester
This course is a comparative study of the principles of structure, physiology, and development in animals. In the laboratory a brief study of insects and the dissection of the frog are used as a practical introduction to the course. Then follow a study of cell structure and cell division, a systematic study of representatives of the chief phyla or branches of the animal kingdom, and a study of the elements of embryology as illustrated by the development of the star-fish and chick. Lectures, quizzes, and laboratory work. Text-book required: Hertwig's Manual of Zoology.

2. MORPHOLOGY OF INVERTEBRATES PROFESSOR SIGERFOOS AND MR. JOHNSON
Six credits (six hours per week) Both semesters

Open to those who have completed course 1; both semesters must be completed before credit is given for the first semester; the laboratory fee is three dollars per semester.

The object of this course is to familiarize the student with the methods and principles of zoology through an intensive study of two or three groups of animals and to acquaint him with the minor phyla not considered in course one.

3. ESSENTIALS OF HISTOLOGY AND EMBRYOLOGY PROFESSOR NACHTRIEB AND ASSISTANT PROFESSOR DOWNEY
Six credits (six hours per week) Both semesters

Open to those who have completed course 1; the laboratory fee is three dollars per semester.

In this course are taken up the development and minute structure of the animal as an organism built up of tissue combined into organs, and the student is given practice in general methods, technique, and the use of apparatus. The course prepares directly for most of the advanced courses. Lectures, quizzes and laboratory work.

4. COMPARATIVE ANATOMY OF VERTEBRATES ASSISTANT PROFESSOR BROWN AND MR. JOHNSON
Six credits (six hours per week) Both semesters

Open to those who have completed course 1 or its equivalent; both semesters must be completed before credit is given for the first semester; the laboratory fee is three dollars per semester.

The first semesters' work is based opon a study of chordates, cartalaginous and bony fishes and all classes up to mammalia; the second semester to a detailed study of the cat and comparative studies of the rabbit, sheep, and man. Lectures, quizzes and laboratory work. Required text-books: Davidson's Mammalian Anatomy and Burkholder's Anatomy of the Brain.

5. GENERAL PHYSIOLOGY PROFESSOR NACHTRIEB
Six credits (three hours per week) Both semesters

Open to those who have completed course 1; both semesters must be completed before credit is given for the first semester.

In the first semester are considered the physical, structural, and functiona features of living substance; the cell, present conditions, and expressions of life; and the theories of the origin of life and death. Demonstrations and simple experiments constitute an essential part of the course in both semesters.

In the second semester the life of the cell is considered in its relations to that of other cells and the course is concluded with special reference to the teaching of physiology in high schools.

D

The School of Agriculture

The School of Agriculture

FACULTY

CYRUS NORTHROP, LL.D., President.
J. W. OLSEN, B.S., Dean
DEXTER D. MAYNE, Principal
J. A. VYE, Secretary
J. M. DREW, Registrar
FANNIE C. BOUTELLE, Preceptress
ANNA M. SMITH, Librarian

AGRICULTURE

ANDREW BOSS, Agriculture
C. P. BULL, B.Agr., Assistant in Agriculture
A. D. WILSON, B.S. in Ag., Assistant in Agriculture
L. B. BASSETT, Farm Machinery
T. P. COOPER, B. S. in Agr., Assistant in Agriculture

AGRICULTURAL CHEMISTRY

HARRY SNYDER, B.S., Agricultural Chemistry
J. A. HUMMEL, B. Agr., Assistant in Agricultural Chemistry
AGNES ERICSON, Asistant in Agricultural Chemistry
CORNELIA KENNEDY, B.A., Assistant in Agricultural Chemistry
WALTER L. BADGER, Assistant in Agricultural Chemistry

AGRICULTURAL ENGINEERING AND PHYSICS

J. T. STEWART, B.S., Agricultural Engineering, Physics
A. L. EWING, M.S., Assistant in Agricultural Physics

ANIMAL HUSBANDRY

ANDREW BOSS, Animal Husbandry
J. M. DREW, Poultry
D. A. GAUMNITZ, M.Agr., Assistant in Animal Husbandry
J. L. EDMUNDS, B.Sc., in Agr., Assistant in Animal Husbandry
W. F. HANDSCHIN, Asistant in Animal Husbandry

DAIRY HUSBANDRY

T. L. HAECKER, Dairy Husbandry, Animal Nutrition
A. J. MCGUIRE, B.Agr., Assistant in Dairying
GEO. P. GROUT, B.S. in Agr., Assistant in Dairy Husbandry
E. K. SLATER, Assistant in Dairy Husbandry

DOMESTIC ART

MARGARET J. BLAIR, Sewing, Household Art
EDITH STAPLES, Assistant in Sewing
AVIS HALL, Assistant in Sewing
GRETA SMITH, Assistant in Sewing

DOMESTIC SCIENCE

JUNIATA L. SHEPPERD, M.A., Cooking, Laundering, Home Economics
MARY L. BULL, Assistant in Cooking, Laundering
MAY MCDONALD, B.S., in Home Economics, Assistant in Cooking

ENGLISH

R. C. LANSING, M. A., English
ESTELLE COOK, Assistant in English
ETHEL E. BUSH, B.A., Assistant in English

ENTOMOLOGY AND ZOOLOGY

F. L. WASHBURN, A.M., Zoology, Entomology
A. G. RUGGLES, M.A., Assistant in Entomology
H. J. FRANKLIN, B.S., Ph.D., Assistant in Entomology

FARM STRUCTURES AND FARM MECHANICS

WM. BOSS, Farm Structures, Farm Mechanics
J. M. DREW, Blacksmithing
A. M. BULL, Drawing, Farm Buildings
H. J. THOM, Assistant in Blacksmithing
THOS. SEWALL, Assistant in Drawing
H. B. WHITE, B.S. in Agr., Assistant in Carpentry
J. L. MOWRY, Assistant in Mechincal Practicums

HORTICULTURE AND FORESTRY

S. B. GREEN, B.S., Horticulture, Forestry
LEROY CADY, B.S., in Agr., Assistant in Horticulture
E. G. CHEYNEY, A.B., Assistant in Forestry
A. R. KOHLER, B.S.A., Assistant in Vegetable Gardening
J. P. WENTLING, M.A., Assistant in Forestry

SOILS

HARRY SNYDER, B.S., Soils
W. H. FRAZIER, B.S., Assistant in Soils
A. D. WILHOIT, M.A., Assistant in Soils

VEGETABLE PATHOLOGY AND BOTANY

E. M. FREEMAN, Ph.D., Vegetable Pathology, Botany
W. L. OSWALD, Assistant in Agricultural Botany

VETERINARY SCIENCE

M. H. REYNOLDS, M.D., D.V.M., Veterinary Science
C. C. LIPP, D.V.M., Comparative Physiology
C. A. PYLE, B.S., D.V.M., Assistant in Veterinary Science

SCHOOL

J. A. Vye, Farm Accounts
D. D. Mayne, Practicums
GRACE B. WHITRIDGE, Physical Training
KARL A. MACHETANZ, B.A., History, Director of Gymnasium
FANNIE C. BOUTELLE, Social Culture
D. B. HOWELL, Ph.B., Mathematics
EDWARD SIGERFOOS, Ph.B., Capt. 5th U. S. Infantry, Military Science and Tactics
MARTHA B. MOORHEAD, M.D., Lecturer in Domestic Hygiene
MARY L. COFFIN, Music
GERTRUDE V. COLLLINS, Assistant in Farm Accounts
H. B. ROE, B.S., in Eng., Mathematics

Committees, School of Agriculture

LIBRARY: Mayne Reynolds, Snyder, Smith, Green.
CATALOG: Vye, Snyder, Drew.
MILITARY DRILL: Sigerfoos, Green, Haecker
ENTERTAINMENT: Mayne, Boutelle, A. Boss.
HEALTH: Reynolds, Mayne, Boutelle, Washburn.
DAIRY SCHOOL: Haecker, Wm. Boss, Snyder.
SHORT COURSE FOR FARMERS: Mayne, A. Boss, Green.
AUDITING: Reynolds, Hummel.
ATHLETICS: Green, Mayne, Machetanz.

The School of Agriculture

TIME OF OPENING

The School of Agriculture will open Monday, October 4th, 1909, and close March 23rd, 1910. The fall term closes at 4:30 p. m., Thursday, December 23rd, and the winter term begins Monday, January 3rd, 1910.

Instruction begins promptly at the opening of each term, and students should be present the first day of the term and remain until the close of the term.

Students are advised to correspond with the registrar of the school, J. M. Drew, University Farm, St. Paul, Minnesota, prior to coming to the institution and to make the necessary preliminary arrangements for registration. Students registered in the fall term will not be received after the second day of the winter term, unless a reasonable excuse is presented for the delay.

LOCATION

The School of Agriculture is located on University Farm, St. Paul, Minnesota, about midway between the business portions of the cities of St. Paul and Minneapolis. Directions for reaching the school are given on page 9. The School of Agriculture is a part of the University of Minnesota and is governed by the University Board of Regents.

PURPOSE

The School of Agriculture was organized in 1888 with the object of giving a practical education to the young men and women who are unable to pursue the full college course in agriculture. It offers a pratcical course of study designed to fit young men and young women for successful farm life, and aims to give to its students the necessary preparation for useful citizenship.

COURSE OF STUDY

The course of study offered covers a wide range of subjects and is largely technical in character, but provision is made for some instruction in English and mathematics. The course is briefly outlined on pages 15

and 16. Instruction is given in the work shops, laboratories, barns and fields, as well as in the class room. The course requires three winters of six months each for completion, and is co-educational. Much of the work is taken in common by the young men and the young women. Some of the subjects, such as blacksmithing, carpentry, field work, handling grain and machinery are taken by the young men, while the young women pursue cooking, sewing, laundering and household art. The methods of instruction tend to educate students toward the farm instead of away from it, to develop in them a love for farm life by showing them its possibilities. In this respect the school has been very successful as over 72 per cent of its graduates continue agricultural pursuits.

HOW TO GET TO THE SCHOOL

Check all baggage to St. Paul or Minneapolis and bring checks to the school.

A charge of 25 cents is made by the school teams for transporting trunks at the opening of the school. No charge is made for the return of the baggage, at the close of school, provided it is ready to go on the days assigned.

Monday and Tuesday, October 4th and 5th, members of the Y. M. C. A., wearing lettered badges, will be at the Union Station in St. Paul, and at the Union, Milwaukee, Great Western, Soo and St. Louis Stations in Minneapolis to meet and direct new students. Take the Como-Harriet or Como-Hopkins car from either St. Paul or Minneapolis and get off at Commonwealth avenue

ADMISSION

All male students are required to have had six months' farm practice before entrance.

Parents are advised not to send pupils under seventeen years of age.

Students who have completed eighth grade work in the common schools are admitted without examination.

Applicants for admission who do not have state certificates or county diplomas showing completion of eighth grade work should send to the registrar for certificates of admission which, when properly filled out by former teachers or superintendents, will be accepted in place of entrance examinations.

Applicants whose home schools do not afford complete instruction in the common branches may be admitted with not more than two conditions which must be removed according to instructions given the student upon admission.

Students from city or grade schools will not be admitted before finishing eighth grade work nor until their former school records have

been passed upon by the registrar. These records must be presented at least three weeks prior to the opening of the school.

State High School Board Certificates are accepted for work in English, physiology, algebra, geometry and civics, or credits of 75 per cent or more received on State Teacher's examinations.

HOME LIFE ON THE CAMPUS

The life of the students while attending the School of Agriculture is subject to supervision.

The home life of each student is carefully guarded, and everything done to promote a healthful, moral atmosphere.

The use of tobacco and spirituous liquors of all kinds is strictly forbidden. No person will be admitted as a student who is known to have the cigarette habit.

Upon entrance students are provided with a copy of the rules.

Any one not in accord with these restrictions and not willing to lend a hand toward a strong moral growth should not come to the School of Agriculture.

CLASSIFICATION OF STUDENTS

No student with incomplete C or preparatory work, or more than one incomplete B subject will be classified as an A, excepting high school graduates.

No student with incomplete preparatory work, or more than one incomplete C subject, excepting high school graduates, will be classified as a B.

No student with incomplete C or preparatory work will be made a commissioned military officer.

STUDENTS IN DORMITORIES

The Principal of the School of Agriculture has charge of the boys in their dormitory and social life, and the Preceptress has charge of the girls in their dormitory and social life, under such regulations as they may make.

From 8:15 a. m. to 4:30 p. m. students not at recitation or chapel are expected to be in their rooms or the library studying or reading, also after 7 in the evening.

The rooms shall at all times be quiet, especially in the evening, so that no student may be disturbed.

The cadet officers shall make daily inspection of the boys' dormitories, under proper supervision of the instructors.

HOLIDAYS

On Lincoln's birthday, Februrary 12th, the regular classes of the last two periods in the forenoon will be omitted and a suitable program substituted.

Washington's birthday, February 22nd, will be observed by appropriate exercises.

On Thanksgiving day no classes will be held, but school will continue as usual on Friday and Saturday following.

REQUIREMENTS FOR GRADUATION

First—The completion of the prescribed course of study with an honorable standing in deportment.

Second—An essay of not less than one thousand words upon a topic connected with agriculture or home economics.

Third—For young men, a practical experience in field work at the University Farm or elsewhere, as shall appear in reports received from responsible sources.

FEES

With an exception of an entrance fee of $5 to residents of Minnesota and $10 to non residents, the school makes no charges.

EXPENSES

The necessary expenses for the year do not exceed $85. This amount does not include the cost of the required military suit for the young men, traveling and personal expense.

The cost to the student for board, heat, light and laundry is the actual cost of maintaining the table (including management), and caring for the buildings. This has not exceeded $3 per week. Each month's board is paid in advance. The buildings are all lighted by electric lights and warmed by steam. The sleeping rooms are each furnished with a bedstead, mattress, dressing bureau, chairs and table.

No deduction in charge is made for absence of less than five days. If students are compelled to be absent for that length of time they are allowed half rates if they make arrangements before leaving.

Text-books are furnished at a rental of $2 per year to students who do not desire to purchase.

A gymnasium fee of 25 cents per term is charged all students.

Each student is required to pay for breakage of apparatus used in practical work.

A competent nurse is kept on the ground to care for the sick. To meet this expense each student pays $1 per term.

For the purpose of supplying, calcimining and painting the sleeping rooms, a reserve fund is created by assessing each one occupying them $2.00.

A deposit of $5 is required of each student, as a guaranty for the return of all books and other articles borrowed. This deposit is not returned until the student severs his connection with the school.

On entering school the student makes a payment of $5 entrance fee; $12 board; $1 book rent and reading room; 25 cents gymnasium fee; $1 maintaining nurse; $2 reserve fund; $5 deposit; total $26.25.

All male students are required to provide themselves with the prescribed uniform, which consists of navy blue blouse, trousers and cap, and is as neat and economical a dress as the student can obtain. The suit complete, to measure is furnished under special contract for $14.50.

Each student provides four sheets, one pair of blankets, one quilt, one bed spread, one pillow, three pillow cases, towels, napkins, comb and brushes, one glass tumbler, and one teaspoon.

An assignment of rooms will be made at 9 a. m., March 19th, which will hold good until 8 p. m., the first day of the following school year. Students wishing to retain their rooms, after vacation, must be present when the second term opens, or pay one-half the price of board and room for the time they are late. Students arriving after the dormitories are filled are compelled to find rooms elsewhere, but are allowed a rebate of $3 per month.

HOSPITAL FUND

The Hospital Fund will be expended under the general direction of the Health Committee.

This fund insures for those contributing to it, the care of regular nurses and such medicines and materials as the regular nurses may use.

It does not provide medical treatment by physician.

It does not provide hospital expense of students rooming off the campus or away from the institution. Students rooming off the campus are not expected to contribute to this fund.

It does not provide for special nurses if such be required by reason of serious or long continued illness except as provided for in the following rule:

RULE

Adopted by the Health Committee March 9, 1909.

"After usual and necessary running expenses connected with the Hospital Fund have been taken care of, any available balance may be used for paying special nurses or other extraordinary expenses. Any

balance still due such special nurses shall be paid by students requiring such extra help and pro-rated according to the number of days attendance for each.

"A dispensary fee of $.25 for each office service by nurses will be collected from those who have not contributed to the hospital fund.

"The regular hospital fee is collected from dining room help the same as for students and this help is then entitled to nurse care on the same basis as students."

LIBRARY

The Agricultural Library is well equipped for supplying the needs of both undergraduate and graduate students. It contains nearly 15,000 volumes of general and technical literature, government reports, etc., besides 4000 unbound pamphlets, bulletins, and reports. The general subject and author card index and the index of publications of the state experiment stations are always at the disposal of all students to aid them in locating the various sources of information which the library affords.

There are complete sets of all the standard encyclopedias and dictionaries and files of over 225 popular and technical magazines and periodicals.

The librarian and her assistants are always ready and glad to give whatever assistance they can, both to those interested in special research work and to those doing regular reference work in connection with their classes. All those wishing to read or study are made welcome and given whatever privileges the library can provide.

ZOOLOGICAL MUSEUM

This is in the third story of the Main building and connecting with the lecture room of the entomologist. It contains, one of the finest collections of birds in the Northwest, a large series of mammals, shells, anatomical models, etc., all used in class instruction. One case is given up to models of injurious insects and a collection of spray pumps, nozzels, etc., showing the various makes on the market. Another case is devoted to a beautiful series of Minnesota fishes, reptiles and amphibians, and on two sides of the large room devoted to museum purposes are cases containing thousands of pinned insects. Friendsof the institution who are inclined to donate zoological specimens may rest assured that they will be properly installed and given the best of care.

STUDENTS' DEBATING SOCIETIES

Students are urged to unite with one of the literary societies of the school for both pleasure and profit. It affords a training in conducting meetings, parliamentary laws, and public speaking obtainable in no other

way. Credit is given for the work as it is under the supervision of one of the instructors in the English department.

LECTURE COURSE

During the school year, a lecture and entertainment course, usually consisting of six lectures and concerts, is given in the chapel at a cost of one dollar for the series for reserved seats. These entertainments are strictly high grade, and furnish a pleasant relaxation from school work, as well as mental stimulus.

The following program, which was provided during the past year, shows the general character of the entertainments:

November 6,	A Russian Nobleman's Story of Siberian Exile and Escape,	Count Alexander M. Lockwitzky
November 13,	Music,	The Dunbar Company
December 18,	Character Studies from Life,	John B. Ratto
January 8,	Lecture Recital,	Paul M. Pearson
January 22,	The Story of LeClaire,	N. O. Nelson
February 12,	Music,	Hruby Brothers
March 13,	Violin Recital,	Alexander Petschnikoff

STUDENTS' CHRISTIAN ASSOCIATIONS

The Young Men's and the Young Women's Christian Associations have for their objects, social fellowship and moral and spiritual development. To this end two receptions are held each year, and Bible classes are held Sunday mornings at 8:30. A general religious service is held each Sunday at 3 p. m., and a mid-week prayer meeting each Wednesday, at 6:30 p. m. The associations are non-sectarian, so that all students may find in them an opportunity for Christian activity and mutual helpfulness.

Course of Study

FIRST (C) YEAR

FIRST TERM

Agricultural botany [4]
Drawing [2]
Music [2]
Farm Mathematics [5]

*Blacksmithing [2] *Carpentry [2] Military Drill [2] Agriculture [3] Gymnasium [2] *Practicums [2]	or	*Cooking [2] Physical training [2] *Sewing [2] Social culture [1] Field agriculture [3]

SECOND TERM

Agricultural botany [5]
English [5]
Music or literary society work [2]
Comparative physiology [5]
Study of breeds [5]

*Carpentry [2] *Drawing (farm buildings) [2] *Blacksmithing [2] Military drill [2] Gynasium [2] *Practicums [2]	or	*Laundering [2] *Drawing farm houses [2] Physical training [2] *Farm accounts [2]

SECOND (B) YEAR

FIRST TERM

English [2]
Agricultural physics [5]
Dairy chemistry [2]

*Dairy husbandry [2½]	Dairy lectures Dairy practice Dairy breeds

Fruit growing [3]
Music [2]

*Farm Accounts [4] *Stock judging [1] Breeding [2] Military drill [2] Gynasium [1]	or	*Farm Accounts [2] *Cooking [2] Household art [1] Physical training [2] *Sewing [2]

SECOND TERM

English [2]
Agricultural chemistry [5]
*Dairy husbandry [2½] } Dairy stock lectures / Dairy practice / Dairy feeding

Music [2]
Agricultural physics [5]
Vegetable gardening [3]

Field crops [5] Military drill [2] Gymnasium [1]	or	*Cooking [2] Home management [1] Physical training [2] *Sewing [2]

THIRD (A) YEAR

FIRST TERM

Agricultural chemistry [7]
Forestry [3]
Zoology [3]
Poultry [3]
Algebra [5]

Handling grain & machinery [1] *Veterinary science [2½] Gymnasium [1] Music or military drill [2]	or	*Cooking [2] *Sewing [2] Music [2] Home nursing optional

SECOND TERM

Civics or English [4]
Plant propagation [3]
Entomology and insect collection [3]
†Algebra [5]

Dressing and curing meats [1] *Stock judging [1] Feeding [3] Soils and fertilizers [5] *Veterinary science [2½]	or	Meats [1] Home economy [1] *Cooking [3] Domestic chemistry [3] *Sewing [3] Domestic hygiene [1]

*Figures in brackets indicate the number of periods per week in which the subject is pursued. All work in subjects marked thus * extends through double time in the daily program.

†Required of those expecting to enter the College of Agriculture.

VACATION WORK

It is essential that the student should do some work of a practical nature during the vacations following the first and second school years respectively. Students will be given a credit for this work just the same

as for other school work. Blanks giving an outline of the work in detail and blanks for certification are furnished to all students.

It is expected that all the boys in the school will devote their vacations to actual farm work, or to some form of agricultural work.

ASSEMBLY

On each school day at 11:40 a. m., the students assemble in the chapel. After the opening exercises brief talks are given by the principal, members of the faculty, or invited guests.

During the year the list of speakers include prominent state and national officials, business men, particularly those connected with the agricultural industries, professional men, prominent clergymen of all denominations, educators from other institutions, and successful farmers. It has been found that this plan gives to the students an opportunity to hear men of prominence discuss a wide range of topics, many of which relate to rural and agricultural problems.

Members of the graduating class at times present essays, and discuss topics as assigned.

Courses of Instruction

AGRICULTURAL BOTANY

This course consists principally of a study of the flowering plants. The practical side of the subject is emphasized by the study of the plants usually found on the farm. Some work is done in the greenhouse which enables the students to see more clearly the functions and different parts of the plant. This course includes a botanical study of weeds found on the farm and the botanical features concerned in methods of eradication. Determination of weed seeds found in grain and grass mixtures is also a part of this course. Plant diseases such as rusts, smuts potato diseases, etc., are studied and the best preventive methods are discussed. Some instruction is given in the use of the compound microscope.

AGRICUTURAL CHEMISTRY

In agriculture chemistry one term is given to the study of the elements and compounds which are or the most importance in agriculture. This work is planned to prepare the student for intelligent study of the subject of the chemistry of foods, soils and fertilizers, and at the same time to familiarize him with the more important chemical changes which take place in every-day life. Laboratory practice forms a prominent feature of the work. In the chemistry of foods, the composition of plant and animal bodies, the chemistry of the plant and of its food and growth, the chemisty of animal nutrition, digestibility and value of foods, and the laws of governing the economic uses of foods, are some of the subjects considered. The composition and the utilization of farm crops for food purposes, and the application of the principles of chemistry to plant and animal life, form the basis of this work.

AGRICULTURAL PHYSICS

In this department it is the aim to enlist the student's interest in a more keen appreciation of the principles that underlie the practices of his vocation. To this end the facts with which he is already somewhat familiar are used to reach the fundamental law. For exmaple, from his knowledge of the relation of weight to bulk in grains, soils and water, he is led to a knowledge of volume, mass, density, weight, force, draft, specific gravity, and fluid pressure. In the laboratory he makes definate determinations along these lines. Likewise the somewhat vague and indefinite notions the young people have from their use of pulleys, eveners and other farm machinery, form fitting stepping stones to definite mathematical results readily reached by them under proper guidance.

The varied questions of soil physics, soil formation, the movements of water and air through soil, soil temperatures, soil grains and granules, and pore space, are matters studied from the practical side and used as avenues to far reaching laws.

AGRICULTURE

It is proposed in teaching this subject to cover the elementary principles governing soils, and field and farm management. The work covers the origin, formation, and cultivation of soils; the movement and control of soil moisture;

selecting and planning farms; subdividing fields; drainage; irrigation; roads; fences; buildings; water supply; groves and wind breaks; farm life; the relations of science to agriculture; a general consideration of farming as a buisness; and methods of farming.

ELEMENTARY ALGEBRA

Beginning algebra is offered throughout the senior year, required of all students intending to enter college and optional for others. This work covers Well's New Higher Algebra or equivalent texts through simple equations of one unknwon quantity. Special attention is given to literal notation, negative numbers, factoring, fractions, and the simple equation.

BLACKSMITHING

The students are instructed in the management of the forge and fire, and in bending, shaping, and welding iron and steel. They are required to make links, rings, hooks, bolts, clevises, whiffletree-irons, tongs, cold-chisels, punches, in short, become familiar with all the operations necessary to enable them to do their own repair work, when they return to the farm. Particular attention is given to rapid and accurate welding and to the shaping and tempering of steel tools. The forges used are such as any farmer can make for himself, and each student is taught to make his own tools, so that he will be able to furnish his shop with very little outlay.

BREEDING

Students receive instruction in the principles that govern breeding, on the influences that affect heredity and in the care and management of breeding stock. Pedigree receives careful consideration, and each student is required to make out pedigrees of two or more pure bred animals. They are also required to become familiar with methods of keeping live stock records of all kinds.

CARPENTRY

Instruction is given by means of lectures on the care and use of the common carpenter tools, such as should be found on every farm; also on methods of farm building construction,—framing, laying out rafters, stairways, estimating building material, painting, etc. In the carpenter shop students are required to make such exercises as will give them some practice in using carpenter tools. They are required to make mortise joints, splices, drawing boards, hammer handles, eveners, cupboards, etc.

Each student is required to file his own saws, sharpen his planes, chisels, etc.

CIVICS

During the last term of the course students receive instruction in this science, and graduate with a good undertsanding of the origin, necessity, nature, and various forms of government, and the machinery employed to carry on public works, establish justice and provide for the common defense; of the organization and management of local institutions—the town, the village, the city and the county; the manner in which states are created and the affairs administered; the three departments—legislative, judicial, and executive—and the functions of each; the interdependence of the state and its citizens, as well as the powers and obligations of each, by due attention to which the state may be strengthened and the condition of its citizens ameliorated.

The relations of the state to the general government, the constsitution and the power it confers and the provisions for amendements, are taught. The more im-

portant principles of commercial law, including contracts, agency, partnership, corporations, and commercial paper, receive attention. Instruction is also given n the United States method of surveying public lands.

COMPARATIVE PHYSIOLOGY

During the first year students take one term of applied physiology. This is an effort to connect technical physiology with the necessities of every day life. The work includes a study of the general plan and structure of the body and the various individual tissues of which is composed; also sources of heat and energy digestion, and the relation of food materials to the various tissues of the body. Considerable attention is given to diseased and innutritious foods, food adulteration and naricotics. The circulation is studied with special reference to the relation of the blood and lymph to tissue nutrition and tissue waste.

Accidents, including poisoning, are studied for the purpose of giving a practical knowledge of what to do in emergencies. Considerable attention is given to the subject of clothing, the various materials in use being considered with reference to fitness for special purposes. Some time is also given to the study of common physiology, of the organs of circulation, digestion, respiration, nervous system, and the relations of bacteria to the common diseases, especially such diseases as consumption, typhoid fever, etc. A brief study is also given to the subject of digestion in the lower animals.

The class work is illustrated by means of large charts, skeletons, manikins, and dissection. Importaant points of difference between human and animal physiology are pointed out in preparation for the third year's work in the veterinary class. Matters of home and personal hygiene are interwoven with the physiology work.

COOKING

Cooking extends through five terms of the currirculum. The subjects covered in each term are as stated below:

First term, C year: Furniture and equipment needed in a home kitchen; best methods of managing kitchen work, caring for kitchen and dining room; utensils, furniture, etc.; the place of measuring and weighing in cookery; the preparation and serving of vegetables, cereals and bread.

First term, B year: Cooking is again taken up, the special topics being preser vation of fruits and vegetables by canning, preserving, pickling and jelly making. The selection, preparation, and serving of meats of all kinds is also considered. A sufficient amount of practical work is given in each case to illustrate the principles brought out. A special study of table service is begun during this term and extends through the year, a practice dinner being given by a portion of the class in the class dining room each month.

Second term, B year: Eggs are considered as to selection, preservation, food value, different ways of cooking and serving. The preparation and serving of soups and beverages is considered together with their food value. The subject of salads is considered in a similar way.

First term, A year: This is devoted to the marketing and care of food. The preparation and serving of dairy foods, and made over dishes and dishes for invalids receive special attention.

Second term, A year: This devoted to the preparation and serving of desserts and to the study of food rations, dietaries, bills of fare, confections, etc. A free use is made of the U. S. Bulletins during the year in the hope of arousing a greater interest in the food question.

DAIRY CHEMISTRY

The chemical and allied changes which take place in the handling of milk and its manufacture into butter and cheese, and the application of these principles to the production of milk and its products form the basis of this work.

DAIRY HUSBANDRY

Farm dairy lectures.—A course of lectures is given in farm dairying, giving instruction in the care of milk and utensils, explaining the principles involved in creaming milk by the gravity and centrifugal process and giving full instruction in gard to running farm separators and the manufacture of butter and cheese in the farm dairy.

During the last half of the first term students receive instruction in regard to the characteristics of the various breeds of dairy cattle, their merits and comparative adaptability for the dairy. Lectures are given upon the points desirable in animals intended for the dairy. The students have practice work in judging dairy stock.

During the second term lectures are given covering both the scientific and practical phases underlying the principles of feeding. Practice work is given in compounding rations and estimating the comparative value of foods stuffs.

Commencing the first Tuesday in February, lectures in bacteriology are given the girls in place of dairy feeding. This work treats in an elementary way the subjects of bacteria, yeasts, and molds in the home. It is the purpose of this course to familiarize the young women with the growth and character of fungi commonly met in household and dairy management. A microscopic examination and study of the more common forms of fungi is made and special stress is laid on the practicel application of the subject to the home.

Dairy practice.—Students receive instruction in the most advanced methods of creaming milk, ripening cream, churning, working and packing butter, the manufacture of sweet curd cheese, and measuring the value of milk by the Babcock test and lactometer. This practice work begins the third week of the first term and continues through the school year.

DOMESTIC CHEMISTRY

The composition of human foods and their combinations to form balanced rations, dietary studies of families, cost and value of foods, chemical changes and losses in the cooking and preparation of foods, cereal food products, animal food products, fruits, adulterations of foods and their detection, fuels, soaps, disinfectants, dye stuffs and colors, composition of common household utensils the household water supply, preparation of homemade baking powders, bakers' chemicals, the composition, food value and characteristics of tea, coffee, chocolate, cocoa, molasses, honey, vinegar, spices, flavors, extracts, etc., the grading and testing of wheat flour, the chemistry of bread making and household sanitation, form the essential parts of this work.

Laboratory practice is given in study of the composition and detecting adulteration of different foods, such as milk, cream, butter, oleomargarine, lard, cheese, coffee, tea, vinegar, catsups, jellies, flavors and extracts, baking powders, cereal breakfast foods, and flour. The aim of this work is to give students an idea of composition, uses and value of food materials, and the part chemistry takes in sanitation and household affairs.

DOMESTIC HYGIENE

Several lectures by a physician will be given upon maidenhood maternity and infancy. These special lectures will be supplemented by the regular lectures

which consider the health of the family as dependent upon pure food, pure water personal cleanliness, and proper habits, as well as upon heredity. The aim is to impress the truth that a knowledge of and obedience to the laws of hygiene are essential to the preservation as well as the restroation of health.

DRAWING

The student is taught the practical value of drawing for the purpose of designing and arranging buildings, machinery, etc. He makes drawings of the shop exercises, then works from his own drawings, thereby learning the application.

Designs are made for dwellings, barns, outbuildings, and machinery. As practical subjects for their designs, students are requested to bring from home data for plans of buidlings needed on their farms. Estimates are made of the amount of material required and cost of construction.

DRESSING AND CURING MEATS

The instruction given the boys consists of demonstration lectures on the preparation of meat for farm use. They are required in addition to take two weeks' practice in dressing, cutting, and curing such meat as is likely to be used on the farm Work is also given them in selecting and judging fat stock and in judging dressed meats.

ENGLISH

Applicants for admission to the school who are deficient in the knowledge of the inflections of the parts of speech, the classification of phrases and clauses, and case constructions, are required to make up the deficiency by a course in grammar for which no school credit will be given.

"C" Class. In the first year, English is studied five hours a week for one term. Three hours are given to constructive work with almost daily practice in writing short exercises based on Mayne's "Modern Businss English." Two hours are given to the interpretation and analysis of literature.

"B" Class. In the second year, English is studied two hours a week for two terms. The writing of weekly themes and the study of the forms of discourse constitute the work.

Intermediate English is required of those who intend to enter any of the colleges. It consists of a study of masterpieces necessary for college entrance, the history of English literature, and considerable writing on subjects in connection. It is given five hours a week for two terms.

"A" Class. In the thrid year an optional course in rhetoric is offered in the second term for four hours a week. The object of the training is fluency and correctness in written and oral English.

ENTOMOLOGY AND ZOOLOGY

The class in entomology receives instruction of a practical nature. The course is divided as follows:

Classification of insects, habits and life histories of injurous forms with special attention to insect pests found in Minnesota. The nature of the idfferent insecticides and methods of application are discussed. The student spends some time in becoming acquainted with the appearance and habits of benefical insects. Each student must collect fifty insects representing at least twenty-five different kinds.

The four-footed pests of the farm—rabbits gophers, squirrels, etc., as well as injurous and beneficial birds, arealso studied.

FARM ACCOUNTS

The workin accounts is applied to the transactions which the student meets in the various duties of the farm. He is taught to keep his accounts, that he may know at any time the profit or loss of any department of his business, and is thus enabled to plan intelligently.

FARM ARITHMETIC

Instruction in this subject consists of the application of its principles to all kinds of farm problems where measurements of material, extension, capacity, etc., are required. The student is prepared also to handle with ease the mathematics of the technical courses in the school.

FEEDING

The princpiles of feeding as applied to the production of horses, beef cattle, sheep and swine are taught. Special attention is given to the choice and preparation of food for animals during different periods of growth and during the time they are used for breeding purposes, and to summer feeding and pasturage. Practice is given in compounding rations that will include in the best manner the food stuffs commonly produced on the farm. Practical lessons in feeding are given at the barns under the supervision of an experienced feeder. Each student thus learns the requirements of each class of stock.

FIELD AGRICULTURE

This work consists of a study of those portions of geology relating to soil formation; effect of the glaciers on the soils of Minnesota; origin of soils in the various agricultural regions of Minnesota; classification of soils; soil moisture and soil tillage; land areas and the planning of fields and farms; the classes of field crops as grain grass, and cultiveated crops; the relation of these crops to each other in a systematic rotation and in their relation to soil fertility; the origin, distribution, and uses of cereal crops and other field crops.

FIELD CROPS

Students are admitted to this subject after having finished the work of agriculture and receive instruction as follows'

Crop rotations, farm management, and planning farms under various conditions; production and care of farm manures and green manure crops; fertility as related to weeds, crop production and profits; preparation of land; planting, cultivating, harvesting, storing, and marketing of grains, roots, fiber, sugar, grass, and other forage crops; meadows and pastures; treatment of field crop diseases; selecting, breeding, and judging seed.

FORESTRY

Forestry includes the consideration of the formation and care of wind breaks and shelter belts; the laying out and planting of home grounds; discussion of the hardiness, habits, and value of our native and introduced trees, and the methods of propagating them.

FRUIT GROWING

Fruit growing is taught with reference to raising fruit for market and in the home garden.

GYMNASIUM WORK

The gymnasium is a large, well lghted, two story brick building. It is well supplied with heavy apparatus for general gymnastic and athletic exercises, together with such appliances as are necessary for the development of a symmetrical body. Besides being fitted up with the finest apparatus, it possesses space and equipment for sprinting, pole vaulting, hurdling high and broad jumping, shot putting, etc.

Class work in physical training is required of all undergraduate young men not excused on account of physical disability. Courses are offered on the heavy apparatus, in corrective work, class drills, and athletic training. In addition to the regular class drill, a certain part of which consists of training in athletic sports, the school is represented by a strong basket ball team, a track athletic team, hand ball team, and an indoor tennis team.

HANDLING GRAINS AND MACHINERY

Practical suggestions for the best metohds of harvesting, shocking, stacking and storing cereal grains; adaptationof the various kinds of machinery with reference to the soil, weeds and seasons; adjustment with special reference to durability, convenience in manipulation, etc., are given.

HOME ECONOMY

The lectures in home economy are a study not only of the just proportion between expenditure and income, but of defininte proportion in the expenditures made for existence, comfort, culture, and philanthrophy. A study is made of the sources of income, especially of the income from the farm in the form of house, food, and luxuries; the purchase of necessities such as household stores and furnishings is con sidered from tue standpoint of the suitable, and desirability shown of saving something to be used in securing things, which promote culture and comfort. The relation of cash and credit to cost is also considered. Attention is given to saving and forms of investment, a book account, and the use of a check book. Students are required to submit an account setting forth in detail the use of a certain named income expended in the support of a family for one year, embracing not only every item of necessary home expense, but also an outlay made for travel, luxuries, accident, sickness, or other emergencies. The habit of keeping a household account is calculated to strengthen the judgment in the wise use of money.

HOME MANAGEMENT

This subject includes both housekeeping and home-making, and the instrution is based on the belief that housekeeping is a business as important as it is difficult and that home-making is the nobliest form of human endeavor. The care of the house and household belongings, of the food, utensils, plumbing, etc., as well as the general ordering of family life, are considered in their relation to an adequate plan for home management. To start the student in the right way of becoming mistress of the business of housekeeping and home-making is the end sought. The practical benefit to be derived from the knowledge students gain in the cookery, sewing, dairy, laundry, and other classes, is emphasized and shown in its relation to an adequate plan for the daily program for the home.

HOUSEHOLD ART

Lectures are given upon house and grounds, noting the distinctive character of the country home; the sanitary conditions involved in the selection of the site of

the house, also the influence of the outlook; an elementary study of architecture in connection with planning a house which will provide "a place for everything" required in housekeeping operations and family life; instruction in the fundamental value of color, form, and design' training the taste and emphasizing the laws of hygiene that should influence the selection of materials and styles in the finishings and furnishings of the house.

LAUNDERING

Second term, C. year: The aim is to give the students a knowledge of the best means of cleansing all fabrics with little injury to the cloth or color. Approved methods of cleasing by the use of chemicals, as removing grease spots, stains, etc., are given.

LITERARY SOCIETY WORK

Any student belonging to a recognized literary cociety of the school may receive credit in the course of study for the work done therein by registering at the beginning of the term, and submitting to the teacher in English all essays to be read by such student before the literary society and rehearsing to said insructor all essays readings, or recitations with a view to correct pronunciation, expression, etc.

MEATS

The instruction given to the girls in the subject of meats pertains to the selection and value of different classes of meat, and to the best methods of curing and preserving.

MILITARY DRILL

Under the provisions of the Act of Congress of 1862, establishing the "Land Grant Colleges" of the United States, instruction in Military Science and Tactics is required to be given at all colleges which are its beneficiaries. For this purpose the United States Goernment furnishes the Department of Agriculture with the necessary arms and equipments, and details an officer of the regular army to take charge of military science and tactics.

All male students of classes B. and C. not physically unfit are required to attend military drill. For the A. Class, drill is an elective.

Military instruction is intended to be so conducted as to develop a soldier-like bearing and foster a spirit of gentlemanly courtesy, soldierly honor, and obedience to lawful authority as well as to familiarize students with battalion manœuvres, guards, and the theoretical and practical use of firearms.

The officers and non-commissioned officers are required to be good students in the other departments, soldier-like in the performance of their duties, exemplary in their general deportment, and able to pass a creditable examination in drill regulations.

In general, the officers are selected from the "A" class; sergeants and corporals from the "B" class.

MUSIC

Instruction in this department takes an elementary theory, sight singing and music history. The course is planned to give the students a basis for musical appreciation and culture, as well as a practical knowledge of musical forms and terms Special attention is given to habits of breath control and enunciation of words, and a thorough system of solfeggio is employed.

For students whose voices and training will admit them, there is offered a chorus class, consisting of a mixed chorus, a women's chorus, and a male chorus. This offers special advantages for [illegible] and appearance.

A student orchestra is maintained which assists in public exercises given by the school.

PHYSICAL TRAINING

The work done in this department aims at symmetry, co-ordination, and control rather than mere physical strength. It is planned to improve the functional activity of the body and to correct and control tendencies toward incorrect development, caused by [illegible] the artificial life of civilization. The work of the beginning class is [illegible] hygienic principles, and directed especially to deep breathing, carriage, [illegible] and [illegible]. The work of the advanced class includes light apparatus [illegible] for grace and suppleness in action. Vigorous games are given to both classes.

PLANT PROPAGATION

In this subject the principles underlying the development of cultivated varieties of plants and seed testing are taught; also the propagation of plants by seed, cuttings, grafting, and budding. The work of the class room is illustrated by the orchards, nurseries, forest plantations, gardens, and greenhouses on the grounds of the experiment station, and by visists to commercial nurseries and greenhouses near by.

POULTRY

The instruction in this subject will include the following topics: History and characteristics in the leading breeds of poultry; breeding, rearing, and management of fowls for eggs and for the market; planning buildings, and arrangement of poultry houses; managing incubators and brooders. A model poultry house, containing pens of the most improved breeds, incubator-cellar, work-room, etc., has been provided, where experimental work and practical instruction are carried on.

PRACTICUMS

During the first year the young men spend four hours each week in a series of lessons and exercises in the barns and fields, taking up such practical lines of work as land surveying, laying tile drains, building fence, setting up farm machinery, soldering, pipe-fitting, splicing rope, making rope halters, cement work, etc.

SEWING

Instruction is given in the principles and use of healthful and appropriate clothing and in the needlework of the home. The course provides for five term's work. During the first term instruction is given in the elements of sewing, including different stitches, seams, hems, and the various kinds of mending; also practical talks on the use and care of the sewing basket, touching the history of the various implements used , and upon the textiles used--cotton, wool, linen, and silk.

In the second year instruction is given in cutting and making plain garments, drafting underwear, shirt waists, and cotton dresses --taught by a simple method in which only a tape line and square are used.

In the third year the more difficult work of dressmaking is taken up, pattern drafting, designing, cutting and fitting dresses. A practical aid to the work in this subject is offered by a museum of exhibits. These exhibits are kept in the class rooms and include primitive and modern sewing implements, weaving pocessess and the various cloth fibers.

Lectures are given on the utilitarian and art values of various textiles, and attention is paid to harmony in color.

SOCIAL CULTURE

A course of lectures is given on the usages of society, including manners, behavior, the voice, conversation, forms of address, invitations, etc. Suggestions are made in reference to reading, literary taste and the choice of books. Special stress is given to the thought that the family life ought to be the highest expression of good society, and that next to the power of thinking correctly is the power of approaching others with ease and speaking with tactful directness.

SOILS AND FERTILIZERS

Some of the topics studied are: The formation of soils, adaptability of crops to different kinds of soils, chemical composition of soils, physical analysis of soils, interpretation of soil analysis, the judging, rating, and scaling of soils, alkali soils, acid soils, humus and its relations to soil fertility, the factors governing the increase and decrease of the nitrogen of the soil, farm manures—their composition and uses, and their action upon soils—green manures, commercial fertilizers, special purpose fertilizers and their use; the influence of different methods of cultivation upon the fertility of the soil, the food requirements of farm crops, the rotation of crops as effecting the fertility of the soil, the income and outgo of fertility from farms where different systems of farming are followed, the general principles of soil exhaustion and soil improvement and the various factors which affect the fertility of soils. The class room work is supplemented by laboratory practice.

STOCK JUDGING

Score cards are used to an extent sufficient to familiarize students with that method of judging, and special efforts are made to do systematic and closely critical work in the selection of animals representative of the breeds and for breeding purposes. Living specimens are used and rings made up for the student contests in stock judging. In connection with the work in dressing and curing meats, the judgment passed on live animals for the block is verified by score cards, judgment of the dressed carcasses, and by actual block tests. These tests are made by the students and bring out the percentage of meat in each commercial cut of the carcass. The quality of meat is passed upon in this connection by experts, and a careful report made to ascertain the type of animals best calculated for the production of the most meat of the best quality.

STUDY OF BREEDS

The market classes of horses, cattle, sheep, and swine are taken up briefly to bring out the form, quality, and condition desirable and common to the different classes. This is followed in each class of stock with the most common and valuable breeds for the state. These are studied carefully as regards their characteristics and origination, and as to their adaptability to the different Minnesota conditions. This work is illustrated with stock from herds and flocks maintained at University Farm for this purpose.

VEGETABLE GARDENING

Vegetable gardening embraces the study of garden tillage, irrigation, and rotation of crops; transplanting; formation and care of hotbeds; study of garden insects; and the growth of various vegetable crops.

VETERINARY SCIENCE

During the A year the student takes up a course of study in veterinary medicine, the purpose of which is to fit him for intellignet care of his farm stock. In this course the teaching is done by means of lectures and reviews and clinical work at the hospital maintained for this purpose. Lectures are illustrated by means of stereopticon charts, manikin of horse, skeleton of horse, and various other appliances.

The work covers the following subjects: Elementary anatomy; elementary pathology; cause and prevention of diseases; diagnosis and treatment of common diseases; examination for soundness; and a final short course on common medicines, studying their effect, uses and doses. At the hospital clinics, students are enabled to examine and care for a variety of cases and to learn the elements of diagnosis for the more common diseases and forms of lameness.

STUDENTS' TRUST FUND

The class of 1902 left with the school a fund of $100 "to assist by temporary loans at a reasonable rate of interest, deserving students needing such help, who are not below the B class in the school of agriculture." This fund is in charge of a committee consisting of the secretary, the principal, the preceptress, and the president of the A class.

THE LUDDEN TRUST

The Honorable John D. Ludden, of St. Paul, gave the University of Minnesota, $5,000 to be held, invested and re-invested by the University, through its Board of Regents, and the income thereof to be collected, received and applied by said Board of Regents to the financial assistance of students of either sex in the School of Agriculture. Mr. Ludden delivered into the hands of the regents for the principal sum one Northern Pacific registered prior lien railway land grant gold bond of the denomination of $5,000, payable to the University of Minnesota and its assigns in gold coin, on the first day of January 1997, with interest at 4 per cent per annum, payable quarter-yearly in like gold coin, the fund to remain so invested until the bond matures, unless by reason of changed conditions a re-investment shall be sooner deemed judicious by the Board of Regents for the safety, conservation, or continued productiveness of the fund. The premium on the purchase of this first grade security was $212.50, and was paid by Mr. Ludden, thus enlarging his donation by that amount.

Mr. Ludden imposes the following conditions: "The beneficiaries must be youths who are residents of the state of Minnesota; they must be and continue of unblemished moral character, and of temperate and industrious habits, and they must be such as by examination and trial shall evince and maintain a taste, habit and aptitude for study and improvement; and any student who shall fail to come, or shall cease to be, within the above conditions shall forfeit all claims to the benefit of such fund. Subject to these conditions the administration of such income is entrusted to the said board of regents, which may make such rules therefor as they may deem judicious."

This fund produces $200 a year. Those wishing to avail themselves of its benefits should apply to the executive committee of the Board of Regents of the University of Minnesota.

Mr. Ludden has since donated another $5,000 for a like purpose so that the yearly income is now $400.

Intermediate Year

For Graduates of the School of Agriculture who wish to enter the College of Agriculture

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The course of study in the School of Agriculture extends over three years, and the school year is six months long. This does not give sufficient time for prepaartion for college work, and it has been found necessary to supplement the course offered in the School of Agriculture by an additional year's work in general academic branches. The subjects offered in the intermediate year can be taken elsewhere in any accredited high school before entering the School of Agriculture. This intermediate year enables graduates of the School of Agriculture to enter the College of Agriculture on the same basis of preparation as students enter other departments of the University. English and mathematics are given prominence in the intermediate year.

The following prescribed course, or its equivalent taken in some other school is required of graduates of the School of Agriculture, who desire to gain admission to the College of Agriculture.:

FIRST SEMESTER	SECOND SEMESTER
Elementary algebra [5]	Higher algebra [5]
Plane geometry [5]	Plane geometry [5]
English [5]	English[5]
General history [4]	General history [4]

The course in algebra for the intermediate year covers Downey's Complete Higher Algebra through logarithms except chapter 14 part I, and chapter 18 and parts of 19 and 20 Part II, covering subjects not specially pertinent to the work of this college. The course in Plane geometry covers Gore's geometry from book I to V or equivalent texts.

Special attention is given in both above courses to practical problems, short methods of computation and a good foundation for plane trigonometry. These courses are open to all who have completed the work in algebra in the third year of the School of Agriculture and are required of all students entering college courses, except that the 2nd term algebra is not required for the course in Home Economics. Regular high school graduates will be required to take the work of the second semester

in higher algebra unless they can furnish regular high school record in same.

The work preliminary to these courses is done by the student in the A year in the School of Agriculture.

The course in English extends through both terms. Two periods a week are devoted to composition, with Scott & Denny's Composition. Rhetoric as a text-book, and three to the study of literature, which will also be made the basis of considerable written work. The characteristic works of the following authors will be studied: Shakespeare, Bacon, Milton, Addison, Gray, Goldsmith, Burns, Wordsworth, Lamb, Macaulay, Ruskin, Browning and Tennyson. Individual members will be assigned readings from various other authors.

CROOKSTON SCHOOL OF AGRICULTURE

The Crookston School of Agriculture, Crookston, Minn., established by the legislature of 1905, is in active operation and offers to the young men and young women of the Red River Valley a three years' course in practical farming and home-making. The school year for 1909–10 will open October 5, 1909 and close March 52, 1910. For further information address Crookston School of Agriculture, Crookston, Minn.

THE MINNESOTA FARM REVIEW

The Minnesota Farm Review is a monthly agriculutural paper owned and published by the Alumini Association of the School of Agriculture. The paper is intended to be a medium by which the former students of this institution shall be kept in touch with each other and also with the School and Experimental Station. It also endeavors to bring the farmers throughout the state generally, into closer connection with the institution and to this end strives to present the latest progress in experimental work at the various Stations. It is the official organ of the Alumni Association and of the Farmers' Club.

THE FARMERS' CLUB

The Farmers' Club of Minnesota is an organization composed of students and ex-students and members of the faculty of the School of Agriculture. Any one who has ever registered as a student in the regular, dairy, or short course or who is or has been a teacher in the School of Agriculture, is eligible to membership. The objects of the club are to foster and strengthen the ties between the School and its former students and to extend the work of the School and Expermient Station among the farmers of the state. To this end the members of the State Club

have formed County Clubs which hold annual meetings for the benefit of the farmers of the community. To quote from the annual address of its president: "The School of Agriculture is an institution of the farmers, for the farmers, and supported in a large measure by them, and each student of the School should use his knowledge to better the conditions about him. The State has invested from one to several hundred dollars in his education and expects to realize on that investment by the knowledge which he will distribute."

Dairy School

FACULTY

CYRUS NORTHROP, LL.D., President.
J. W. OLSEN, B.S., Dean.
T. L. HAECKER, Dairy Husbandry and Animal Nutrition.
E. K. SLATER, Dairy Husbandry.
J. A. VYE, Creamery Records and Accounts.
HARRY SNYDER, B.S., Dairy Chemistry.
M. H. REYNOLDS, M.D., D.V.M., Diseases of the Dairy Cow.
J. M. DREW, Forage, Farm Buildings.
WM. BOSS, Practical Engineering.
H. L. RUSSELL, Ph.D., Dairy Bacteriololgy.
ELOV ERICSSON, Cultures and Starters.
I. O. DYBEVICK, Butter-making.
P. M. MORTESEN, Cultures and Starters.
GEO P. GROUT, Dairy Laboratory.
H. T. SONDERGAARD, Judge of Dairy Products.
A. G. SCHANDELL, Assistant in Cultures and Starters.

The next session of the Dairy School will open Monday, November 15th, 1909, and continue four weeks.

This course is designed to furnish persons who are actually engaged in the manufacture of butter and cheese in creameries and cheese factories an opportunity to become more skilled in their work and also to study the many problems which have a direct bearing upon the dairy industry. Recoginzing the fact that such persons cannot be away from business for a long period, the term has been so arranged that the time of each student is fully occupied by lectures and actual work in the creamery training room every hour of every working day of the term.

The rapid growth of the dairy industry in the Northwest calls for constant enlargement in equipments for dairy hall.

With each succeeding year, as dairy products manufactured in our creameries take higher rank in quality and finish, the character of the instruction given must be of high order. To meet these requirements the training rooms are each year equipped with the best apparatus, and the corps of instructors is composed of the most skillful workmen and best instructors.

No pains will be spared to maintain the high standard which the school has attained. Each member of the faculty has special qualifications for the duties to which he has been assigned. The lecture course and practical instruction are arranged with special reference to giving the greatest amount of training and practice possible in a four weeks' session.

Instruction is divided into seven courses:

1st. Lectures covering the entire field of dairy husbandry.

2nd. Practical work daily in the butter room.

3rd. Practical work daily in the cheese room, where the manufacture of flats, cheddars, Swiss, brick, Edam and Gouda cheese is carried on.

4th. Practice work in the laboratory, examining milk, making daily composite tests, and the pasteurization of milk and cream.

5th. Practical engineering, steam fitting and plumbing.

6th. Practical work in factory bookkeeping.

7th. Practical work with cultures and starters.

LECTURES

The course in sixty lectures furnishes in a plain and concise form the most valuable information for those who are interested in any branch of agriculture, covering, as it does, the most important points in the breeding, rearing, feeding, and genera l management of dairy stock, the economical production of milk, growing and preserving of forage and grain crops, the management of meadows and pastures, management of barns, stables, and yards, construcion of silos, co-operative dairying, creamery and cheese factory management, judging and marketing dairy products, the chemistry of milk, dairy bacteriology, engineering, animal hygiuene, and treatment of the common diseases of the dairy cow.

BUTTER MAKING

The running of separators, ripning and churning cream, how to ripen cream to secure best flavor, how to churn, wash, and salt butter so as to avoid specks and mottles, to secure good grain and best methods of preparing for market are some of the points which receive special attention. As all creamery men should be able to judge butter from a commercial standpoint, students are trained daily in the art of scoring butter by the score card.

CHEESE MAKING

The work in the cheese room is conducted on a large scale, including the manufacture of several brands of fancy cheese, The fact that there is a demand for these at highly remunerative prices has induced the Regents to provide the necessary means for carrying on this work.

A complete record of every step taken is required of each student. Here is a good opportunity for cheese makers to meet. investigate new methods, make experiments on doubtful points, compare notes, and thus gather, in a few weeks, knowledge that otherwise would take years to acquire.

MILK TESTING

It has been found that the value of milk for both butter and cheese is measured by the per cent of fat content, and nearly all our factories and creameries now base the payment for milk on the fat content. It is therefore necessary for every

factoryman to familiarize himself with the best methods of milk testing. The chemist gives a general outline of the work, but in order that each student may have thorough training in milk testing, daily exercise is given. Steam turbine and hand power machines and other apparatus are provided and operated in the laboratory.

The pure and wholesome milk and cream supply for our cities is a matter of vital importance, and there is great need for improved methods of handling milk intended for this purpose. To meet this, milk and cream pasteurizing apparatus of the latest and most improved makes has been provided for the dairy school, and a few advanced students will be given instruction in this work.

MOTIVE POWER

The work in engineering consists of practical talks on the construction, care, and management of creamery engines and boilers, pumps, injectors, heaters, etc., and work in the practice room.

In the practice room are provided an eight horse power, simple, slide-valve engine, three types of boiler feed pumps, two types of deep well pumps, one injector, two milk pumps and a steam gauge, which the students have the privilege of examining and operating. Instruction is also given in pipe fitting, placing shafting, babbiting bearings, soldering, etc.

It is the aim to make this work as practicable as possible. Questions of interest on the subject are freely discussed.

FACTORY BOOKKEEPING

All the essential features of creamery accounting from the receipt of the milk to the returns in net proceeds are thoroughly considered. Paying for the milk according to the fat content, or otherwise, is fully explained. The students do the actual one month's accounting of a creamery in books provided.

STARTERS AND CULTURES

Since all students who are admitted to the school have had some exeperience in the routine work of running separators and since the most important part in butter making is the art of uniformly making a product having a fine flavor and good keeping qualities, special attention is given to cultures, starters, and pasteurization. Constant additions will be made to the equipment needed to make this course inviting to those who wish to fit themselves for masters of the art of creamery butter making.

REQUIREMENTS FOR ADMISSION

Experience has shown that students who have had some practical training in the creamery or cheese factory before coming to the dairy school are, as a rule, the ones who are able to make the most of the course; it is therefore required that persons who intend to take this course shall have had at least one season's experience before coming to the school. No entrance examination is required.

EXPENSE

A registration fee of $15 is required of each student. Students can board in either city and reach the school by street car, or board can be secured near the school for from $3.50 to $4.00 per week. Each student

is required to supply himself with two white suits, including caps, to be worn during working hours in the creamery and cheese rooms. The suits may be procured for about $1 each.

DAIRY CERTIFICATES

The Regents will grant dairy certificates to students who have taken the course and passed a satisfactory examination and in addition have demonstrated by at least one year's work in a factory that they have acquired special skill in the art of butter and cheese making, and are thoroughly qualified to take charge of a creamery or cheee factory.

To reach the school from either St. Paul or Minneapolis, take the Como-Hopkins of Como-Harriet street car and get off at Commonwealth avenue.

Address applications for admission to T. L. Haecher, University Farm, St. Paul. Minn.

Short Course for Farmers

FACULTY

CYRUS NORTHROP, LL.D., President.
J. W. OLSEN, B.S., Dean.
SAMUEL B. GREEN, B.S., Horticulture, Forestry.
J. A. VYE, Business Methods.
HARRY SYNDER, B.S., Agricultural Chemistry, Soils.
T. L. HAECKER, Dairy Husbandry and Animal Nutrition.
M. H. REYNOLDS, M.D., V.M., Veterinary Science.
J. M. DREW, Poultry, Workshop Hints.
A. BOSS, Live Stock, Dressing and Curing Meats.
WM. BOSS, Farm Mechanics.
F. L. WASHBURN, M.A., Insect Enemies.
E. M. FREEMAN, Ph.D., Plant Diseases.
COATES P. BULL, B.Agr., Farm Implements, Grains.
W. L. OSWALD, Farm Botany.
D. D. MAYNE, Parliamentary Practice.
A. L. EWING, M.S., Farm Physics.
JUNIATA L. SHEPPERD, Domestic Science.
MARGARET BLAIR, Domestic Arts.
J. T. STEWART, B.S., Farm Drainage.
GEO. P. GROUT, B.S., in Agri., Dairy Stock.

This course of instruction is provided by the Faculty of the School and College of Agriculture to meet the needs of men and women of mature years who are actively interested in the work of the farm.

The next term will be open on Friday, Jan. 14th, and will continue for four weeks, closing on Friday Feb. 11th, 1910.

This is a lecture course, covering the more important branches of agriculture, horticulture, live stock, farm botany, farm chemistry, entomology, poultry, dairying, etc. Special instruction will be given in the judging of grains, soils, and animals.

The daily program will be so arranged as to allow the ladies to take the lectures in entomology, botany, horticulture, poultry, and other subjects of the short course in which they would be interested in common with the men.

Work will begin at 8:15 o'clock a. m. and close at 3:40 p. m. During the course there will be no work on Monday, but this day will be spent in visiting places of interest such as the stock yards, stock farms, flour and flax mills, etc.

For the entire course, or any part thereof, registration fee of $5.00 will be charged.

Those taking this course should register and secure boarding places not later than Thursday, January 13th, as work will begin promptly at 8:15 on Friday, January 14th.

Board may be secured in either of the Twin Cities at $3.50 to $4.50 per week.

Farmers wishing to register for the course, or desiring further information, should write to D. D. Mayne, Principal, or Jas. M. Drew, Registrar, University Farm, St. Paul, Minn.

AGRICULTURAL CHEMISTRY

The chemistry of plant growth and the chemical principles involved in farm life, and their application to the production of crops, form the basis of this work.

AGRICULTURE

The selection of farms and soils suitable for specific crop production; planning farms; developing the fields, drainage, roads, fences; developing the farmstead and its buildings; managing fields and growing, cultivating, harvesting and preserving forage and grain crops; the rotation of grain, cultivated and grass crops; the use of live stock; and general farm management.

ANIMAL HUSBANDRY

A series of lectures will be given on animal breeding. These lectures will include the known laws of breeding, such as heredity, variation and atavism. Attention will be given to such features as the selection of prepotent sires and dams, to cross-breeding, in-breeding, and other matters of interest to the breeder of live stock. Pedigrees will be discussed and the students made familiar with the registration and transfer of pure bred stock. The feeding and management of horses, beef cattle, sheep and swine will also be discussed. Foods suitable to each class of animals, and methods of preparing and feeding them will be among the subjects receiving attention, together with directions for the practical management of stock while in the stable and pasture.

DAIRY HUSBANDRY

The lectures in dairy husbandry will cover the characteristics of the various breeds of dairy cattle, their comparative adaptability for the various phases of dairying and the style or type of cow that has demonstrated her ability as a large and economical producer. The scientific

and practical phases of feeding for milk production will be explained, and practical instruction and training given in calculating rations for milk production.

DAIRY STOCK JUDGING

The instruction given in judging dairy stock will be based upon the actual performance of animals bred and reared in the dairy division, the records covering a period of five years and giving the annual yield of milk and butter fat, cost of production and profits.

DRESSING AND CURING MEATS

The work in dressing and curing meats will be given in a course of demonstration lectures. In demonstrating these lectures the animals will be dressed before the class and the reason for each operation fully explained. The methods of cutting up the dressed carcass for different purposes will also be shown before the class and the use and value of each cut explained. Sausage making, lard rendering, and the "working-up" of all parts of the animals will be taught in a simple and direct way.

ECONOMIC ENTOMOLOGY

The entomologist will give a course of lectures on injurious and beneficial insects, and will discuss the various insecticides and methods of application. The four-footed pests of the farm—rabbits, gophers, etc., are also studied, and a few lectures are given on practical bee-keeping. If there be sufficient demand to warrant, and time permits, a few lectures will be given on birds and their relation to agriculture.

FARM ACCOUNTS

A series of lectures will be given on business forms, business arithmetic and the keeping of simple farm accounts and records.

FARM BOTANY

Eight lectures will be given on the phases of botany of special interest to farmers. For example, the pollination of flowers, weeds and weeds seeds, poisonous plants, fungus diseases of plants and how to deal with them will be considered.

FARM HORTICULTURE

Lectures will be given on the care and management of the apple and plum in this climate, including such subjects as location of the orchard, selection of the trees, planting, cultivation, green manuring; prepara-

tion for winter; advantages and disadvantages of root grafting, budding and top working; diseases injurious to orchards. Lectures on the care and management of small fruits will consider the subjects of selection of varieties, planting and cultivation, origin of new varieties, propagation, marketing, winter protection, also the insects and diseases injurious to raspberries, blackberries, currants, gooseberries, strawberries and grapes. Under vegetable gardening will be considered the growing of potatoes, tomatoes, celery, onions, squash and cucumbers.

FARM IMPLEMENTS

The lectures on farm implements will be illustrated, as far as possible, by samples. Stereopticon views will be made use of in illustrating machines that cannot well be taken to the class room. It is the aim in these lectures to bring out the lines covering the draft of implements and the objects attained by their use. Suggestions will be made on selection of implements adapted to various kinds of work. The care of implements when not in use will also be discussed, and an attempt made to give as fully as possible all information that will be beneficial in the care and handling of farm machinery.

FARM MECHANICS

The instruction given in this subject will consist of lectures on farm mechanics, taking up such subjects as pumps, farm water systems, windmills, the general principles of steam and gasoline engines, placing shafting, pulleys and belts, pipe fitting, soldering, etc. Some instruction will also be given in sharpening and using hand tools, such as saws, planes, chisels and other tools necessary in farm practice.

PHYSICS AND FARM DRAINAGE

This course consists of six lectures with illustrative experiments. In these exercises the following topics are discussed: The principles of draft in the horse; the causes of draft in wagons, including the effect of road-bed; the effect of grades or hills, involving the principle of the inclined plane; the various questions involved in eveners, road construction and maintenance; including the question of reducing grades, the power at which a horse works to secure the necessary change in the soil to produce the highest degree of plowing, hauling, etc.; horse power; weather forecasting.

POULTRY

Lectures will be given on this subject with special reference to the needs of the Minnesota farmer. The following subjects will be considered Location and construction of poultry buildings and yards; a study of the

breeds best adapted to the farmer's use; the hatching, rearing and management of the farmer's stock; feeding for eggs and for fattening; killing and dressing fowls, and packing for market; marketing eggs.

SOILS

Lectures are given on the conservation of the fertility of the soil, the composition and use of farm and commercial manures, the draft of different farm crops upon the soil and the methods of making the fertility of the soil available by the rotation of crops and other means so as to secure the necessary changes in the soil to produce the highest degree of fertility. The judging of soils is made a feature of this work and includes the testing of soils and the determination of the type to which a soil belongs, the methods of cultivation and the crops most suitable to grow upon the soil.

VETERINARY SCIENCE

This work includes a series of lectures on elementary anatomy, animal foods and digestion; and causes, prevention and treatment of common diseases of farm stock. An especial effort is made to have this work practical and helpful to men who are actually handling farm stock.

WORKSHOP HINTS

In addition to the above, four lecture periods will be devoted to farm workshop hints, such as splicing rope, making rope halters and rope belting, and tempering simple tools.

Short Course for Teachers

FACULTY

CYRUS NORTHROP, LL.D., President.
C. G. SCHULZ, State Superintendent of Public Instruction.
JOHN W. OLSEN, Dean.
D. D. MAYNE, Principal.
SAMUEL B. GREEN, B.S., Horticulture, Forestry.
HARRY SNYDER, B.S., Agricultural Chemistry, Soils.
T. L. HAECKER, Dairy Husbandry, Animal Nutrition.
M. H. REYNOLDS, M.D., V.M., Veterinary Science.
ANDERW BOSS, Agriculture, Animal Husbandry.
FREDERICK L. WASHBURN, M.A., Entomology.
E. M. FREEMAN, Ph.D., Plant Pathology.
WILLIAM BOSS, Farm Mechanics.
J. A. VYE, Secretary and Treasurer, Accounts.
J. M. DREW, Registrar, Blacksmithing, Poultry.
FANNIE C. BOUTELLE, Domestic Economy.
JUNIATA L. SHEPPERD, M.A., Domestic Science.
MARGARET BLAIR, Domestic Art.
JOHN A. HUMMEL, B. Agr., Assistant in Agricultural Chemistry.
COATES P. BULL, B. Agr., Assistant in Agriculture.
LEROY CADY, B.S., in Agr., Assistant in Horticulture.
D. A. GAUMNITZ, M. Agr., Assistant in Animal Husbandry.
A. D. WILSON, B. S. in Agr., Assistant in Agriculture.
A. G. RUGGLES, M.A., Assistant in Entomology.
T. P. COOPER, B.S., in Agr., Assistant in Agriculture.
J. P. WENTLING, M.A., Assistant in Forestry.
A. D. WILHOIT, M.A., Assistant in Soils.
A. R. KOHLER, B.S.A., Assistant in Vegetable Gardening.

PURPOSE OF THE SCHOOL

The short summer course for teachers, principals, and superintendents, has been etablished to meet the demand for agricultural instruction by educators who wish to teach the elements of agriculture, or who wish to be able to supervise the teaching of the subjects intelligently in the pulbic schools. It is intended to be especially helpful to teachers who

desire to be more efficient in teaching the elements of agriculture in rural schools, or in small village schools having an attendance largely from the country.

High school teachers who wish to get more complete information on agriculturel subjects and technical work so as to make more practical their teaching of botany, physics, chemistry, and other natural sciences, may find here the opportunity they have long been seeking.

Principals of high schools who wish to introduce carpentry, blacksmithing, the elements of agriculture, sewing, cooking, may here get such an insight into the subjects that they may go about their introduction and supervision with some degree of confidence.

County superintendents having to do with country conditions more than others should seek to become familiar with modern agricultural problems and their solution. It is hoped that this short course may appeal to all the special classes mentioned as well as to some who are interested merely in the form of industrial education presented as a means of general information and culture.

LOCATION

The school is located at the University Farm, midway between Minneapolis and St. Paul. It is about a 15-minute walk from the street car line. To reach the school from either city, take a Como-Harriet or Como-Hopkins car, and get off at Commonwealth Avenue.

Although the school is located in the country, and has all the advantages of the quiet and fresh air of the country, yet it is close enough to the Twin Cities to get all the benefits of these large centers. No more beautiful spot between the two cities could have been selected for such a school. Situated on picturesque hills, overlooking the midway and the two cities, the buildings are grouped conveniently about the undulating campus. Nature has done much to make this a beauty spot and the landscape artist has added to the beauty in the arrangement of paths and the replacing of trees and shrubs with many varieties suited to the climate.

PLAN OF THE COURSE

This course is complete in itself, covering three weeks of lectures and laboratory work, commencing Monday, June 21st, and closing Saturday, July 10th, 1909.

It is expected that those who register for the course will take the work as outlined, the topics under consideration have been chosen with great care with reference to a useful and logical arrangement. The morning sessions are planned to interest the entire class in one body, while the afternoon periods offer an optional course. Those desiring to specialize in domestic science and art find that work offered, while the men are occupied in blacksmith and carpentry shop work.

EXPENSE

The registration fee for the entire course or for any part of it, is $3.00.

Good board will be furnished at the large dining hall for $3.50 per week. Dormitory rooms may be used free of charge. These rooms have all necessary furniture, except pillows, pillow cases, sheets, quilts and towels. Those expecting to occupy the dormitories should bring such articles with them. If desired, the articles named may be rented at the school for 60 cts. per week. It will aid greatly in making arrangements for the proper accommodations, if those who expect to attend will write of their intention before June 1st.

Any one desiring further information in regard to this course may apply to Jas. M. Drew, Registrar, University Farm, St. Paul, Minn.

THE CONFERENCE HOUR

A conference hour is arranged for each day before dinner. At this time subjects of special interest to school men and women will be considered. Round table discussions of pedagogical problems especially related to the introduction of vocational subjects into the public school curriculum will be held.

Short talks and lectures by men prominent in educational work will be given. All subjects presented will be open for question and debate.

A number of evening lectures and entertainments will also be provided during the course.

During the course Dr. Reynolds will give two illustrated lectures on ventilation and animal diseases.

AGRICULTURE

The lectures in agriculture will cover the principles of soil formation and classification, soil water, its movements, and effect on plant growth; the relation of tillage to plant growth and the effect of tillage on the conservation of soil fertility. Field crops, their cultivation, growth and care, will be presented from the standpoint of economic relation to farming. A series of discussions of the arrangement of crops and of farm plans will form a cistinctive feature of this subject, thus giving the principles of soil preparation, crop growth and farm management.

AGRICULTURAL CHEMISTRY

The composition and comparative value of food materials, the changes which take lacep during the production, and the appiication of the principles of chemistry to plant and animal life form the basis of this work

ANIMAL HUSBANDRY

In animal husbandry, the work will consist of sketches of the history, development and classification of the various classes of live stock and their relation to farming; of comparisons of the types of each class, and a study of the breeds of horses, cattle, sheep and swine. Good specimens will be used for illustrating the characteristics of each breed and for demonstating the principles of selecting for specific purposes.

BLACKSMITHING

A course of lessons in iron work will be offered to those who desire to prepare for teaching this subject in the common schools. This course will cover the essential principles of forging iron and steel and tempering tools in common use.

DAIRY HUSBANDRY AND ANIMAL NUTRITION

The lectures will cover the characteristics of the various breeds of dairy cattle, their adaptability for the various phases of dairying, and the style or type of cow that has demonstrated her ability as a large and economical producer. Instruction will be given in the scientific principles and practical phases of feeding, and training will be given in calculating and formulating rations.

DAIRY STOCK

The instruction given in dairy stock will be based upon the actua performance of animals bred and reared in the dairy division, the records covering a period of five years giving the annual yield of milk and butter fat and the cost of production and profits.

DOMESTIC ART

The course will consist of lectures and exercises on models and plans for graded work in the public schools, including basting, the seam, the hem, the gusset, the placket, patching, darning, buttonholes and other hand sewing, also garment drafting and making, including the shirt waist. Lectures will be given on the production and use of textiles, the judging of fabrics, the harmony of color, and the beautifying of the useful in the school room.

DOMESTIC SCIENCE

This work will consist of lectures, class room demonstrations and of such library research as will enable students to make bibliography, which will aid in securing reliable data for use in teaching this subject. The principles set forth in the lectures and discussions will be illustrated in

either demonstration lectures or in individual practice, as the majority of the class may elect. The various methods of teaching this subject, now in general use, will be discussed and exemplified. In connection with this, a list showing utensils needed for a laboratory kitchen with approximate cost will be compiled and considered.

Results of experiments will be studied to ascertain the best means for introducing into the rurual schools some work along domestic lines.

ENTOMOLOGY

Lectures will be given on the important features represented by this department. Such subjects as scale insects, plant lice, bee keeping, friendly insects, etc., will be dealt with in an effort to make the course as comprehensive as time permits, and suited to the needs of teachers.

HORTICULTURE AND FORESTRY

The course in horticulture and forestry will include lectures and laboratory periods, aimed to illustrate the fundamental principles underlying these subjects, and to show the best way in which they can be taught.

PLANT DISEASES

Lectures will be given on important plant diseases of farm and garden crops; their economic importance, botanical features, and methods of prevention and cure. Demonstrations and exhibitions of material will also be given.

POULTRY

A course of lectures and demonstrations in the care and management of poultry will be given, covering the subjects of poultry buildings, the breeds of poultry, incubation, brooding, feeding, and marketing. This course will be given at the season when incubators and brooders are in use, thus affording a chance for practical work in this line to those who desire it.

SOILS

Formation, physical properties, chemical composition and the judging, rating, and scaling of soils are studied in the laboratory. Lectures are given on the principles of soil fertility and the compoistion and use of farm and commercial manures.

TENTATIVE PROGRAM

Monday, June 21, Registration

	8:15	9:05	9:55	10:45	11:35	1:15	2:05	2:55	3:45
Tuesday, 22nd.....	Agriculture	Fruit Growing	Household Art Lecture	An. Husbandry Cattle	CONFERENCE HOUR.	Chemistry Lecture	Chemical Laboratory		
Wednesday, 23d ..	"	"	"	"		Soils Lecture	Soils Laboratory	Field Practicums	
Thursday, 24th ...	"	"	"	"		Blacksmithing Lecture and Shop Work / Household Art			
Friday, 25th.	"	"	Domestic Science Lecture	"		Carpentry Lecture and Shop Work / Domestic Science			
Saturday, 26th....	"	Dairy Lectures	"	Sheep		Dairy Lectures	Dairy Practicums		
Tuesday, 29th	"	Vegetable Gardening	"	"		Chemistry Lectures	Chemical Laboratory		
Wednesday, 30th..	"	"	Entomology	Swine		Soils Lecture	Soils Laboratory	Field Practicums	
July— Thursday, 1st.....	"	"	"	"		Blacksmithing Lecture and Shop Work. / Household Art			
Friday, 2d....	"	"	"	Poultry		Carpentry Lecture and Shop Work / Domestic Science			
Saturday, 3d	"	Dairy Lectures	"	"		Dairy Lectures	Dairy Practicums		
Tuesday, 6th.....	"	Forestry	Plant Diseases	Horses		Chemistry Lectures	Chemical Laboratory		
Wednesday, 7th...	"	"	"	"		Soils Lecture	Soils Laboratory	Field Practicums	
Thursday, 8th.....	"	"	"	"		Blacksmith Lecture and Shop Work / Household Art			
Friday, 9th.	"	"	"	"		Carpentry Lecture and Shop Work / Domestic Science			
Saturday, 10th. ...	"	Dairy Lectures	"	"		Dairy Lectures	Dairy Practicums		

THE SHORT COURSE IN TRACTION ENGINEERING

The growing use of traction engines in general farm work has made it advisable to offer a special course in the use of power machinery as one of the "short courses" in the Department of Agriculture of the University of Minnesota.

The course is complete in itself, covering four weeks of study and practice. The mornings are devoted to lectures and class-room work, and the afternoons to actual practice in the various departments under the supervision of the instructors of the school.

Such a course opens a great opportunity to the young man interested in mechanics, or to the one who has had some practical experience in the handling of engines, offering in a short time the training in the theory of engineering.

EXPENSE OF COURSE

The tuition for the entire course is fifteen dollars, payable as a registration fee at the time of entrance. This covers the instruction in all departments, traction stationary and gas engines. No deduction is made if the student elects but a part of the course, or fails to complete work from any cause whatever.

Each student is required to furnish work-clothes, overalls and gloves, and be prepared for expense of car-fare on trips of inspection to visit factories, etc.

ARRANGEMENTS FOR ACCOMMODATION

Good board and room will be furnished on the campus of the school for $3.50 per week. The large dining-hall at the school will be in service, and the dormitory rooms may be used under proper regulations. The rooms have all necessary furniture except pillows, sheets, quilts and towels. These articles may be brought from home by the student, or for a small fee he may rent them for use during the month.

This arrangement will keep all the students together and will allow more time for the practice work in all departments.

REQUIREMENTS FOR ADMISSION

Any person of good moral character, who can reed and write, may be admitted to this school. No entrance examination is required. The work is made so plain and simple that those whose education is limited may pursue the course with profit. Knowlidge of physics or of algebra

is not necessary. Those who have had these subjects may make good use of their knowledge in the course, but they are not required for admission.

TIME OF SESSION

The Short Course in Traction Engineering opens Tuesday, May 24, and continues for four weeks, closing Friday, June 17, 1910. Those desiring to take the course should register and secure boarding places not later than Monday, May 23, as work begins promptly Tuesday morning.

COURSE OF STUDY

TRACTION ENGINES

STEAM.—Properties of steam, the steam table, latent heat of vaporization, total heat of vaporization, specific volume of steam, work done by steam, work diagrams, expansion of steam.

BOILERS.—Types of boilers: Steam boiler, locomotive boiler, return-flue boiler, the vertical boiler. Construction and repairing of boilers. Boiler materials. Riveted joints, staying flat surfaces, tubes and tube sheets. Boiler fittings: Fusible plugs, grates, safety valve, steam and water gauges, the whistle. Boiler feeders: Pumps, the injector.

COMBUSTION OF FUELS.—The process of combustion: Igniting temperature; products of combustion; combustion of carbon complete; combustion of carbon incomplete; combustion of hydrogen; heat of combustion; temperature of combustion; conditions required for economical combustion. Fuels. Firing.

THE TRACTION STEAM ENGINE.—The mechanism of the steam engine. The slide valve and steam distribution: Outside lap, inside lap, angle of advance, effects of lap, lead, position of the eccentric, rocker-arms, direct and indirect valves, setting the slide valve, dead centers, to place the engine on its dead center, directions for setting slide valve. Reversing gears. Single-eccentric reversing gear, the Stephenson link motion. Compound engines: Efficiency of heat engines; absolute zero; absolute temperatures; principles of the compound engine; compound traction engines. Various details of the traction engine: The traction gearing; compensating gear; drive wheels; the governor; cylinder lubricators. Operation and care of the traction engine: General examination; the boiler; feedwater; exhaust nozzles; use of the whistle; the engine; starting the engine; the engine on the road; guiding the engine; the friction clutch; setting the engine; connecting-rod brasses; tests for leaks; friction and lubrication; winter care of the engine; portable engines.

INDICATORS AND INDICATOR DIAGRAMS.—Description of the indicator. Directions for using the indicator: Reducing motion; directions for taking indicator diagrams; points and lines of the diagram. Horse-power: Mean effective pressure; approximate determination of mean effective pressure; piston speed; friction horse-power; net horse-power mechanical efficiency. To find the traction force of a traction engine. Reading indicator diagrams. Operation of traction engine: Ascending and descending hills, pulling load in the sand, in mud, over bridges, getting out of a sink hole, etc.

STATIONARY ENGINES

Although the general principles given with reference to traction engines apply with equal force to stationary engines, yet there are some subjects that should be taught with reference to the stationary engine that do not apply to the traction engine. Students who wish to do so may take this work in a special class that will be formed of those interested in stationary engines.

GASOLINE ENGINEERING

Within the past few years the engines using the explosive power of gas as the means of securing mechanical motion have come into very extensive use. Whereas ten or fifteen years ago such engines were very few in number and very uncertain in results, at the present time they probably outnumber engines of all other kinds, and in point of efficiency they are an undisputed success. The use of denatured alcohol in such engines, it is hoped, will greatly decrease the cost of operation and will increase the number used. Instruction in the construction and operation of gasoline and other engines of this class will be given throughout the term. The use of the gasoline traction engine will also be taught, and practical work on it will be given.

Those who complete the work with the gasoline engine wiil be given a special certificate for that course.

BLACKSMITHING

The competent enginner should know how to handle iron at the forge. He should be able to weld when the necessity arises and to temper his tools skillfully. To the students of this course a series of practical exercises wil be offered covering the elements of iron and setel forging, tool making and tempering. The aim will be to make the course as useful as possible to threshermen and engineers.

BABBITTING

Lectures will be given on babbitt and babbitting. Each student will be required to do actual work in babbitting boxes.

BELT-LACING

Demonstrated lectures are given on the speed of pulleys, belting and belt-lacing. Students are required to figure speed of pulleys and make samples of the belt-lacing in common use.

PIPE-FITTING

Demonstrated lectures are given on pipe-fitting, valves, etc. Students are required to cut and thread pipes and do some work in pipe-fitting.

ROPE-SPLICING

Every thresherman and engineer should know how to splice a rope and tie all the useful knots known to the sailor. A series of lessons in this art will be given covering all the common knots and splices.

SOLDERING

Demonstrated lectures are given on tinning, making soldering acids and soldering iron. Students are required to solder samples of various metals, etc.

TUBE SETTING

Instruction in tube setting is given, and students are required to put in and remove tubes

LICENSE

A number of states require any man who runs an engine to obtain a license based on an examination held by an inspector. The State of Minnesota has such a law:

"Any person who shall operate any steam boiler or steam machinery of any kind without first obtaining a license from an inspector, shall be deemed guilty of a misdemeanor, and fined not less than twenty-five dollars nor more than fifty dollars."

Engineers shall be divided into four classes, namely:

Chief Engineers;

First Class Engineers;

Second Class Engineers;

Special Engineers.

Chief Engineers must have at least five years' actual experience, and must be qualified to take charge of all classes of steam boilers and steam machinery.

First Class Engineers must have had at least three years of experience, and must show that they are qualified to take charge of all classes of steam boilers and steam machinery not exceeding 300 horse-power.

Second Class Engineers must have had at least one year of actual experience, and be licensed to operate boilers and steam machinery not to exceed 100 horse-power.

Special Engineers, if found competent on examination ,are licensed to operate setam boilers and steam machinery not to exceed 30 horse-power.

Pupils who take the course in this cshool and receive the diploma after examination will receive an engineer's second class license. If the length of service warrants it, first class and chief engineer's licenses will be issued.

Licenses will be issued by the Board of State Boiler Inspectors on payment of the legal fee of $1.00.

The licenses issued in this state will be accepted by most of the states as evidence of qualification to operate steam boilers and steam engines.

INQUIRIES

Anyone desiring further information in regard to these courses may apply to Jas. M. Drew, Registrar, University Farm, St. Paul, Minn.

The Agricultural Experiment Station

STATION OFFICERS

J. W. OLSEN, B.S., Director.
J. A. VYE, Secretary.

EXPERIMENT CORPS

SAMUEL B. GREEN, B.S., Horticulturist.
HARRY SNYDER, B.S., Agricultural Chemistry and Soils.
T. L. HAECKER, Dairy Husbandry and Animal Nutrition.
M. H. REYNOLDS, M.D., D.V.M., Verterinarian.
ANDREW BOSS, Agriculturist and Animal Husbandry.
FREDERICK L. WASHBURN, M.A., Entomologist.
E. M. FREEMAN, M.S., Vegetable Pathology.
JOHN T. STEWART, B.S., Agricultural Engineering.
J. A. HUMMEL, B.Agr., Assistant Chemist.
COATES P. BULL, B.Agr., Assistant in Agriculture.
A. G. RUGGLES, M.A., Assistant Entomologist.
A. J. MCGUIRE, B.Agr., Superintendent, Grand Rapids.
D. A. GAUMNITZ, M.S.Agr., Assistant in Animal Husbandry.
LEROY CADY, B.S., in Agr., Assistant in Horticulture.
A. D. WILSON, B.S.Agr., Assistant in Agriculture.
WM. ROBERTSON, B.S., Superintendent, Crookston.
C. C. LIPP, D.V.M., Assistant Veterinarian.
A. D. WILHOIT, M.A., Assistant in Soils.
L. B. BASSETT, Assistant in Agriculture.
A. R. KOHLER, B.S.A., Assistant in Horticulture.
T. P. COOPER, B.S., in Agr., Assistant in Agriculture.
W. H. FRAZIER, B.S., Assistant in Soils.

The bulletins of this station are mailed free to all residents of this state who make application for them.

The Agricultural Experiment Station of the University of Minnesota was established by National and State legislation in 1887. The function of the Experiment Station as set forth in the Hatch Act is "to aid in acquiring and diffusing among the people useful and practical information on the subjects connected with agriculture and to promote scientific investigation and experiment respecting the principles and applications of

agricultural science." The funds provided by the National Government have been supplemented recently by the Adams Act which will ultimately provide $15,000 annually, and appropriations for special lines of experimental work have also been made by the State Legislature.

The Experiment Station is located at University Farm, St. Paul, and is one of the Divisions of the Department of Agriculture of the University of Minnesota, and the officers of the station are also professors and instructors in the School and College of Agriculture. The chief executive officer of the station is the Director who is also Dean of the College of Agriculture. Affiliated with the main station are a score or more of trial stations maintained by the State Horticultural Society. The Experiment Station also carries on co-operative tests and investigations with the U. S. Department of Agriculture and with farmers in various parts of the State. The Station has published since its organization in 1887, one hundred nine regular, and thirty-one press and fifteen class bulletins.

The principal lines of work conducted at the station are as follows: Chemistry of soils and farm crops; field experiments—rotations, tests of varieties of cereals and forage crops, time and depth of seeding grains and amount of seed, methods of seeding grasses; horticultural—tests of varieties of fruits and vegetables, use of wind-breaks, testing hardy stocks for apple trees, improvement of native fruits; forestry; diseases of plants; food and nutrition of man; plant and animal breeding; feeding experiments; diseases of animals; entomology, dairying; farm management and farm statistics.

NORTHWEST EXPERIMENT FARM

To give special consideration to local conditions in the northwestern part of the state an experiment farm was established at Crookston in 1895. The farm contains 450 acres and is one mile north of the city. It has a well-equipped poultry plant from which much good breeding stock is being distributed among the farmers. With aid from the U. S. Office of Experiment Stations the farm is taking an active part in testing surface and tile drainage for the Red River Valley region. It is also encouraging a more extensive growing of clover. The Crookston School of Agriculture is operated in connection with the farm. (See page 31).

EXPERIMENT FARM AT GRAND RAPIDS

The legistature of 1895 also provided for a second experiment farm to make possible a more thorough study of the agricultural conditions of the northeastern portions of the state. This farm was located at Grand Rapids April, 6, 1896, and lies two miles east of the village. It contains approximately 375 acres of land, with the necessary farm equipment consisting of dwelling house, barns, machinery, live stock, etc.

Bulletins of the Experiment Station for 1908

GENERAL BULLETINS

BULLETIN No. 102--Division of Agricultural Chemistry and Soils. Soil Investigations.

1. Fertilizer tests with wheat and corn.
2. Influence of Fertilizers upon the composition and quality of wheat.
3. A comparison of Chemical methods and field tests for determining the fertilizer requirements of soils.

BULLETIN No. 103--Verterinary division. Dissemination of Tuberculosis by the manure of infected cattle.

BULLETIN No. 104--Animal husbandry and agricultural divisions. Pork production

BULLETIN No. 105--Division of entomology. The importance of the study of entomology. How to collect and preserve insects.

BULLETIN No. 106--Division of dairy husbandry and animal nutrition. Investigation in milk production.

The relation of Nutrient to product.

BULLETIN No. 107--Division of agriculture. Corn breeding in Minnesota.

BULLETIN No 108--Division of entomology. The so-called "Green Bug" and other grain aphids in Minnesota in 1907.

BULLETIN No. 109--Divisions of agriculture and agricultural chemistry and soils. The rotation of crops. 1. Report of 10 years on 44 rotation plots. 2. Influence of rotation of crops and continuous cultivation upon the composition and fertility of soils.

PRESS BULLETINS

PRESS BULLETIN No. 28--1 The Fall web worm a menace to Minnesota.

2. Autumn remedies for the stalk borer in flower gardens.

PRESS BULLETIN No. 29--Seed corn shortage.

PRESS BULLETIN No. 30--Bearded Spring wheat compared with blue stem in Minnesota.

PRESS BULLETIN No. 31--Suggestions to those Contemplating spraying.

E

THE COLLEGE of LAW

The College of Law

FACULTY

CYRUS NORTHROP, LL.D., President.
WILLIAM S. PATTEE, LL.D., Dean and Professor of Law
A. C. HICKMAN, LL.D., Professor of Law
JAMES PAIGE, A.M., LL.M., Professor of Law
HENRY J. FLETCHER, LL.M., Professor of Law
EDWIN A. JAGGARD, LL.D., Associate Justice of the Supreme Court
HOWARD S. ABBOTT, B.L., of the Hennepin County Bar
ROBERT S. KOLLINER, LL.B., of the Hennepin County Bar
HUGH E. WILLIS, A.M., LL.M., Assistant Professor
HUGH V. MERCER, L.L.M., Minneapolis

LIBRARIAN

HOMER W. STEVENS

QUIZ MASTER

H. S. MITCHELL

LECTURERS

CHARLES W. BUNN, St. Paul
Federal Jurisdiction
CHRISTOPHER D. O'BRIEN, St. Paul
Criminal Procedure
JARED HOW LL.B., St. Paul
Landlord and Tenant
CASSIUS M. FERGUSON
Minnesota Practice
F. E. HOBBS, LL.B., Minneapolis
ARTHUR L. HELLIWELL, LL. B., Minneapolis

SPECIAL LECTURES FOR 1909–10

HON. JOHN LIND, Minneapolis; Ex-Governor of Minnesota
Law of Interstate Commerce

CHARLES B. ELLIOTT, Minneapolis; Justice Supreme Court of Minn.
Disputed Questions in International Law

A. B. JACKSON, LL.B., Minneapolis
Conflict of Laws

T. D. O'BRIEN, St. Paul; Ex-Insurance Commissioner
Proper Exercise of the Police Power of the State

JOHN W. WILLIS, A.B., St. Paul; Ex-Judge of District Court
Lawyers, Oriental, Medieval and Modern

WM. A. LANCASTER, Minneapolis; Ex-Judge District Court of Minn.
Impairing Obligation of Contracts

JOHN F. MCGEE, Minneapolis; Ex-Judge District Court, Minn.
Federal Jurisdiction

ROME G. BROWN, LL.B., Minneapolis
Water-rights

HON. DANIEL FISH, Minneapolis
Law Making

HON. EDMUND S. DURMENT, St. Paul
Eminent Domain

The College of Law

OBJECT

It is the object of the College of Law of the University of Minnesota to educate its students by means of the study of jurisprudence, and at the same time to familiarize them with the fundamental principles of positive law so that they will be able, at the end of their course, to safely enter upon the duties of the legal profession. Education, and not simply information, is the prime object. The power to think clearly, to reason cogently, to perceive distinctions quickly, to investigate thoroughly, to generalize carefully and to express his thoughts accurately are the basis qualifications of the safe counsellor. To secure for the students these habits of thought and expression should be the aim of both the student himself and his instructor.

The method of work generally pursued in the college is threefold. First. The reported cases, being the original repositories of the principles of law and equity, are read by the student and considered in the class-room. To facilitate the work and save expense for the student, volumes of these, cases are reprinted and put free of charge, into the hands of the student during the continuance of the subject, and each subject is pursued daily until its completion. Second. Besides reading the cases, the student in most subjects is required to prepare a written analysis of each case, stating in his own words, the issue upon which it turns, the law which governs it, a brief statement of the facts, and the conclusion which the law and facts logically necessitate. This practice has proved helpful in securing a greater thoroughness in reading, greater carefulness in reasoning and greater accuracy on the part of the student in the art of expression. Third. In addition to the student's investigation of the cases, and his presentation of them to his instructor, a systematic and orderly arrangement of each subject in the form of a summary, and much additional information regarding the details of the law's application in particular instances, and a consideration of the exceptions, limitations and statutory modifications of general principles, and especially information regarding the art of practice, are indispensable, and are in most instances supplied by printed lectures prepared for that purpose, or by well-written text-books upon the subject under consideration. Information, as well as education, is necessary to prepare a student to begin the practice of law. So far as possible he should, at the end of his

course, grasp the various subjects of law in the unity of system, and to do this he must, in many instances take the generalizations of his instructor, or take them from some text-book, until he shall find time to investigate the subject for himself.

LAW BUILDING

The Law building, recently enlarged, is admirably adapted to the uses for which it was constructed. It supplies ample facilities for all the varied exercises of the college. The entire upper story is devoted to the library and reading room, except that portion of it conveniently arranged for the Judge's Chambers, the Court room, the Clerk's office, the Jury room, and the offices of the Dean. Upon the first floor there is a large and convenient auditorium, lecture rooms, and private offices for the professors, besides the general office for the special business of the department. Under the most recently constructed portion of the building there is a well-lighted and convenient basement, devoted to society rooms for the legal literary, and debating organizations. As now reconstructed and arranged the building provides for all the conveniences of a modern court house for the practice department, furnishes ample light and well ventilated reading rooms and other excellent library facilities, and affords sufficient room for all the other regular work of the College.

ENTRANCE REQUIREMENTS

Beginning in September, 1909, candidates for the degree of L.L.B., in order to enter the College of Law, must have completed one year's work in the academic department of the University of Minnesota, or of some other College or University of equal grade.

Such candidates, together with those who have graduated from the academic department of such accredited Colleges or Universities, or have completed more than one year's work therein, may be admitted by presenting their diplomas, or other credentials of the college work they have completed, to the Registrar of the University.

Graduates of a high school, or other school of equal grade, whose course of study extends over a period of four years, may be admitted to the College if 19 years of age, but not for a degree, upon the presentation of their diplomas to the Registrar of the University.

Persons over 21 years of age, who have not the full preparation as required in the foregoing statements, may apply for admittance to the College of Law, but not for a degree, upon presenting their credentials to the Registrar of the University; and if, after considering their qualifications, any such application is accepted, the Registrar will give to such applicant a card of admittance to the College.

ANNOUNCEMENT

Beginning in September, 1911, only those students will be admitted to the College of Law who have completed two or more years of Academic work in some accredited College or University.

Students, however, if they elect studies in both the day and evening courses, pursuing both at the same time, will be charged ten dollars per term additional tuition.

Students in the day or evening classes will not be permitted to attend more than two courses of lectures daily, unless in exceptional cases, and then a card of admission must be procured from the faculty and ten dollars per term additional tuition must be paid.

Students who are regular members of one class, either day or evening, will not be permitted to pursue studies in any class in advance of that to which they belong, unless there are special circumstances requiring it, and only upon special permission granted by the faculty.

SENIOR ELECTIVES

Students in the senior class of the College of Science, Literature and the Arts, are permitted to elect, throughout the senior year, work in the College of Law, including the elements of contracts, domestic relations, torts, criminal law and negotiable paper. The satisfactory completion of the above named subjects will give the student a six hour credit throughout the senior year, and will entitle him to admission to the middle class of the College of Law. No such student will be permitted to take more than one lecture per day in the College of Law, without special permission of the faculty of the College of Science, Literature and the Arts.

ADVANCED STANDING

Should any person desire to enter the middle or senior class for a degree he must pass the required preliminary examination upon the subjects of the preceding year or years, or their equivalents, but no person will be allowed to receive his degree who has not spent one full year in this department. Attorneys at law, however, who have been admitted to practice in the state of Minnesota and have one year of academic work in college may enter the senior class without examination upon presentation of their certificates of admission to the Registrar, and shallbe entitled to their degree upon a satisfactory showing at the final examination of the year upon the entire work of the three years.

ELECTIVES IN OTHER DEPARTMENTS

Students in the College of Law, may be permitted, after the junior year and under proper regulations, to elect work in other departments

of the University, without extra charge, so far as it does not interfere with their work in Jurisprudence The faculty of law encourage students to avail themselves of this opportunity during the middle and senior years, but such election of work should be made only after consultation with the faculty. Among the subjects which may be profitably selected are English sociology, political science, and economics. Students who elect such work must complete it in a satisfactory manner before the degree in law will be conferred upon them.

TRANSFER OF STUDENTS

Students who matriculate in the College of Science, Literature and the Arts, or in other departments of the University, and fail in their work in such college, will not be admitted to the College of Law until such unfinished work shall have been satisfactorily completed.

The faculty earnestly advises all young men contemplating a course in law, and especially those who expect to engage in practice, to take the first two years at least in the College of Science, Literature and the Arts, and if possible to complete the entire course there, before entering the College of Law.

DAY COURSE OF THREE YEARS

FIRST YEAR—JUNIOR

Contracts (twelve weeks)	PROFESSOR FLETCHER
Illustrative cases.	
Quiz work throughout the subject	MR. MITCHELL
Personal Property and Sales (eight weeks)	ASSISTANT PROFESSOR WILLIS
Illustrative cases.	
Quiz work throughout the subject	MR. HOBBS
Domestic Relations (four weeks)	PROFESSOR PAIGE
Illustrative cases.	
Common Law Pleading (three weeks)	PROFESSOR HICKMAN
Text Book, Phillips.	
Torts (nine weeks)	PROFESSOR PAIGE
Illustrative cases.	
Equity (Maxims) (six weeks)	DEAN PATTEE
Illustrative cases.	
Quiz work throughout the subject	MR. MITCHELL
Commercial Paper (four weeks)	PROFESSOR PAIGE
Illustrative cases.	
Quiz work throughout the subject	MR. MITCHELL
Blackstone (Second Book) (four weeks)	PROFESSOR PAIGE
Lewis' or Cooley's Blackstone.	
Agency (three weeks)	PROFESSOR PAIGE
Illustrative cases.	
Criminal Law (five weeks)	PROFESSOR PAIGE
Illustrative cases.	
Quiz work throughout the subject	MR. MITCHELL

SECOND YEAR—MIDDLE

Wills and Administration (four weeks) — PROFESSOR PAIGE
Illustrative cases.

Chattel Mortgages (three weeks) — PROFESSOR FLETCHER
Illustrative cases.

Partnership (four weeks) — PROFESSOR PAIGE
Illustrative cases.

Code Pleading (seven weeks) — PROFESSOR HICKMAN
Phillips on Code Pleading and Illustrative Cases.

Liens (two weeks) — PROFESSOR FLETCHER
Illustrative cases.

Bankruptcy (two weeks) — PROFESSOR FLETCHER
Illustrative cases.

Bailments and Carriers (four weeks) — ASSISTANT PROFESSOR WILLIS
Illustrative cases.

Private Corporations (five weeks) — ROBERT S. KOLLINER
Illustrative cases.
Quiz work throughout the subject — MR. FERGUSON

Public Corporations (three weeks) — HOWARD S. ABBOTT
Illustrative cases.

Insurance (three weeks) — ASSISTANT PROFESSOR WILLIS
Illustrative cases.

Equity (Doctrines) (six weeks) — DEAN PATTEE
Illustrative cases.

Damages (four weeks) — ASSISTANT PROFESSOR WILLIS
Illustrative cases.

Real Property (twelve weeks) — PROFESSOR FLETCHER
Illustrative cases.
Quiz work throughout the subject — MR. MITCHELL

Landlord and Tenant (two weeks) — JARED HOW
Illustrative cases.

THIRD YEAR—SENIOR

Evidence (five weeks) — PROFESSOR HICKMAN
Greenleaf on Evidence (Vol. I) and Illustrative cases.

Trusts (three weeks) — PROFESSOR FLETCHER
Illustrative cases.

Minnesota Real Property (five weeks) — PROFESSOR PAIGE
Illustrative cases.

Constitutional Law (six weeks) — PROFESSOR FLETCHER
Illustrative cases.

International Law (four weeks) — PROFESSOR FLETCHER
Illustrative cases and text-book.

Taxation (four weeks) — JUSTICE E. A. JAGGARD
Professor's text-book and illustrative cases.

Equity (Remedies) (six weeks) — DEAN PATTEE
Illustrative cases.

Mortgages (four weeks) — DEAN PATTEE
Illustrative cases.

College Court. Each student is required to have two cases in court of Justice of Peace.
Four cases in District Court. — A. C. HICKMAN, JUDGE
One Case in Supreme Court. — W. S. PATTEE, C. M. FERGUSON, H. E. WILLIS, JUSTICES

FOUR YEAR EVENING COURSE

To accommodate those who cannot attend the school during the day there is offered an evening course, comprising the same subjects as those above enumerated, extending over a period of four years, of nine months each. But if any student in this course will, during the first three years, complete the work of the fourth year, in the day class, he may be allowed to graduate at the end of the third year.

FIRST YEAR

Contracts (eleven weeks) — Assistant Professor Willis
Illustrative cases.
Domestic Relations (four weeks) — Professor Paige
Illustrative cases.
Personal Property and Sales (seven weeks) — Assistant Professor Willis
Illustrative cases.
Torts (nine weeks) — Robert Kolliner
Illustrative cases.
Criminal Law (five weeks) — Professor Paige
Illustrative cases.

SECOND YEAR

Wills and Administration (four weeks) — Professor Paige
Illustrative cases.
Partnership (four weeks) — Professor Paige
Illustrative cases.
Equity (Jurisdiction and Maxims) (four weeks) — Dean Pattee
Illustrative cases.
Bailments and Carriers (three weeks) — Assistant Professor Willis
Illustrative cases.
Private Corporations (six weeks) — Robert S. Kolliner
Illustrative cases.
Public Corporations (three weeks) — Howard S. Abbott
Illustrative cases.
Commercial Paper (four weeks) — Professor Paige
Illustrative cases.
Blackstone (three weeks) — Professor Paige
Lewis' or Cooley's Blackstone.
Insurance (three weeks) — Assitant Professor Willis
Illustrative cases.
Common Law Pleading (two weeks) — Professor Hickman
Text-book, Phillips.

THIRD YEAR

Evidence (five weeks) — Professor Hickman
Greenleaf on Evidence (First Vol.) and illustrative cases.
Code Pleading (seven weeks) — Professor Hickman
Phillips on Code Pleading and illustrative cases.
Chattel Mortgages (two weeks) — Professor Fletcher
Illustrative cases.

Constitutional Law (five weeks) — PROFESSOR FLETCHER
Illustrative cases.
Equity (Doctrines and Remedies) (seven weeks) — DEAN PATTEE
Illustrative cases.
Real Property (ten weeks) — PROFESSOR FLETCHER
Illustrative cases.

FOURTH YEAR

Liens (two weeks) — PROFESSOR FLETCHER
Illustrative cases.
Real Estate Mortgages (three weeks) — DEAN PATTEE
Illustrative cases.
Minnesota Real Property (four weeks) — PROFESSOR PAIGE
Illustrative cases.
Agency (three weeks) — PROFESSOR PAIGE
Illustrative cases
International Law (three weeks) — PROFESSOR FLETCHER
Text-book and illustrative cases.
Trusts (three weeks) — PROFESSOR FLETCHER
Illustrative cases.
Damages (four weeks) — ASSISTANT PROFESSOR WILLIS
Illustrative cases.
Taxation (three weeks) — JUSTICE E. A. JAGGARD
Professor's text-book and illustrative cases.
College Court Work, throughout the year.
Special lectures during the year upon the subjects of Abstracts, Practice in the United States Courts, Conflict of Laws, Federal Jurisdiction, Bankruptcy, Criminal Procedure, and Landlord and Tenant.

SPECIAL COURSE

For the benefit of those who do not care to pursue an extended course of legal instruction, but desire such a knowledge of law as will be of value to them in a business career, the foregoing regular courses are arranged so that,upon consultation with the faculty and registration as special students, such men may pursue certain special courses, embracing the following: Contracts, including statute of frauds; agency; commercial paper; partnership; bankruptcy law; liens; bailments; master and servant; insurance; sales and such other subjects as their business life or preference may render desirable.

GRADUATE COURSE

FIRST

For the benefit of those students who wish to pursue their legal studies further than they are able to do in the undergraduate years, two graduate courses are offered, the first leading to the degree of master of laws, (LL.M.), the second to the degree of doctor of civil law, (D.C.L.).

The courses of lectures offered in the first year of graduate work are as follows:

Philosophic basis of jurisprudence.

Roman law.

Political science.

Constitutional jurisprudence and history.

Those who enter this course as candidates for the degree must have already received the degree of bachelor of laws, from this or some other college having a three-year course of study. Those who spend the entire year in the work prescribed for this course, and pass a satisfactory examination upon the subjects taken, will be entitled to the degree of master of laws.

But the diploma conferring this degree of LL.M. does not entitle its holder to admission to the bar.

SECOND

Students who have received the degree of LL.B., from this or some other law school requiring three years' study of law for said degree, and who have also received the degree of LL.M., from this or some other school, after not less than one year of graduate study, and who have taken high rank in all the studies leading to these degrees, may apply to the faculty for the degree of Doctor of Civil Law. A knowledge of French or German, as well as of Latin is required, and special proficiency in Roman history is necessary to entitle a student to entrance for such degree.

There is no prescribed time within which students are required to do their work in this course, but they must make themselves proficient in the subjects of Roman law, political science, comparative constitutional law, and the philosophy of jurisprudence before any thesis will be accepted from them.

None of the aforementioned degrees will be conferred until a satisfactory thesis is presented to the faculty by the student, and the thesis for the doctors' degree must be one evincing original investigation and special excellence.

Whether a class will be organized in this course during the academic year of 1909 and 1910 will depend upon the number of applicants for admission.

TUITION

UNDERGRADUATE STUDENTS

A matriculation fee of ten dollars must be paid by every student entering the college. The tuition fee is sixty dollars a year, or twenty dollars per term payable in advance at the beginning of each term.

GRADUATE STUDENTS

The tuition fee for graduate students is forty dollars per year,payable in advance as follows: twenty dollars at the beginning of the school year, and twenty dollars February 1st following. In addition a matriculation fee of ten dollars is due from each student entering upon the course who has not previously matriculated in this college.

FREE CASE BOOKS

In order to protect the College, Bar Association and State Libraries from the special injury incident to continual use, and to facilitate the class work of the college, free case books are furnished the students by the University.

LIBRARIES

The college has a good library containing those English and American reports most frequently cited, digests, dictionaries, and a full and excellent selection of standard text-books. To this collection additions are being constantly made.

Further facilities are afforded the college by the generous action of the Bar Association of Minneapolis in granting to the students the free use of its extensive and ample library located in the Court House. It contains all the American reports, state and national, and also the English text-books and reports, so necessary for the student in his study of fundamental jurisprudence.

Besides the University and Bar Association libraries, the State library, containing all books which a student would have occasion to consult, is located at the capitol, in St. Paul, and is thus within easy reach of the students.

The general library at the University contains about seventy-five thousand bound volumes, besides many thousand volumes of pamphlets, magazines, reports, etc. About one hundred and twenty periodicals are received regularly by the library, not inclusive of technical magazines and newspapers in English and other languages.

Besides the general library of the University, there are several special libraries, consisting mainly of books of reference and current periodicals relating to technical subjects in connection with the several departments of engineering, biology, and botany. These libraries are open during the entire day, and the University library is open also in the evening.

METHODS OF INSTRUCTION

The recitations of the Junior and Middle day classes occupy the forenoon, and the Senior day class the afternoon, and the evening classes begin their work at seven-thirty P. M. Each subject is continued daily until its completion, one recitation following another immediately, in order to save the student the expense and time required in going to and returning from the University.

Each recitation period continues sixty to ninety minutes, and the work of the class room continues six days each week, except that the Senior day and the night classes do not meet on Saturdays.

EXAMINATIONS FOR PROMOTION

Examination will be held at the close of each subject during the middle and junior years, and no student who fails to pass a satisfactory examination in any of his studies will be advanced to the next higher class, except upon special permission of the faculty; and no such permission will be granted to any student who has failed in more than two subjects; but if he has not failed in more than two subjects he may be admitted to the next higher class provided he makes up those studies in which he is deficient by taking them in the regular classes where they are taught.

At the end of the middle year an examination is held upon the work of both the Junior and Middle years, for such students as the Faculty may select because of their low grades, or because their work, in whole or in part, was taken in another school, and if any student fails to pass this examination satisfactorily to the faculty he will be denied admission to the Senior class.

EXAMINATION FOR GRADUATION

While the grades secured by students upon examination at the end of each subject will, as a general rule, stand as a final grade, yet, if a student has taken any part of his work in an office or in another law school, or for any other reason the faculty consider a review of any student's work desirable, he shall take such examination upon such subjects as the faculty may select, and only upon passing such examination satisfactorily to the faculty, shall he be entitled to his diploma.

COLLEGE COURTS

As fast as the student becomes acquainted with the primary rights of persons, cases are prepared for his consideration, whereby he may apply the principles of law with which he has become familiar.

There is also established in the senior year a system of college courts corresponding to the justice, the district and the supreme courts of Minnesota, wherein the student may become familiar with the practice and the rules of the courts respectively.

It is the aim of the department to acquaint the student with the practice as well as the theory of law, and to this end the subjects of pleading, evidence, rules of practice adopted by our state courts, methods of securing provisional remedies, appeals from one court to another, the writs of habeas corpus, certiorari, and others of frequent use, conveyancing drawing contracts and other like practices which comprise the daily work of the general practioner, will, during the senior year, receive special and careful attention.

Some member of the faculty will preside over each of these courts, and the student is required to prepare appeal papers, bonds, paper books and to furnish the courts with his points and authorities according to requirements of law applicable to the various courts of the state.

STATE AND UNITED STATES COURTS

The department is located with 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, 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 all the opportunity for witnessing the trial of actual cases which the student will have either time or desire to improve.

THE LITERARY SOCIETIES

The students of the college have organized three literary societies for the purpose of general improvement and for cultivation in the practice of extemporaneous speaking. They hold weekly meetings and derive great benefit from their exercises.

PRIZES

The Pillsbury Prize

Three prizes of $100, $50, and $25, offered by the heirs of the Hon John S. Pillbury, are awarded for the best work in the rhetorical department, as evidenced finally by an oration in public.

The Dunwoody Prize

Mr. Wm. H. Dunwoody, president of the St. Anthony and Dakota

Elevator Co., offers $100 to that student who shall earn the right to represent Minnesota in the Northern Oratorical League. This league is composed of the seven largest universities of the central states, viz: Minnesota, Iowa, Wisconsin and Michigan State Universities, and Oberlin, Chicago and Northwestern.

The Lowden Prize

Mr. Frank O. Lowden, of Chicago, offers a prize to be competed for by the Northern Oratorical League, an endowment of $3,000, which will yield an annual income of about $175. A prize of $100 will be given to the winner of the first place, $50 to the orator who gets second place, and the remainder will be set aside each year for an interest fund to accumulate, and, in time, produce another endowment.

DEGREE OF BACHELOR OF LAWS

The degree of bachelor of laws will be conferred upon regular students of good moral character who pursue the full course in this college and pass an approved examination, and the degree will also be conferred upon those who, having attended another law school for the period of two years, shall also attend one year in this college and pass a like examination upon the three years' work. Students who pass their examinations with distinguished excellence will receive the degree of Bachelor of Laws, *cum laude*.

EXPENSES

These depend largely upon the tastes and habits of the individual. Students find no difficulty in obtaining board among the people of the city. Good board can be obtained for $4.00 per week. Students board in clubs at less expense.

For further particulars write to the Dean, W. S. Pattee, and all the information necessary for the student will be furnished promptly. The Dean will be pleased to correspond with any one who is thinking of pursuing a course of legal study. Letters addressed to him at Minneapolis, Minnesota, will receive prompt attention.

ADMISSION TO THE BAR

Students residing in Minnesota are admitted to the bar of this state upon presenting to the court their diploma, conferring the degree of LL.B. without examination or other condition, except that each applicant for admission must furnish a certificate of good moral character, and make affidavit of residence and citizenship in Minnesota.