



The
University of Minnesota
Bulletin

General Catalogue

1908-1909

Volume XI

November 30, 1908

No. 16

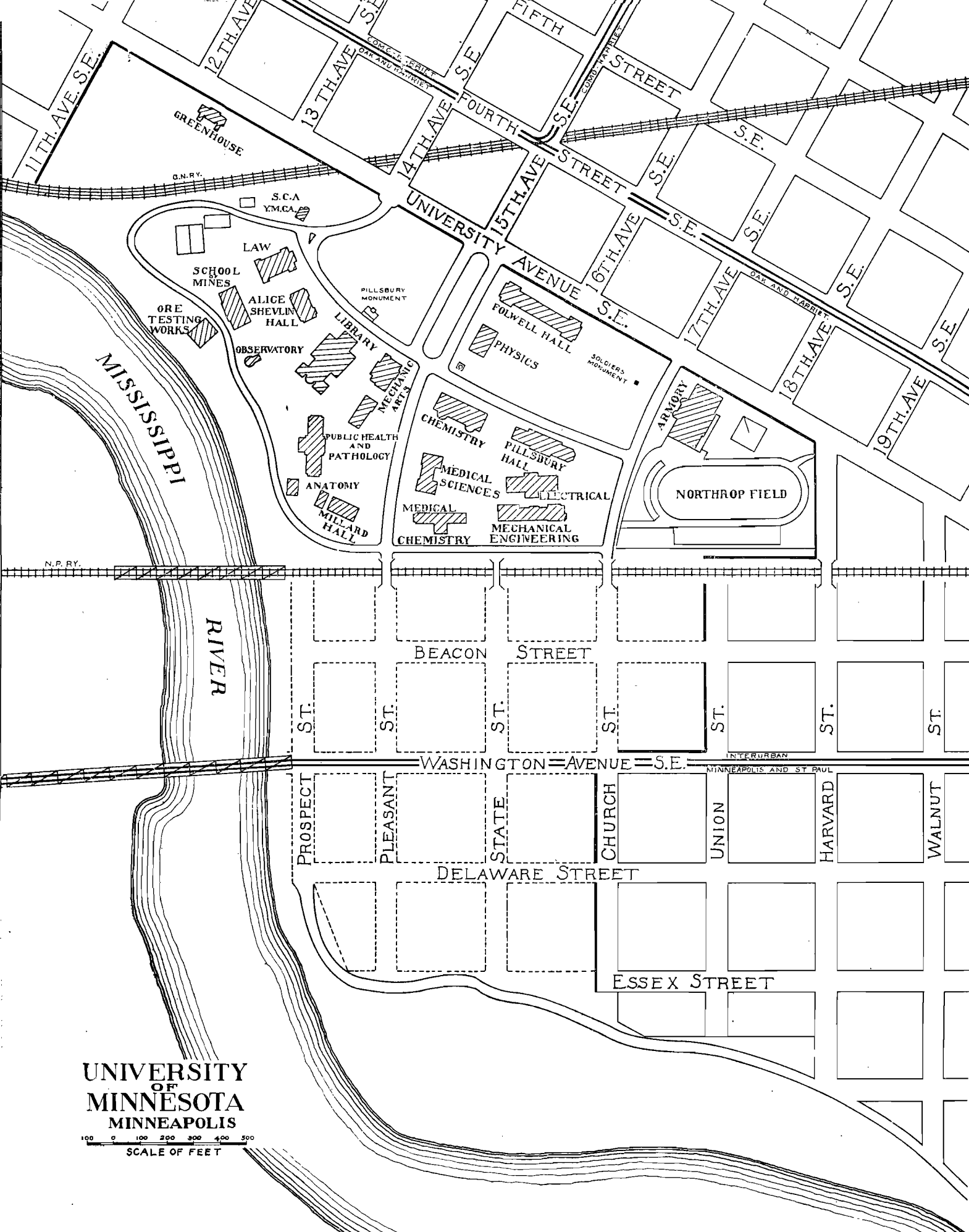
Entered at the Postoffice
in Minneapolis as second-class matter
MINNEAPOLIS, MINN.

The University catalogues are published by authority of the Board of Regents, is a regular series of bulletins. One bulletin for each college is published every year, and in addition a bulletin of general information outlining the entrance requirements of all colleges of the University, and embodying such items as University equipment, organizations and publications, expenses of students, loan and trust funds, scholarships, prizes, etc. Bulletins will be sent gratuitously, postage paid, to all persons who apply for them. In calling for bulletins, please state the college or school of the University concerning which information is desired. Address,

THE REGISTRAR,

The University of Minnesota,

Minneapolis, Minnesota.



**UNIVERSITY
OF
MINNESOTA
MINNEAPOLIS**

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SCALE OF FEET

THE UNIVERSITY OF MINNESOTA

CATALOGUE

FOR THE YEAR

1907-1908

AND

ANNOUNCEMENTS

FOR THE YEAR

1908-1909

Entered as Second-class Matter in the Postoffice at Minneapolis

PUBLISHED BY THE UNIVERSITY
MINNEAPOLIS
1908

THE EAGLE PRINTING COMPANY, PRINTERS
DELANO MINN.

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CALENDAR FOR 1908-1909

1908

1909

MAY

S.	M.	T.	W.	T.	F.	S.
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3	4	5	6	7	8	9
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31

JUNE

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University Calendar

1907-1908

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.

FEBRUARY	4 T	Second semester begins—classes called for regular work
	12 W	Lincoln's birthday—legal holiday
	22 S	Washington's birthday—legal holiday
APRIL	17 F	Good Friday. Recess two days
MAY	2 Th	Regular meeting Board of Regents
	25 M	Senior examinations begin
	30 S	Decoration Day—legal holiday
JUNE	1 M	Semester examinations begin
	6 S	Semester examinations close

COMMENCEMENT WEEK, 1908

SUNDAY	June 7	Baccalaureate service
MONDAY	June 8	Senior class exercises
TUESDAY	June 9	Phi Beta Kappa address. Senior promenade
WEDNESDAY	June 10	Alumni Day. Regular meeting Board of Regents
THURSDAY	June 11	Commencement Day. The thirty-sixth annual commencement
FRIDAY	June 12	Summer vacation begins

1908-1909

SEPTEMBER	7-14	Entrance examinations, condition examinations and registration
	15 T	Classes called for regular work. Seventeenth annual session
OCTOBER	1 Th	Regular meeting Board of Regents
	5 M	Regular meeting University Council. Opening day, School of Agriculture
NOVEMBER	26 Th	Thanksgiving Day. Recess three days
DECEMBER	7 M	Regular meeting University Council
	8 T	Annual meeting Board of Regents
	19 S	Holiday recess begins (no classes)
JANUARY	5 T	Work resumed in all departments
	23 S	Semester examinations begin
	30 S	Semester examinations close
FEBRUARY	2 T	Second semester begins—classes called for regular work
	12 F	Lincoln's birthday—legal holiday
	22 M	Washington's birthday—legal holiday
APRIL	5 M	Regular meeting University Council
	9 F	Good Friday. Recess two days

MAY	6 Th	Regular meeting Board of Regents
	24 M	Senior examinations begin
	31 M	Decoration Day—legal holiday
JUNE	1 T	Semester examinations begin
	5 S	Semester examinations close
	7 M	Regular meeting University Council

COMMENCEMENT WEEK, 1909

SUNDAY	June 6	Baccalaureate service
MONDAY	June 7	Senior class exercises
TUESDAY	June 8	Sigma Xi address. Senior promenade
WEDNESDAY	June 9	Alumni Day. Regular meeting Board of Regents
THURSDAY	June 10	Commencement Day. The thirty-seventh annual commencement
FRIDAY	June 11	Summer vacation begins

PROGRAM—ENTRANCE EXAMINATIONS

MONDAY,	September 7,	9 A. M.	3 Botany
			3 Zoology
			1* Astronomy
			3 Geology
	2 P. M.		2 American Government
			2 Political Economy
TUESDAY,	September 8,	9 A. M.	2 History
			5 Physics
	2 P. M.		4 Chemistry
			3 Physiography
WEDNESDAY,	September 9,	9 A. M.	1 English
			2 P. M. 1 German
			1 French
			1 Latin
			1 Scandinavian
THURSDAY,	September 10,	9 A. M.	1 Elementary Algebra
			2 Commercial Geography
	2 P. M.		1 Higher Algebra
FRIDAY,	September 11,	9 A. M.	1 Plane Geometry
			2 P. M. 1 Solid Geometry

1 Folwell Hall, 2 Library Building, 3 Pillsbury Hall, 4 Chemical Laboratory, 5 Physics Building, 6 Mechanic Arts Building.

PROGRAM OF CONDITION EXAMINATIONS

TUESDAY,	September 8,	9 A. M.	English, Rhetoric, Sociology
			2 P. M. Mathematics, Philosophy, Psychology
WEDNESDAY,	September 9,	9 A. M.	Animal Biology, Botany, Geology, Physics
			2 P. M. Astronomy, Chemistry, Economics, Drawing
THURSDAY,	September 10,	9 A. M.	French, German, Greek, Scandinavian
			2 P. M. History, Latin, Education, Politics

For notice of the class-rooms in which these examinations will be given, see bulletin in library building.

The school year for 1909-10 will begin Tuesday, Sept. 14.

PROGRAM--SUPPLEMENTARY EXAMINATIONS

College of Engineering and Mechanic Arts, School of Mines

TUESDAY,	Sept. 8,	9:00-12:00	Mathematics and Mechanics
		2:00-5:00	Mining Engineering Subjects
WEDNESDAY,	Sept. 9,	9:00-12:00	Chemistry
		2:00-5:00	Drawing and Descriptive Geometry
THURSDAY,	Sept. 10,	9:00-12:00	Mechanical Engineering subjects
		2:00-5:00	Metallurgical subjects
FRIDAY,	Sept. 11,	9:00-12:00	Physics
		2:00-5:00	Electrical Engineering subjects
			Geology and Mineralogy

SCHEDULE OF EXAMINATIONS FOR ADVANCED STANDING
AND TO REMOVE CONDITIONS

Medical Department

September 7-12, 1908.

Monday, Sept. 7, 9:00 a. m.	2:00 p. m.
I. Year.	I. Year Histology and Embryology, practical.
II. Year Histology and Embryology, practical.	II. Year General Pathology and Bacteriology, practical.
III. Year Special Pathology and Bacteriology, practical.	III. Year Practical Pharmacy.
IV. Year by arrangement.	IV. Year by arrangement.
Tuesday, Sept. 8, 9:00 a. m.	2:00 p. m.
I. Year Physiology.	I. Year Histology and Embryology, written.
II. Year Chemistry.	II. Year Histology and Embryology, written.
III. Year Principles of Surgery.	III. Year Surgery.
Wednesday, Sept. 9, 9:00 a. m.	2:00 p. m.
I. Year Chemistry.	I. Year.
II. Year Physiology.	II. Year General Pathology and Bacteriology, written.
III. Year Practice of Medicine.	III. Year Special Pathology and Bacteriology, written.
Thursday, Sept. 10, 9:00 a. m.	2:00 p. m.
I. Year Anatomy.	I. Year.
II. Year Anatomy.	II. Year Materia Medica and Pharmacology.
III. Year Surgical Anatomy.	III. Year Therapeutics.

Examination for advanced standing and to remove conditions in the following third- and all fourth-year subjects will be held by *appointment* during September 7-12: Diseases of Children Physical Diagnosis, all elective subjects, and all subjects not listed above. In all subjects not specifically scheduled, condition examinations must be arranged for not later than Sept. 7.

Students must register for examinations in dean's office at least twenty-four hour prior to any examination they may wish to take. See also under Rules, page 41, for regulations concerning unremoved conditions, etc.

Conditioned students will not be admitted to any examination without presenting receipt from the cashier for the examination fee, to the dean and obtaining entrance ticket.

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 Agriculture

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

THE COLLEGE OF HOMEOPATHIC MEDICINE AND SURGERY

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.

In the COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS, there is a four-year course of study leading to the degree, Bachelor of Arts. The work of the first year 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 elastic, scientific or literary, to suit his individual purpose.

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 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.

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 so familiarize them with the fundamental principles of positive law 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 basal

qualifications of the safe counsellor. To secure for the student these habits of thought and expression should be the aim of both the student himself and his instructor.

The art of practice is taught so far as that is possible in a law school. A system of courts embracing the court of a justice of the peace and the district and supreme courts of the state is organized and maintained. Students begin their practice work in the lowest court, and continue it, under the guidance of an able practitioner, throughout the system. The rules of practice adopted by the District and Supreme Courts of Minnesota are printed and a copy is placed in the hands of each student; the codes of practice in the state are studied with special care, and instruction, covering the work of brief-making, is given the students by a successful member of the bar in daily practice. Jury trials are conducted throughout the senior year, and the usual appeals, motions for new trial, and re-argument and all the other points of practice in the courts of the state are considered as each student proceeds from the justice court up through the district and supreme courts of the system.

The degree Bachelor of Laws is granted upon the completion of the three-year day course, or the four-year evening course, entitling the graduate to admission to the bar without examination.

Two graduate courses are offered, the first leading to the degree Master of Laws, the second to the degree Doctor of Civil Law.

THE COLLEGE OF MEDICINE AND SURGERY, and THE COLLEGE OF HOMEOPATHIC MEDICINE AND SURGERY offer four-year courses of study, of nine months each, requiring two years of collegiate work for admission. Upon completion of either of the prescribed courses the degree, Doctor of Medicine, is conferred.

In the Colleges of Science, Literature, and the Arts, of Medicine and Surgery, and of Homeopathic Medicine and Surgery, there has been established a combined course of six years, leading to the degrees, Bachelor of Science, and Doctor of Medicine.

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 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 in the Northwest. 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 be inaugurated in 1909 or 1910. The Board of Regents have also authorized the introduction of a course somewhat lower than the regular course now given, to comply however with the requirements of the American Conference of Pharmaceutical Faculties. This course probably will not begin until 1909 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 metallurgy. The technical courses consist of lecture work in mining, metallurgy and allied subjects supplemented by laboratory work in assaying, chemistry, ore dressing and metallurgy; field work in plan and underground surveying; actual practical mining and metallurgical work in Minnesota and western mining centers. A system of apprenticeship during summer vacations 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 each 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, leading to the degrees, Bachelor of Science in Chemistry, and Bachelor of Science in Chemical Engineering, offers two courses of study of four years each in analytical and applied chemistry.

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 teach-

ers 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 each 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, 1858, 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 Schools 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.

The Board of Regents

CYRUS NORTHROP, LL. D., MINNEAPOLIS	<i>Ex-Officio</i>
The President of the University	
The HON. JOHN LIND, MINNEAPOLIS	1914
The President of the Board	
The HON. JOHN A. JOHNSON, ST. PETER	<i>Ex-Officio</i>
The Governor of the State	
The HON. JOHN W. OLSEN, ALBERT LEA	<i>Ex-Officio</i>
The State Superintendent of Public Instruction	
The HON. THOMAS WILSON, ST. PAUL	1909
The HON. A. E. RICE, WILLMAR	1909
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*

EUGENE W. RANDALL, *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, Ph. D., *Dean of the School of Chemistry*

GEORGE F. JAMES, Ph. D., *Dean of the School of Education*

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

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 to 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 NORTHPROP

The College of Science, Literature and the Arts

DEAN JOHN F. DOWNEY

PROFESSOR JOHN H. GRAY

PROFESSOR J. C. HUTCHINSON

PROFESSOR H. F. NACHTRIEB

PROFESSOR NORMAN WILDE

The College of Engineering and the Mechanic Arts

DEAN FREDERICK S. JONES

PROFESSOR GEORGE D. SHEPARDSON

The College and School of Agriculture

DEAN EUGENE W. RANDALL

PROFESSOR HARRY SNYDER

PROFESSOR SAMUEL B. GREEN

The College of Law

DEAN WILLIAM S. PATTEE

PROFESSOR HENRY J. FLETCHER

The College of Medicine and Surgery

DEAN F. F. WESBROOK

PROFESSOR THOMAS G. LEE

The College of Homeopathic Medicine and Surgery

DEAN EUGENE L. MANN

The College of Dentistry

DEAN ALFRED OWRE

The College of Pharmacy

DEAN FREDERICK JOHN WULLING

The School of Mines

DEAN WILLIAM R. APPLEBY

The School of Chemistry

DEAN GEORGE B. FRANKFORTER

The College of Education

DEAN GEORGE F. JAMES

The Graduate School

DEAN HENRY T. EDDY

General Alumni Association

DAVID P. JONES

The Dean of Women

ADA L. COMSTOCK

University Council Committees

The University Auditing Committee

PROFESSORS ANDERSON, FLETCHER, OWRE, SIGERFOOS, SPRINGER

The Committee on Athletics

PROFESSORS PAIGE, BROOKE, HARDING, D. P. JONES, LITZENBERG

The Committee on Grounds and Sanitation

PROFESSORS FLATHER, BASS, BRACKEN, HICKMAN, RANDALL, SIDENER,
WESBROOK

The Committee on Catalogue, Programs and Course of Study

DEANS APPELBY, EDDY, FRANKFORTER, JAMES, JONES, MANN, OWRE,
WULLING; PROFESSORS FLETCHER, JOHNSTON, SCHLENKER, SNYDER,
E. B. PIERCE

The Press Committee

PROFESSORS SCHAPER, BAUER, CONSTANT, ERDMANN, JAMES

The Committee on Commencement and other University Functions

PROFESSORS NACHTRIEB, JENKS, OWRE, PATTEE, RANDALL, SCHLENKER,
WASHBURN

The Committee on Student Entertainments and Social Affairs

PROFESSORS FRANKFORTER, BASS, COMSTOCK, COOKE, MULLEN, PIKE

The Committee on University Relations to other Institutions of Higher Learning

PROFESSORS DOWNEY, BOTHNE, EDDY, GRAY, GREEN, JAMES, LEE

The Committee on University Extension and University Lectures

PROFESSORS WEST, HAECKER, RANKIN, SCHLENKER, SHEPARDSON

The Committee on the Library

PROFESSORS EDDY, FLETCHER, F. S. JONES, LEE, REYNOLLS,
VAN BARNEVELD, WEST

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* Died Feb. 27, 1908.	
** Died May 29, 1908.	
† Resigned June, 1908.	

INSTRUCTORS

FRED L. ADAIR, B.S., M.D.	Andrus Building
Clinical Instructor in Obstetrics.	
CEPHAS D. ALLIN, M.A., LL.B.	1005 University Ave. S. E.
Instructor in Political Science.	
E. VILLIERS APPELEY, M.D.	Lowry Arcade, St. Paul
Clinical Instructor in Ophthalmology.	
GUSTAVE BACHMAN, Phm.D.	Minneapolis
Instructor in Pharmacy, and Laboratory Assistant.	
WALTER BADGER, B.A., B.S.	3311 Portland Ave.
Instructor in Chemistry.	
CHARLES R. BALL, M.D.,	Minneapolis
Clinical Instructor in Nervous and Mental Diseases.	
GEORGE C. BARTON, M.D.	Andrus Building
Clinical Instructor in Gynecology.	
L. B. BASSETT	St. Anthony Park
Instructor in Agriculture.	
W. L. BEEBE, D.V.M.	St. Anthony Park
Instructor in Bacteriology.	
ARTHUR E. BENJAMIN, M.D.	Pillsbury Building
Clinical Instructor in Diseases of Women.	
EMMA BERTIN	1223 Fourth St. S. E.
Instructor in French.	
MARGARET BLAIR	St. Anthony Park
Instructor in Sewing and Household Art.	
FANNIE C. BOUTELLE	St. Anthony Park
Preceptress, English, Social Culture, School of Agriculture.	
CHARLES H. BRADLEY, M.D.	Donaldson Building
Clinical Instructor in Medicine.	
JOHN B. BRIMHALL, M.D.	Moore Building, St. Paul
Clinical Instructor in Orthopedic Surgery.	

A. M. BULL	St. Anthony Park
Instructor in Drawing.	
MARY BULL	St. Anthony Park
Instructor in Domestic Science.	
ANNA M. BUTNER	1915 Portland Ave.
Instructor in Physical Culture.	
FREDERICK K. BUTTERS, M. S.	Minneapolis
Instructor in Botany and Practical Pharmacognosy.	
LEROY CADY, B.Agr.	St. Anthony Park
Instructor in Horticulture.	
R. A. CAMPBELL, M.D.	Century Building, St. Paul
Clinical Instructor in Rhinology and Laryngology.	
HENRIETTA CLOPATH	701 Delaware St.
Instructor in Drawing.	
LILLIAN COHEN, M.A.	415 Fourteenth St. E.
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A. R. COLVIN, M.D.	Lowry Arcade, St. Paul
Clinical Instructor in Surgery.	
WILLIAM H. CONDT, B.S., M.D.	Andrus Building
Instructor in Therapeutics.	
GEORGE M. COON, M.D.	Lowry Arcade, St. Paul
Clinical Instructor in Genito-Urinary Diseases.	
JOHN M. COULTER, M.A.	Minneapolis
Instructor in Economics.	
NORMAN J. COX, B.S., D.M.D.	Masonic Temple
Instructor in Operative Dentistry.	
JOSEPHINE CRAIG	St. Anthony Park
Instructor in Agricultural Chemistry.	
J. GROSVENOR CROSS, B.S., M.D.	Pillsbury Building
Clinical Instructor in Medicine.	
ALVIN S. CUTLER, C.E.	Minneapolis
Instructor in Railway Engineering.	
J. M. DAMON, D.D.S.	Minneapolis
Instructor in Prosthetic Dentistry and Dental Anatomy.	
WARREN A. DENNIS, B.S., M.D.	Lowry Arcade, St. Paul
Clinical Instructor in Surgery.	
CHARLES F. DIGHT, M.D.	Minneapolis
Instructor in Pharmacology.	
J. M. DREW	St. Anthony Park
Instructor in Blacksmithing and Poultry, Registrar of the School of Agriculture.	
A. W. DUNNING, M.D.	Endicott Arcade, St. Paul
Clinical Instructor in Nervous and Mental Diseases.	
R. E. FARR, M.D.	Syndicate Block
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OSCAR W. FIRKINS, M.A.	1528 Fourth St. S. E.
Instructor in English.	
FRANCIS C. FRARY, M.S.	Minneapolis
Instructor in Chemistry.	
W. H. FRAZIER, B.S.	St. Anthony Park
Instructor in Agricultural Chemistry and Soils.	
JAMES GILFILLAN, M.D.	Minneapolis
Clinical Instructor in Medicine.	
HALDOR E. GISLASON, B.A., LL.B.	Minneapolis
Instructor in Rhetoric.	
H. S. GODFREY, D.M.D.	Syndicate Block
Instructor in Operative Dentistry.	
JUDD GOODRICH, M.D.	Lowry Arcade
Clinical Instructor in Surgery.	
ROBERT L. GREEN, D.D.S.	Minneapolis
Instructor in Operative Dentistry.	
FRANK F. GROUT, B.S.	Minneapolis
Instructor in Mineralogy.	
GEORGE D. HAGGARD, M.D.	Pillsbury Building
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.	124 State St. S. E.
Instructor in Chemistry.	
EARLE R. HARE, B.S., M.D.	327 Fourteenth Ave. S. E.
Instructor in Anatomy.	

MARY V. HARTZELL, D.M.D.	Instructor in Comparative Dental Anatomy.	Andrus Building
ROWLAND HAYNES, M.A.	Instructor in Psychology.	606 7th St. S. E.
U. E. HEDDY, D.D.S.	Instructor in Operative Technics.	710 21st Ave. S.
T. L. HINCKLEY, B.S.	Instructor in Civil Engineering.	Minneapolis
P. A. HOFF, M.D.	Clinical Instructor in Medicine.	Lowry Arcade, St. Paul
CHARLES M. HOLT, B.A.,	Instructor in Education.	Waverly Hotel
OLAF HOVDA, B.S.	Instructor in Engineering Mathematics.	Minneapolis
ANNAH H. HURD, Phm.D., M.D.	Lecturer on Diseases of the Blood and Ductless Glands.	Pillsbury Building
C. E. INGBERT, M.D.	Associate in Neurology.	Minneapolis
H. W. JONES, M.D.	Clinical Instructor in Nervous and Mental Diseases.	2418 W. Twenty-Second St.
LEULAH H. JUDSON, B.A.	Instructor in History.	901 Sixth St. S. E.
HENRY J. KESNER	Instructor in Structural Engineering.	1625 University Ave. S. E.
A. R. KOHLER, B.S.A.	Instructure in Horticulture.	St. Anthony Park
ALOIS F. KOVARIK, M.A.	Instructor in Physics.	1523 Seventh St. S. E.
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W. F. LASBY, B.S., D.D.S.	Instructor in Technics.	Minneapolis
ARTHUR A. LAW, M.D.	Instructor in Operative Surgery.	Pillsbury Building
J. F. LEMSTROM, M.D.	Instructor in Histology and Embryology.	Minneapolis
CHARLES N. MCCLOUD, Phm.D., M.D.	Lecturer on First Aids to the Injured.	965 Selby Ave., St. Paul
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LINDA H. MALEY, B.L.	Instructor in Rhetoric.	613 Washington Ave. S. E.
JAMES E. MANCHESTER, Sc.D.	Instructor in Mathematics.	405 Oak St. S. E.
JOHN V. MARTENIS, M.E.	Instructor in Machine Design.	Minneapolis
HERMAN A. MAVES, D.D.S.	Instructor in Operative Dentistry.	Minneapolis
CARL M. MELOM, M.A.	Instructor in French and Spanish.	506 Fifteenth Ave. S. E.
HUGH V. MERCER, LL.D.	Lecturer on Jurisprudence.	327 Sixth Ave. S. E.
CHARLES W. NICHOLS, M.A.	Instructor in Rhetoric.	Minneapolis
WALLACE NOTTESTEIN, Ph.D.	Instructor in History.	Minneapolis
OSCAR OWRE, M.D.	Instructor in Oral Surgery.	Minneapolis
E. C. PARKER, B.Agr.	Instructor in Agriculture.	St. Anthony Park
PETER PETERSON	Instructor in Foundry Practice.	710 Nineteenth Ave. S.
RAYMOND V. PHELAN, Ph.B.	Instructor in Economics.	219 Church St. S. E.
JAY N. PIKE, D.D.S.	Instructor in Prosthetic Dentistry and Dental Anatomy.	Masonic Temple
EDWARD QUIGLEY	Instructor in Forge Work.	Minneapolis

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- JEAN RANKIN 916 5th St. S. E.
Instructor in Education.
- SOREN P. REES, B.S., M.D. Andrus Building
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- H. M. REID, D.D.S. 2014 Queen Ave. S.
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- WILLIAM H. RICHARDS Minneapolis
Instructor in Carpentry and Pattern Work.
- HARRY P. RITCHIE, Ph.B., M.D. Lowry Arcade, St. Paul
Clinical Instructor in Diseases of Women.
- H. B. ROE St. Anthony Park
Instructor in Mathematics.
- BERT A. ROSE 41 S. Sixth St.
Instructor of Cadet Band.
- NORMAN W. ROSE, M.E. 209 State St. S. E.
Instructor in Drawing.
- FRANK B. ROWLEY, B.S., M.E. Minneapolis
Instructor in Drawing.
- A. G. RUGGLES, M.A. St. Anthony Park
Instructor in Entomology.
- WILLIAM RYAN, E.E. Minneapolis
Instructor in Electrical Engineering.
- J. FRANCIS SCHEFCIK, B.S., Ph.G., M.D., C.M. Masonic Temple
Instructor in Materia Medica
- THEOPHILUS SCHROEDER Minneapolis
Instructor in German.
- C. SCHROEDER, St. Anthony Park
Instructor in Animal Husbandry.
- JULIUS PARKER SEDGWICK, B.S., M.D. Andrus Building
Instructor in Physiological Chemistry.
- W. D. SHELDON, M.D. Andrus Building
Clinical Instructor in Medicine, and Instructor in Therapeutics.
- JUNIATA SHEPPERD, M.A. St. Anthony Park
Instructor in Cooking, Laundering and Home Economics.
- S. CARL SHIPLEY, B.S. Minneapolis
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- CHARLES F. SHOOP, B.S. 209 State St. S. E.
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- HENRY UBRICH Minneapolis
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- HENRY L. ULRICH, M.D. 519 First Ave. S.
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- J. A. VYE St. Anthony Park
Instructor in Farm Accounts and Secretary of the Experiment Station.
- J. A. WATSON, M.D. Andrus Building
Clinical Instructor in Diseases of Nose and Throat.
- AMOS S. WELLS, B.A., D.D.S. Andrus Block
Instructor in Prosthetic Dentistry and Dental Anatomy.
- ANDREW J. WEISS 3705 Stevens Ave.
Instructor in Technics.
- H. B. WHITE, B.S.A. St. Anthony Park
Instructor in Farm Structures and Farm Mechanics.
- NELLIE A. WHITNEY, B.A. Minneapolis
Instructor in Rhetoric.
- GRACE B. WHITRIDGE St. Anthony Park
Instructor in Physical Culture.
- VAN H. WILCOX, M.D. 812 Pillsbury Building
Instructor in Operative Surgery.

- A. D. WILHOIT, M.A.
Instructor in Agriculture. Minneapolis
- CHARLES WILLIAMS, M.A.
Instructor in German. 312 Union St. S. E.
- ARCHIE D. WILSON, B. Agr.
Instructor in Agriculture. St. Anthony Park
- FRANK R. WRIGHT, D.D.S., M.D.
Clinical Instructor in Dermatology and Genito-Urinary Diseases. 713 Pillsbury Building
- FRED S. YEAGER, D.D.S.
Instructor in Crown and Bridge Work . Minneapolis
- * Died May 18, 1908.

III
EQUIPMENT

Equipment

GROUNDS AND BUILDINGS

The twenty-three buildings of the University 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 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, 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 students' 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 students' 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 provisions 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, 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. Pillsbury, 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:

(a) *In Geology and Mineralogy.* 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 to be recognized as the A. S. Williams collection of Photographs and Photographic Negatives.

(b) *In Zoology.* All the material collected by the State Zoologist; 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, 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. Other groups of animals are more or less numerously represented, and are receiving annual additions from the Zoological Survey.

(c) *In Botany.* 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.

(d) *In 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, dye-woods and other materials used in dyeing; specimens illustrating the bleaching and printing of cotton, linen and woolen goods, earthenware, pottery, etc.

(e) *In Classics.* Some material illustrating classical geography, topography, chronology, mythology, archaeology, and art has been collected, consisting mainly of plans and charts, casts, pictorial illustrations, fac-similes of manuscripts and inscriptions.

(f) *In English.* A few fac-similes of manuscripts, plates that may serve the purpose of archaeological instruction, publication of texts, reprints of blackletter books and of original editions, photographs and portraits have been gathered.

(g) *In 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.

(h) *In Mechanical Engineering.* The collection consists of models of mechanical motions especially relating to the work in kinematics; sectioned apparatus, such as injectors, water meters and steam separators; various collections of drop forging 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, and other material especially useful for illustrative purposes.

(i) *In 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, 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.

(j) *In 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.

(k) *In Mathematics.* 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, 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 and 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.

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 object 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 services are free to students in all departments of the institution, as well as a committee to help students to 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 University. 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 young women of the University. Its object is "to deepen spiritual thought in the University woman, 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 devotional 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 room before registering. Women from the upper classes will be there during the opening days to give advice and assistance.

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 any one 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 on or 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 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 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.

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

PHILONETHIAN 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.

WOMEN STUDENTS

After June first, 1908, 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 woman 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 WOMAN'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 attempt to secure dormitories.

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.

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.

FARM STUDENTS' REVIEW.—This 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.

Scholarships 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

1908-9 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 wish of the late Dr. A. F. Elliot to aid young men who find their efforts to obtain a practical education embarrassed through lack of means, the sum of \$5,000 was placed in the hands of the Board of Regents as a scholarship fund. The income from this fund is loaned students in the School of Mines on the following conditions:

The financial needs of the applicant, his scholarship, moral character, enthusiasm shown in his work and promise of usefulness in his profession. When money is available it may be loaned to pay 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 in the University. For the year 1908-9 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.

Armour Scholarships

Through the exhibit's of live stock at the International Exposition in 1907, the College of Agriculture has been awarded two of the J. Ogden Armour scholarships. Each scholarship amounts to \$250.00 and is to be awarded to a worthy student in the Agricultural College. These scholarships will be available during the next college year.

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 consisting of the secretary, the principal, the preceptress, and the president of 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.

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 graduating class. The award is made by a professor in 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 a 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 and seventy-five dollars. A prize of one hundred dollars will be given to the orator winning 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, Rr. 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.

Admission

Admission to the colleges or schools of the University, is either by certificate or by examination. For exception see pages 40-41, Bulletin of the College of Science, Literature, and the Arts. The candidate must offer fifteen year credits of high school work so chosen as to include those required for 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.

LIST A

REQUIRED BY ALL COLLEGES

English	four years
Elementary Algebra	one year
Plane Geometry	one year

Certain of the nine additional credits required for admission are prescribed by individual colleges, as indicated in the following list, and in no case is substitution allowed.

REQUIRED BY INDIVIDUAL COLLEGES

College of Science, Literature, and the Arts

List A	6 credits
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See also page 31, Bulletin of the College of Science, Literature, and the Arts.

College of Engineering and the Mechanic Arts

List A	6 credits
Chemistry	1 credit
Higher Algebra	$\frac{1}{2}$ credit
Solid Geometry	$\frac{1}{2}$ credit
Language	2 credits

10 credits

College of Agriculture

For high school graduates, see requirements for admission to the College of Science, Literature and the Arts.

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

College of Medicine and Surgery

List A 6 credits

Latin 2 credits

Higher Algebra $\frac{1}{2}$ credit

Solid Geometry $\frac{1}{2}$ credit

Two years of college work, to include the satisfactory completion of one year of at least three credit* hours per week, including laboratory, in each of the following named subjects:

- 1) Physics.
- 2) General Inorganic Chemistry.
- 3) Qualitative Analysis.
- 4) Biology, *i. e.* Zoology or Botany.
- 5) Language, *i. e.* German or French.

College of Homeopathic Medicine and Surgery.

See Table for Medicine and Surgery.

College of Dentistry

List A 6 credits

Latin 1 credit

Manual Training 1 credit

8 credits

College of Pharmacy

English 2 credits

Elementary Algebra 1 credit

Plane Geometry 1 credit

Physics 1 credit

Latin 2 credits

7 credits

*NOTE.—A credit hour is taken to be two or more hours of consecutive laboratory work.

School of Mines

List A	6 credits
Higher Algebra	$\frac{1}{2}$ credit
Solid Geometry	$\frac{1}{2}$ credit

7 credits

School of Analytical and Applied Chemistry

List A	6 credits
Higher Algebra	$\frac{1}{2}$ credit
Solid Geometry	$\frac{1}{2}$ credit

7 credits

College of Education

Two years of collegiate work in any college or university of recognized standing.

Graduate School

See bulletin of that school.

THE REMAINDER OF THE FIFTEEN CREDITS MUST BE MADE UP FROM THE SUBJECTS IN LIST B.

LIST B

Mathematics

Higher algebra, one half year

Solid geometry, one half year

Latin

Grammar, one year

Caesar, four books, one year

Cicero, six orations, one year

Virgil, six books, one year

Greek

Grammar, one year

Anabasis, four books, one year

German

Grammar, one year

Literature, one year

French

Grammar, one year

Literature, one year

Spanish

Grammar, one year

Literature, one year

Swedish, Danish-Norwegian, Icelandic

Grammar, one year

Literature, one year

History

- Ancient to Charlemagne, one year
- Modern, from Charlemagne, one year
- England, one half year
- Senior American, one half year

American Government, one half year*Business Subjects*

- History of commerce, one half year
- Commercial geography, one half year or one year
- Elementary economics, one half year
- Business law, one half year
- Business arithmetic, one half year
- Elementary bookkeeping, one half year
- Advanced bookkeeping and business practice, one year
- Stenography and typewriting, two years
- Business spelling and correspondence, one half year

Physics, one year*Chemistry*, one year*Botany*, one half or one year*Zoology*, one half or one year*Astronomy*, one half year*Geology*, one half year*Physiography*, one half year*Manual Subjects*

- Freehand drawing, two credits¹
- Mechanical drawing, two credits¹
- Shop work, two credits¹
- Modeling and wood carving, one credit¹
- Domestic art and science, two credits¹

ADMISSION BY CERTIFICATE

Graduates of the following courses, provided they present the credits required in List A, are admitted to the freshman class without conditions. For applicants under (a) or (b), all records shall be entered on the principal's 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

¹For explanation of the term *credit*, as here used, see the syllabi for manual subjects given on page 54.

they have not, on the average, more than one semester mark below "passed with credit" for each year subject to the rule. Entrance examination in English is required for admission to the College of Science, Literature and the Arts, and in mathematics for admission to the College of Engineering and the Mechanic Arts, and the School of Mines.

For more detailed information see the bulletins of the separate colleges.

- (a) Any four year course of a Minnesota state high school
- (b) A four year course of other accredited schools in the state
- (c) A four year course of schools in any other state accredited to the state university of that state
- (d) 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 of admission for school year 1908-1909 may be secured from the registrar, and should be filled out and returned to him for approval before Aug. 25th, 1908. 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 these entrance conditions must be removed before the beginning of the sophomore year.

ADMISSION BY EXAMINATION

Whenever admission is by examination, the candidate must pass examinations in the credits from list A, required for entrance to the college in question, and in addition sufficient credits from the list of electives in list B, to make a total of fifteen year credits; provided that, if the total of entrance conditions 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.

PROGRAM OF ENTRANCE EXAMINATIONS

See Page 3.

LIST OF ACCREDITED SCHOOLS

The following High Schools are accredited :

Ada	Eveleth	Long Prairie	Royalton
Adrian	Excelsior	Luverne	Rush City
Aitkin	Fairfax	Lyle	Rushford
Albert Lea	Fairmont	McIntosh	St. Charles
Alden	Faribault	Mabel	St. Cloud
Alexandria	Farmington	Madelia	St. Louis Park
Amboy	Fergus Falls	Madison	St. James
Annandale	Fertile	Mankato	St. Paul—
Anoka	Fosston	Mantorville	Central
Appleton	Frazee	Mapleton	Cleveland
Argyle	Fulda	Marshall	Humboldt
Arlington	Gaylord	Mazeppa	Mechanic Arts
Atwater	Glencoe	Milaca	St. Peter
Austin	Glenwood	Minneapolis—	Sandstone
Barnesville	Graceville	Central	Sauk Centre
Belle Plaine	Grand Meadow	East	Shakopee
Bemidji	Grand Rapids	North	Sherburn
Benson	Granite Falls	South	Slayton
Bird Island	Hallock	West	Sleepy Eye
Blooming Prairie	Halstad	Minneota	South St. Paul
Blue Earth	Harmony	Montevideo	Springfield
Brainerd	Hastings	Montgomery	Spring Grove
Breckenridge	Hawley	Monticello	Spring Valley
Browns Valley	Hector	Moorhead	Staples
Buffalo	Henderson	Mora	Stephen
Caledonia	Herman	Morris	Stewartville
Cambridge	Heron Lake	Morton	Stillwater
Canby	Hibbing	Mountain Lake	Thief River Falls
Cannon Falls	Hinckley	New Prague	Tracy
Cass Lake	Hopkins	New Richland	Two Harbors
Chaska	Houston	New Ulm	Virginia
Chatfield	Howard Lake	Northfield	Wabasha
Chisholm	Hutchinson	North St. Paul	Wadena
Clarkfield	Jackson	Olivia	Warren
Cloquet	Janesville	Ortonville	Waseca
Cokato	Jordan	Osakis	Waterville
Cottonwood	Kasota	Owatonna	Welcome
Crookston	Kasson	Park Rapids	Wells
Dawson	Kenyon	Paynesville	West Concord
Delano	Kerkhoven	Pelican Rapids	Wheaton
Detroit	Lake Benton	Perham	White Bear
Dodge Center	Lake City	Pine City	Willmar
Duluth	Lake Crystal	Pine Island	Willow River
Central	Lakefield	Pipestone	Windom
Irving	Lake Park	Plainview	Winnebago
Eagle Bend	Lamberton	Preston	Winona
E. Grand Forks	Lanesboro	Princeton	Winthrop
Elbow Lake	Le Roy	Red Lake Falls	Worthington
Elgin	Le Sueur	Red Wing	Zumbrota
Elk River	Le Sueur Center	Redwood Falls	
Elmore	Litchfield	Renville	
Ely	Little Falls	Rochester	

The following private schools are also accredited to the University:

St. Mary's Hall, Faribault	St. Paul's College, St. Paul Park
St. Paul Academy	The Loomis School, St. Paul
Shattuck Military Academy,	The Backus School for Girls, St. Paul
Faribault	The College of St. Catherine, St. Paul
Stanley Hall, Minneapolis	St. Margaret's Academy, Minneapolis
Windom Institute, Montevideo	The Winona Seminary, Winona
Concordia College, Moorhead	St. John's College, Collegeville
Pillsbury Academy, Owatonna	Minnesota College, Minneapolis.
St. Joseph's Academy, St. Paul	

ADMISSION TO ADVANCED STANDING

I. 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. 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 p. 40, 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*, books one and two; Burke's *Conciliation with America*; 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 Cati- line*, *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 typically 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.
- 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 Eu-

phrates, 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 afterwards 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.

BUSINESS SUBJECTS: 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 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.

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.

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 manfolding 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 most prominent industries of the locality.

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, including 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.

MANUAL SUBJECTS: 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, 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 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)

GRADUATION AND DEGREES

GRADUATION

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 preceding 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.

DEGREES

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.

Expenses

FEES

COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

	Per semester Resident
Incidental fee*	\$10.00
Animal Biology, 1 to 6, each	3.00
Animal Biology, 7	1.00
Botany, 1, 2, 3, 5, 6, each	3.00
Chemistry 1 (a), 1 (b), 2, 3, each	5.00
Chemistry 4, 5, each	7.00
Chemistry, 6	10.00
Geology, 9 and 10, each	1.00
Mineralogy, 1, 2, 3, and 4, each	3.00
Music, 1, 2, 3, 6 7, each	4.00
Music, 4	\$25.50 to \$85.00
Music, 5	2.00
Physics 2, 4, 5, 6, 8, 10, 13, 15, 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.	
*Incidental fee, non-resident, \$20.00.	

COLLEGE OF ENGINEERING

Incidental fee*	\$15.00
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FRESHMAN YEAR

<i>First Semester</i>	
Shop work	\$ 4.50
<i>Second Semester</i>	
Shop work	\$ 4.50

FOR CLASSES GRADUATING IN 1909-1910-1911

SOPHOMORE YEAR

<i>First Semester</i>	
Shop work	\$ 7.00
Physics	3.00
Chemistry	3.00

Second Semester

Shop work	7.00
Physics	3.00

JUNIOR YEAR

First Semester

Shop work	\$ 4.50
Materials Testing Laboratory	6.00
Electrical Laboratory	1.50
Physics	3.00

Second Semester

Shop work	\$ 4.50
Steam Laboratory	3.00
Hydraulic Laboratory	3.00
Fuel and Gas analysis	5.00
Electrical Laboratory	6.00

SENIOR YEAR

First Semester

Electrical Laboratory	\$3.00
Electric Power	3.00
Experimental Laboratory	6.00

Second Semester

Electrical Laboratory	\$ 4.50
Electric Power	3.00
Gas Engine Laboratory	4.50
Deposit fee—military department, freshman and sophomore years ..	\$ 5.00
Drill suit	15.00

*Incidental fee, non-resident, \$30.00.

COLLEGE OF AGRICULTURE

See statement for College of Science, Literature and the Arts

COLLEGE OF LAW

Matriculation fee	\$10.00
Incidental fee (three terms) per term	20.00

COLLEGE OF MEDICINE AND SURGERY

	Per semester
Incidental fee	\$50.00
Microscope fee, 1st year	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

Caution fee (see p. 39, Bulletin of College of Medicine and Surgery)	Per year	\$5.00
Hospital fee (Jr. and Sr. year)		3.00

COLLEGE OF HOMEOPATHIC MEDICINE AND SURGERY
See College of Medicine and Surgery

COLLEGE OF DENTISTRY

Incidental fee	Per semester	\$75.00
Breakage deposit (see p. 19, Bulletin of College of Dentistry)	Per year	5.00

COLLEGE OF PHARMACY

	Per year	
TWO YEAR COURSE		
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

Incidental fee*	Resident	\$30.00
Chemical laboratory fee		10.00
Mineralogical laboratory fee		6.00
Assaying laboratory fee		15.00
Books		13.00
Draughting instruments		15.00
Note book and supplies		6.00
		\$95.00

SOPHOMORE YEAR

Incidental fee*		\$30.00
Chemical laboratory fee		14.00
Books		8.00
Note books and supplies		2.00
		\$54.00

JUNIOR YEAR

Incidental fee*	\$30.00
Steam laboratory	2.00
Trip to the mines	\$100.00 to 175.00
Books	20.00
Note books and supplies	2.00
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	\$152 to \$227.00

SENIOR YEAR

Incidental fee*	\$30.00
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
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	\$93.00
Deposit fee	3.00

*Incidental fee, non-resident, \$60.00.

THE SCHOOL OF CHEMISTRY

Incidental fee*	\$15.00
Shop	7.00
Assaying	15.00
Courses 1, 2, 3, 10, 14, 18, 19, 23	5.00
Courses 4, 5	7.00
Course 6	10.00
Courses 9, 11, 12, 13, 15, 16, 17, 20, 24	3.00

Incidental fee, non-resident, \$30.00.

THE COLLEGE OF EDUCATION

See statement under College of Science, Literature, and the Arts.

THE GRADUATE SCHOOL

Incidental fee	\$10.00
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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.

EXPENSES

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 two dollars and a quarter 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 Univer-

sity, 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

THE COLLEGE of SCIENCE,
LITERATURE and THE ARTS

FACULTY

- CYRUS NORTHROP, LL. D., *President*
JOHN F. DOWNEY, M. A., C. E., *Dean, Professor of Mathematics*
WILLIAM W. FOLWELL, LL. D., *Emeritus Professor of Political Science*
JABEZ BROOKS, D. D., *Professor of Greek*
JOHN G. MOORE, B. A., *Professor of German*
CHRISTOPHER W. HALL, M. A., *Professor of Geology and Mineralogy*
JOHN CORRIN HUTCHINSON, B. A., *Professor of Greek Language and Literature*
JOHN SINCLAIR CLARK, B. A., *Professor of Latin Language and Literature*
MARIA L. SANFORD, *Professor of Rhetoric and Elocution*
CHARLES WILLIAM BENTON, Litt. D., *Professor of the French Language and Literature*
HENRY F. NACHTRIEB, B. S., *Professor of Animal Biology*
FREDERICK S. JONES, M. A., *Professor of Physics*
WILLIS MASON WEST, M. A., *Professor of History*
GEORGE BELL FRANKFORTER, Ph. D., *Professor of Chemistry*
FRANCIS P. LEAVENWORTH, M. A., *Professor of Astronomy*
FREDERICK KLAEBER, Ph. D., *Professor of Comparative and English Philology*
JOSEPH BROWN PIKE, M. A., *Professor of Latin*
CHARLES PETER SIGERFOOS, Ph. D., *Professor of Zoology*
JOHN ZELNY, Ph. D., *Professor of Physics*
SAMUEL G. SMITH, Ph. D., LL. D., *Professor of Sociology*
GEORGE FRANCIS JAMES, Ph. D., *Professor of Education*
NORMAN WILDE, Ph. D., *Professor of Philosophy and Psychology*
WILLIAM A. SCHAPER, Ph. D., *Professor of Political Science*
†FRANK MALOY ANDERSON, M. A., *Professor of History*
CHARLES FREDERICK SIDENER, B. S., *Professor of Chemistry*
CARL SCHLENKER, B. A., *Professor of German*
ALBERT WILLIAM RANKIN, B. A., *Professor of Education*
RICHARD BURTON, Ph. D., *Professor of English Literature*
†GEORGE NEANDER BAUER, Ph. D., *Professor of Mathematics*
FREDERIC EDWARD CLEMENTS, Ph. D., *Professor of Botany*
ALBERT ERNEST JENKS, Ph. D., *Professor of Anthropology*
FRANCES SQUIRE POTTER, M. A., *Professor of English*

†On leave of absence during 1908-9.

‡On leave of absence during the second semester of 1908-9.

ALBERT BEEBE WHITE, Ph. D., *Professor of History and Politics*
 JOHN HENRY GRAY, Ph. D., *Professor of Economics and Politics*
 EDWARD VAN DYKE ROBINSON, Ph. D., *Professor of Economics and Politics*
 GISLE BOTHNE, M. A., *Professor of Scandinavian Languages and Literature*
 ANDREW ADIN STOMBERG, M. A., *Professor of Scandinavian Languages and Literature*

CHARLES MARTIN ANDRIST, M. L., *Assistant Professor of French*
 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*
 ADA LOUISE COMSTOCK, M. A., *Assistant Professor of Rhetoric and Dean of Women*

LOUIS JOSEPH COOKE, M. D., *Director of Gymnasium*
 HANS H. DALAKER, M. A., *Assistant Professor of Mathematics*
 SAMUEL N. DEINARD, Ph. D., *Assistant Professor of Semitic Language and Literature*

HAL DOWNEY, M. A., *Assistant Professor of Animal Biology*
 †HENRY ANTON ERIKSON, B. E. E., *Assistant Professor of Physics*
 JULIUS T. FRELIN, B. A., *Assistant Professor of French*
 JOHN EVENSON GRANRUD, Ph. D., *Assistant Professor of Latin*
 HANS JUERGENSEN, M. A., *Assistant Professor of German*
 EDWARD M. LEHNERTS, B. S., *Assistant Professor of Geography*
 **EDWARD EUGENE McDERMOTT, M. S., *Assistant Professor of Rhetoric*
 JAMES BURT MINER, Ph. D., *Assistant Professor of Psychology*
 EDWARD E. NICHOLSON, M. A., *Assistant Professor of Chemistry*
 OSCAR W. OESTLUND, Ph. D., *Assistant Professor of Biology*
 MARY GRAY PECK, M. A., *Assistant Professor of English*
 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*
 CHARLES ALBERT SAVAGE, Ph. D., *Assistant Professor of Latin and Greek*
 CARLYLE SCOTT, *Assistant Professor of Music*
 DAVID FERDINAND SWENSON, B. S., *Assistant Professor of Philosophy*
 FLETCHER HARPER SWIFT, Ph. D., *Assistant Professor of Education*
 JOSEPHINE E. TILDEN, M. S., *Assistant Professor of Botany*
 *WILLIAM LINN WESTERMANN, Ph. D., *Assistant Professor of History*
 MATILDA JANE CAMPBELL WILKIN, M. L., *Assistant Professor of German*
 HENRY L. WILLIAMS, M. D., *Director of Athletics*

†On leave of absence during 1908-9.

*Resigned May 7, 1908.

**Died February 27, 1908.

ANTHONY ZELENY, Ph. D., *Assistant Professor of Physics*
EDWARD SIGERFOOS, Ph. D., Capt. U. S. A., *Professor of Military Science*

INSTRUCTORS

CEPHAS DANIEL ALLIN, M. A., LL. B., *Political Science*
EMMA BERTIN, *French*
ANNA M. BUTNER, *Physical Culture*
HENRIETTA CLOPATH, *Drawing*
LILLIAN COHEN, M. A., *Chemistry*
JOHN M. COULTER, M. A., *Economics*
OSCAR W. FIRKINS, M. A., *Rhetoric*
FRANCIS C. FRARY, M. S., *Chemistry*
HALDOR B. GISLASON, B. A., LL. B., *Rhetoric*
FRANK F. GROUT, B. S., *Geology and Mineralogy*
ROWLAND HAYNES, M. A., *Psychology*
CHARLES M. HOLT, B. A., *Education*
LEULAH J. JUDSON, M. A., *History*
ALOIS F. KOVARIK, M. A., *Physics*
JENNINGS C. LITZENBERG, B. S., M. D., *Gymnasium*
LINDA H. MALEY, B. L., *Rhetoric*
JAMES E. MANCHESTER, Sc. D., *Mathematics*
CARL M. MELOM, M. A., *Spanish and French*
CHARLES W. NICHOLS, M. A., *Rhetoric*
RAYMOND V. PHELAN, Ph. D., *Economics*
BERT A. ROSE, *Band*
THEOPHILUS SCHROEDEL, B. A., *German*
ROYAL R. SHUMWAY, B. A., *Mathematics*
NELLIE A. WHITNEY, B. A., *Rhetoric*
†CHARLES WILLIAMS, M. A., *German*

†On leave of absence during 1908-9.

FEES

All students in the college, who are residents of the state, 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. Save in the case of the first registration, the incidental fee is increased twenty-five cents for each day's delay in registration, beginning with the day set for recitations to begin. In addition to this fee, students who take work in laboratories are charged a sum sufficient to cover the cost of material and breakage.

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 a 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.

Admission

Every applicant for admission, except those belonging to classes four and five below, must take the entrance examination in English. For details see page 41. No student is admitted with more than three half-year conditions and all such conditions must be removed by examination within one year.

The regulations governing admission recognize seven different classes of applicants, according to the mode of their preparation or the line of work which they propose to pursue.

1. ADMISSION TO THE FRESHMAN CLASS BY CERTIFICATE

- A. Graduates of the following courses are admitted to the freshman class, provided they have completed four years of English and one year each of algebra and plane geometry, on the terms specified under B.
- (a) Any four-years course of a Minnesota state high school.
 - (b) Any four-years course of other accredited schools in Minnesota.
 - (c) Any four-years course of schools in any other state which are accredited to the state university of that state.
 - (d) The advanced Latin or English course of the Minnesota state normal schools.

For applicants under (a) or (b) however, this certificate privilege is 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.

- B. 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".¹

¹In per cents, 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.

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.

2. ADMISSION TO THE FRESHMAN CLASS BY EXAMINATION

Entrance examinations are offered at the University during the opening week of the University year. The program for the year 1908-9 is printed in this bulletin on page 4. Certificates of Minnesota state high school board examinations will be accepted in place of University entrance examinations in whole or in part.

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" below 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.

A. SUBJECTS REQUIRED OF ALL

English, four years, including

- (a) Classics
- (b) Principles of composition
- (c) Practice in written expression

Mathematics

- (a) Elementary algebra, one year
- (b) Plane geometry, one year

B. ELECTIVES, NINE YEAR-CREDITS REQUIRED

Mathematics

- Higher algebra, one-half year
- Solid geometry, one-half year

Latin

- Grammar, one year
- Caesar, four books, one year

Cicero, six orations, one year

Virgil, six books, one year

Greek

Grammar, one year

Anabasis, four books, one year

German

Grammar, one year

Literature, one year

French

Grammar, one year

Literature, one year

Spanish

Grammar, one year

Literature, one year

Swedish, Danish-Norwegian, Icelandic

Grammar, one year

Literature, one year

History

Ancient to Charlemagne, one year

Modern from Charlemagne, one year

England, one-half year

Senior American, one-half year

American Government, one-half year

Business Subjects

History of commerce, one-half year

Commercial geography, one-half year or one year

Elementary economics, one-half year

Business law, one-half year

Business arithmetic, one-half year

Elementary bookkeeping, one-half year

Advanced bookkeeping and business practice, one year

Stenography and typewriting, two years

Business spelling and correspondence, one-half year

Physics, one year

Chemistry, one year

Botany, one-half or one year

Zoology, one half or one year

Astronomy, one-half year

Geology, one-half year

Physiography, one-half year

Manual Subjects

- Freehand drawing, two credits¹
- Mechanical drawing, two credits¹
- Shop work, two credits¹
- Modeling and wood carving one credit¹
- Domestic art and science, two credits¹

3. ADMISSION TO THE SIX YEARS MEDICAL COURSE

For a full statement of all matters connected with the six year medical course see pages 117-121.

4. 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 three and four, provided the usual requirements regarding majors and minors on pages 44-45 be complied with. Such students will not be permitted to elect education five or seven, mathematics one or two, rhetoric one, or history one, and upon registering for mathematics three and four 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 the 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.

5. 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.

6. ADMISSION AS UNCLASSSED 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 unclassified student. He must take the same examinations or present the same credentials as are required of those who enter the freshman class. (See classes one and two.) Exceptions can be made only upon vote of the faculty. A new application must be made each semester to the enrollment committee.

7. 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 one and two). 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 four and five 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 maximum of seventeen hours of work per week including this course. These students must take rhetoric one, 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 one.

Part II. Advanced.

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

The entrance examination will be given at the University in the chapel of the library building, Saturday May 16, and Wednesday, Sept. 9, at 9:00 a. m.

The examination in May 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 16, 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 further change in registration necessitated by the program and rules of the college.

Courses of Study

Students pursuing work in the College of Science, Literature, and the Arts are classified as follows: (1) those pursuing the four years course in science, literature, and the arts leading to the degree bachelor of arts; (2) those pursuing the six years medical course in science and medicine; (3) music students; (4) unclassified students. The regulations regarding the course of study prescribed for each category of students are outlined below:

1. FOUR YEARS 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 one and two, mathematics one and two, chemistry one (a), rhetoric one, or history one, 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 25. For the purpose of this count each "excellent" shall balance one "pass," making an average of "good" for both records.¹
- 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.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 be-

¹This 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.

- ginning languages (excepting Spanish, Greek, and Hebrew), English one and two, mathematics one and two, general chemistry one (a), rhetoric one, and history one.
2. Each student must choose his major subject before the end of the sophomore year.
 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.

The distribution of the work by years is in accordance with the following plan:

FRESHMAN YEAR

Required

For men, military drill, three hours, and gymnasium, one hour in two periods; for women, physical culture, three hours.

English one, three hours, for those who have passed part two of the entrance examination in English with a grade of good or excellent, or rhetoric one, three hours, for those who have not obtained one of these grades upon the entrance examination in English.

Mathematics one and two, five hours, for those who do not present entrance credits in higher algebra, part one, and solid geometry.

Elective by Groups

The amount of work must be not less than fifteen hours nor more than seventeen exclusive of that mentioned in the first paragraph above. The subjects chosen must be continued through the year.

Those who have credits in both First Part Higher Algebra and Solid Geometry must select one subject from each of the following groups and one additional subject from any one of the groups.

Those who have not credits in both First Part Higher Algebra and Solid Geometry must select from the following groups three subjects if the language chosen is three times per week, and two subjects if the language chosen is five times per week. When two subjects are elected, they must be in different groups; but when three are elected, two may be from one group.

GROUP ONE.

French one, five hours; or French three, three hours, with or without

French four (conversation), two hours.

German one, five hours; or German four, three hours, with or without

German five (conversation), two hours.

Latin one, three hours.

Scandinavian one, five hours, or three, three hours; or Scandinavian two, five hours, or four, three hours.

GROUP TWO.

Animal biology one, three hours.

Botany one, three hours.

Chemistry one or two, three hours.

GROUP THREE.

Greek one, five hours; or Greek three, three hours.

History one or two, three hours.

Mathematics three and four, three hours.

SOPHOMORE YEAR

Military Drill, two hours—Required of men.

In addition to military drill, sophomores shall elect not less than fifteen nor more than eighteen credit-hours of work from the subjects open to them. See departmental statements.

JUNIOR AND SENIOR YEARS

The work of these two years is entirely elective, it being provided that no student shall elect less than fifteen nor more than eighteen hours of work in any semester, save by permission of the committee on students' work.

1. Students who carry military drill beyond the required two years will be allowed two semester credits for each year; but no credit will be allowed for such drill for less than one year.

2. Seniors contemplating entering the medical department are permitted to elect the courses in anatomy, chemistry, histology and physiology (it being understood that no repetition of work is allowed) in the medical department. The work completed in any or all of these subjects will be applied toward the work required for a degree in this department.

3. Members of the senior class of this college are permitted to elect throughout the senior year, work in the College of Law, including the elements of contracts, domestic relations, torts, and criminal law. The satisfactory completion of the above named courses will give the student twelve senior credits, and will entitle him to admission to the middle class of the College of Law. The student may also elect the subject of negotiable paper and receive credit in the College of Law, but such election shall not be a basis for a claim for additional credits in the College of Science, Literature, and the Arts. No student will be permitted to take more than one lecture each day in the College of Law, without special permission of the faculty of this college. The work must be taken with the night class in the College of Law.

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.

2. To become a candidate for the degree of A. B. 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 44.)
- 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.

2. SIX-YEARS COURSE IN SCIENCE AND MEDICINE LEADING TO THE DEGREE OF BACHELOR OF SCIENCE AND DOCTOR OF MEDICINE

For all matters connected with this course see pages 117-121.

3. COURSE FOR MUSIC STUDENTS

Students who have entered the University for the express purpose of studying music are required to register for courses one and four 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.

4. 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 unclassified 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 pages 44-46.

Departmental Statements

ORDER OF DEPARTMENTAL STATEMENTS

- 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
- IX. Fine Arts
 - (a) Drawing, (b) Music
- X. Military Science and Physical Culture

I. English Language and Literature

ENGLISH

The requirements for a major in English are the completion of courses 6, 7, 14, 15, 22, and twelve additional credits from other courses offered by the department. For a minor the requirements are the completion of one of the following courses: 1, 18, 19 and 22, and twelve additional credits from courses offered by the department. For distinction in English the special requirements of the department are the completion of a major in English and twelve additional credits from courses offered by the department, of which six shall be in Old English, and rhetoric 6. To obtain the recommendation of the department for a teacher's certificate courses 3 (first semester), 6, 7, 14, 15, 18 and 22, six additional credits from courses offered by the department, and rhetoric 6 must be completed.

Table of Courses Offered in 1903-9.

No.	Title	Semester	Credits	Offered to	Prerequisite
1.	Outline Eng. Lit.	1	3††	All	None
2.	Outline Am. Lit.	2	3††	All	See statement
3.	Early Eng.	1, 2	6	Soph., Jr., Sr.	None
4.	Middle Eng.	1	2	Soph., Jr., Sr.	See statement
6.	Chaucer	1	3	Soph.	None
7.	Spenser	2	3	Soph.	None
8.	Outline 18 Cent. Lit.	1	3	Soph., Jr.	Six credits
9.	Outline 19 Cent. Lit.	2	3	Soph., Jr.	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.	Courses 6 and 7, or six credits
15.	Shakespeare	2	3	Jr.	Courses 6, 7 and 14, or nine credits
16.	Mod. Drama	1, 2	6	Sr.	Course 15 or nine credits
18.	Teachers' Course	1, 2	2*	Sr.	Courses 6, 7, 14 and 15.
19.	Hist. Lit. Crit.	1, 2	2*	Jr., Sr.	None
20.	Eng. Prose	1	3	Jr., Sr.	Six credits
21.	Browning-Tennyson	2	3	Jr., Sr.	Six credits
22.	Hist. Eng. Lang.	2	1	Soph., Jr., Sr.	Course 3 (1st sem.)
23.	Sen. Seminar	1, 2	1	Sr.	See statement
24.	Anglo-Saxon	1	..	Grad.	Major in Eng.
25.	Beowulf	2	..	Grad.	Major in Eng.
26.	Criticism ....	..	..	Grad.	See statement
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.

†Sophomores, 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** PROFESSOR BURTON, ASSISTANT PROFESSORS PECK AND BEACH
 Three credits (three hours per week) First semester
 Open to all, but sophomores, 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** PROFESSOR BURTON, ASSISTANT PROFESSORS PECK AND BEACH
 Three credits (three hours per week) Second semester
 Open to freshmen who have completed course 1, and, at half credit, to sophomores, juniors and seniors; not credited towards a major in English.

A study of the salient figures of our native literary development. Special attention is given to contemporary writers.

3. **EARLY ENGLISH** PROFESSOR KLAEBER, ASSISTANT PROFESSOR 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

PROFESSOR 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

PROFESSOR 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 ASSISTANT PROFESSORS PECK AND 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 ASSISTANT PROFESSORS PECK AND 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*.

8. OUTLINE OF EIGHTEENTH CENTURY LITERATURE

ASSISTANT PROFESSOR BEACH

Three credits (three hours per week) First semester
Open to sophomores and juniors 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.

9. OUTLINE OF NINETEENTH CENTURY LITERATURE

ASSISTANT PROFESSOR BEACH

Three credits (three hours per week) Second semester
Open to sophomores and juniors 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

PROFESSOR 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

PROFESSOR 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

PROFESSOR 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. SHAKESPEARE PROFESSOR POTTER
 Three credits (three hours per week) 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 Shakespeare plays, with a critical study of selected comedies, tragedies, and historical plays.

16. CONSTRUCTION AND DEVELOPMENT OF THE MODERN DRAMA ASSISTANT PROFESSOR 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. TEACHERS' COURSE IN ENGLISH PROFESSOR 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 PROFESSOR 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 PROSE PROFESSOR 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 PROFESSOR 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 PROFESSOR 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. SENIOR SEMINAR IN ENGLISH ASSISTANT PROFESSOR PECK
 Two credits (one hour per week) Both semesters
 Open to seniors who have taken courses 3 and 4 or any of the following courses: 6, 19, 20, 22.

Hakluyt's Voyages will be studied in 1908-9. 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.

24. ANGLO-SAXON PROFESSOR 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.

25. **BEOWULF** PROFESSOR 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.
26. **PRINCIPLES OF CRITICISM** MR. FIRKINS
 Open to graduate students who have taken an undergraduate major in English; other arrangements may be ascertained upon application to the department.
 This course comprises a brief treatment of the elements or forces in literature, e. g., clearness, vigor, beauty, precision, art, taste, humor, truth, ethics, and the like; an exposition of literary types, e. g., lyric, epic, drama, short story, novel, biography, etc., in relation to the standards and methods of judging each.
27. **SHAKESPERE** PROFESSOR 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** PROFESSOR BURTON
 Both semesters
 Open to graduate students who have taken an undergraduate major in English; other arrangements may be ascertained upon application to the department.
29. **THE DRAMA AS A LITERARY FORM** PROFESSOR BURTON
 Both semesters
 Open to graduate students who have taken an undergraduate major in English; other arrangements may be ascertained upon application to the department.

COMPARATIVE PHILOLOGY

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.

The requirements for a major in comparative philology are the completion of courses 1, 3, 4, 5, and 6; for a minor, twelve credits. For distinction in comparative philology the special requirements of the department are to take all the undergraduate courses offered in two consecutive years, four of the graduate courses (of two hours each) given in two consecutive years, either English 3, 4 and 22, or English 3 and German 14.

Table of Courses Offered in 1908-9.

No.	Title	Semester	Credits	Offered to	Prerequisite
1.	Sc. of Lang.	1	2	Soph., Jr., Sr.	None
3.	Life of Words	1	2	Soph., Jr., Sr.	None
4.	Esperanto	2	1	Soph., Jr., Sr.	None
6.	Comp. Phonology	2	3	Soph., 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** PROFESSOR 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. **HISTORY OF THE ALPHABET** PROFESSOR KLAEBER
 Two credits (two hours per week) First semester
 Open to sophomores, juniors, and seniors, who have had four years of preparatory Latin; alternates with course 3.
 Survey of the principal systems of writing. Development of the letters in the Indo-European languages. History of English spelling and spelling reform.

3. THE LIFE OF WORDS PROFESSOR KLAEBER
Two credits (two hours per week) First semester
Open to sophomores, juniors, and seniors; alternates with course 2.
Etymology and semasiology. Growth of vocabulary; change of words in form and meaning. Lectures and exercises with special reference to English and other Germanic languages.
4. ESPERANTO AND THE IDEA OF AN INTERNATIONAL LANGUAGE PROFESSOR KLAEBER
One credit (one hour per week) Second semester
Open to sophomores, 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. INTRODUCTION TO TEUTONIC PHILOLOGY PROFESSOR KLAEBER
One credit (one hour per week) Second semester
Open to sophomores, juniors, and seniors, who have a fair knowledge of German; alternates with course 4.
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).
6. COMPARATIVE PHONOLOGY OF ENGLISH AND GERMAN PROFESSOR KLAEBER
Three credits (three hours per week) Second semester
Open to sophomores, juniors, and seniors who have a fair knowledge of German.
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 PROFESSOR 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 PROFESSOR 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 *Uifilas*, 10th edition).
9. URGERMANISCHE GRAMMATIK PROFESSOR KLAEBER
Open to graduate students who have completed course 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 PROFESSOR 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 *Heliland*.
11. OLD HIGH GERMAN PROFESSOR 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.

RHETORIC AND ELOCUTION

The requirement for a major in rhetoric is the completion of courses 1, 2, 3, and 6; for a minor, twelve credits. For distinction in rhetoric the

special requirements of the department are the completion of courses 1 to 4 inclusive, 6, and three credits for individual work with some professor in the department. Students who desire to obtain distinction in rhetoric are advised to take English 19 and 22. To obtain the recommendation of the department for a teacher's certificate courses 1, 2, 3 and 6, and eighteen credits in English must be completed.

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 on the Pillsbury oratorical contest, may, if the department deems them worthy, receive honors in public speaking.

Table of Courses Offered in 1908-9.

No.	Title	Semester	Credits	Offered to	Prerequisite
1 (a)	Rhetoric	1, 2	6‡	All	None
1 (b)	Argumentation	1, 2	6	Fresh., Soph.	See statement
2 (a)	Rhetoric	1, 2	6	All	See statement
2 (b)	Argumentation	1, 2	6	Soph., Jr., Sr.	Course 1
3.	Lit. Crit.	1	3	Jr., Sr.	Course 1
4.	Art. Lec.	2	3	Jr., Sr.	Course 1
6.	Advanced Rhet.	1, 2	6	Jr., Sr.	Courses 1 and 2
7.	Advanced Rhet.	1, 2	6	Jr., Sr.	Course 6
8.	Reading	1, 2	4*	Soph.	None

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

‡Juniors and seniors receive only half credit.

RHETORIC

1 (a) RHETORIC MESSRS. FIRKINS AND NICHOLS, AND MISSES MALEY, GRIFFITH AND WHITNEY

Six credits (three hours per week) Both semesters
Open to all classes, but juniors and seniors must obtain the consent of the department and receive only half credit.

This course includes the study of formal rhetoric, the writing of compositions, and the study and analysis of masterpieces of prose.

1 (b) ARGUMENTATION MR. GISLASON
Six credits (three hours per week) Both semesters

Open to freshmen and sophomores recommended by the department; students who have had special preparation in debate may, by consent of the head of the department, substitute argumentation for rhetoric.

This course aims at instruction in the science of argumentation and in the art of debate. The work consists of study of the laws and processes of reasoning and their application to written and spoken argument. Speeches of eminent lawyers made before courts in the trial of famous cases are briefed and analyzed. Practical exercises in debate on the floor form an important part of the work.

2 (a) RHETORIC MR. FIRKINS, MISSES MALEY AND WHITNEY
Six credits (three hours per week) Both semesters

Open to freshmen who have obtained a grade of excellent upon the entrance examination in English, and to sophomores, juniors, and seniors, who have completed course 1.

The course consists of a study of the short story in the first semester, and of the essay and forms of public address in the second semester. The writing of compositions and the keeping of a note book form the greater part of the work.

2 (b) ARGUMENTATION MR. GISLASON
Six credits (three hours per week) Both semesters

Open to sophomores, juniors, and seniors, who have taken course 1 and have had some previous experience in debate.

3. **LITERARY CRITICISM** PROFESSOR SANFORD
 Three credits (three hours per week) First semester
 Open to sophomores (by special permission), juniors, and seniors,
 who have taken course 1.
 A study of models of English poetry, oratory, fiction, etc., with critical
 essays.
4. **ART LECTURES** PROFESSOR SANFORD
 Three credits (three hours per week) Second semester
 Open to sophomores (by special permission), juniors, and seniors,
 who have taken course 1.
 This course embraces a study of the development of architecture, sculp-
 ture, and painting from the earliest remains in Chaldea and Egypt through
 the sixteenth century A. D. Some attention is also given to more recent art.
 Van Dyke's *College Histories of Art*, Radcliffe's *Schools and Masters
 of Painting and of Sculpture*, Hoyt's *Painters* and other works are used as
 text-books. Essays upon the history of art are required.
5. **DEBATE** PROFESSOR SANFORD
 Six credits (three hours per week) Both semesters
 Open to juniors and seniors who have taken courses 1 (b) and
 2 (b); not offered in 1908-9.
 This course aims at the training of men in public speaking. It consists
 of theoretical work in argumentation. Standard debates and orations are
 analyzed and briefed; original debates are briefed, written, and rehearsed
 for criticism. Special emphasis is laid upon class-room debate with criticism
 on delivery, thought, and composition.
6. **ADVANCED RHETORIC** ASSISTANT PROFESSOR COMSTOCK
 Six credits (three hours per week) Both semesters
 Open to seniors and juniors who have taken courses 1 and 2.
- ADVANCED RHETORIC (3) 1, 2 ASSISTANT PROFESSOR COMSTOCK
 Open to juniors and seniors who have completed course 2 (a).
 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.
 This course, in addition to the courses in literature, is required of
 students who desire a recommendation in English toward a
 teacher's certificate.
7. **ADVANCED RHETORIC** ASSISTANT PROFESSOR COMSTOCK
 Six credits (three hours per week) Both semesters
 Open to juniors and seniors who have taken courses 1, 2, and 6.
 A continuation of course 6 and conducted along the same lines.

ELOCUTION

8. **READING** PROFESSOR SANFORD
 Six credits (three hours per week) Both semesters
 Open to sophomores; both semesters must be completed before
 credit is given for the first semester.
 The object of this course is voice building and training in interpretation
 and expression. The text used is Shakespeare's plays.
9. **VOCAL EXPRESSION** *ASSISTANT PROFESSOR McDERMOTT
 (Three hours) Both semesters
 Open to juniors and seniors who have taken course 1; not offered
 in 1908-9.
 This course aims at the following objects: An understanding of the
 vocal mechanism; the strengthening and cultivation of the voice; the correc-
 tion of foreign accent, defective enunciation, and common faults of quality
 such as aspirated, oral, pectoral, guttural, and nasal tones; the specific appli-
 cation of the principles of clearness, simplicity, strength, and variety in
 delivery. Interpretation is approached from within, not from without, and
 correct thinking is made the basis of correct expression.

*Professor McDermott died February 27th, 1908. His successor has not
 yet been selected.

10. THE PSYCHOLOGICAL SIDE OF VOCAL EXPRESSION

*ASSISTANT PROFESSOR McDERMOTT
Both semesters

(Three hours)

Open to juniors and seniors who have taken course 1; not offered in 1908-9.

In this course the functions of the dramatic instinct, the will, the intellect, the imagination, and the emotions, are considered independently and conjointly with reference to delivery. The effect upon expression of the neglect of any one of these elements is shown and literature is studied with a view to the harmonious development of all.

11. AMERICAN ORATORY

*ASSISTANT PROFESSOR McDERMOTT
Both semesters

(Three hours)

Open to juniors and seniors who have taken course 1; not offered in 1908-9.

Standard orations are analyzed; synopses, oral biographies, accounts of historical settings, and expositions of the orator's style and logic are required. Forensics and debates are prepared, one original oration each semester is required, a short selection from the oration under consideration is committed for practice in delivery, and short stories from best modern authors are retold for fluent command of English. Besides class work each student is given a brief period for individual criticism; for this reason only a limited number can be admitted.

II. Ancient Languages and Literatures

GREEK

The requirement for a major in Greek is the completion of eighteen credits from the courses offered by the department; for a minor, twelve credits. For distinction in Greek the special requirements of the department are the completion of at least courses 4 to 7 inclusive, 8 or 9, 10, and two hours per week of seminar work throughout one year.

Table of Courses Offered in 1908-9.

No.	Title	Semester	Credits	Offered to	Prerequisite
1.	First Year Greek	1, 2	10*	All	None
2.	Hist. and Epic Poetry	1, 2	6*	Soph., Jr., Sr.	Course 1
3.	Xenophon and Herodotus	1, 2	6*	All	See statement
4.	Oratory	1	3	Soph., Jr., Sr.	Course 2 or 3
5.	Philosophy	2	3	Soph., Jr., Sr.	Course 2 or 3
6.	Lyrics	1	3	Jr., Sr.	Course 4 or 5
7.	Tragedy	2	3	Jr., Sr.	Course 5
8.	Philosophy Advanced	1	3	Jr., Sr.	Course 5
10.	Epic Poetry	2	3	Jr., Sr.	Course 7
11.	Modern Greek	1	3	Soph., Jr., Sr.	Course 2 or 3
12.	Archæology	1, 2	6*	Soph., Jr., Sr.	None
13.	Dramatic Poetry	1, 2	4	Soph., Jr., Sr.	See statement
14.	Composition	1, 2	2*	Jr., Sr.	Courses 4 and 5
15.	Greek Lit. and Life	1	2	Jr., Sr.	None
16.	Later Greek	1, 2	6	Jr., Sr.	Course 5
17.	Seminar	1	1	Jr., Sr.	Course 4 or 5
18.	Seminar	1	1	Jr., Sr.	Course 5
19.	Epic Poetry	..	..	Grad.	
20.	Dramatic Poetry	..	..	Grad.	
21.	Oratory	..	..	Grad.	
22.	Later Greek	..	..	Grad.	
23.	Adv. Mod. Greek	..	..	Grad.	

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

1. FIRST YEAR IN GREEK

PROFESSOR 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 Brooks' *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*

ASSISTANT PROFESSOR 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. HISTORY: Xenophon and Herodotus

ASSISTANT PROFESSOR 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

ASSISTANT PROFESSOR SAVAGE

Three credits (three hours per week)

First 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 Andocides' speech *On the Mysteries* may also be read. This work is supplemented by lectures on Greek oratory, and some attention is given to the study of Greek rhetoric. 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 *Crito*.

ASSISTANT PROFESSOR SAVAGE

Three credits (three hours per week)

Second semester

Open to those who have completed course 2 or course 3.

The course consists chiefly in the reading of Plato's *Apology* and *Crito*; and, in connection with these works, selections from Xenophon's *Memorabilia* may also be read. The reading of texts is supplemented by lectures on Greek philosophy.

6. LYRICS

PROFESSOR 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

PROFESSOR BROOKS

Three credits (three hours per week)

Second semester

Open to juniors and seniors who have completed course 5.

8. **PHILOSOPHY: Plato's Republic** PROFESSOR HUTCHINSON
 Three credits (three hours per week) First semester
 Open to juniors and seniors who have completed course 5; alternates with course 9.
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: Demosthenes' De Corona** PROFESSOR HUTCHINSON
 Three credits (three hours per week) First semester
 Open to juniors and seniors who have completed course 4; offered in alternation with course 8; not given in 1908-9.
 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. **ADVANCED COURSE IN EPIC POETRY: The Odyssey** PROFESSOR 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 the entire epic is, if possible, read.
11. **MODERN GREEK** PROFESSOR BROOKS
 Three credits (three hours per week) First semester
 Open to sophomores, juniors and seniors, who have completed course 2 or course 3.
12. **ARCHAEOLOGY** PROFESSOR BROOKS
 Six credits (three hours per week) Both semesters
 Open to sophomores, juniors and seniors; a knowledge of the Greek language is not required; both semesters must be completed before credit is allowed for the first semester.
 A study of the monuments or remains of Greek art, illustrating Greek customs, civilization, and life. Laboratory methods and theses are largely employed.
13. **DRAMATIC POETRY: Euripides and Aristophanes** ASSISTANT PROFESSOR SAVAGE
 Four credits (two hours per week) Both semesters
 Open in the first semester to those who have completed courses 2, 3, or 7, and in the second to those who have completed the first semester or 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.
14. **GREEK COMPOSITION** PROFESSOR 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.
15. **GREEK LITERATURE AND LIFE** ASSISTANT PROFESSOR SAVAGE
 Two credits (two hours per week) First semester
 Open to juniors and seniors; a knowledge of Greek is not required.
 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, the lectures will be illustrated by stereopticon views. The course is especially recommended to students who are intending to teach Greek, Latin, English, or ancient history.

16. LATER GREEK PROFESSOR 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.
17. SEMINAR IN ORATORY OR PHILOSOPHY PROFESSOR HUTCHINSON
One credit (one hour per week) First semester
Open to juniors and seniors who have completed course 4 or course 5.
In 1908-9 the work will be in connection with Demosthenes' *De Corona*.
18. SEMINAR IN GREEK TRAGEDY PROFESSOR 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 PROFESSOR HUTCHINSON
Open to graduate students only; other arrangements may be ascertained upon application to the department.
20. ADVANCED COURSE IN GREEK DRAMATIC POETRY PROFESSOR BROOKS
Open to graduate students only; other arrangements may be ascertained upon application to the department.
21. ADVANCED COURSE IN GREEK ORATORY ASSISTANT PROFESSOR SAVAGE
Open to graduate students only; other arrangements may be ascertained upon application to the department.
22. LATER GREEK (322 B. C. to 200 A. D.) PROFESSOR HUTCHINSON
Open to graduate students only; other arrangements may be ascertained upon application to the department.
23. ADVANCED COURSE IN MODERN GREEK PROFESSOR BROOKS
Open to graduate students only; other arrangements may be ascertained upon application to the department.

LATIN

The requirement for a major in Latin is the completion of eighteen credits from the courses offered by the department; for a minor, twelve credits. For distinction in Latin the special requirement of the department is the completion of thirty credits from courses offered in the department. To obtain a recommendation for a teacher's certificate in Latin, courses 1, 2, 3, 4, 6, and 7 must be completed; courses 10 and 12 are also recommended.

Table of Courses Offered in 1908-9.

No.	Title	Semester	Credits	Offered to	Prerequisite
1.	Livy	1	3	Fresh.	4 yrs. prep. Latin
2.	Plautus and Terence....	2	3	Fresh.	Course 1
3.	Horace	1	3	Soph., Jr., Sr.	Courses 1 and 2
4.	Roman Lit.	2	3	Soph., Jr., Sr.	Courses 1-3
5.	Ovid	1, 2*	2	Soph., Jr., Sr.	Courses 1 and 2
6.	Adv. Caesar	1	3	Jr., Sr.	Courses 1-4
7.	Adv. Virgil	2	3	Jr., Sr.	Courses 1-4
8.	Pliny's Letters	1	2	Jr., Sr.	Courses 1-4
9.	Med. Latin	1	1	Jr., Sr.	Courses 1-4
10.	Composition	2	2	Jr., Sr.	Courses 1-4
11.	Elegiac Poetry	1	3	Jr., Sr.	Courses 1-4
12.	Corresp. of Cicero.....	1	2	Jr., Sr.	Courses 1-4
13.	Satire	2	3	Jr., Sr.	Courses 1-4
14.	Drama	2	2	Jr., Sr.	Courses 1-4
15.	Arch. and Public Life ..	1	1	Jr., Sr.	None
16.	Private Life	2	1	Jr., Sr.	None
17.	Lucretius	1, 2	3	Grad.	
18.	Seneca	1, 2	3	Grad.	
19.	Roman Eloquence	1, 2	..	Grad.	

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

1. **LIVY: Books I, II, XXI, XXII. Selections** PROFESSORS CLARK AND PIKE, AND ASSISTANT PROFESSOR 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 the Latin into idiomatic 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** PROFESSORS CLARK AND PIKE, AND ASSISTANT PROFESSOR GRANRUD
 Three credits (three hours per week) Second semester
 Open to freshmen who have completed course 1.
 The course comprises the translation 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** PROFESSOR PIKE AND ASSISTANT PROFESSOR GRANRUD
 Three credits (three hours per week) First semester
 Open to those who have taken courses 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** PROFESSOR PIKE AND ASSISTANT PROFESSOR 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** PROFESSOR 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 CAESAR** PROFESSOR 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** PROFESSOR 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 and 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** PROFESSOR 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. **MEDIAEVAL LATIN** PROFESSOR 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 selected documents of the middle ages with an outline of the main peculiarities of medieval Latin.

10. **LATIN COMPOSITION** PROFESSOR PIKE
Two credits (two hours per week) Second semester
Open to those who have completed courses 1 to 4 inclusive.
A course in advanced Latin composition and a study of Latin prose style.
11. **ROMAN ELEGIAC POETRY** PROFESSOR 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** PROFESSOR 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** PROFESSOR CLARK
Three credits (three hours per week) Second semester
Open to those who have completed courses one to four 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** PROFESSOR CLARK
Two credits (two hours per week) Second semester
Open to those who have completed courses 1 to 4 inclusive.
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 ARCHEOLOGY AND PUBLIC LIFE** ASSISTANT PROFESSOR GRANRUD
One credit (one hour 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.
16. **ROMAN PRIVATE LIFE** ASSISTANT PROFESSOR GRANRUD
One credit (one hour 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.
17. **LUCRETIVS** PROFESSOR CLARK
Three 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** PROFESSOR PIKE
Three 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 HISTORY AND THEORY OF ROMAN ELOQUENCE** ASSISTANT PROFESSOR GRANRUD
Three credits (two hours per week) Both semesters
Open to graduate students; other arrangements may be ascertained upon application to the department.
The *Brutus* of Cicero will form the basis of the work during the first semester and the *Orator* during the second semester.

SEMITIC LANGUAGES

Table of Courses Offered in 1908-9.

No.	Title	Semester	Credits	Offered to	Prerequisite
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** ASSISTANT PROFESSOR 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 reading of some book of the Old Testament and a review of Hebrew grammar.
2. **ELEMENTARY ARABIC** ASSISTANT PROFESSOR 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** ASSISTANT PROFESSOR 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 Brockelman's *Syrische Grammatik*.
4. **HISTORY OF THE HEBREWS TO THE CLOSE OF THE PERSIAN PERIOD** ASSISTANT PROFESSOR 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.

III. Modern Languages and Literatures

GERMAN

The requirement for a major in German is the completion of eighteen credits from the courses offered by the department; for a minor, twelve credits. For distinction in German the special requirement of the department is the completion of courses 8, 9, 10, and any two of the following: 12, 13, 14, and 17. To obtain the recommendation of the department for a teacher's certificate, courses 4, 6 or 7, 8, 9, 10 and 11 must be completed.

Table of Courses Offered in 1908-9.

No.	Title	Semester	Credits	Offered to	Prerequisite
1.	Beginning	1, 2	10*	All	None
2.	Intermediate	1, 2	6*	Soph., Jr., Sr.	Course 1
3.	Scientific Inter.	1, 2	6*	Soph., Jr., Sr.	Course 1
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.	Courses 1 and 2, or 4
7.	Adv. Sc. Reading	1, 2	6*	Soph., Jr., Sr.	Courses 2 and 3, or 4
8.	Adv. Conversation	1, 2	4*	Soph., Jr., Sr.	Courses 1 and 2, or 4
9.	Classic Period	1, 2	6*	Jr., Sr.	See statement
10.	Modern Authors	1, 2	6*	Jr., Sr.	See statement
11.	Teachers' Course	2	1	Sr.	Course 10
12.	Reformation	1, 2	4*	Sr. Grad.	Course 9 or 10
13.	Middle High Ger.	1, 2	4*	Sr. Grad.	Course 9 or 10
14.	Old High Ger.	1, 2	4*	Sr.	Course 9 or 10
15.	Seminar on Drama	1, 2	..	Grad.	See statement
16.	Volkstied	1, 2	2	Grad.	Course 9 or 10
17.	Hist. of Ger. Lit.	1, 2	4*	Sr. Grad.	Course 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.

1. BEGINNING PROFESSOR SCHLENKER, ASSISTANT PROFESSORS WILKIN
AND JUERGENSEN, MR. BURKHARD, AND MR. WILLIAMS
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.
2. INTERMEDIATE PROFESSOR SCHLENKER, MR. BURKHARD, AND
MR. WILLIAMS
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.
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.
4. PROSE AND POETRY PROFESSOR MOORE, ASSISTANT PROFESSOR
WILKIN, MESSRS. BURKHARD AND WILLIAMS
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.
First semester: Meissner's *Aus deutschen Landen; Goethe's Gedichte*.
Second semester: Schrakamp's *Beruhmte Deutsche*, Heine's *Buch der Lieder*.
Geography, history and legend. Review of German grammar throughout the
year. This course may be supplemented by course 5.
5. ELEMENTARY CONVERSATION AND COMPOSITION ASSISTANT PROFESSORS
WILKIN AND JUERGENSEN, MESSRS. BURKHARD AND WILLIAMS
Four credits (two hours per week) Both semesters
Open to those who are taking or have taken course 2, 3, or 4;
not open 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 PROFESSOR SCHLENKER, ASSISTANT PROFESSORS
WILKIN AND JUERGENSEN, AND MR. 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 semester: 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 ASSISTANT PROFESSOR JUERGENSEN
Six credits (three hours per week) Both semesters
Open to those who have taken course 2, 3, or 4; both semesters
must be completed before credit is given for first semester.
Reading of monographs and periodicals.

8. **ADVANCED CONVERSATION, GRAMMAR, AND COMPOSITION** PROFESSOR SCHLENKER, ASSISTANT PROFESSOR WILKIN, AND MR. BURKHARD
 Four credits (two hours per week) Both semesters
 Open to those who have completed courses 1 and 2, or course 4; 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** PROFESSOR 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 two. Lectures and collateral reading; essays by the class. Schiller's ballads, and other representative poems of this period. German versification. Second semester: Reading and discussion of Lessing's more important critiques, the *Laocoon*, and *Dramaturgie*.
10. **MODERN AUTHORS** PROFESSOR 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. **TEACHERS' COURSE** PROFESSOR 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** PROFESSOR 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** PROFESSOR SCHLENKER
 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 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, *Parzival*, etc.
14. **OLD HIGH GERMAN** PROFESSOR KLAEBER
 Four credits (two hours per week) Both semesters
 Open to seniors who have taken course 9 or course 10; both semesters must be completed before credit is given for the first semester.
 This course is identical with comparative philology 11.
15. **SEMINAR IN GERMAN DRAMA** PROFESSOR 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 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) Second semester
 Open to graduate students who have completed course 9 or course 10.
 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** ASSISTANT PROFESSOR 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** ASSISTANT PROFESSOR 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 9 or 10; both semesters must be completed before credit is given for the first semester.
 1908-9 The literature of evolution (Haeckel, Reinke, et al.)
 1909-10 Chemistry and physics (Ostwald, Helmholtz, et al.)
 1910-11 Psychology and philosophy (especially Wundt.)
 For courses in Germanic philology see the statement of the department of comparative philology, pp. 52-53.

ROMANCE LANGUAGES

The requirement for a major in French or Spanish is the completion of eighteen credits from the courses offered in those subjects; for a minor, twelve credits. For distinction in French the special requirement of the department is the completion of courses 2 or 3, 5, 7, and four credits from courses 6, 8, 9, or 10; for distinction in Spanish the required courses are 5, 11, 12, and 13.

Table of Courses Offered in 1908-9.

No.	Title	Semester	Credits	Offered to	Prerequisite
1.	Begin. French	1, 2	101*	All	None
2.	Intermediate French ...	1, 2	6*	Soph., Jr., Sr.	Course 1
3.	Adv. Fr. G. and Comp... 1, 2	1, 2	6*	All	None
4.	Begin. Fr. Conversation. 1, 2	1, 2	4*	Soph., Jr., Sr.	See statement
5.	Classic Fr. Lit.	1, 2	6*	Soph., Jr., Sr.	Course 2 or 3
6.	Adv. Fr. Conversation.. 1, 2	1, 2	4*	Soph., Jr., Sr.	Course 2 or 3
7.	Fr. Lit. of 19 Cent. 1, 2	1, 2	6*	Soph., Jr., Sr.	Course 2 or 3
8.	Teachers Fr.	1, 2	2*	Jr., Sr.	Course 5
9.	Romance Phil.	1, 2	2*	Jr., Sr.	Course 5
10.	Italian Lit.	1, 2	2*	Jr., Sr.	Course 5
11.	Begin. Span.	1, 2	10*	Soph, Jr., Sr.	Two yrs. prep. Fr.
12.	Intermediate Span. 1, 2	1, 2	6	Soph., Jr., Sr.	Course 11
13.	Adv. Span.	1, 2	6*	Jr., Sr.	Course 12
14.	Old French	1, 2	4	Grad.	
15.	Hist. of Fr. Lit.	1, 2	6*	Grad.	
16.	Ital. Lit.	1, 2	2*	Grad.	Course 5

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

†Juniors and seniors receive only half credit.

1. **BEGINNING FRENCH** ASSISTANT PROFESSORS ANDRIST AND FRELIN,
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 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.
François *Advanced French Prose Composition*; modern texts will be read, including some of the works of Coppée, Mérimée, Daudet, Scribe, et al.
3. ADVANCED FRENCH GRAMMAR AND COMPOSITION ASSISTANT PROFESSOR ANDRIST
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.
François' *Introduction to French Composition*; readings from modern authors, including selections from Coppée, Feuillet, Sandeau.
4. BEGINNING FRENCH CONVERSATION ASSISTANT PROFESSORS ANDRIST AND FRELIN, MADAME 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.
Conversations based on modern French life.
5. THE CLASSICAL PERIOD OF FRENCH LITERATURE PROFESSOR 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, Molière, La Fontaine, et al. Compositions.
6. ADVANCED FRENCH CONVERSATION PROFESSOR BENTON
Four credits (two 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.
Conversations on French history, literature, the drama, etc.
7. FRENCH LITERATURE OF THE NINETEENTH CENTURY PROFESSOR 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. TEACHERS' COURSE IN FRENCH PROFESSOR 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 PROFESSOR 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.
Lectures on the phonetical development of the French and other Romance languages from popular Latin. Reading of old French texts.
10. ITALIAN LITERATURE PROFESSOR 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 Languellies'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 completed before credit is given for the first semester.
 First semester: Loiseaux, *Spanish Composition*; Brownell, *El Pajaro Verde*. Second semester: Gray'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** PROFESSOR 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** PROFESSOR 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** PROFESSOR 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 LANGUAGES

The requirement for a major in the Scandinavian languages is the completion of eighteen credits from courses offered by the department; for a minor, twelve credits.

Table of Courses Offered in 1908-9.

No.	Title	Semester	Credits	Offered to	Prerequisite
1.	Elem. Norwegian	1, 2	10*†	All	None
2.	Adv. Norwegian	1, 2	6*	Soph., Jr., Sr.	Course 1
3.	Elem. Swedish	1, 2	10*†	All	None
4.	Adv. Swedish	1, 2	6*	Soph., Jr., Sr.	Course 3
5.	Old Norse (Icelandic)	1, 2	4	Jr., Sr., Grad.	Courses 1 and 2, or 3 and 4
6.	Modern Norwegian Lit.	1, 2	6*	Jr., Sr., Grad.	Courses 1 and 2
7.	Swedish Literature	1, 2	6*	Jr., Sr., Grad.	Courses 3 and 4
8.	Henrik Ibsen	1	2*	Jr., Sr., Grad.	See statement
9.	History of Northern Europe	1, 2	6	Jr., Sr.	None

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

†Juniors and seniors received only half credit.

1. **ELEMENTARY NORWEGIAN** PROFESSOR 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** PROFESSOR 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** PROFESSOR 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** PROFESSOR 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 Tegnér's *Frithjofs Saga* and Runeberg's *Fänrik Ståls Sägner*.
5. **OLD NORSE (Icelandic)** PROFESSOR 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.
 Grammar and reading. *Gunnlaugs Saga Ormstungu*.
6. **MODERN NORWEGIAN LITERATURE** PROFESSOR 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. Special attention paid to Björnson and Ibsen.
7. **SWEDISH LITERATURE** PROFESSOR 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 Lagerlöf, Geijerstam, Strindberg.
8. **IBSEN** PROFESSOR BOTHNE
 Two credits (two hours per week) First semester
 Open to qualified students upon the approval of the department.
 Lectures and readings.
9. **HISTORY OF NORTHERN EUROPE** PROFESSOR 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** PROFESSOR BOTHNE
 (Not given in 1908-9.)
11. **MODERN DANISH LITERATURE** PROFESSOR BOTHNE
 (Not given in 1908-9.)

FOR GRADUATES

12. MODERN SWEDISH LANGUAGE AND LITERATURE

13. HISTORY OF THE SCANDINAVIAN LANGUAGES

For courses in Scandinavian philology, see the statement of the department of comparative philology, pp. 52-53.

IV. Biological Sciences

ANIMAL BIOLOGY

The requirements for a major in animal biology are the completion of course one and twelve additional credits from related courses; for a minor, twelve credits. For distinction in animal biology the special requirements of the department are the completion of a major and at least six additional credits from courses offered by the department. To obtain the recommendation of the department for a teacher's certificate courses one, fifteen, or two, or three, or four, or five, and twelve additional credits in the biological sciences, six of which shall be in botany, must be completed.

Students who contemplate taking a major or advanced work in animal biology are advised to confer with the head of the department in planning their work.

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.

Table of Courses Offered in 1908-9.

No.	Title	Semester	Credits	Offered to	Prerequisite
1.	Gen. Zoology	1, 2	6	All	None
2.	Morphol. Invertebrates	1, 2	6*	Soph., Jr., Sr.	Course 1
3.	Histol.-Embryol.	1, 2	6	Soph., Jr., Sr.	Course 1
4.	Comp. Ant. Vertebrates	1, 2	6	Soph., Jr., Sr.	Course 1
5.	Gen. Physiol.	1, 2	6*	Soph., Jr., Sr.	Course 1
7.	Entomol.	1, 2	6*	Soph., Jr., Sr.	Course 1
8.	Ichthyology	1	3	Soph., Jr., Sr.	Course 1
9.	Ornithology	2	3	Soph., Jr., Sr.	Course 1
11.	Animal Habits—Intel.	2	2	Jr., Sr.	See statement
13.	Teachers' Course	1	1	Jr., Sr.	Eighteen credits
14.	Problems & Research	1, 2	6 or 12*	Jr., Sr.	See statement
15.	Elements of Entomol. & Ornith.	1, 2	6*	Soph., Jr., Sr.	Course 1

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

1. GENERAL ZOOLOGY PROFESSOR SIGERFOOS, ASSISTANT PROFESSOR 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 starfish 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 one; 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 thru an intensive study of two or three groups of animals and to acquaint 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 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 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 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 semester's work is based upon a study of chordates, cartilaginous 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 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; not given in 1908-9.

7. ENTOMOLOGY ASSISTANT PROFESSOR 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 discussion 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 ASSISTANT PROFESSOR BROWN

Six credits (six hours per week) First semester
Open to those who have completed course 1; the laboratory fee
is three dollars.

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 ASSISTANT PROFESSOR BROWN

Six credits (six hours per week) Second semester
Open to those who have completed course 1; the laboratory fee
is three dollars.

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** PROFESSOR 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; not offered in 1908-9.
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** PROFESSOR 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.
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** PROFESSOR NACHTRIEB
Two credits (two hours per week) Second semester
Open to juniors and seniors; alternates with course 11; not given in 1908-9.
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** PROFESSOR 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** PROFESSOR 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 Assistant Professor Brown
(b) Blood, connective tissue and excretory organs of vertebrates under Assistant Professor Downey
(3) Entomology under Assistant Professor Oestlund
(d) Experimental zoology
(e) General physiology under Professor Nachtrieb
(f) Invertebrate embryology under Professor Sigerfoos
(g) Invertebrate morphology under Professor Sigerfoos
(h) Vertebrate embryology or morphology under Professor Nachtrieb.
15. **ELEMENTS OF ENTOMOLOGY AND ORNITHOLOGY** ASSISTANT PROFESSORS 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; the laboratory fee is three dollars per semester.
This course is planned with special reference to candidates for the teacher's certificate. During the first semester the class meets with Assistant Professor Oestlund during the third and fourth hours on Monday, Wednesday and Friday. During the second semester the class meets with Assistant Professor Brown on Monday, Wednesday and Friday at the hours arranged with him.

BOTANY

The requirement for a major in botany is the completion of eighteen credits from the courses offered by the department; for a minor twelve credits. For distinction in botany the special requirement of the department

is the completion of courses 1, 2, and 3, and any advanced course covering two semesters. To obtain a teacher's certificate courses 1 and 2, and twelve additional credits in biological sciences, of which six shall be in animal biology, must be completed.

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 eleven to fifteen. 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.

Table of Courses Offered in 1908-9.

No.	Title	Semester	Credits	Offered to	Prerequisite
1.	Gen. Botany	1, 2	6*	All	None
2.	Adv. Botany	1, 2	6	Soph., Jr., Sr.	Course 1
3.	Plant Phys. and Ecol.	1, 2	6	Soph., Jr., Sr.	See statement
4.	Algae	1, 2	6	Jr., Sr.	Courses 1 and 2
5.	Fungi	1, 2	6	Jr., Sr.	Courses 1 and 2
6.	Mosses and Ferns	1, 2	6	Jr., Sr.	Courses 1 and 2
7.	Flowering Plants	1, 2	6	Jr., Sr.	Courses 1 and 2
8.	Ecology	1, 2	6	Jr., Sr.	Courses 1, 2 and 3
9.	Plant Physiol.	1, 2	6	Jr., Sr.	Courses 1, 2 and 3
10.	Cytology	1, 2	6	Jr., Sr.	Courses 1 and 2
11.	Industrial Botany	1, 2	6	Soph., Jr., Sr.	See statement
12.	Wood Technology	1	6	Soph., Jr., Sr.	Course 1
13.	Water Supply Botany	2	3	Soph., Jr., Sr.	Course 1
14.	Timber and Timber Diseases	1	3	Soph., Jr., Sr.	Course 1
15.	Bot. Microchemistry	1, 2	3	Soph., Jr., Sr.	Course 1
16.	Plant Studies	1, 2	3	Jr., Sr.	Courses 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 PROFESSOR CLEMENTS, ASSISTANT PROFESSORS TILDEN AND ROSENDAHL, MR. HUFF AND MR. BUTTERS
 Six credits (six hours per week) Both semesters
 Open to all; both semesters must be completed before credit is given for the first semester; the laboratory fee is three dollars per semester.

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.

2. ADVANCED BOTANY PROFESSOR CLEMENTS, ASSISTANT PROFESSORS TILDEN AND ROSENDAHL
 Six credits (six hours per week) Both semesters
 Open to those who have completed course 1; the laboratory fee is three dollars per semester.

A study of the structure and classification of the great groups of plants, based on identification; the details of cell-division, of the formation of tissues and of reproduction; and the general relations of the plant to the physical factors of its home. Lectures and quizzes, laboratory, greenhouse and field work.

SPECIAL COURSES

3. **PLANT PHYSIOLOGY AND ECOLOGY** PROFESSOR CLEMENTS AND MR. 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; the laboratory fee is three dollars per semester.
A study of the factors that affect the plant and its response to them; the adaptations of plants and the origin of new forms; the structure and development of vegetation, as shown in migration, invasion, competition, etc. Lectures and quizzes, greenhouse and field work.
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 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. **MOSESSES AND FERNS** ASSISTANT PROFESSOR ROSENDAHL AND MR. 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.

10. **CYTOLOGY** 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 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** ASSISTANT PROFESSOR TILDEN
Six credits (six hours per week) Both semesters
Open to technical students who have completed course 1, and to academic 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.
12. **WOOD TECHNOLOGY** PROFESSOR CLEMENTS AND MR. BUTTERS
Six credits (six hours per week)
Open to those who have had course 1; the laboratory fee is three dollars per semester.
A critical study of the most important woods, with especial reference to their structure, differences, and uses, and the life history and relationship of the various genera.
13. **WATER SUPPLY BOTANY** ASSISTANT PROFESSOR TILDEN
Three credits (six hours per week) Second semester
Open to those who have completed course 1; the laboratory fee is three dollars.
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; the laboratory fee is three dollars.
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** PROFESSOR CLEMENTS
Six credits (six hours per week) Both semesters
Open to those who have completed course 1; laboratory fee is three dollars.
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** 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.
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** ASSISTANT PROFESSOR 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 ALGOLGY** ASSISTANT PROFESSOR 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** PROFESSOR 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** PROFESSOR 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; origin and development of the primary tissues; development of organs; correlation, etc.

V. Physical Sciences

CHEMISTRY

The requirement for a major in chemistry is the completion of eighteen credits from courses offered by the department; for a minor, twelve credits. To obtain the recommendation of the department for a teacher's certificate courses 1 and 2, and six additional credits in physical sciences must be completed.

Table of Courses Offered in 1908-9.

No.	Title	Semester	Credits	Offered to	Prerequisite
1.	Gen. Chem.	1, 2	6†*	All	Course 4
2.	Adv. Gen. Chem.	1, 2	6*	All	Course 3
3.	Qual. Anal.	1, 2	6	Soph., Jr., Sr.	Course 3
4.	Quant. Anal. (Grav.) ...	1	3	Jr., Sr.	See statement
5.	Quant. Anal. (Vol.) ...	2	3	Jr., Sr.	None
6.	Organic Chem.	2	6	Jr., Sr.	Course 2
7.	Teachers	2	1	Sr.	Course 3
8.	Spec. Inorganic ....	..	..	Grad.	
9.	Electro-Chem. ....	..	..	Grad.	
10.	Organic Chem. ....	..	..	Grad.	
11.	Alkaloids ....	..	..	Grad.	
12.	Analytical Chem. ....	..	..	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 credit is given for the first semester; the laboratory fee is five dollars per 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** PROFESSOR 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; the laboratory fee is five dollars per 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** ASSISTANT PROFESSOR NICHOLSON AND MR FRARY
 Six credits (six hours per week) Both semesters
 Open to those who have completed course 2; the laboratory fee is five dollars per semester.
 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 (Gravimetric)** PROFESSOR SIDENER
 Three credits (six hours per week) First semester
 Open to those who have completed course 3; the laboratory fee is five dollars.
 Lectures and laboratory work. The course includes an introduction to quantitative and a beginning of gravimetric analysis.
5. **QUANTITATIVE ANALYSIS (Volumetric)** PROFESSOR SIDENER
 Three credits (six hours per week) Second semester
 Open to those who have completed course 4; the laboratory fee is five dollars.
 Lectures and laboratory work. The course includes an introduction to volumetric analysis with a discussion of standard solutions and the necessary stoichiometric calculations.
6. **ORGANIC CHEMISTRY** PROFESSOR FRANKFORTER, ASSISTANT PROFESSORS DERBY AND HARDING
 Six credits (six hours per week) Both semesters
 Open to those who have completed course 3.
 Lectures and laboratory work. The course includes the aliphatic and aromatic series with a preparation of the more important compounds.
7. **TEACHERS' COURSE** MISS COHEN
 One credit (one hour per week) Second semester
 Open to seniors who have completed course 3.
 This course is specially arranged for students who expect to teach. The course will be largely didactic, with the experimental work necessary to a thorough understanding of the new methods and theories.
8. **SPECIAL INORGANIC CHEMISTRY**
 Open to graduate students; other arrangements may be ascertained upon application to the department.
9. **ELECTRO-CHEMISTRY**
 Open to graduate students; other arrangements may be ascertained upon application to the department.
10. **ORGANIC CHEMISTRY**
 Open to graduate students; other arrangements may be ascertained upon application to the department.
11. **THE ALKALOIDS**
 Open to graduate students; other arrangements may be ascertained upon application to the department.
12. **ANALYTICAL CHEMISTRY**
 Open to graduate students; other arrangements may be ascertained upon application to the department.

GEOLOGY AND MINERALOGY

The requirement for a major in geology and mineralogy is the completion of eighteen credits from the courses offered by the department; for a minor, twelve credits. No recommendation for a teacher's certificate in geology and mineralogy is issued, but a minor recommendation to go with similar recommendations in biological or physical sciences may be obtained.

Students who desire to take double courses in geology may do so by electing any of the following combinations: First semester, 1 and 2, 1 and 6, 1 and 10, 6 and 7, 7 and 8, 10 and 12; second semester, 3 and 4, 5 and 6, 7 and 9, 7 and 10. 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 1908.

GEOLOGY

Table of Courses Offered in 1908-9.

No.	Title	Semester	Credits	Offered to	Prerequisite
1.	Gen. Geol.	1	3	Jr., Sr.	None
2.	Ess. Phys. Geog.	1	3	Jr., Sr.	None
3.	Indust. Geog.	2	3	Jr., Sr.	None
4.	Elements of Meteorology	2	3	Jr., Sr.	Course 1 or 2
5.	Geog. and Geol. of Minn.	2	3	Jr., Sr.	Course 1 or 2
6.	Historical Geol.	2	3	Jr., Sr.	Course 1
7.	Elements of Paleontol...	1	3	Jr., Sr.	Courses 1 and 7, or 8
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.	See statement
11.	Petrography	2	3	Jr., Sr.	Course 1
12.	Applied Geol.	1	3	Jr., Sr.	Course 10
13.	Ore Deposits	1	3	Jr., Sr.	Course 1
14.	Special Problems	2	2	Sr.	Course 1
15.	Method and Material of Geog.	1, 2	2	Jr., Sr.	Geol. 1 and Min. 1
16.	Outline Study of Miner- als and Rocks.....	1, 2	2	Jr., Sr.	Course 1 or 13
17.	Field and Lab. Practice.	1, 2	2	Sr.	None
18.	Petrographical Problems	1, 2	..	Jr., Sr.	None
19.	Keweenawan Eruptions.	1, 2	..	Grad.	See statement
20.	Glacial Geol.	1, 2	..	Grad.	See statement
21.	Paleontologic Geol. ....	..	3	Grad.	See statement
22.	Advanced Paleontology.	1, 2	6	Grad.	Courses 1, 6 and 8 Course 8

MINERALOGY					
1.	Elements of Min.	1	3	Soph., Jr., Sr.	None
2.	Descriptive Min.	1, 2	6	Soph., Jr., Sr.	None
3.	Quantitative Min.	2	3	Soph., Jr., Sr.	None
4.	Optical Min.	2	3	Sr.	Course 1
5.	Morphology of Minerals.	1	3	Jr., Sr.	Course 1
6.	Physico-Chem. Methods.	2	3	Sr.	
7.	Outline of Min.	1, 2	2	Jr., Sr.	None
8.	Original Problems	1, 2	..	Grad.	See statement
9.	Special Investigations . . .	..	..	Grad.	See statement
10.	Occurrences and Associ- ation	1, 2	..	Grad.	See statement

GEOLOGY

1. GENERAL GEOLOGY

Three credits (three hours per week)
Open to juniors and seniors.

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.

PROFESSOR HALL
First semester

2. **ESSENTIALS OF PHYSICAL GEOGRAPHY** ASSISTANT PROFESSOR LEHNERTS
 Three credits (three hours per week) First semester
 Open to juniors and seniors.
 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 PROFESSOR 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 local industries effected 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 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** 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 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** ASSISTANT PROFESSOR 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** ASSISTANT PROFESSOR SARDESON
 Three credits (three hours per week) First semester
 Open to juniors and seniors who have taken or are taking 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** ASSISTANT PROFESSOR 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** ASSISTANT PROFESSOR SARDESON
 Six credits (three hours per week) Both semesters
 Open to juniors and seniors who have completed course 3; 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. Kemp's *Handbook of Rocks*, 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 fitile 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. Text-book and reference reading.
13. **ORE DEPOSITS** PROFESSOR 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** PROFESSOR HALL
 Two credits (two hours per week) Second semester
 Open to seniors who have completed course 1 or 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** ASSISTANT PROFESSOR LEHNERTS
 Two credits (one hour per week) Both semesters
 Open to juniors and seniors; designed specially 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** PROFESSOR HALL AND MR. 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. **FIELD AND LABORATORY PRACTICE** PROFESSOR HALL AND ASSISTANT PROFESSOR 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.
18. **PETROGRAPHICAL PROBLEMS** PROFESSOR HALL AND MR. 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.
19. **THE KEWEENAWAN ERUPTIVES** PROFESSOR HALL AND MR. 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 problem in the Keweenaw to be selected on consultation.
20. **GLACIAL GEOLOGY** PROFESSOR 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.
21. **PALEONTOLOGIC GEOLOGY** ASSISTANT PROFESSOR 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.
22. **ADVANCED PALEONTOLOGY** ASSISTANT PROFESSOR SARDESON
 Six credits (three hours per week) Both semesters
 Open to graduate students who have completed course 8.
 The 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** 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.
2. **DESCRIPTIVE MINERALOGY** PROFESSOR HALL AND MR. 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** PROFESSOR APPELEY AND ASSISTANT
PROFESSOR 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 value 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.
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** Second semester
Three credits (three hours per week)
Open to seniors.
The method of micro-chemical analysis 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**
PROFESSOR HALL AND MR. GROUT
Both semesters
Open to graduate students; other arrangements may be ascer-
tained upon application to the department.
Investigations in mathematical crystallography and its application 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 ascer-
tained 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 com-
pounds 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** PROFESSOR HALL AND MR. GROUT
Both semesters
Open to graduate students; other arrangements may be ascer-
tained upon application to the department.
A discussion of genetic relationships. Field work in connection with the
different phases of the particular problem in hand.

PHYSICS

The requirement for a major in physics is the completion of eighteen credits from the courses offered by the department; for a minor, twelve credits. For distinction in physics the special requirements of the department are the completion of courses 5, 6, and 7, and three other courses selected from those open to juniors and seniors, together with mathematics 6 and 7;

work in the department must be pursued during the senior year. To obtain the recommendation of the department for a teacher's certificate courses 1 to 4 inclusive, 20, four other credits in physics, and six credits in chemistry, or courses 5, 6, 20, and six credits in chemistry, must be completed.

Table of Courses Offered in 1908-9.

No.	Title	Semester	Credits	Offered to	Prerequisite
1.	Gen. Physics	1	3	Soph., Jr., Sr.	Math. 4
2.	Gen. Lab. Practice.....	1	1	Soph., Jr., Sr.	See statement
3.	Gen. Physics	2	3	Soph., Jr., Sr.	Course 1
4.	Gen. Lab. Practice.....	2	1	Soph., Jr., Sr.	See statement
5.	Adv. Gen. Physics.....	1	6	Soph., Jr., Sr.	Math. 4
6.	Adv. Gen. Physics.....	2	6	Soph., Jr., Sr.	Course 5
7.	Electrical Measurements	1	3	Jr., Sr.	Courses 5 and 6
8.	Physical Manip. and Lab. Technique	2	3	Jr., Sr.	Courses 5 and 6
9.	Dynamics	1	3	Jr., Sr.	Courses 5 and 6, and Math. 6 and 7
10.	Adv. Physical Measurements	1	3	Sr. Grad.	Courses 5 and 6
11.	Adv. Physical Measurements	1	6	Sr. Grad.	Courses 5 and 6
12.	Theory of Light	2	3	Grad.	Courses 5 and 6, and Math. 6 and 7
13.	Elect. Meas. of Precision	2	3	Sr.	Course 7
14.	Radioactivity	1, 2	6	Grad.	Courses 5 and 6
15.	Adv. Phys. Measurements	2	3	Grad.	Courses 5 and 6
16.	Adv. Phys. Measurements	2	6	Sr. Grad.	Courses 5 and 6
17.	Kinetic Theory of Gases	2	3	Grad.	Courses 5 and 6, and Math. 6 and 7
18.	Discharge of Elect. thru Gases	1	3	Grad.	Courses 5 and 6, and Math. 6 and 7
19.	Math Theory of Elect. and Magnetism	2	3	Grad.	Courses 5 and 6, and Math. 6 and 7
20.	Teachers' Course	2	1	Sr.	Courses 1-4 incl., or 5 and 6

1. GENERAL PHYSICS PROFESSOR JOHN ZELFNY
 Three credits (three hours per week) First semester
 Open to sophomores, juniors, and seniors; may be taken separately or in conjunction with course 2.

Mechanics of solids and fluids, heat and sound. This is the first part of a general course in physics. The treatment is experimental rather than mathematical. The course is designed to give the student a general knowledge of the fundamental principles of the subject and will be found specially useful to those pursuing other sciences. 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 PROFESSOR JOHN ZELFNY
 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 a general course in physics. 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 2; the laboratory fee is three dollars.
 Physical measurements in light, electricity, and magnetism, giving the
 student a knowledge of experimental methods.
5. **ADVANCED GENERAL PHYSICS** PROFESSOR JONES, ASSISTANT
PROFESSORS ANTHONY ZELENY, AND ERIKSON
 Six credits (seven hours per week) First semester
 Open to sophomores, juniors, and seniors, who have completed
 mathematics 4 (trigonometry); the laboratory fee is three
 dollars; adapted to those students who expect to specialize in
 physics, to teach the science, or to enter upon a technical
 course.
 Mechanics of solids and fluids, the properties of matter, heat, and sound.
 This course is intended to give a thorough training in general physics and
 includes the solution of numerous problems. There will be two lectures,
 three recitations, and one laboratory (double) period each week.
6. **ADVANCED GENERAL PHYSICS** PROFESSOR JONES, ASSISTANT
PROFESSORS ANTHONY ZELENY, AND ERIKSON
 Six credits (seven hours per week) Second semester
 Open to sophomores, juniors, and seniors, who have completed
 course 5; the laboratory fee is three dollars; intended for those
 students who wish to specialize in the science, to teach the
 subject, or to enter upon a technical course.
 Light, electricity, and magnetism. This course completes the work in
 general physics. There will be two experimental lectures, three recitations,
 and one (double) laboratory period each week.
7. **ELECTRICAL MEASUREMENTS** ASSISTANT PROFESSOR ANTHONY ZELENY
 Three credits (five hours per week) First semester
 Open to juniors and seniors who have completed courses 5 and 6;
 the laboratory fee is five dollars.
 The course aims to give a thorough practical knowledge of electrical
 instruments and the fundamental electrical measurements. The system of
 electrical units is developed theoretically and experimentally. There will be
 two (double) laboratory periods each week, the class being divided into
 sections for that purpose.
8. **PHYSICAL MANIPULATION AND LABORATORY TECHNIQUE** PROFESSOR JOHN ZELENY
Second semester
 Three credits (six hours per week)
 Open to juniors and seniors who have completed courses 5 and 6;
 the laboratory fee is three dollars; especially valuable to those
 who intend to teach the science or to specialize in it.
 The object of this 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 gauges, etc.)
9. **DYNAMICS** PROFESSOR JONES
 Three credits (three hours per week) First semester
 Open to juniors and seniors who have completed courses 5 and 6,
 and mathematics 6 and 7 (calculus).
 A discussion of some problems in dynamics which are important in the
 study of advanced physics.
10. **ADVANCED PHYSICAL MEASUREMENTS** PROFESSOR JOHN ZELENY
 Three credits (six hours per week) First semester
 Open to 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 spe-
 cially 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.

11. **ADVANCED PHYSICAL MEASUREMENTS** PROFESSOR JOHN ZELENY
Six credits (twelve hours per week) First semester
Open to 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.
12. **THE THEORY OF LIGHT** PROFESSOR JONES
Three credits (three hours per week) Second semester
Open to graduate students who have completed courses 5 and 6,
and mathematics 6 and 7 (calculus).
A study of the important optical phenomena. Preston's *Theory of Light*
is used as a text.
13. **ELECTRICAL MEASUREMENTS OF PRECISION** ASSISTANT PROFESSOR
ANTHONY ZELENY
Three credits (six hours per week) Second semester
Open to seniors who have completed course 7; the laboratory fee
is three dollars; intended for electrical engineering and scien-
tific 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 measure-
ments of highest precision; experimental problems involving capacity, in-
ductance, and magnetic flux; measurement of temperatures by electrical
methods.
14. **RADIO-ACTIVITY** MR. KOVARIK
Six credits (three hours per week) Both semesters
Open to graduate students who have completed courses 5 and 6.
The course consists entirely of lectures, experimental and descriptive.
The various theories and the methods of investigation are fully considered.
15. **ADVANCED PHYSICAL MEASUREMENTS** PROFESSOR 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.
16. **ADVANCED PHYSICAL MEASUREMENTS** PROFESSOR 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 5, except that twice as much time is devoted to the
subject.
17. **THE KINETIC THEORY OF GASES** ASSISTANT PROFESSOR ERIKSON
Three credits (three hours per week) Second semester
Open to graduate students who have completed courses 5 and 6,
and mathematics 6 and 7 (calculus).
This course is a study of Meyer's *Kinetic Theory of Gases*.
18. **DISCHARGE OF ELECTRICITY THROUGH GASES** PROFESSOR JOHN ZELENY
Three credits (three hours per week) First semester
Open to graduate students who have completed courses 5 and 6,
and mathematics 6 and 7 (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, radioactive
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.
19. **THE MATHEMATICAL THEORY OF ELECTRICITY AND MAGNETISM**
PROFESSOR JOHN ZELENY
Three credits (three hours per week) Second semester
Open to graduate students who have completed courses 5 and 6,
and mathematics 6 and 7 (calculus).
This course consists in the study of J. J. Thomson's *Elements of the
Mathematical Theory of Electricity and Magnetism*.

20. **TEACHERS' COURSE** PROFESSOR JONES
 One credit (one hour per week) Second semester
 Open to seniors who have completed courses 1 to 4 or courses
 5 and 6.

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.

VI. Pure and Applied Mathematics

MATHEMATICS

The requirement for a minor in mathematics is the completion of courses 3, 4, 5 and 6; for a major, the same courses and in addition course 7 and three other credits. For distinction in mathematics the special requirement of the department is one year of pure mathematics in addition to the requirements for a major. To obtain the recommendation of the department for a teacher's certificate an average of at least *good* must be obtained in courses 3, 4, 5, 6, and 8 or 9.

MATHEMATICS

Table of Courses Offered in 1908-9.

No.	Title	Semester	Credits	Offered to	Prerequisite
1.	Higher Alg. Part I.	1	5	Fresh.	See statement
2.	Solid Geom.	2	5	Fresh.	See statement
3.	Higher Alg. Part II.	1	3	Fresh.	See statement
4.	Trigonometry	2	3	Fresh.	See statement
5.	Analyt. Geom.	1	3	Soph., Jr., Sr.	Courses 3 and 4
6.	Differential Calculus. . .	2	3	Soph., Jr., Sr.	Courses 3, 4 and 5
7.	Integral Calculus	1	3	Jr., Sr.	Courses 3, 4, 5 and 6
8.	Adv. Algebra	1	3	Soph., Jr., Sr.	Courses 3 and 4
9.	Theory of Equations	2	3	Soph., Jr., Sr.	Courses 3, 4 and 8
10.	Differential Equations. .	2	3	Jr., Sr.	Courses 3-7 incl.
11.	Adv. Plane Anal. Geom. .	1	3	Jr., Sr.	Courses 3-6 incl.
12.	Solid Anal. Geom.	2	3	Jr., Sr.	Courses 3-8 incl.
13.	Math. Pedagogy	2	1		Courses 3 and 4
14.	Method of Least Squares	2	2	Jr., Sr.	Courses 3-7 incl.
15.	Descriptive Geom.	1, 2	4*	Jr., Sr.	Courses 3, 4 and 5
16.	Adv. Diff. and Int. Cal..	1, 2	4	Grad.	Courses 3 to 7 incl.
17.	Theory of Curves and Surfaces	1, 2	4	Grad.	Courses 3-7 incl. and 10 and 12
18.	Galois Theory of Equa- tions	1, 2	4	Grad.	Courses 3-9 incl.
19.	Functions of a Complex Variable	1, 2	4	Grad.	Courses 1-10 incl.
20.	Projective Geom.	1, 2	4	Grad.	Courses 3-7 incl., and 11 and 12
21.	Elliptic Integrals	1, 2	4	Grad.	Courses 3-7 incl., and 10

MECHANICS

1. Applied Mechanics 1, 2 10 Sr. Math. 3-7 incl.

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

1. **FIRST PART OF HIGHER ALGEBRA** MESSRS MANCHESTER AND SHUMWAY
 Five credits (five hours per week) First semester
 Required of freshmen who do not have an entrance credit in
 the subject; must be followed by course 3; not open to those
 who have taken the subject in the preparatory school; not
 credited toward a minor in mathematics.

The fundamental rules, factoring, highest common divisor, lowest common multiple, fractions, involution, evolution, surds, imaginaries, simple equations

with one, two or more unknown quantities, ratio, proportion, problems.

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. SOLID GEOMETRY MESSRS. MANCHESTER AND SHUMWAY
 Five credits (five hours per week) Second semester
 Required of freshmen who have no entrance credit in the subject;
 not open to those who have taken the subject in the prepara-
 tory school; not credited toward a minor in mathematics; not
 to be offered after 1907-8.

Demonstrations, exercises, and problems.

3. SECOND PART OF HIGHER ALGEBRA PROFESSOR BAUER, ASSISTANT
 PROFESSOR BUSSEY, MESSRS. DALAKER, MANCHESTER AND SHUMWAY
 Three credits (three hours per week) First semester
 Open to those who have completed course 1; required of all
 freshmen.

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 PROFESSOR BAUER, ASSISTANT PROFESSOR BUSSEY,
 MESSRS. DALAKER, MANCHESTER, AND SHUMWAY
 Three credits (three hours per week) Second semester
 Open to those who have completed courses 1 and 3, and required
 of freshmen who take course 3.

Text, tables, and numerous problems.

5. ANALYTICAL GEOMETRY PROFESSOR DOWNEY, ASSISTANT PROFESSOR
 BUSSEY, MESSRS. DALAKER AND MANCHESTER
 Three credits (three hours per week) First semester

Open to those who have completed courses 3 and 4; courses 8 and 9 can be taken in conjunction with this course and course 6, and this is recommended to students specializing in mathematics.

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 equations.

6. DIFFERENTIAL CALCULUS PROFESSOR DOWNEY, ASSISTANT PROFESSOR
 BUSSEY, MESSRS. DALAKER AND MANCHESTER
 Three credits (three hours per week) Second semester

Open to those who have completed courses 3 to 5 inclusive.

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.

7. INTEGRAL CALCULUS PROFESSOR DOWNEY
 Three credits (three hours per week) First semester

Open to those who have completed courses 3 to 6 inclusive.

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 volume.

8. ADVANCED COURSE IN ALGEBRA MESSRS. DALAKER AND SHUMWAY
 Three credits (three hours per week) First semester

Open to those who have completed courses 3 and 4; may be taken in conjunction with course 5.

Indeterminate equations, Sturm's theorem and method, recurring equations, series with applications to interpolation and piles of spheres, permutations and combinations, determinants.

9. THEORY OF EQUATIONS MR. SHUMWAY
 Three credits (three hours per week) Second semester

Open to those who have completed courses 3, 4, and 8; may be taken in conjunction with course 6.

Based on the texts of Cojori and Burnside and Pantou.

10. DIFFERENTIAL EQUATIONS PROFESSOR DOWNEY
Three credits (three hours per week) Second semester
Open to those who have completed courses 3 to 7 inclusive.
Text and lectures.
11. ADVANCED COURSE IN PLANE ANALYTICAL GEOMETRY PROFESSOR BAUER
Three credits (three hours per week) First semester
Open to those who have completed courses 3 to 6 inclusive.
Supplementary to course 5, treating more fully some of the subjects of
that course and taking up additional subjects.
12. SOLID ANALYTICAL GEOMETRY PROFESSOR BAUER
Three credits (three hours per week) Second semester
Open to those who have completed courses 3 to 8 inclusive.
A lecture course. 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. Nu-
merous examples are assigned to illustrate the theory.
13. MATHEMATICAL PEDAGOGY PROFESSOR BAUER
One credit (one hour per week) Second semester
Open to those who have completed courses 3 and 4.
A lecture course, in which special attention is paid to the fundamental
principles of algebra and geometry.
14. METHOD OF LEAST SQUARES PROFESSOR LEAVENWORTH
Two credits (two hours per week) Second semester
Open to those who have completed courses 3 to 7 inclusive.
A study of the combination and adjustment of observations and the
discussion of their precision as applied especially to engineering, physics, and
astronomy.
15. DESCRIPTIVE GEOMETRY PROFESSOR KIRCHNER
(In the College of Engineering)
Four credits (two hours per week) Both semesters
Open to those who have completed courses 3 to 5 inclusive;
both semesters must be completed before credit is given for the
first semester.
Problems relating to points, lines, planes, solids, surfaces of revolution
and warped surfaces; orthographic, isometric, horizontal, oblique, and
perspective projections; shades and shadows. Recitations, lectures, and
practice.
16. ADVANCED DIFFERENTIAL AND INTEGRAL CALCULUS PROFESSOR DOWNEY
Four credits (two hours per week) Both semesters
Open to graduate students who have completed courses 3 to 7
inclusive.
This course goes farther into some of the subjects treated in courses 6
and 7 and takes up some important subjects not included in those courses.
17. THEORY OF CURVES AND SURFACES PROFESSOR BAUER
Four credits (two hours per week) Both semesters
Open to graduate students who have completed courses 3 to 7
inclusive and 10 and 12.
This is a course in differential geometry. The fundamental equations
of the theory of curves and of surfaces will be developed. The work will be
based upon Scheffer's *Theorie der Curven und Flaechen*.
18. THE GALOIS THEORY OF EQUATIONS ASSISTANT PROFESSOR BUSSEY
Four credits (two hours per week) Both semesters
Open to graduate students who have completed courses 3 to 9
inclusive.
19. THEORY OF FUNCTIONS OF A COMPLEX VARIABLE DR. MANCHESTER
OR MR. DALAKER
Four credits (two hours per week) Both semesters
Open to graduate students who have completed courses 1 to 10
inclusive.
Lectures, readings, and problems.
20. PROJECTIVE GEOMETRY ASSISTANT PROFESSOR BUSSEY
Four credits (two hours per week) Both semesters
Open to graduate students who have completed courses 3 to 7
inclusive and courses 11 and 12.

21. **ELLIPTIC INTEGRALS** ASSISTANT PROFESSOR BROOKE
 (In the College of Engineering)
 Four credits (two hours per week) Both semesters
 Open to graduate students who have completed courses 3 to 7
 inclusive and course 10.

MECHANICS

1. **APPLIED MECHANICS** PROFESSOR EDDY
 (In the College of Engineering)
 Ten credits (five hours per week) Both semesters
 Open to seniors who have completed mathematics 3 to 7 inclusive.
 Recitations and lectures. Statics, dynamics, strength and elastic prop-
 erties of the ordinary materials of construction, hydro-mechanics.

ASTRONOMY

ASTRONOMICAL OBSERVATORY

The students' 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 students' meridian circle and zenith telescope; a Repsold photographic measuring machine, a chronograph, and astronomical clocks.

The requirements for a major in astronomy are the completion of courses 1 and 2 (the latter as a six-hour course); for a minor, courses 1 and 2 (the latter as a three-hour course). For distinction in astronomy the special requirements of the department are the completion of courses 1 (taking in addition laboratory work with instruments three hours per week), 2 (as a six-hour course), and six credits in physics.

Table of Courses Offered in 1908-9.

No.	Title	Semester	Credits	Offered to	Prerequisite
1.	Gen. Astronomy	1, 2	6	Soph., Jr., Sr.	Math. 4
2.	Practical Astronomy	1, 2	6 or 12	Jr., Sr.	Course 1 and Math. 5, 6 and 7
3.	Adv. Practical Astronomy	1, 2	6	Grad.	Courses 1 and 2
4.	Celestial Mechanics	1, 2	6	Grad.	Courses 1 and 2
5.	Astrophotography	1, 2	6	Grad.	Courses 1 and 2

1. **GENERAL ASTRONOMY** PROFESSOR LEAVENWORTH
 Six credits (three hours per week) Both semesters
 Open to those who have completed mathematics 4 (trigonometry).
 A study of the general principles of astronomy illustrated by lantern
 slides and telescopic observations.
2. **PRACTICAL ASTRONOMY** PROFESSOR 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 5, 6, and 7.
 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.
3. **ADVANCED PRACTICAL ASTRONOMY** PROFESSOR LEAVENWORTH
 Six credits (three hours per week) Both semesters
 Open to graduate students who have completed courses 1 and 2.
4. **CELESTIAL MECHANICS** PROFESSOR LEAVENWORTH
 Six credits (three hours per week) Both semesters
 Open to graduate students who have completed courses 1 and 2.
5. **ASTROPHOTOGRAPHY** PROFESSOR LEAVENWORTH
Both semesters
 Open to graduate students who have completed courses 1 and 2.
 Photography of the heavenly bodies, measurement of plates, deter-
 mination of positions, parallax, etc.

VII. Philosophy, Education and Sociology

PHILOSOPHY AND PSYCHOLOGY

The requirement for a major in philosophy and psychology is the completion of eighteen credits from courses offered by the department; for a minor, twelve credits. For distinction in philosophy and psychology the special requirement of the department is the completion of twenty-four credits from the courses offered by the department, of which at least three must be 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 to 12 inclusive.
3. *Advanced intensive courses*: 13 to 23 inclusive. 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, 8 and 14.
3. Fundamental courses in philosophy: 1, 2, 9, 10, 11 and 13.

Table of Courses Offered in 1908-9.

No.	Title	Semester	Credits	Offered to	Prerequisite
1.	Introductory Psych.	1	3	Soph., Jr., Sr.	None
2.	Logic	1 or 2	3	Soph., Jr., Sr.	None
3.	Educational Psych.	2	3	Soph., Jr., Sr.	Course 1
4.	Exp. Psych.: The Senses	1	3	Jr., Sr.	Course 1
5.	Exp. Psych.: Higher Mental Processes	2	3	Jr., Sr.	Courses 1 and 4
7.	Psychological Interpretation	1	3	Jr., Sr.	Course 1
8.	Psychological Principles	2	3	Jr., Sr.	Courses 1 and 2
9.	Ancient and Med. Philos	1	3	Jr., Sr.	Course 1 or 2
10.	Modern Philosophy	2	3	Jr., Sr.	Course 1 or 2
11.	Principles of Ethics	1	3	Jr., Sr.	Course 1 or 2
12.	Phil. of Religion	2	3	Jr., Sr.	Course 1 or 2
13.	Logic of Science	2	3	Jr., Sr.	Course 2
14.	Psychological Problems.	1, 2	..	Sr. Grad.	Courses 1, 4 and 5
15.	Research in Psych.	1, 2	6†	Grad.	Course 14
*16.	Descartes, Spinoza, Leibnitz	1, 2	6†	Sr. Grad.	Courses 9 and 10
*17.	Kant	1, 2	6†	Sr. Grad.	Courses 9 and 10
*18.	Hume	1, 2	6†	Sr. Grad.	Courses 9 and 10
19.	Herbert Spencer	2	3	Sr. Grad.	Courses 1 and 2
*20.	Metaphysics	1, 2	6†	Sr. Grad.	Courses 9 and 10, or 13
*21.	Systematic Ethics	1, 2	6†	Sr. Grad.	Courses 9, 10 and 11
*22.	Hist. of Ethics	1, 2	6†	Sr. Grad.	Courses 9, 10 and 11
*23.	German Idealism	1, 2	6†	Grad.	Courses 9, 10 and 17

†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** PROFESSOR WILDE, ASSISTANT PROFESSORS MINER AND SWENSON, AND MR. HAYNES
 Three credits (three hours per week) First 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 PROFESSOR WILDE, ASSISTANT PROFESSOR SWENSON,
AND MR. HAYNES
Three credits (three hours per week) Repeated each semester
Open to sophomores, juniors, and seniors.
A study of the nature, knowledge, and 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 ASSISTANT PROFESSOR MINER AND MR. HAYNES
Three credits (three hours per week) Second 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 ASSISTANT PROFESSOR MINER
AND MR. 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 must 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
ASSISTANT PROFESSOR 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 ASSISTANT PROFESSOR MINER
Three credits (three hours per week) Second semester
Open to juniors and seniors who have completed course 1; not given in 1908-9.
A study of the methods and accredited results of experimental investigation in psychology. Class-room demonstrations, lectures, and discussion.
7. PSYCHOLOGICAL INTERPRETATION ASSISTANT PROFESSOR 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. PSYCHOLOGICAL PRINCIPLES ASSISTANT PROFESSOR SWENSON
Three credits (three hours per week) Second 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.

9. ANCIENT AND MEDIAEVAL PHILOSOPHY PROFESSOR 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 PROFESSOR 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 PROFESSOR 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 PROFESSOR 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 signifi-
 cance; an analysis of the conception of God and a discussion of the place
 and function of religion in modern life.

ADVANCED INTENSIVE COURSES

13. LOGIC OF SCIENCE ASSISTANT PROFESSOR 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.
14. PSYCHOLOGICAL PROBLEMS ASSISTANT PROFESSOR 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 or special topics.
15. RESEARCH IN PSYCHOLOGY ASSISTANT PROFESSOR MINER
 Both semesters
 Six credits (three hours per week)
 Open to graduate students who have completed course 14; 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.
16. THE PHILOSOPHY OF DESCARTES, SPINOZA, AND LEIBNITZ ASSISTANT PROFESSOR SWENSON
 Both semesters
 Six credits (three hours per week)
 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.

17. **THE PHILOSOPHY OF KANT** ASSISTANT PROFESSOR 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 semesters 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.
18. **THE PHILOSOPHY OF HUME** ASSISTANT PROFESSOR 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 critical reading of Hume's philosophical works; the position of Hume
 in the development of English philosophy.
19. **THE PHILOSOPHY OF HERBERT SPENCER** ASSISTANT PROFESSOR SWENSON
 Three credits (three hours per week) Second semester
 Open to seniors and graduate students who have completed
 courses 1 and 2.
 A critical reading of the *First Principles* with references to other im-
 portant features of the *Synthetic Philosophy* and to the philosophical charac-
 ter of the modern scientific movement. The course is intensive, the aim
 being to develop the power of philosophical criticism in regard to such
 questions as the logical foundations of the theory of evolution, the relations
 of science and religion, and the place of the scientific interest among the
 other interests of life.
20. **METAPHYSICS** ASSISTANT PROFESSOR 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 semesters must be completed
 before credit is given for the first semester.
 A critical and constructive discussion of theories of knowledge and
 reality.
21. **SYSTEMATIC ETHICS** PROFESSOR 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.
22. **HISTORY OF ETHICS** PROFESSOR 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.
23. **GERMAN IDEALISM** PROFESSOR WILDE
 Six credits (three hours per week) Both semesters
 Open to graduate students who have completed courses 9, 10,
 and 17; 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.

EDUCATION

The requirement for a major in education is the completion of eighteen credits from courses offered by the department; for a minor, twelve credits.

Table of Courses Offered in 1908-9.

No.	Title	Semester	Credits	Offered to	Prerequisite
1.	Hist. of Educ. to Reformation	1	3	Jr., Sr.	None
2.	Hist. of Mod. Education	2	3	Jr., Sr.	Course 1
3.	Educational Psych.	2	3	Soph., Jr., Sr.	Philosophy 1
4.	Secondary Education ..	1	3	Jr., Sr.	Courses 1 and 2
5.	Prin. and Org. of El. Teaching	2	3	Sr.	Courses 1, 2 and Philosophy 1
6.	Prin. and Org. of Sec. Teaching	2	3	Jr., Sr.	Course 4
7.	Theory of Education ...	1	3	Jr., Sr.	Philosophy 1
8.	School Administration..	1	3	Sr.	Courses 1 and 2
9.	School Supervision	2	3	Sr.	See statement
10.	Comp. Study of Sch. System	2	3	Sr.	Courses 1 and 2
11.	Modern Educ. Theories..	2	3	Sr.	Courses 1 and 2, and Philosophy 1
12.	Current Prob. in Elem. Teaching	1	2	Sr. Grad.	Course 5
13.	Educational Classics ...	1	2	Sr.	Courses 1 and 2
14.	Current Prob. in Sec. Teaching	2	2	Sr. Grad.	Course 6
15.	Probl. in Sch. Administration	2	2	Sr. Grad.	Courses 1 and 2
16.	School Sanitation	1	2	Sr. Grad.	None
17.	Organization of Higher Education	2	1	Sr. Grad.	Courses 1 and 2

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 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 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 ASSISTANT PROFESSOR MINER AND MR. 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** PROFESSOR JAMES
Three credits (three hours per week) 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** PROFESSOR RANKIN
Three credits (three hours per week) 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 school 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** PROFESSOR RANKIN
Three credits (three hours per week) Second semester
Open to seniors who have completed courses 1 and 2, and who have completed course 4 or are pursuing course 10.
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** PROFESSOR JAMES
Three credits (three hours per week) 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** PROFESSOR RANKIN
Three credits (three hours per week) 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. This course is planned for students without any teaching experience, who hope later to do work in supervision.
9. **SCHOOL SUPERVISION** PROFESSOR RANKIN
Three credits (three hours per week) Second semester
Open to seniors; intended only for students with experience in teaching; credit will not be given both for course 8 and for course 9.
An advanced course treating of the duties of principals and superintendents.
10. **COMPARATIVE STUDY OF SCHOOL SYSTEMS** PROFESSOR JAMES
Three credits (three hours per week) 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** PROFESSOR JAMES
Three credits (three hours per week) Second semester
Open to seniors who have completed courses 1 and 2, and philosophy 1.
An advanced course in educational theory, dealing particularly with the contributions of Rousseau, Froebel, and Herbart, special emphasis being laid upon one of these writers in each successive year.

12. **CURRENT PROBLEMS IN ELEMENTARY TEACHING** PROFESSOR 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 student under the direction of the instructor through readings, the visiting of schools, and through class discussions.

13. **EDUCATIONAL CLASSICS** PROFESSOR 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 the detailed study of corresponding periods in educational history.

14. **CURRENT PROBLEMS IN SECONDARY TEACHING** PROFESSOR 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** PROFESSOR 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** PROFESSOR 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 well-being of the pupils.

17. **ORGANIZATION OF HIGHER EDUCATION** PROFESSOR 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.

ANTHROPOLOGY

See sociology and anthropology, pp. 109-111.

VIII. Social Sciences

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 departments unite in the following recommendations for the freshman 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 adviser selected from the department in which the major subject is taken.

ECONOMICS AND POLITICAL SCIENCE

DEPARTMENT REQUIREMENTS

Students taking a major (eighteen credits) in the department will take it all in one line of work (either economics or political science); and in addition will take a minor in the other line of work represented in the department.

Students taking one minor (twelve credits) in the department will take it all in either economics or political science. They may, however, take two minors, one in each line of work.

Students desiring a recommendation for a teacher's certificate must complete either a major or a minor in the department, according to the foregoing definitions. All desiring a recommendation to teach business subjects must complete a major in economics. For distinction in economics or political science the special requirements of the department are the completion of at least twenty-four credits in the line chosen and a minor in the other. The thesis must be typewritten and shall be filed in the department. in the department.

All students taking a major in the department must secure the approval of their official advisers for forty-eight credits. Of these, not less than six credits in the case of an ordinary major, and not less than twelve credits in the case of a degree with distinction, shall be taken in other departments of the social science group.

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		In Preparation for	POLITICAL SCIENCE	
Courses advised for a minor.	Additional advised for a major		Courses advised for a minor	Additional advised for a major
6, 7, 11, 10, 27	5, 28, 8, 9, 24 or 30	Law	2, 3, 8, 15, 7	4, 5, 10, 9, 12, 14
3, 6, 7, 11, 10	29, 26, 27	Public Service	2, 3, 7, 15, 14, 9	8, 4, 5, 10, 12
2, 3, 12, 13, 29	5, 28, 8, 9	Consular and Diplomatic Service	2, 3, 5, 10, 14	4, 8, 12
5, 28, 6, 7, 11, 10	29, 30, 16, 26	Journalism	2, 3, 7, 8, 9, 10	4, 5, 12
8, 9, 11, 10	16, 19, 20, 22	Engineering or Railway Service	6, 7, 14, 15,	4, 8
2, 12, 13, 11, 16	19, 20, 22, 29	Chemistry or Manufactures	2, 3, 7, 14, 9	8, 12, 14
8, 9, 11, 16	2, 12, 13, 20	Mining	2, 3, 7, 15, 9	8, 12, 14
5, 28, 15, 29	19, 20, 25	Insurance or Banking	2, 3, 7, 14, 15	4, 8, 10, 12
2, 3, 5, 28, 12, 13	19, 20, 22, 25	General Business	2, 3, 7, 15, 9	8, 12, 15
2, 14, 23, 12, 13	8, 9, 5, 19, 20	Forestry or Agriculture	2, 3, 15, 14	9, 12, 8
2, 3, 5, 28, 30	19, 20, 22, 24	Teaching Business Subjects or American Government	2, 3, 7, 9, 15	4, 5, 12, 10, 8, 14
1, 3, 5, 18	6, 7, 11, 10	Medicine	2, 3, 7, 15, 9	8, 12, 15
3, 16, 17, 18	26, 27, 24 or 30	Charity Work or the Ministry	2, 3, 7, 8	9, 12, 15

ECONOMICS

Table of Courses Offered in 1908-9.

No.	Title	Semester	Credits	Offered to	Prerequisite
INTRODUCTORY COURSES:					
1.	Elements of Economics	1 or 2	3	Soph., Jr., Sr.	None
2.	Economic Geography...	1	3	Soph., Jr., Sr.	None
3.	Indus. and Com. Hist...	1, 2	3	Soph., Jr., Sr.	None
GENERAL COURSES:					
4.	Advanced Economics...	2	3	Soph., Jr., Sr.	Course 1
5.	Money and Banking...	1 or 2	3	Soph., Jr., Sr.	Course 1
28.	Financ. Hist. of the U. S.	2	3	Soph., Jr., Sr.	Courses 1 and 5
6.	Public Finance	1	3	Soph., Jr., Sr.	Course 1
7.	Problems in Taxation...	2	3	Soph., Jr., Sr.	Course 6
8.	Econs. of Transportation and Communication	2	3	Soph., Jr., Sr.	Courses 1, 2 or 3
9.	*Railway Economics...	1	3	Soph., Jr., Sr.	Course 8
11.	The Modern Bus. Corporation	1	3	Soph., Jr., Sr.	Course 1
10.	Municipal Industries	2	3	Soph., Jr., Sr.	Course 1
12.	*Economics of Commerce	1	3	Soph., Jr., Sr.	Courses 1, 2 or 3
13.	*Econ. of Colonization...	2	3	Soph., Jr., Sr.	Courses 1, 2 or 3
26.	*Social Theories and Reforms	1	3	Soph., Jr., Sr.	Course 1
27.	*The State in Relation to Industry	2	3	Soph., Jr., Sr.	Course 26
16.	Labor Problems, Part I.	1	3	Soph., Jr., Sr.	Course 1
17.	Labor Problems, Part II.	2	3	Soph., Jr., Sr.	Course 1
18.	Charities and Corrections	1 or 2	3	Soph., Jr., Sr.	Courses 1 or 3, or Soc. 1
BUSINESS COURSES:					
19.	The Principles of Accounting	1, 2	3	Soph., Jr., Sr.	Course 1
20.	The Elem. of Bus. Law.	2	3	Soph., Jr., Sr.	Course 1
22.	Business Organization...	2	3	Soph., Jr., Sr.	Course 1
23.	Economics of Forestry and Irrigation	1	3	Soph., Jr., Sr.	Course 1 or 2
14.	Economics of Agriculture	2	3	Soph., Jr., Sr.	Course 1 or 2
15.	Economics of Insurance.	1	3	Soph., Jr., Sr.	Course 1
25.	Economics of Investment and Speculation	2	3	Jr., Sr.	Course 5
ADVANCED AND GRADUATE COURSES:					
29.	*Theory and Practice of Statistics	1	2	Jr., Sr.	Six credits in Econ.
30.	*Hist. of Econ. Thought	1	2	Jr., Sr.	Six credits in Econ.
24.	*Scope and Methods of Economics	1	2	Jr., Sr.	Six credits in Econ.
21.	Seminar in Economics..	1, 2	3-6	Sr.	Twelve cred. in Ec.

*Starred courses are not given every year.

INTRODUCTORY COURSES

- 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. 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.
- ECONOMIC GEOGRAPHY** 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.

GENERAL COURSES

4. ADVANCED ECONOMICS PROFESSOR 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 largely 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.
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, topics, 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 view point of public wants. Budget systems 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, interurban electric lines, steam railways, inland waterways, and ocean transportation; the organization of ocean commerce. Lectures, assigned readings, and discussions.

9. RAILWAY ECONOMICS PROFESSOR ROBINSON
 Three credits (three hours per week) First semester
 Open to those who have completed courses 1 and 8, and to students in the technical colleges.
 An advanced 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.
11. THE MODERN BUSINESS CORPORATION PROFESSOR 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.
10. MUNICIPAL INDUSTRIES PROFESSOR GRAY
 Three credits (three hours per week) Second semester
 Open to those 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 of such industries. The general question of municipal ownership. Text-books, lectures, and quizzes.
12. ECONOMICS OF COMMERCE PROFESSOR ROBINSON
 Three credits (three hours per week) First semester
 Open to those who have completed course 1, 2, or 3.
 Causes and characteristics of commercial crises; theory and mechanism of international commerce; free trade, reciprocity and protection; 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 PROFESSOR ROBINSON
 Three credits (three hours per week) Second semester
 Open to those who have completed course 1, 2, or 3.
 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.
26. SOCIAL THEORIES DR. PHELAN
 Three credits (three hours per week) First semester
 Open to those who have completed course 1.
 A survey of social Utopias 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.
27. THE STATE IN RELATION TO INDUSTRY Second semester
 Three credits (three hours per week)
 Open to those who have completed courses 1 and 26.
 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** DR. PHELAN
 Three credits (three hours per week) First semester
 Open to those 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 well-being. Lectures, text-book, assigned readings, and discussions.
17. **LABOR PROBLEMS: Part II** DR. PHELAN
 Three credits (three hours per week) Second semester
 Open to those who have completed course 1, but should also be preceded by course 16.
 A study of races and immigrants in America, with reference to their economic and social contributions; the economic and social conditions in foreign countries that lead to emigration; the general problem of immigration; the special problems of the Slav, the Italian, the negro, the Chinese and the Japanese. Lectures, text-book, topics, and discussions.
18. **CHARITIES AND CORRECTIONS WITH SPECIAL REFERENCE TO ECONOMIC CONDITIONS IN AMERICAN CITIES** MR. LIES
 Three credits (three hours per week) First or second semester
 Open to those who have completed course 1, course 3, 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. **THE PRINCIPLES OF ACCOUNTING** Both semesters
 Six credits (three hours per week)
 Open to those who have completed course 1.
 The theory and practice of accounting, with a view to general business efficiency. Methods employed in manufacturing, mercantile, banking, and railway accounting. Analysis of industrial, bank, and railway reports. Lectures and exercises.
20. **ELEMENTS OF BUSINESS LAW** DR. PHELAN
 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 everyday business affairs. Assigned readings, lectures, and quizzes.
22. **BUSINESS ORGANIZATION** Second semester
 Three credits (three hours per week)
 Open to those who have completed course 1.
 A study of the internal organization and management of large-scale industry, covering typical manufacturing and mercantile concerns.
 Based on Sparling's *Introduction to Business Organization*, with lectures, assigned readings, and discussions.
23. **ECONOMICS OF FORESTRY AND IRRIGATION** MR. COULTER
 Three credits (three hours per week) First semester
 Open to those 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.

14. **ECONOMICS OF AGRICULTURE** MR. COULTER
 Three credits (three hours per week) Second semester
 Open to those who have completed course 1 or course 2, and to others by special permission of the instructor.
- Preliminary survey and classification of industries as extractive, manufacturing, and distributive; and comparison of the several extractive industries in the United States, viz. fishing, forestry, grazing, farming, and mining. Historic development of agriculture and comparison of existing systems, with reference to stage of economic development and geographic conditions. Transition in the United States from extensive to intensive and from general to specialized farming in relation to the law of decreasing returns. Markets, transportation facilities, and other causes affecting the value of land and the prices of farm products. The size, organization, labor-system, and ownership of farms as bearing on economic efficiency and social and political conditions. Lectures, assigned readings, reports on special topics, and quiz.

15. **ECONOMICS OF INSURANCE** First semester
 Three credits (three hours per week)
 Open to those who have completed course 1 and to others by special permission of the department.
- Kinds and economic functions of insurance: life, fire, marine, accident, fidelity; history and theory of life insurance, forms of standard policies, public supervision. The aim is to treat those aspects of insurance which are of importance to practical men of affairs.

25. **ECONOMICS OF INVESTMENT AND SPECULATION** First semester
 Three credits (three hours per week)
 Open to juniors and seniors who have completed course 5.
- The causes affecting the values of securities; classes of investments and methods of calculating income; bearings of investment on the formation of social classes; the economic functions of speculation; organization and working of stock and produce exchanges; their relation to industry and to the money market; the work of Wall Street. Lectures, assigned readings, and exercises in the interpretation of current quotations for securities.

ADVANCED AND GRADUATE COURSES

23. **THEORY AND PRACTICE OF STATISTICS** First semester
 Two credits (two hours per week)
 Open to those who have completed six credits in economics.
- An introduction to the theory and method of statistics; aspects of economic and social life which are capable of statistical measurement; use and limitations of index numbers; theory of prices and price levels; based on the works of Bowley and Mayo-Smith, with lectures and practical exercises.

30. **HISTORY OF ECONOMIC THOUGHT** PROFESSOR ROBINSON
 Two credits (two hours per week) First semester
 Open to those who have completed six credits in economics.
- A survey of economic thought, especially since Adam Smith. Emphasis is placed on the most recent period. Lectures, assigned readings, and reports on special topics.

24. **SCOPE AND METHODS OF ECONOMICS** PROFESSOR ROBINSON
 Two credits (two hours per week) Second semester
 Open to those who have completed six credits in economics.
- Consideration of the successive views which have prevailed as to the scope and logical method of economics; relation of economics to the other social sciences and to ethics. Lectures, assigned readings, and discussions.

21. **SEMINAR IN ECONOMICS** PROFESSORS GRAY AND ROBINSON,
MR. GROULD, DR. PHELAN AND MR. 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: Professor Gray in connection with local public service corporations; Professor Robinson in connection with taxation, transportation, and industries of importance in this section, such as wheat and iron; Dr. Phelan in connection with currency questions, labor, socio-economic theories, and taxation.

POLITICAL SCIENCE

Table of Courses Offered in 1908-9.

INTRODUCTORY COURSE

No.	Title	Semester	Credits	Offered to	Prerequisite
1.	Am. Gov't	1or2	3	Soph., Jr., Sr.	None

GENERAL COURSES

2.	Comp. Gov't	1	3	Jr., Sr.	Courses 1 and 2
3.	Elements of Jurisp.....	1	3	Jr., Sr.	Course 1
7.	Municipal Adm.	2	3	Soph., Jr., Sr.	Course 1
9.	Political Parties	1	2	Sr.	Course 1
10.	Diplomacy	2	2	Soph., Jr., Sr.	Course 1
12.	Colonial Adm.	2	3	Sr.	Courses 1 and 2
15.	State and Local Adm....	2	3	Soph., Jr., Sr.	Course 1

SPECIAL COURSES

13.	Teachers' Gov't	2	1		Course 1
16.	Engineers' Am. Gov't....	..	..		None
6.	Engineering Law	1	2	Sr.	None

ADVANCED AND GRADUATE COURSES

4.	Am. Const. Law.....	1, 2	4*	Sr.	Courses 1, 2 and 8
8.	Theory of the State....	2	3	Sr.	Courses 1 and 2
5.	International Law	1, 2	6	Sr.	Courses 1 and 2
11.	Seminar .....	..	..
14.	Adm. Law.	2	2	Sr.	Courses 1, 2 and 8

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

1. 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 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 description and analysis of the government as the agent of the state; 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 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 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 PROFESSOR SCHAPER
Four credits (two hours per week) Both semesters
Open to those who have completed courses 1, 2, and 8; both semesters must be completed before credit is given for the first semester; given in alternate years; not offered in 1908-9.

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.
6. **ENGINEERING LAW** MR. ALLIN
Two credits (two hours per week) First semester
Intended primarily for seniors in the College of Engineering.
7. **MUNICIPAL ADMINISTRATION** PROFESSOR SCHAPER
Three credits (three hours per week) Second semester
Open to those who have completed course 1.
A comparative study in 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** PROFESSOR SCHAPER
Three credits (three hours per week) Second semester
Open to those who have completed courses 1 and 2.
A study in the theory of the state, its origin, nature, purpose and justification, the elements of population and territory. Important 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** PROFESSOR SCHAPER
Two credits (two hours per week) First semester
Open to those who have completed 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** PROFESSOR SCHAPER AND MR. 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) Second semester
Open to those who have completed courses 1 and 2.
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 reading, and special topics.
13. **TEACHER'S COURSE IN GOVERNMENT** Second semester
One credit (one hour per week)
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** PROFESSOR SCHAPER
Two credits (two hours per week) Second semester
Open to those who have completed courses 1, 2, and 8, and to graduates.
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** PROFESSOR SCHAPER
Two credits (two 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; not given until the new curriculum goes into effect.

HISTORY

The requirements for a major in history are the completion of at least twenty-four credits from courses offered by the department; for a minor, twelve credits. For distinction in history the special requirements of the department are that thirty-six credits, of which nine shall be in intensive courses, must be completed and at least twelve credits must be obtained in other departments of the social science group. To obtain the recommendation of the department for a teacher's certificate twenty-four credits must be completed from courses offered by the department, including at least six credits in intensive courses and course 16.

Table of Courses Offered in 1908-9.

No.	Title	Semester	Credits	Offered to	Prerequisite
1.	Europe 31 B.C.-1500 A.D.	1, 2	6†	All	None
2.	Eng. Const.	1, 2	6	All	Two yrs. prep. hist.
3.	Ren. and Reform.	1	3	Soph., Jr., Sr.	Course 1 or 2
4.	Europe since 1789	1, 2	6	Soph., Jr., Sr.	Course 1 or 2
5.	American to 1840	1, 2	6	Soph., Jr., Sr.	Course 2
6.	American since 1840	1	3	Jr., Sr.	Course 5
7.	Making of Const'n	1, 2	6*	Jr., Sr., Grad.	See statement
9.	Am. Statesmen	2	3	Jr., Sr., Grad.	Course 5
10.	Hist. Masterpiece	1	3	Jr., Sr., Grad.	See statement
11.	Am. Dipl.	1	3	Jr., Sr., Grad.	Course 5
12.	Europe Dipl.	2	3	Jr., Sr., Grad.	Course 4
14.	Auth's for N. E.	1, 2	4*	Sr. Grad.	See statement
15.	Hist'l Method	2	2	Soph., Jr., Sr.	Course 1 or 2
16.	Teacher's Course	2	1	Sr. Grad.	See statement
18.	Eng. Judiciary	2	3	Jr., Sr., Grad.	See statement
21.	Hist. of Greece	1	3	Soph., Jr., Sr.	Course 1 or 2
22.	Greek Political Inst's ...	2	3	Jr., Sr., Grad.	See statement
23.	Roman Imp. Organ. ...	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). 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.

ASSISTANT PROFESSOR WESTERMANN

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

PROFESSOR WHITE AND MISS JUDSON

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

PROFESSOR 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

PROFESSOR ANDERSON

Six credits (three hours per week) Both semesters

Open to those who have completed course 1 or 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 recitations. 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

PROFESSOR 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 co-operative 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 PROFESSOR 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. TEACHERS' COURSE PROFESSOR 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 PROFESSOR 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; not given in 1908-9.
 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 ASSISTANT PROFESSOR WESTERMANN
 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 PROFESSOR 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 1908-9, 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 PROFESSOR 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 PROFESSOR 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 1908-9.

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 PROFESSOR ANDERSON

Three credits (three hours per week) Second semester
Open to juniors, seniors, and graduate students, who have completed course 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 1908-9 the work will be confined to the period of the the Federalist supremacy, 1789-1801.

10. A CRITICAL STUDY OF A HISTORICAL MASTERPIECE PROFESSOR 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 discussions carried on by the students under the direction of the instructor. In 1908-9 Rhodes' *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 PROFESSOR 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 PROFESSOR ANDERSON

Three credits (three hours per week) Second semester
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 PROFESSOR 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 1908-9.

The history of the colonial acquisitions of the great nations will be surveyed rapidly and colonial institutions and governments will be studied and compared in detail.

14. A CRITICAL STUDY OF AUTHORITIES FOR EARLY NEW ENGLAND HISTORY PROFESSOR 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 criticize in the light of the original sources. The study involves also a careful comparison of the chief sources with one another, and incidentally 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. **MEDIAEVAL ECONOMIC DOCUMENTS** PROFESSOR WHITE
 Two credits (two hours per week) Second semester
 Open to seniors and graduates who have completed twelve credits
 in history; not given in 1908-9.
 Characteristic documents relating mainly to twelfth and thirteenth cen-
 tury economic history are to be carefully studied with reference both to
 language difficulties and historical criticism. Such documents will be selected
 as will tend to throw the most light on the leading economic problems of the
 medieval period. The work is to be based on Fagniez's *Documents relatifs*
a l'histoire du commerce en France.
18. **ORIGIN OF THE ENGLISH JUDICIAL SYSTEM** PROFESSOR WHITE
 Three credits (three hours per week) Second semester
 Open to juniors, seniors, and graduates, who have completed six
 credits, including course 2, and obtain the permission of the in-
 structor; students must be able to read medieval 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 kings' 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 at-
 tention.
19. **THE EXPANSION OF AMERICA, STUDIED IN ITS HIGHWAYS OF EMIGRATION**
 Six credits (three hours per week) Both semesters
 Open to seniors and graduates who have completed course 5;
 both semesters must be completed before credit is given for the
 first semester; not given in 1908-9.
 This is a study of roads and methods of pioneer travel in that westward
 movement of population which extended the inhabited area of the United
 States from the seaboard to the Mississippi.
22. **GREEK POLITICAL INSTITUTIONS** ASSISTANT PROFESSOR WESTERMANN
 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 opera-
 tion as seen in typical oligarchic, democratic, federal, and monarchic states.
23. **ROMAN IMPERIAL ORGANIZATION** ASSISTANT PROFESSOR WESTERMANN
 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 administra-
 tion of the municipalities and provinces under the Empire and to the de-
 velopment of despotism.

SOCIOLOGY AND ANTHROPOLOGY

The requirement for a major in sociology and anthropology is the comple-
 tion of eighteen credits from courses offered by the department; for a minor,
 twelve credits. For distinction in sociology and anthropology the special
 requirements of the department are the completion of twenty-four credits, at
 least six of which shall be advanced work, three of which shall be from
 courses offered below, and three from individual work done under special direc-
 tion of the department.

Table of Courses Offered in 1908-9.

No.	Title	Semester	Credits	Offered to	Prerequisite
1.	Descrip. Sociology.....	1	3	Jr., Sr.	None
2.	Elements of Sociol.	1 or 2	3	Jr., Sr.	None
3.	Social Pathology	1	3	Jr., Sr.	None
4.	Social Theory	1	3	Sr.	Course 1 or 2
5.	Social Groups	1	3	Sr.	Course 1
6.	Institutions	1	3	Sr.	Course 1
7.	Anthropology	1	3	Jr., Sr.	None
8.	Ethnology	2	3	Jr., Sr., Grad.	Course 1, 2 or 7
9.	Philippine People	2	3	Jr., Sr., Grad.	None
10.	Physical Anthropology..	2	3	Jr., Sr., Grad.	Course 7 or 8
11.	Am. Negro Race.....	2	3	Jr., Sr., Grad.	None
12.	Am. People	1	3	Jr., Sr., Grad.	None
13.	Biblical Sociology	1	3	Jr., Sr., Grad.	None
14.	Mod. Soc. Institutions..	1	3	Sr.	Course 7

1. **DESCRIPTIVE SOCIOLOGY** PROFESSOR 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, civilization, and enlightenment; and it discovers the activities and institutions natural and peculiar to these cultures. Text-book, lectures, assigned readings, and thesis.

2. **ELEMENTS OF SOCIOLOGY** ASSISTANT PROFESSOR REEP
 Three credits (three hours per week) Repeated 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** PROFESSOR SMITH
 Three credits (three hours per week) First semester
 Open to juniors and seniors.

Dealing with problems of poverty, crime, insanity, social degeneration, and a discussion of the child problem and methods of social amelioration.

4. **SOCIAL THEORY** ASSISTANT PROFESSOR REEP
 Three credits (three hours per week) First semester
 Open to those who have completed course 1 or 2.

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** PROFESSOR SMITH
 Three credits (three hours per week) First semester
 Open to those who have completed course 1.

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** PROFESSOR 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** PROFESSOR 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 also 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** PROFESSOR 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 in America, Europe, Asia,
 Africa, and Oceania; the various historical classifications of men into races
 are presented; the causes of the origin and distribution of the several races
 and subraces are sought, and from historical perspective and present indica-
 tions an attempt is made to judge of the future development of races; ethno-
 logical problems are also presented. Text-books, lectures, assigned readings,
 and thesis.
9. **THE PHILIPPINE PEOPLE** PROFESSOR JENKS
 Three credits (three hours per week)
 Second semester
 Open to juniors, seniors, and graduate students.
 This course presents the geography, natural resources, and ethnology of
 the Philippine 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 affect American home interests in the orient. This course aims to
 present a practical model for the investigator of human culture, and to in-
 troduce students to oriental race problems; it will also better fit students for
 government, business, or missionary service in the orient. Lectures, illus-
 trated lectures, assigned readings, and thesis.
10. **PHYSICAL ANTHROPOLOGY** PROFESSOR JENKS
 Three credits (three hours per week)
 Second semester
 Open to juniors and seniors who have completed course 7 or 8,
 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** PROFESSOR JENKS
 Three credits (three hours per week)
 Second semester
 Open to juniors, seniors, and graduate students; not given in 1908-9.
 This course begins with a study of the negro's African tribal kinsmen,
 and traces the rise and development of the American negro race from the
 birth of American slavery. The present characteristics, traits, and conditions
 of the negro are especially considered. 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** PROFESSOR 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 de-
 velopment 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** PROFESSOR SMITH
 Three credits (three hours per week)
 First semester
 Open to juniors, seniors, and graduate students.
 Lectures, and the Old Testament as a text book.
14. **MODERN SOCIAL INSTITUTIONS** ASSISTANT PROFESSOR REEF
 Three credits (three hours per week)
 First semester
 Open to those who have completed course 7.
 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.

IX. Fine Arts

DRAWING

The practical aim of this work in the University is two-fold, to help the students who need drawing for scientific work and to train those who wish to prepare for teaching drawing. The educational side of the work is emphasized in the development of the powers of the mind in the order of observation, memory, and imagination. Special efforts are made toward educating the taste to an appreciation of what is good in form, construction, and color, and in showing the relation of artistic and esthetic principles to life.

A certain amount of work is given in the different mediums used in the schools and in the representative, decorative and constructive work found in all educational courses in drawing.

Lectures are offered on the theory and practice of drawing as related to education and on the principles which are at the foundation of all art, illustrating those by the best examples of pictorial and decorative work.

Table of Courses Offered in 1908-9.

No.	Title	Semester	Credits	Offered to	Prerequisite
1.	Representative Drawing.	1	3	Jr., Sr.	None
2.	Adv. Drawing	2	3	Jr., Sr.	Course 1
3.	Design	1, 2	6	Sr.	Course 1 or 2
4.	Historical Design	1, 2	6	Jr., Sr.	Course 1
5.	Drawing and Education.	1	3	Sr.	
6.	Teaching of Drawing.	2	3	Sr.	Course 3

1.	REPRESENTATIVE DRAWING Three credits (three hours per week) Open to juniors and seniors. The course includes: Drawing from objects, plants, landscape, and figure poses in pencil and in water color; the study of perspective; work from cast in charcoal; brush drawing.				MISS CLOPATH First semester
2.	ADVANCED REPRESENTATIVE DRAWING Three credits (three hours per week) Open to juniors and seniors who have completed course 1. More advanced work from objects and from cast; work in water color and colored chalks; pen and ink drawing; simple exercises in lettering and composition.				MISS CLOPATH Second semester
3.	DESIGN Six credits (three hours per week) Open to seniors who have completed courses 1 and 2. Exercises in composition, illustrating the various principles of decorative work; adaptation of plant forms, stencils, illuminated lettering; designs applied to simple forms of handicraft; lectures on the fundamental principles of designs illustrated by art masterpieces.				MISS CLOPATH Both semesters
4.	HISTORICAL DESIGN Six credits (three hours per week) Open to juniors and seniors who have completed course 1. Original designs in different styles applied to articles of household use; color harmony; simple forms of pottery with applied designs. Lectures and collateral reading.				MISS CLOPATH Both semesters
5.	DRAWING AS RELATED TO EDUCATION Three credits (three hours per week) Open to juniors and seniors who have completed course 1. Exercises in all the different kinds of art work used in the schools; advanced work in black and white, and in color.				MISS CLOPATH First semester
6.	THE TEACHING OF DRAWING One credit (one hour per week) Open to seniors who have completed course 3. This course is conducted by lectures and collateral reading on the methods and educational value of drawing, as revealed through a study of the instincts and mental processes of the child.				MISS CLOPATH Second semester

MUSIC

Students entering the University for the express purpose of studying music must register for courses 1 and 4 and in addition two other three-hour subjects outside of the department of music.

The 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 preception 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 years of pianoforte, are able to play one of the standard concertos, and in addition show marked musical ability.

Table of Courses Offered in 1908-9.

No.	Title	Semester	Credits	Offered to	Prerequisite
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	2	Jr., Sr.	See statement
6.	History of Music	1, 2	2	Jr., Sr.	None

1.	HARMONY	ASSISTANT PROFESSOR 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, and the harmonization of given melodies. Foote and Spaulding's <i>Modern Harmony</i> is used as text book.				
2.	COUNTERPOINT	ASSISTANT PROFESSOR 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 will include the harmonization of melodies in two, three, and four voices in the different orders of counterpoint. Spaulding's <i>Tonal Counterpoint</i> is used as a text-book.				
3.	MUSICAL FORM AND FREE COMPOSITION	ASSISTANT PROFESSOR SCOTT			
	Two credits (two hours per week)	Second semester			
	Open to seniors who have completed course 1 and the first semester of course 2; intended 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	PROFESSOR OBERHOFFER AND ASSISTANT PROFESSOR SCOTT			
	Three or six credits (one and a half or three hours per week)	Both semesters			
	Open to juniors and seniors; intended for those who intend to pursue the higher branches of the pianoforte, the art of playing, or to fit themselves for piano teachers; other arrangements may be ascertained upon application to the department.				
	While private lessons are the rule, classes of not more than four students may be arranged. Students in this course should have mastered technical difficulties of the degree of Czerny's <i>School of Velocity</i> and the easier Haydn and Mozart sonatas.				
5.	CHORAL CULTURE	PROFESSOR OBERHOFFER			
	Four credits (two hours per week).	Both semesters			
	Open to juniors and seniors; a single credit may be secured for chorus work, provided that students pursuing the work for credit pursue courses 1 or 2 at the same time; 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.)				

6. HISTORY OF MUSIC

ASSISTANT PROFESSOR 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.

X. Military Science and Tactics

CAPTAIN EDWARD SIGERFOOS, Ph.B., 5th U. S. Infantry, Commandant.

Drill is required of all men in the freshman and sophomore classes. It 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 considered 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.

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 United States Military Academy cadet uniform. It costs in Minneapolis about fifteen dollars and is as neat and economical a dress as the student can obtain.

Each student registered for military drill is required to make a deposit of five dollars with the accountant of the university to cover loss and breakage of equipments. The deposit is returned to the student on the return of the equipments issued to him.

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 company and battalion manoeuvres, guards, and the theoretical and practical use of firearms.

On the graduation of each class the commandant will report to the adjutant general of the army the names of three graduates who 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 required course of instruction in military science consists of:

Freshman year: practical instruction in schools of the soldier, company, and battalion; signals, ceremonies; schools of the cannoneer and battery.

Sophomore year: 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.

During the second semester a course of instruction, two hours per week, is open to juniors and seniors. When satisfactorily completed it will give, in connection with the year's drill, four credits. The course includes theoretical instruction in field service, consisting of organization, orders, advance and rear guards, out posts, reconnaissance, camping; duties of company commanders; articles of war; records.

ROSTER OF THE CORPS OF CADETS.

CADET COLONEL

H. P. Councilman

CADET MAJORS

D. I. Okes, Second Battalion
L. A. Frye, First Battalion
A. B. Lathrop, Third Battalion

BAND

B. A. Rose, Instructor of Music
 J. S. Mikesb, Cadet Chief Musician
 R. T. Glycer, Cadet Principal Musician

CADET CAPTAINS

J. H. Ray, Regimental Adjutant
 C. S. Wilson, Company I
 A. L. McAfee, Regimental Quartermaster
 Edwin G. Eklund, Company B
 W. D. Shaw, Company C
 W. B. Crosby, Company F
 H. C. Deering, Company G
 H. D. Frary, Battery
 H. G. Knowlton, Company H
 Guy C. Bland, Company E
 C. C. Houston, Company D
 J. R. Smith, Company A
 J. W. Haw, Company K
 C. J. Eklund, Company L
 W. F. Cantwell, Company M
 F. E. Shumway, Company N
 E. H. King, Company O.

CADET FIRST LIEUTENANTS

L. W. King, Adjutant Second Battalion
 L. S. Diamond, Adjutant First Battalion
 L. B. Swain, Adjutant Third Battalion
 P. L. Sheaf, Quartermaster Third Battalion
 W. T. Newton, Company B
 R. V. Hauser, Company E
 C. Dana McGrew, Company F
 Walter Mallory, Company A
 F. G. Scobie, Company D
 R. H. Cone, Company H
 M. B. Moyer, Company C
 W. L. Councilman, Company I
 R. W. Foulke, Company G
 E. Reiff, Battery
 H. N. Bush, Company K
 C. A. Jones, Company L
 E. A. Maylott, Company M
 H. A. Folingstad, Company N
 C. F. Dow, Company O

CADET SECOND LIEUTENANTS

Willis Shippa, Company B
 S. G. Mooney, Company G
 R. Nelson, Company A
 H. J. Cliff, Company C
 M. V. Jeness, Company D
 A. B. Stork, Company D
 C. L. Hamilton, Company A
 W. G. Workman, Company E
 J. R. Buffington, Company F
 Zenas Potter, Company H
 W. D. Timperly, Battery
 G. M. Briggs, Assistant Adjutant Third Battalion
 H. R. Blackburn, Company K
 M. C. Brownell, Company L
 C. L. Adly, Company M
 W. E. Mather, Company N

PHYSICAL CULTURE

For Women

MISS BUTNER AND MISS MATSON

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 gymnasium 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 young women of the University. These include basket ball, battle ball, numerous other ball games, and also running games, all of which tend to cultivate the play instinct and give the nerve stimulus that comes from natural play.

For Men

DR. COOKE AND DR. LITZENBERG

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 condition 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 of lectures on personal hygiene during the first semester.

Six-Year Medical Course

In the year 1903-04 the University established a six-year course of study arranged especially for students of medicine. The first two years of the 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 end of the first four years, and to the degree of doctor of medicine at the end of the six years course.

In the College of Science, Literature, and the Arts the year is divided into two semesters. In the College of Medicine and Surgery the year is divided into four quarters (half semesters). In the College of Medicine and Surgery the work is given on a concentration plan, but two subjects being carried at a time, and consequently a greater number of hours per week.

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

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

COURSES IN THE COLLEGE OF SCIENCE, LITERATURE AND THE ARTS

Page references refer to the bulletins of the College of Science, Literature and the Arts, and of the College of Medicine and Surgery for more detailed information.

FIRST YEAR

ANIMAL BIOLOGY (See p. 69)

1. GENERAL ZOOLOGY PROFESSOR SIGERFOOS, ASSISTANT PROFESSORS
Six credits (six hours per week) OESTLUND, BROWN, AND DOWNEY
First and second semesters

BOTANY (See p. 72)

1. GENERAL BOTANY PROFESSOR CLEMENTS, ASSISTANT PROFESSORS
Six credits (six hours per week) TILDEN AND ROSENDAHL AND INSTRUCTORS
First and second semesters

CHEMISTRY (See pp. 75-76)

1. GENERAL CHEMISTRY MISS COHEN AND MR. BADGER
OR,
2. ADVANCED GENERAL CHEMISTRY PROFESSOR FRANKFORTER, MISS COHEN,
AND MR. BADGER
Six credits (six hours per week) First and second semesters

GERMAN (See p. 63)

1. BEGINNING GERMAN PROFESSOR SCHLENKER, ASSISTANT PROFESSORS
WILKIN AND JURGENSEN, MR. BURKHARD AND MR. WILLIAMS
Ten credits (five hours per week) First and second semesters

MATHEMATICS (See p. 36)

3. SECOND PART HIGHER ALGEBRA PROFESSOR BAUER, ASSISTANT PROFESSOR
BUSSEY, DR. MANCHESTER, MR. DALAKER AND MR. SHUMWAY
Three credits (three hours per week) First semester
4. TRIGONOMETRY PROFESSOR BAUER, ASSISTANT PROFESSOR BUSSEY
DR. MANCHESTER, MR. DALAKER AND MR. SHUMWAY
Three credits (three hours per week) Second semester

MILITARY DRILL CAPTAIN EDWARD SIGERFOOS, U. S. A.
Required of all men First and second semesters

GYMNASIUM DR. COOKE
Required of all men First and second semesters

SECOND YEAR

ANIMAL BIOLOGY (See p. 70)

4. COMPARATIVE ANATOMY OF VERTEBRATES ASSISTANT PROFESSOR BROWN
MR. JOHNSON
Six credits (six hours per week) First and second semesters

CHEMISTRY (See p. 76)

3. QUALITATIVE ANALYSIS ASSISTANT PROFESSOR NICHOLSON,
MR. FRARY AND ASSISTANTS
Six credits (six hours per week) First and second semesters

ECONOMICS (See pp. 98 and 101)

1. ELEMENTS OF ECONOMICS PROFESSOR ROBINSON, DR. PHELAN, AND
MR. COULTER
Three credits (three hours per week) First semester
18. CHARITIES AND CORRECTIONS MR. LIES
Three credits (three hours per week) Second semester

FRENCH (See p. 65)

1. BEGINNING FRENCH ASSISTANT PROFESSORS ANDRIST AND
FRELIN, MADAME BERTIN
Ten credits (five hours per week) First and second semesters

GERMAN (See p. 63)

3. SCIENTIFIC INTERMEDIATE ASSISTANT PROFESSOR JUERGENSEN
Six credits (three hours per week) First and second semesters

PHYSICS (See pp. 82-83)

1. and 3. GENERAL PHYSICS PROFESSOR JOHN ZELENY
Six credits (three hours per week) First and second semesters
2 and 4. GENERAL LABORATORY PRACTICE MR. KOVARIK
Two credits (two hours per week) First and second semesters

- Four and one-half credits (twelve lectures and recitations, six laboratory periods) Third quarter
3. SYSTEMIC PHYSIOLOGY PROFESSOR BEARD, ASSISTANT PROFESSOR WILCOX, DR. SEDGWICK
Four and one-half credits (twelve lectures and recitations, six laboratory periods) Fourth quarter
4. SYSTEMIC PHYSIOLOGY (Continued) PROFESSOR BEARD, ASSISTANT PROFESSOR WILCOX, DR. SEDGWICK
Four and one-half credits (twelve lectures and recitations, six laboratory periods) Fourth quarter

FOURTH YEAR

ANATOMY (See p. 45)

4. DISSECTIONS ASSISTANT PROFESSOR MEYER, DRs. HARE AND TYRELL
Nine credits (twenty-four hours per week for nine weeks) Third quarter

CHEMISTRY (See p. 50)

7. TOXICOLOGY, WATER AND FOOD ANALYSIS PROFESSOR FRANKFORTER, ASSISTANT PROFESSORS HARDING AND DERBY
Three and three-quarter credits (three lectures, three laboratory periods) Second quarter

HISTOLOGY AND EMBRYOLOGY (See pp. 46-48)

3. MICRO-TECHNIQUE AND THE MORPHOLOGY OF THE SPECIAL SENSE ORGANS PROFESSOR LEE
Four and one-half credits (six lectures and recitations, three laboratory periods) Third quarter
13. SPECIAL EMBRYOLOGY OF MAN AND VERTEBRATES PROFESSOR LEE
Four and one-half credits (six lectures and recitations, three laboratory periods) Third quarter
22. THE HUMAN NERVOUS SYSTEM ASSOCIATE PROFESSOR JOHNSTON, DR. INGBERT
Four and one-half credits (six lectures and recitations, three laboratory periods) First quarter

PATHOLOGY AND BACTERIOLOGY (See pp. 56-57)

1. GENERAL PATHOLOGY PROFESSOR WESBROOK
Three credits (six lectures, recitations and demonstrations) Fourth quarter
2. GENERAL PATHOLOGY DRs. MULLIN AND ROBERTSON
Three credits (six lectures, recitations and demonstrations) Fourth quarter
3. GENERAL PATHOLOGY PROFESSOR WESBROOK, DRs. MULLIN AND ROBERTSON
Three credits (twelve hours laboratory) Fourth quarter
4. GENERAL BACTERIOLOGY ASSISTANT PROFESSOR HILL, DR. PRATT
Three credits (six lectures, recitations and demonstrations) Fourth quarter
5. GENERAL BACTERIOLOGY PROFESSOR WESBROOK, ASSISTANT PROFESSOR HILL, DR. PRATT
Four and one-half credits (eighteen hours laboratory) Fourth quarter

PHARMACOLOGY (See p. 53)

1. ELEMENTARY PHARMACY PROFESSOR BROWN
Four and one-half credits (six lectures and recitations, three laboratory periods)
2. GENERAL PHARMACODYNAMICS PROFESSOR BROWN
Four and one-half credits (six lectures and recitations, three laboratory periods)

PHYSIOLOGY (See p. 52)

5. METABOLISM AND NUTRITION PROFESSOR BEARD, ASSISTANT
PROFESSOR WILCOX, DR. SEDGWICK
Four and one-half credits (twelve lectures and recitations, six laboratory periods) First quarter
6. PHENOMENA OF STIMULATION PROFESSOR BEARD, ASSISTANT
PROFESSOR WILCOX, DR. SEDGWICK
Four and one-half credits (twelve lectures and recitations, six laboratory periods) First quarter
7. PHYSIOLOGY OF SPECIAL SENSE ORGANS PROFESSOR BEARD, ASSISTANT
PROFESSOR WILCOX, DR. SEDGWICK
Four and one-half credits (twelve lectures and recitations, six laboratory periods) Second quarter
8. PHYSIOLOGY OF CENTRAL NERVOUS SYSTEM PROFESSOR BEARD, ASSISTANT
PROFESSOR WILCOX, DR. SEDGWICK
Four and one-half credits (twelve lectures and recitations, six laboratory periods) Second quarter

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 NORTROP, LL.D., *President*
FREDERICK S. JONES, M.A., *Dean*

FREDERICK H. BASS, B.S., *Assistant Professor of Municipal and Sanitary Engineering*
WILLIAM E. BROOKE, B.C.E., M.A., *Professor of Mathematics and Mechanics*
CHARLES W. BENTON, M.A., Litt.D., *Professor of French*
FREDERICK E. CLEMENTS, Ph.D., *Professor of Botany*
FRANK H. CONSTANT, C.E., *Professor of Structural Engineering*
HENRY T. EDDY, C.E., Ph.D., LL.D., *Professor of Mathematics and Mechanics*
HENRY A. ERIKSON, E.E., *Assistant Professor of Physics*
JOHN J. FLATHER, Ph.B., M.M.E., *Professor of Mechanical Engineering*
GEORGE B. FRANKFORTER, M.A., Ph.D., *Professor of Chemistry*
EVERHART P. HARDING, M.S., Ph.D., *Assistant Professor of Chemistry*
ARTHUR EDWIN HAYNES, M.S., M.Ph., Sc.D., *Professor of Engineering Mathematics*
FREDERICK S. JONES, M.A., *Professor of Physics*
WILLIAM H. KAVANAUGH, M.E., *Professor of Experimental Engineering*
WILLIAM H. KIRCHNER, B.S., *Professor of Drawing and Descriptive Geometry*
FRANCIS P. LEAVENWORTH, M.A., *Professor of Astronomy*
JOHN G. MOORE, B.A., *Professor of German*
HENRY F. NACHTRIEB, B.S., *Professor of Animal Biology*
BURT L. NEWKIRK, Ph.D., *Assistant Professor of Mathematics and Mechanics*
EDWARD E. NICHOLSON, M.A., *Assistant Professor of Chemistry*
EDWARD VAN DYKE ROBINSON, Ph.D., *Professor of Economics*
MARIA L. SANFORD, *Professor of Rhetoric and Elocution*
FREDERICK W. SARDESON, Ph.D., *Assistant Professor of Geology*
WILLIAM A. SCHAPER, M.A., Ph.D., *Professor of Political Science*
GEORGE D. SHEPARDSON, M.A., M.E., *Professor of Electrical Engineering*
CHARLES F. SIDENER, B.S., *Professor of Chemistry*
EDWARD SIGERFOOS, Captain U. S. A., *Professor of Military Science*
FRANK W. SPRINGER, E.E., *Professor of Electrical Engineering*
FRANK F. WESBROOK, M.A., M.D., C.M., *Professor of Pathology and Bacteriology*
ANTHONY ZELENY, M.S., Ph.D., *Assistant Professor of Physics*
JOHN ZELENY, B.A., Ph.D., *Professor of Physics*

INSTRUCTORS

ALVIN S. CUTLER, C.E., *Instructor in Railway Engineering*
 T. L. HINCKLEY, B.S., *Instructor in Civil Engineering*
 OLAF HOVDA, B.S., *Instructor in Engineering Mathematics*
 HENRY J. KESNER, B.A., *Instructor in Structural Engineering*
 ALOIS F. KOVARIK, B.A., *Instructor in Physics*
 JOHN V. MARTENIS, M.E., *Instructor in Machine Design*
 PETER PETERSON, *Instructor in Foundry Practice*
 EDWARD QUIGLEY, *Instructor in Forge Work*
 WILLIAM H. RICHARDS, *Instructor in Carpentry and Pattern Work*
 NORMAN W. ROSE, M.E., *Instructor in Drawing*
 FRANK B. ROWLEY, B.S., M.E., *Instructor in Drawing*
 WILLIAM T. RYAN, E.E., *Instructor in Electrical Engineering*
 S. CARL SHIPLEY, B.S., *Instructor in Machine Work*
 C. F. SHOOP, B.S., *Instructor in Mechanical Engineering*
 HENRY UBRICH, *Instructor in Carpentry*

ASSISTANTS

HARRY W. DIXON, *Engineer*
 CARL L. HERRICK, M.E., *Assistant in Mechanical Engineering*
 L. W. MCKEEHAN, *Assistant in Drawing and Descriptive Geometry*
 FRANK L. NEMEC, *Assistant in Drawing*
 LEONARD B. SPERRY, M.E., *Assistant in Electrical Engineering*

STANDING COMMITTEES

Enrollment—PROFESSORS CONSTANT, HAYNES, SPRINGER
Curriculum—PROFESSORS EDDY, FLATHER, CONSTANT, BASS, JONES,
 SHEPARDSON
Degrees—PROFESSORS JONES, FLATHER, SHEPARDSON; BASS
Library—PROFESSORS EDDY, FLATHER, JONES, 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

- F. A. Sager, Engineer, The Arnold Company, Chicago. "What is an Engineer-Constructor?"
C. H. Harris, Engineer, Stone & Webster Company, Minneapolis. "The Taylors Falls Hydro-Electric Development."
W. S. Hart, Erecting Engineer, Electric Storage Battery Company, Chicago. "The Installation of a Storage Battery."
Truman Hibbard, Designing Engineer, Electric Machinery Company, Minneapolis. "The Design of Electric Machinery." "The Design of a 300 Kilowatt Direct Current Generator."
A. G. Wessling, Assistant Engineer, Bullock Electric Mfg. Company, Cincinnati. "The Works and Factory Methods of the Allis-Chalmers and the Bullock Companies."
C. E. Downton, Foreman of Apprentices, Westinghouse Electric and Manufacturing Company, Pittsburg. "The Factory Post-Graduate Course."

Admission

Students proposing to enter this college must be prepared to pass examinations in *fifteen* high-school year-credits or their equivalent chosen from the following list of subjects. The first six subjects, amounting to eight year-credits, are required of all students and substitutes cannot be accepted. Of the remaining seven year-credits at least *two* year-credits must be chosen from one of the language groups. Two half year-credits are equivalent to one year-credit. The ground to be covered for each credit is given in the syllabus on page 18.

EIGHT YEAR-CREDITS REQUIRED:

Elementary Algebra, one year
Higher Algebra, one half year
Plane Geometry, one year
Solid Geometry, one half year
English, four years
Chemistry, one year

SEVEN YEAR-CREDITS REQUIRED FROM THIS GROUP, OF WHICH AT LEAST TWO YEAR-CREDITS SHALL BE CHOSEN FROM ONE OF THE LANGUAGE GROUPS:

Latin

Grammar, one year
Caesar, four books, one year
Cicero, six orations, one year
Vergil, six books, one year

Greek

Grammar, one year
Anabasis, one year

German

Grammar, one year
Literature, one year

French

Grammar, one year
Literature, one year

Spanish

Grammar, one year
Literature, one year

History

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

Civics, one half year

Political Economy, one half year

Physics, one year

Botany, one half or one year

Zoology, one half or one year

Astronomy, one half year

Geology, one half year

Physiography, one half year

Commercial Geography, one half or one year

Drawing, one half or one year

Shop Work, one half or one year

ENTRANCE EXAMINATIONS

I. Every applicant for admission to the freshman class, whether a graduate of a high school or not, 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.

No applicant will be admitted who fails to obtain credit in one of these two ways 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.

II. Graduates of Minnesota State high schools; of advanced courses of Minnesota normal schools; or of Minnesota high schools or academies not under the supervision of the State High School Board, but which are accredited by the faculty of the University, will be admitted without examination in the remaining subjects presented for entrance, provided,

(a) that the school maintain a full four year course.

(b) that the applicant present to the registrar the principal's certificate on the blank form provided by the University (see note below), showing the satisfactory completion of at least fourteen of the required fifteen year credits. Such deficiency, when not a mathematical subject, is charged against the student as an entrance condition which must be removed before he enters the sophomore class.

III. Graduates of such schools, whose principal's certificate shows them to be deficient in not more than one and one half year credits and who have made such additional preparation in one or more of these subjects as they deem necessary, may take the regular entrance examinations in such subjects to reduce their deficiency to one year credit or less. But graduates whose principal's certificate shows them to be deficient in more than one and one half year credits, even though they have made such additional preparation as they deem necessary, must take the regular entrance examinations in all subjects.

IV. Graduates from schools in any other state, accredited to the state university of that state, will be admitted on the same terms as graduates of Minnesota State high schools.

V. Applicants from schools not coming within any of the above classes must take the regular entrance examinations or present State High School Board certificates, which will be accepted in lieu of an examination in the subjects which they represent.

N. B.—Students bringing records from accredited schools are required to present them on the blank form provided for the purpose by the University. Blank forms may be obtained from the registrar. No other form of certificate will be accepted. Students who do not bring their certificates on the proper form of blank will not be allowed to register until they have secured the certificate on the required form.

N. B.—Any Minnesota high school or academy not under supervision of the State High School Board, but requiring for graduation a four years' course, exclusive of the common school branches, conforming essentially in distribution of time to the entrance requirements of at least one of the University courses, will, upon application, be inspected by a committee, and after favorable recommendation, may be accredited by the faculty in all respects as are the State high schools, provided,

(1) that the school be open to inspection at any time by the University;

(2) that it take such supplementary examinations as may be prescribed from time to time.

TIME AND PLACE OF EXAMINATIONS

Entrance examinations are held only at the beginning of the college year (Tuesday, Sept. 8th). 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.

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 students to get the greatest benefit from it. It is very important that the candidate be fully prepared in the entrance requirement in chemistry.

ADVANCED CREDIT

Advanced credit for work done in manual training in the high schools is allowed under the following conditions:

(a) The courses in drawing and shop work in the high schools must be approved by the corresponding departments in the College;

(b) Students presenting two or three year credits in wood-work from such courses will receive an advanced credit in the first semester freshman shop.

(c) Students presenting three year credits from such courses in drawing will receive an advanced credit of the second semester freshman drawing.

(d) Students presenting four year credits from such courses in shop will receive an advanced credit of the first semester freshman and one-half semester sophomore shop.

(e) 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 equivalent to the work done in this University, subject to the approval of the department concerned. In bringing records from other institutions, the certificates must be on the official blanks of the institution granting the certificate, 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.

UNCLASSIFIED STUDENTS

Unclassified 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 results 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 5th, 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 reëntering 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 by 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.

Fees and Expenses

A registration fee of fifteen dollars per semester, payable in advance, is required of all residents of the state who register in this college. Non-residents are charged double this fee, or thirty dollars per 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 laboratory work are charged a sum sufficient to cover the cost of material and breakage. The fees are as follows:

FRESHMAN YEAR.

<i>First Semester.</i>	
Shop work	\$ 4.50
<i>Second Semester.</i>	
Shop work	\$ 4.50

FOR CLASSES GRADUATING IN 1909-1910-1911

SOPHOMORE YEAR.

<i>First Semester.</i>	
Shop work	\$ 7.00
Physics	3.00
Chemistry	3.00
<i>Second Semester.</i>	
Shop work	\$ 7.00
Physics	3.00

JUNIOR YEAR.

<i>First Semester.</i>	
Shop work	\$ 4.50
Materials Testing Laboratory	6.00
Electrical Laboratory	1.50
Physics	3.00
<i>Second Semester.</i>	
Shop work	\$4.50
Steam Laboratory	3.00
Hydraulic Laboratory	3.00
Fuel and Gas analysis	5.00
Electrical Laboratory	6.00

SENIOR YEAR.

<i>First Semester.</i>	
Electrical Laboratory	\$3.00
Electric Power	3.00
Experimental Laboratory	6.00
<i>Second Semester.</i>	
Electrical Laboratory	\$4.50
Electric Power	3.00
Gas Engine Laboratory	4.50

A fee of 25 cents per day is charged for each day of delayed registration.

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 Electric 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.

HYDRAULIC AND MUNICIPAL 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-operative work.

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 execu-

tion 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 reports of state and engineering societies.

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.

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.

A new building especially designed to meet the requirements of instruction in the various lines of shop work, has recently been erected and the increased facilities thus afforded for the prosecution of this work are unexcelled.

This building consists of a two-story portion, containing the ma-

chine shop on the first floor and the wood shop on the second; beyond the machine shop and at a different level is the forge shop and foundry, both one story in height.

Slow burning mill construction is used throughout. This consists of brick walls and heavy timbers which, in case of fire, burn slowly and are safer than the ordinary iron and timber combination for this class of buildings.

A two-story extension has recently been added in which are located the mechanical engineering lecture and recitation rooms, drawing rooms, library and offices.

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 in 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 or 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, 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, 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 $3\frac{1}{2} \times 3\frac{1}{2} \times 5$ feet, and one $3\frac{1}{2} \times 7 \times 6$ 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 laboratory equipment.

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 experiments with mechanical draft.

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. A 150-h.p. cross-compound Corliss engine especially designed for the mechanical engineering department has recently been erected and is available for experimental work.

This engine is provided with a 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 of the experimental laboratory.

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 regular 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 offer exceptional facilities for the prosecution of this work. The Northwest Railway Club, meeting monthly for papers and discussions, is open for the attendance of students.

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.

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 220 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.

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 the 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. In addition to the boilers in the university heating plant, 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 Tuerk 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.

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.

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 number, upwards of four thousand

volumes, comprising many works which are the private property of professors, is 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 secured 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.

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. Hovda
4	English, E. 1.	Professor Sanford, Mr. Gislason
4	Drawing, D. 1, 3, 2, 4.	Professor Kirchner, Mr. Rowley, Mr. Rose, Mr. McKeehan
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 YEAR

4	Mathematics, M. 3, 4.	Professor Haynes, Professor Brooke
4	Physics, P. 5, 6.	Professor Jones, Professor J. Zeleny, Assistant Professor A. Zeleny, Assistant Professor Erikson, Mr. Kovarik
3	Chemistry, C. 2.	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	Geology, G. M. 1, (First semester)	Assistant Professor Sardeson
3	Astronomy, A. 1,(Second semester)	Professor Leavenworth
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 A. Zeleny, Assistant Professor Erikson, Mr. Kovarik
3	Chemistry, C. 3.	Professor Sidener
3	Animal Biology or Botany, A. B. 1 or B. 1.	Professor Nachtrieb, Professor Clements
3	Economics, Ec. 1.	Professor Robinson, Mr. Phelan
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, Assistant Professor A. Zeleny, Assistant Professor Erikson, Mr. Kovarik
3	Surveying, C. E. 1.	Assistant Professor Bass, Mr. Cutler
3	Animal Biology or Botany, A. B. 1 or B. 1.	Professor Nachtrieb, Professor Clements
3	Transportation, Ec. 9 A.	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. 12.	Professor Constant, Mr. Kesner
4	Surveying, C. E. 2.	Assistant Professor Bass, Mr. Cutler, Mr. Hinckley
2	American Government, P. S. 16.	Professor Schaper, Mr. Allin
2	Experimental Laboratory Ex. E. 1.	Professor Kavanaugh, Mr. Shoop
3	Elective.	

Second Semester

4	Mechanics, M. 8.	Professor Eddy, Professor Brooke, Assistant Professor Newkirk
3	Stresses, C. E. 13.	Professor Constant, Mr. Kesner
4	Surveying, C. E. 3.	Assistant Professor Bass, Mr. Hinck- ley
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. 14.	Professor Constant, Mr. Kesner
4	Hydraulic Engineering, C. E. 5.	Assistant Professor Bass Mr. Hinckley
5	Masonry, C. E. 17.	Professor Constant
6	Railway Engineering, C. E. 9.	Mr. Cutler
3	Experimental Laboratory, Ex. E. 8.	Professor Kavanaugh
3	or Water Analysis, C. 5.	Professor Frankforter
3	or Railway Engineering, C. E. 10	Mr. Cutler

*Option allowed by the Committee on Students' Work, in cases of students who have completed the modern language requirement.

Second Semester

5	Structural Design, C. E. 15.	Professor Constant, Mr. Kesner
4	Municipal Engineering, C. E. 6.	Assistant Professor Bass
3	Reinforced Concrete, C. E. 18.	Professor Constant
5	Thesis.	
4	Swing Bridges, C. E. 16.	Professor Constant
	or	
4	Bacteriology, P. B. 1.	Professor Wesbrook
	or	
4	Railway Economics, C. E. 11.	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, Assistant Professor A. Zeleny, Assistant Professor Erikson, Mr. Kovarik
3	Chemistry, C. 2.	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, Assistant Professor A. Zeleny, Assistant Professor Erikson, Mr. Kovarik
3	Chemistry, C. 3, 6.	Professor Sidener, Assistant Pro- fessor Harding
3	Economics, Ec. 1, 9A.	Professor Robinson, Mr. Phelan
3	Mechanism and Kinematics, M. E. 11, 12.	Mr. 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. 16.	Professor Schaper, Mr. Allin
3	Stresses, C. E. 12.	Professor Constant, Mr. Kesner
5	Machine Design, M. E. 13.	Professor Flather, Mr. Martenis.
1	Boilers, M. E. 19.	Mr. Shoop
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, Mr. Martenis
2	Gas Engines, M. E. 21.	Mr. Shoop
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
	or	
4	Railway Design, M. E. 25.	Professor Flather
3	Heating and Ventilation, M. E. 23.	Mr. Martenis
	or	
2	Railway Technology, M. E. 24.	Mr. 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 Administration, Ec. 9B.	Professor Robinson
	{ 2 Railway Mech. Eng. M. E. 26.	Professor Flather
4	Machine Design, M. E. 16.	Professor Flather
	or	
4	Railway Design, M. E. 25.	Professor Flather, Mr. 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, Assistant Professor A. Zeleny, Assistant Professor Erikson, Mr. Kovarik
3	Chemistry, C. 2.	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, Assistant Professor A. Zeleny, Assistant Professor Erikson, Mr. Kovarik
3	Kinematics and Mechanism, M. E. 11.	Mr. Martenis
3	Economics, Ec. 1.	Professor Robinson, Mr. Phelan
3	Chemistry, C. 3.	Professor Sidener
4	Shop, M. E. 5.	Mr. Shipley

*Option allowed by Committee on Students' Work in cases of students who have completed the modern language requirement.

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.	Mr. Martenis
3	Economics, Ec. 9A.	Professor Robinson, Mr. Phelan
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, Mr. Martenis
1	Steam Boilers, M. E. 19.	Mr. Shoop

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. 12.	Professor Constant, Mr. Kesner
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, 7, 8 or 9, E. E.	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, Mr. Shoop
2	Thesis.	Professor Shepardson
3	Elective.	

Second Semester

3	Alternating Currents, E. E. 6.	Professor Shepardson
3	Electrical Engineering Practice, 8, 10, 11, 12, E. E.	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.	

ORDER OF STUDIES FOR CLASSES GRADUATING 1909-1910-1911

CIVIL ENGINEERING

SOPHOMORE YEAR

First Semester

5	Mathematics, M. 3'.	Professor Haynes, Professor Brooke
6	Physics, P. 1a.	Professor Jones
3	Technological Chemistry, C. 3.	Professor Sidener
3	Drawing, D. 5.	Professor Kirchner, Mr. Rose
4½	Topography, C. E. 2.	Assistant Professor Bass, Mr. Hinckley
3	Drill, M. S. 1.	Captain Sigerfoos

Second Semester

5	Mathematics, M. 4'.	Professor Haynes, Professor Brooke
6	Physics, P. 1b.	Professor Jones and Assistants
2	Drawing, D. 5.	Professor Kirchner, Mr. Rowley
2	Astronomy, A. 1.	Professor Leavenworth
4½	Topography, C. E. 3.	Assistant Professor Bass, Mr. Hinckley
2	Highways, C. E. 7.	Assistant Professor Bass
3	Drill, M. S. 1.	Captain Sigerfoos

JUNIOR YEAR

First Semester

5	Mechanics, M. 7'.	Professor Eddy
3	Physics P. 2 or Elective.	Assistant Professor A. Zeleny
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. 12.	Professor Constant, Mr. Kesner

Second Semester

5	Mechanics, M. 8'.	Professor Eddy
3	Structural Details, C. E. 13.	Mr. Kesner
3	Stresses, C. E. 12, 13.	Professor Constant, Mr. Kesner
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. 17.	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. 14.	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. 15.	Professor Constant
3	Reinforced Concrete, C. E. 18.	Professor Constant
2	Transportation, Ec. 9A.	Professor Robinson
3	Sanitary Engineering, C. E. 6.	Assistant Professor Bass, Mr. Hinckley
2	Contracts and Specifications, M. E. 28.	Professor Flather
5	Thesis.	

ORDER OF STUDIES FOR CLASSES GRADUATING 1909-1910-1911

MECHANICAL ENGINEERING

SOPHOMORE YEAR

First Semester

5	Mathematics, M. 3'.	Professor Haynes, Professor Brooke
6	Physics, P. 1a.	Professor Jones and Assistants
3	Technological Chem., C. 3.	Professor Sidener
3	Drawing, D. 5.	Professor Kirchner, Mr. Rose
4½	Shop, M. E. 2, 4.	Mr. Shipley, Mr. Quigley
3	Drill, M. S. 1.	Captain Sigerfoos

Second Semester

5	Mathematics, M. 4'.	Professor Haynes
6	Physics, P. 1b.	Professor Jones and Assistants
2	Drawing, D. 5.	Professor Kirchner, Mr. Rowley
2	Kinematic Drawing, M. E. 12.	Mr. Martenis
3	Mechanism, M. E. 11.	Mr. Martenis
4½	Shop, M. E. 2, 4.	Mr. Shipley, Mr. Quigley
3	Drill, M. S. 1.	Captain Sigerfoos

JUNIOR YEAR

First Semester

5	Mechanics, M. 7a'.	Professor Eddy, Assistant Professor Newkirk
3	Physics, P. 2.	Assistant Professor A. Zeleny
3	Stresses, C. E. 12.	Professor Constant
4	Machine Design, M. E. 13.	Professor Flather, Mr. Martenis
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, Mr. Martenis
2	Gas Engines and Producers, M. E. 21.	Mr. Shoop
3	Experimental Lab. Ex. E. 2, 3.	Professor Kavanaugh, Mr. Shoop
1	Steam Boilers, M. E. 19.	Mr. Shoop
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.	Mr. 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
3	Fuel and Gas Analysis, C. 6.	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 ap- proval of department.	
	Thesis.	

Second Semester

2	Steam Turbines, M. 11'.	Professor Eddy
	or	
2	Railway Engineering, M. E. 25.	Professor Flather
2	Contracts and Spec., M. E. 28.	Professor Flather
2	Transportation, Ec. 9A.	Professor Robinson
4	Machine Design, M. E. 16.	Professor Flather
	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.	

ORDER OF STUDIES FOR CLASSES GRADUATING 1909-1910-1911

ELECTRICAL ENGINEERING

SOPHOMORE YEAR.

First Semester

5	Mathematics, M. 3'.	Professor Haynes, Professor Brooke
6	Physics, P. 1a.	Professor Jones and Assistants
3	Technological Chemistry, C. 3.	Professor Sidener
3	Drawing, D. 5.	Professor Kirchner, Mr. Rose
4½	Shop, M. E. 2, 4.	Mr. Shipley, Mr. Quigley
3	Drill, M. S. 1.	Captain Sigerfoos

Second Semester

5	Mathematics, M. 4'.	Professor Haynes, Professor Brooke
6	Physics, P. 1b.	Professor Jones and Assistants
2	Applied Electricity, E. E. 1.	Professor Shepardson
4	Kinematics and Mechanism, M. E. 11, 12.	Mr. Martenis
2	Drawing, D 5.	Professor Kirchner, Mr. Rowley
3½	Shop, M. E. 2, 4.	Mr. Shipley, Mr. Quigley
3	Drill, M. S. 1.	Captain Sigerfoos

JUNIOR YEAR

First Semester

5	Mechanics, M. 7a'.	Professor Brooke
3	Physics, P. 2.	Assistant Professor A. Zeleny
3	Stresses, C. E. 12.	Professor Constant
2	Electrical Machinery, E. E. 2.	Professor Springer
1	Electrical Laboratory, E. E. 17.	Professor Springer.
1	Steam Boilers, M. E. 19.	Mr. Shoop
4	Machine Design, M. E. 13.	Professor Flather, Mr. Martenis
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, Mr. Martenis
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	Water turbines, ** M. 10'.	Professor Eddy
2	Political science, P. S. 16.	Professor Schaper
2	Electrical laboratory, E. E. 18.	Professor Springer
3	Elective.	
	Thesis.	

Second Semester

3	Alternating currents, E. E. 5.	Professor Shepardson
2	Electrical engineering practice, E. E. 9 to 12.	Professor Shepardson
2	Contracts and spec., M. E. 28.	Professor Springer, Mr. Ryan
2	Transportation, Ec. 9A.	Professor Flather
3	Electrical design, E. E. 15.	Professor Robinson
3	Electrical laboratory, E. E. 18.	Mr. Ryan
3	Elective.	Professor Springer
3	Thesis.	

MUNICIPAL ENGINEERING

SOPHOMORE YEAR

First Semester

5	Mathematics, M. 3'.	Professor Haynes, Professor Brooke
6	Physics, P. 1a.	Professor Jones
3	Quantitative Anal., C. 4.	Professor Sidener
3	Drawing, D. 5.	Professor Kirchner, Mr. Rose
4½	Topography, C. E. 2.	Assistant Professor Bass
3	Drill, M. S. 1.	Captain Sigerfoos

Second Semester

5	Mathematics, M. 4'.	Professor Haynes, Professor Brooke
6	Physics, P. 1b.	Professor Jones
2	Drawing, D. 5.	Professor Kirchner, Mr. Rowley
2	Astronomy, A. 1.	Professor Leavenworth
4½	Topography, C. E. 3.	Assistant Professor Bass, Mr. Hinckley
2	Highways, C. E. 7.	Assistant Professor Bass
3	Drill, M. S. 1.	Captain Sigerfoos

JUNIOR YEAR

First Semester

5	Mechanics, M. 7'.	Professor Eddy
3	Physics, P. 2 or Elective.	Assistant Professor A. Zeleny
2½	Curves and earthwork, C. E. 9.	Mr. Cutler
2½	Water analysis, C. 5.	Professor Frankforter
2	Experimental lab., Ex. E. 1.	Professor Kavanaugh, Mr. Shoop
3	Field work, C. E. 10.	Mr. Cutler
3	Stresses, C. E. 12.	Professor Constant, Mr. Kesner

** This course in 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 wishing to specialize in Telephone Engineering will be allowed to elect an optional course in Telephony instead of Water Turbines, but they may, nevertheless, elect Water Turbines as preparation for Steam Turbines of the second semester if they desire to take Steam Turbines as an elective.

Second Semester

5	Mechanics, M. 8'.	Professor Eddy
3	Structural Details, C. E. 12, 13.	Professor Constant, Mr. Kesner
3	Stresses, C. E. 13.	Professor Constant, Mr. Kesner
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. 17.	Professor Constant
2	Experimental lab., Ex. E. 8.	Professor Kavanaugh
3	Electric power, E. E. 4.	Mr. Ryan.
5	Structural design, C. E. 14.	Professor Constant
2	Political science, P. S. 16.	Professor Schaper
4	Hydraulic engineering, C. E. 5.	Assistant Professor Bass

Second Semester

3	Biology, B. 2.	Assistant Professor Tilden
4	Bacteriology, P. B. 1.	Professor Wesbrook
5	Sanitary engineering, C. E. 6.	Assistant Professor Bass
2	Transportation, Ec. 9A.	Professor Robinson
2	Contracts and spec., M. E. 28.	Professor Flather
3	Thesis.	

COURSE IN SCIENCE AND TECHNOLOGY

SOPHOMORE YEAR

5	Mathematics, M. 3', 4'.	Professor Haynes, Professor Brooke
3	History or Chemistry, or French or English.	
6	Physics, P. 1.	Professor Jones and assistants
4	Drawing, D. 1, 3, 2, 4.	Professor Kirchner
1	Rhetoric, E. 1.	Professor Sanford, Mr. Gislason
3	Military Drill, M. S. 1.	Captain Sigerfoos

JUNIOR YEAR

First Semester

5	Mechanics, M. 7'.	Professor Eddy
3	Physics, P. 2.	Assistant Professor Zeleny
3	Drawing, D. 5.	Professor Kirchner
4	Technical work.	
4	Elective work.	

Second Semester

5	Mechanics, M. 8'.	Professor Eddy
2	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
Three credits (four hours laboratory, two lectures per week) First and second semesters

Open to juniors, 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. PRACTICAL ASTRONOMY PROFESSOR LEAVENWORTH
Three credits (three hours per week) Second semester
Sophomore C. E. course. Preparation: course M. 3.
Spherical co-ordinates; time; latitude; longitude, and other astronomical problems. Lectures.

BOTANY

PROFESSOR CLEMENTS, ASSISTANT PROFESSOR TILDEN, ASSISTANT PROFESSOR
ROSENDAHL

1. GENERAL BOTANY PROFESSOR CLEMENTS, ASSISTANT PROFESSOR TILDEN
Three credits (four hours laboratory, two lectures per week) First semester

Open to juniors, C. E. course.

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.

2. BIOLOGY ASSISTANT PROFESSOR TILDEN
Three credits (six hours per week).
Required of seniors, municipal engineering course.
Brief course in general biology. Microscopical examination of samples of water for small plants and animals of frequent occurrence in public water supplies. Sedgwick-Rafter method.

CHEMISTRY

PROFESSOR FRANKFORTER, PROFESSOR SIDENER, ASSISTANT PROFESSOR NICHOLSON, ASSISTANT PROFESSOR HARDING, MR. FRARY

2. **QUALITATIVE ANALYSIS** ASSISTANT PROFESSOR NICHOLSON, MR. FRARY
Three 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.
3. **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 2.
Includes technical analysis of materials of engineering, with special references to iron and steel. Lectures and laboratory work.
4. **VOLUMETRIC ANALYSIS** PROFESSOR SIDENER
Three credits First semester
Required of sophomores, municipal engineering course. Preparation: course 2.
5. **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.
6. **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 AND MUNICIPAL ENGINEERING; SURVEYING

ASSISTANT PROFESSOR BASS, MR. HINCKLEY; MR. CUTLER

1. **SURVEYING** ASSISTANT PROFESSOR BASS, MR. CUTLER
Three credits, (five hours per week) Second 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 coordinate 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** ASSISTANT PROFESSOR BASS, MR. HINCKLEY
Four credits, (eight hours) First semester
Senior 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.
3. **SURVEYING AND TOPOGRAPHY** MR. HINCKLEY
Four 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.

4. SURVEYING MR. HINCKLEY
 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, (six 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, (six 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. HINCKLEY

9. RAILWAY ENGINEERING MR. CUTLER, MR. HINCKLEY
 Six credits (ten hours per week) First semester
 Post senior, C. E. course.
 Study of the mathematics of curves and earthwork, with application to practical problems in location and construction. Preliminary and final location survey is made of about four miles of relocation, "profiles," "mass diagrams," description of right of way, complete estimate of cost. Text books: "Railroad Curves and Earthwork," Allen; "The Railroad Spiral," Searles.
10. RAILWAY ENGINEERING 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.
11. RAILWAY ENGINEERING MR. CUTLER
 Three credits, (three hours per week) Second semester
 Post senior, C. E. course. Optional.
 Recitation 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. Textbook: "Economics of Railroad Construction," Webb.

STRUCTURAL ENGINEERING

PROFESSOR CONSTANT, MR. KESNER

12. **STRESSES IN FRAMED STRUCTURES** PROFESSOR CONSTANT, MR. KESNER
 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 and girders and roof truss bents. Recitations, problems and plates. Ketchum's *Steel Mill Buildings*. Handbooks of Steel Manufacturers.
13. **STRESSES IN FRAMED STRUCTURES** PROFESSOR CONSTANT, MR. KESNER
 Three credits, (three hours per week) Second semester
 Continuation of course 12, with special reference to stresses in bridge trusses under moving loads. Recitations, problems and plates. Burr and Falk's "Design and Construction of Metallic Bridges"; Burr and Falk's "Influence Lines."
14. **STRUCTURAL DESIGN** PROFESSOR CONSTANT, MR. KESNER
 Five credits (ten hours per week) First semester
 Post-senior. Open to students who have completed courses 12 and 13.
 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.
15. **STRUCTURAL DESIGN** PROFESSOR CONSTANT, MR. KESNER
 Five credits, (ten hours per week) Second semester
 Post senior continuation of course 14.
 With special reference to the design of a steel railway bridge and the theory and design of steel arch bridges. Lectures, problems and designs. Merriman and Jacoby's *Roofs and Bridges*, Part IV.
16. **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.
17. **MASONRY CONSTRUCTION** PROFESSOR CONSTANT
 Five credits (seven hours per week) First semester
 Post senior, preparation: course 12.
 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, three hours per week; drawing room work, four 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.
18. **REINFORCED CONCRETE** PROFESSOR CONSTANT
 Three credits, (six hours per week) Second semester
 Post senior. Preparation: course 17.
 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. MCKEEHAN, MR. NEMEC

1. DRAWING MR. ROSE, MR. MCKEEHAN, MR. ROWLEY
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. MCKEEHAN, MR. ROWLEY
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, MR. ROWLEY,
MR. ROSE, MR. MCKEEHAN
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, MR. MCKEEHAN
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
Three credits each semester (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.
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. ROWLEY, MR. ROSE
Three credits each semester (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

8. DESCRIPTIVE GEOMETRY AND APPLICATIONS
9. PROJECTIVE GEOMETRY

ECONOMICS

PROFESSOR GRAY, PROFESSOR ROBINSON, MR. PHELAN

1. ELEMENTS OF ECONOMICS PROFESSOR ROBINSON, MR. PHELAN
Three credits (three hours per week) First or second semester
Required of juniors

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.

9. A. ECONOMICS OF TRANSPORTATION AND COMMUNICATION

PROFESSOR ROBINSON
Second semester

Three credits (three hours per week)

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. B. RAILWAY ECONOMICS

PROFESSOR ROBINSON
Second semester

Three credits (three hours per week)

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 affecting economy of operation; (2), passenger and goods traffic; (3), underlying economic principles.

ELECTRICAL ENGINEERING

PROFESSOR SHEPARDSON, PROFESSOR SPRINGER, MR. RYAN, MR. SPERRY

1. APPLIED ELECTRICITY

PROFESSOR SHEPARDSON
Second semester

Three credits (three hours per week)

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

Three 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. Textbook: Norris, Introduction to the Study of Electrical Engineering.

5. ELECTRIC POWER

MR. RYAN

Three 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. Textbook: Franklin and Esty, Elements of Electrical Engineering Practice.

6. ALTERNATING CURRENTS PROFESSOR SHEPARDSON
Two and three 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.
Textbook: 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. Textbook: 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 PROFESSOR SPRINGER
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 telegraphy 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 pow-
 er plant
17. **ELECTRICAL LABORATORY** PROFESSOR SPRINGER
 Three credits (six hours per week) First and second semester
 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 char-
 acteristic curves of generators and motors.
18. **ELECTRICAL LABORATORY** PROFESSOR SPRINGER
 Three credits (six hours per week) First and second semesters
 Post senior year.
 Experimental study of alternating currents; regulation and effi-
 ciency tests of alternators, transformers, motors and rotaries;
 photometric tests of incandescent and arc lamps.
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. **PLANT OPERATION** MR. RYAN, MR. DIXON
 One credit (equivalent to two hours per week) First or second
semester
 Practice in operation and care of boilers, engines, motors,
 dynamos, battery and circuits of the University lighting plant.
22. **JOURNAL READING** PROFESSOR SHEPARDSON
 One credit First and second semester
 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 re-
 sistance, voltage, current, self-induction and capacity; stand-
 ardization of measuring instruments. Open to a limited num-
 ber subject to approval.
24. **ILLUMINATING ENGINEERING** PROFESSOR SHEPARDSON
 Lectures and laboratory work. Investigation of performance of
 electric and gas lamps, reflectors and diffusers; luminous effi-
 ciency, distribution, color characteristics, physiological phenom-
 ena, methods of determining location, kind and quantity 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, in-
 cluding induction, transpositions, 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. GISLASON

1. ENGLISH PROFESSOR SANFORD, MR. GISLASON

Four 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
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 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 1909, 1910 and 1911.

1. MATERIALS TESTING LABORATORY; two credits required of juniors
First semester
2. STEAM LABORATORY; two credits, required of juniors, M. E. and
E. E. Second semester
3. HYDRAULIC LABORATORY; two credits, required of juniors M. E. and
C. E. Second semester
5. EXPERIMENTAL LABORATORY; two credits, required of senior miners.
Second semester
6. EXPERIMENTAL LABORATORY; three credits, required of senior M. E.
First semester

7. EXPERIMENTAL LABORATORY; three credits required of senior E. E. First semester
 8. EXPERIMENTAL LABORATORY; two credits (elective), First semester
 9. GAS ENGINE LABORATORY; four credits required of senior 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, ASSISTANT PROFESSOR ANDRIST, ASSISTANT PROFESSOR FRELIN, MR. MELOM

1. BEGINNING ASSISTANT PROFESSOR ANDRIST, ASSISTANT PROFESSOR FRELIN
 Three credits (three hours per week) First and second semesters
 Open to freshmen.
 Fraser and Squair's *French Grammar and Reader*; modern texts.
2. INTERMEDIATE FRENCH ASSISTANT PROFESSOR FRELIN
 Three credits (three hours per week) First and second semesters
 Open to sophomores who have completed 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 ASSISTANT PROFESSOR ANDRIST
 Three 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 Copee, Feuillet, and Sandeau.
5. THE CLASSICAL PERIOD OF FRENCH LITERATURE PROFESSOR BENTON
 Three 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
 Three 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
 Three credits (three hours per week) First and second semesters
 Open to those who have completed F. 11.
 First Semester; Loiseaux, Spanish Composition. Brownell, *El Pizarro Verde*.
 Second Semester: Gray's *Fortuna*; Alarco's *El Capitan Veneno*.

GEOLOGY AND MINERALOGY

PROFESSOR HALL, ASSISTANT PROFESSOR SARDESON

1. GEOLOGY ASSISTANT PROFESSOR SARDESON
 Three credits (three hours per week) First semester
 Required of sophomores C. E. course.
 A condensed course in physical and historic geology, for civil engineers. Geodynamics, structural geology, physiography, stratigraphic and historical geology are treated of 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, MR. BURKHARD

1. BEGINNING ASSISTANT PROFESSOR JUERGENSEN, MR. BURKHARD
Three credits (three hours per week) First and second semesters
Open to all.
Pronunciation, grammar, conversation and composition; selected reading in easy prose and verse.
3. SCIENTIFIC INTERMEDIATE ASSISTANT PROFESSOR JUERGENSEN
Three credits (three hours per week) First and second semesters
Open to all who have completed course 1. 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.
4. PROSE AND POETRY PROFESSOR MOORE, ASSISTANT PROFESSOR JUERGENSEN, MR. BURKHARD
Three credits (three hours per week) First and second semesters
Open to all who enter the university with two years of German. First semester: Meissner's *Aus Deutschen Landen*; Goethe's *Gedichte*. Second semester: Schrakamp's *Berühmte Deutsche*; 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 PROFESSOR JUERGENSEN
Three credits (three hours per week) First and second semesters
Open to those who have taken course two, three or four. Reading of monographs and periodicals.

MATHEMATICS AND MECHANICS

PROFESSOR EDDY, PROFESSOR HAYNES, PROFESSOR BROOKE, ASSISTANT PROFESSOR NEWKIRK, MR. HOVDA

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. HOVDA
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. HOVDA
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.

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 1909, 1910, 1911

- 3'. ANALYTICAL GEOMETRY AND ELEMENTARY CALCULUS PROFESSOR HAYNES, PROFESSOR BROOKE
 Five credits, (five hours per week) First semester
 Required of all sophomores. Conic sections and other loci; analytical geometry of three dimensions, including the point, straight line and plane and the quadric; differentiation and integration.
- 4'. CALCULUS PROFESSOR HAYNES, PROFESSOR BROOKE
 Five credits (five hours per week) Second semester
 Required of all sophomores. Differential coefficients, expansions in series, maxima and minima, differential properties of curves and surfaces, indeterminate forms, evolutes and envelopes, curve tracing, rectification, quadrature, cubature, center of gravity, center of pressure, moment of inertia.
- 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 course 7'. The principles of statics and dynamics, and the mechanics of the materials 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, 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 hours per week) First 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, MR. MARTENIS, MR. SHOOP, MR. SHIPLEY,
MR. RICHARDS, MR. PETERSON, MR. QUIGLEY, MR. HERRICK

SHOP WORK

1. CARPENTRY AND PATTERN MAKING MR. RICHARDS
Four credits (six hours per week, twenty-four weeks) First and second semester
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 or second semester
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 or second semester
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 or second semester
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. **ENGINE ROOM PRACTICE** MR. MARTENIS, 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** MR. MARTENIS
Three credits (three hours per week, lectures and recitations) First semester
Preparation: Required of juniors, M. E. and E. E. courses. 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** MR. MARTENIS
Three credits (six hours per week) Second semester
Preparation: Required of juniors, M. E. and E. E. courses. 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 AND MR. MARTENIS
Five credits (ten hours per week) First semester
Preparation: 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, MR. MARTENIS
Three credits (six hours per week) Second semester
Preparation: 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
Preparation: Required, post senior year, M. E. course. 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
Preparation: Required, post senior year, M. E. course. 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** MR. SHOOP
 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. SHOOP
 Two credits, (two hours per week) Second semester
 Senior year. Open only to students pursuing course C. 6.
 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
 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.
 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** MR. 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, reci-
 tations and design.
 Seminar. Open to seniors and post seniors once a week.

RAILWAY MECHANICAL ENGINEERING

The following courses are available to students desiring to prepare themselves for special work in railway engineering.

24. **RAILWAY TECHNOLOGY** MR. 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
 principal 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
 Four credits (eight hours per week) First and second semesters
 Post senior. Preparation: course 24.
 (a) Of link and valve motions. Continuation of course 12
 with special applications of the Stephenson link.
 (b) Of locomotive 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 equaliz-
 ing arrangements, running gear, brakes, trucks, lubrication.
 (b) Of locomotive boilers and connected parts. Types, propor-
 tions, grates, flues, smoke-box arrangements and stacks,
 riveted joints, bracing and staying. Lagging, smoke pre-
 vention.
 (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
Second semester
 Post senior.
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, reci-
 tations and practice in writing specifications.

FOR GRADUATES

Courses are offered in:
 Engineering design.
 Experimental investigation.
 Railway engineering.

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 the instruction in military drill and administration the students are organized into a corps of cadets, consisting of four 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, 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. MILITARY SCIENCE CAPTAIN SIGERFOOS
(Two hours per week) Second semester
Optional with 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 obedience to lawful authority, as well as to familiarize students with company and battalion 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 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.

PATHOLOGY AND BACTERIOLOGY

- PROFESSOR WESBROOK, ASSISTANT PROFESSOR HILL, DR. PRATT
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

PHYSICS

PROFESSOR JONES, PROFESSOR J. ZELENY, ASSISTANT PROFESSOR A. ZELENY,
ASSISTANT PROFESSOR ERIKSON, MR. KOVARIK

5. MECHANICS OF SOLIDS AND FLUIDS PROFESSOR JONES, PROFESSOR
J. ZELENY, ASSISTANT PROFESSOR A. ZELENY,
ASSISTANT PROFESSOR ERIKSON, MR. KOVARIK
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, ASSISTANT 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, ASSISTANT
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 ASSISTANT 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 1909-1910-1911

The mathematics of the freshman year is required as preparation for all courses in this department.

1. **PHYSICS** PROFESSOR JONES AND ASSISTANTS
Six credits, (two lectures, three recitations and two hours laboratory per week) First and second semesters
(a) Mechanics, heat, and sound.
(b) Electricity, magnetism, and light.
2. **ELECTRICAL MEASUREMENTS** ASSISTANT PROFESSOR A. ZELENY
Three credits (one lecture or recitation and four hours laboratory per week) First semester
3. **ADVANCED LABORATORY WORK** PROFESSOR JOHN ZELENY
Open to those who have completed course 2.

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.

DEPARTMENT OF AGRICULTURE

THE COLLEGE OF AGRICULTURE

The College of Agriculture

FACULTY

- CYRUS NORTHROP, LL. D., *President.*
E. W. RANDALL, *Dean.*
SAMUEL B. GREEN, B. S., *Professor of Horticulture and Forestry.*
HARRY SNYDER, B. S., *Professor of Agricultural Chemistry and Soils.*
T. L. HAECKER, *Professor of Dairy Husbandry and Animal Nutrition*
M. H. REYNOLDS, M. D., V. M., *Professor of Veterinary Medicine and Surgery.*
ANDREW BOSS, *Professor of Agriculture and Animal Husbandry.*
FREDERICK WASHBURN, M. A., *Professor of Entomology*
WILLIAM BOSS, *Professor of Farm Structures and Farm Mechanics.*
E. M. FREEMAN, M. S., *Professor of Vegetable Pathology and Botany.*
JOHN STEWART, B.S., *Professor of Agricultural Engineering*
R. C. LANSING, M.A., *Professor of English*
D. D. MAYNE, *Principal of School of Agriculture*
JOHN A. HUMMEL, B. Agr., *Assistant Professor of Agricultural Chemistry.*
C. P. BULL, B. Agr., *Assistant Professor of Agriculture.*
D. A. GAUMNITZ, M. Agr., *Assistant Professor of Animal Husbandry.*
C. C. LIPP, D.V.M., *Assistant Professor of Veterinary Medicine and Surgery*
E. G. CHEYNEY, B. S., *Assistant Professor of Forestry.*
S. B. DETWILER, B. S., *Assistant Professor of Forestry.*
EDWARD SIGERFOOS, Ph.S., *Military Instruction*

INSTRUCTORS

- J. A. VYE, *Farm Accounts.*
J. M. DREW, *Blacksmithing, Poultry.*
JUNIATA SHEPPERD, M. A., *Domestic Science.*
MARGARET BLAIR, *Domestic Art.*
FANNIE C. BOUTELLE, *Domestic Economics*
MARY BULL, *Domestic Science*
A. D. WILSON, B. Agr., *Agriculture.*
LE ROY CADY, B. S. A., *Horticulture*

- GRACE B. WHITRIDGE, *Physical Culture*
A. G. RUGGLES, M. A., *Entomology*.
E. C. PARKER, B. Agr., *Agriculture*.
L. B. BASSETT, *Agriculture*
A. M. BULL, *Drawing*
W. L. BEEBE, D. V. M., *Bacteriology*.
W. H. FRAZIER, B. S., *Agricultural Chemistry and Soils*
A. E. WILHOIT, M. A., *Agricultural Chemistry and Soils*
H. B. WHITE, B. S. A., *Farm Structures and Farm Mechanics*
JOSEPHINE CRAIG, *Agricultural Chemistry*
A. R. KOHLER, B. S. A., *Horticulture*
C. SCHROEDER, B. S., *Animal Husbandry*
HENRIETTA CLOPATH, *Drawing*
H. B. ROE, *Mathematics*
MARTHA B. MOORHEAD, M. D., *Lecturer in Domestic Hygiene*

General Information

REQUIREMENTS FOR ADMISSION TO ALL COURSES IN THE COLLEGE OF AGRICULTURE

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, Literature, 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 universities: 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 course.

Special Students: Graduates of the School of Agriculture may 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 University, and no credit shall be given for subjects in which the student has not been previously registered.

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 144 credit hours (all the work required in the Freshman B year being counted as 36 credits), together with such practical experience as may be required by the committee on college course, students in the course in agriculture will be recommended for graduation with the degree of Bachelor of Science in Agriculture and students in the course in home economics with the degree of Bachelor of Science in Home Economics.

Students in the course in Forestry after completing the prescribed course of study, equivalent to 158 credit hours, will be recommended for graduation with the degree of Bachelor of Science in Forestry.

The elective studies designed 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 colleges. 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 experiment 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 within 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.

FEEES

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.

DAILY ROUTINE

The daily session is divided into eight recitation periods of fifty minutes each, four in the morning and four in the afternoon. The morning session begins at 8:15 and closes at 11:30 o'clock. A general assembly of the faculty and students is held at 11:30 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. With the exception of Saturday afternoon work extends through six days of the week.

LIBRARY

The library of the College of Agriculture contains between 10,000 and 11,000 carefully selected volumes and a large number of pamphlets, bulletins, and reports which are unbound.

Each department connected with the school and college aids in bringing together all valuable material, and students will find every inducement to pursue an extended reading course in connection with their class work. The library also contains a small but well selected number of the standard works in English and American literature, and is well provided with general reference books and general technical periodicals. The card catalogue of author and subject aids greatly in the use of the books which are all classified by the Dewey Decimal Classification. Those in charge are always pleased to assist students and aim to make the library a center for all agricultural research study.

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, the work is mostly elective and gives the student an opportunity to take work along certain lines for which he has a special aptitude and liking.

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 crop 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 "laboratories" and studies 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 AND SOILS

Nature of Courses. All students are required to take courses 1 to 5 inclusive. Courses 7 and 8 are general lecture courses required in the agricultural course. These courses can be taken either with or without the laboratory courses, Nos. 9 and 10. Course 6 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 soils, foods and agricultural products is provided. The equipment contains an experiment mill for the production of wheat flour, a Berthelot-Atwater calorimeter for the determination of the caloric value of foods, vacuum ovens, apparatus for the chemical and physical analysis of soils, an electrical apparatus for determining the resistance of soils to soluble salts, and the necessary facilities for human and animal food investigations. Special facilities are offered in soil investigations and in the analysis and testing of 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 dietary problems. Standard reference books and journals, including Jahresbericht der Agrikultur Chemie, Comptes Rendus, Biedermann's Centralblatt, Annales de la Science Agronomique and Veruschs-Stationen are provided for the advanced work in agricultural chemistry.

Fees. In all of the laboratory courses in agricultural chemistry, a fee is charged to cover the cost of material used, and breakage. The student is assigned a certain amount of apparatus and material for which he gives a receipt, and deposits \$3 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.

DAIRY HUSBANDRY

Equipment. Students in the college course have the advantages of the equipment of the dairy school. The feeding and breeding experiments in the dairy division of the experiment station serve a most useful purpose in the collegiate instruction. The cordial relations existing between the department of agriculture and the other state institutions are often advantageous to college students well advanced in dairy work.

Representatives of several breeds of cattle are kept for class use. Herds in the vicinity and those shown at the state fair are useful to students in this course.

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, but also over 10,000 specimens, 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 museums 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.

FARM STRUCTURES AND FARM MECHANICS

Lectures and practicums in designing and 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 construction of farm buildings.

The buildings on the campus, such as farm house, barns, dairy buildings, greenhouses, live stock pavilion, sheep barns, swine barns, silos, 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 house 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 meet farm conditions.

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 classroom and laboratory exercises. The special work in breeding and testing fruits is carried on at Zumbra Heights, Carver county, where one hundred acres of land is 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 this 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.

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 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 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.

COURSE IN FORESTRY

The course in forestry is a four years course intended to prepare men to take charge of private forest properties, for the Government Service, or for positions as teachers. It leads to the degree of Bachelor of Science in Forestry.

Although 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 near-by forests, to lumber

camp, saw mills, wood manufacturing and paper mills; to the Boom Company's work on the Mississippi river; to near-by 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 the state 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 Forestry 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 Forestry 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 presented as opportunity offers.

COURSE IN HOME ECONOMICS

The work in home economics offered in the College of Agriculture is a four years 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 positions 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.

NORMAL COURSE

In addition a short two years normal course is offered in home economics, which includes all the special technical subjects given in the four years

course in the College of Agriculture at the University Farm, but does not include the required general cultural studies which are given in the College of Science, Literature, and the Arts. Those who complete this course receive a certificate only.

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.

OUTLINE OF COURSE IN AGRICULTURE

(Numbers after subjects indicate number of courses)

FRESHMAN YEAR

Division A.

For graduates of the School of Agriculture

First Semester

Mathematics 1, three hours, Mr. Roe
Geology 1, three hours, Professor Hall
German 1, five hours, Professor Schlenker and Assistants
Rhetoric 1, three hours, Professor Lansing
Botany 1, six hours, Professor Clements and Assistants

Second Semester

Mathematics 3, half semester, three hours, Mr. Roe
Drawing 2, half semester, four hours, Miss Clopath
German 1, five hours, Professor Schlenker and Assistants
Rhetoric 1, three hours, Professor Lansing
Botany 1, six hours, Professor Clements and Assistants
Agricultural Chemistry 4, six hours, Mr. Wilhoit

FRESHMAN YEAR

Division B

For graduates of approved High Schools or others of equal standing.

First Semester

Rhetoric 1, three hours, Professor Lansing
Farm Mechanics 1, four hours, Professor Wm. Boss and Assistants.
Agricultural Chemistry 1, five hours, Professor Snyder and Assistants
Animal Husbandry 1, three hours, Mr. Schroeder
Entomology 1, half semester, three hours, Professor Washburn
Horticulture 1, two hours, Mr. Cady
Agriculture 2, half semester, three hours, Mr. Parker
Drawing 1, four hours, Mr. A. Bull
Veterinary 1, three hours, Professor Reynolds
Agriculture 1, three hours, Assistant Professor Bull
Military Drill, three hours, Captain Sigerfoos, U. S. A.
Gymnasium, one hour

Second Semester

Animal Husbandry 3, three hours, Professor A. Boss
Farm Mechanics 2, four hours, Mr. Drew
Agricultural Chemistry 2, three hours, Professor Snyder and Assistants
Animal Husbandry 2, half semester, four hours, Mr. Schroeder
Horticulture 2, half semester, three hours, Professor Green and Assistants
Animal Husbandry 4, half semester, three hours, Mr. Drew
Drawing 2, half semester, four hours, Miss Clopath
Rhetoric 1, three hours, Professor Lansing
Mathematics 3, half semester, three hours, Mr. Roe
Horticulture 3, half semester, four hours, Mr. Cady
Dairy Husbandry 2, half semester, four hours, Professor Haeccker and Assistants
Military Drill, three hours, Captain Sigerfoos, U. S. A.
Gymnasium, one hour

SOPHOMORE YEAR

First Semester

Botany (B) 1, six hours, Professor Clements and Assistants
Zoology 1, six hours, Professor Sigerfoos and Assistants
German or *French* 3, three hours, Professor Schlenker and Assistants, or Professor Benton and Assistants
Agricultural Chemistry 5, six hours, Professor Snyder and Assistants
Rhetorc 2, three hours, Professor Lansing
Agricultural Physics 1, three hours, Professor Stewart
Horticulture 1, or *Animal Husbandry* 6, half semester, four hours, Professor Green, or Professor A. Boss
Military Drill (B), three hours, Captain Sigerfoos, U. S. A.

Second Semester

Botany (B) 1, six hours, Professor Clements and Assistants
Zoology 1, six hours, Professor Sigerfoos and Assistants
German or *French* 3, three hours, Professor Schlenker and Assistants, or Professor Benton and Assistants
Agricultural Chemistry 5, six hours, Professor Snyder and Assistants
Rhetoric 2, three hours, Professor Lansing
Economics 1, three hours, Professor Robinson
Agriculture 10, half semester, four hours, Professor A. Boss and Assistants
Military Drill (B), three hours, Captain Sigerfoos, U. S. A.

JUNIOR YEAR

First Semester

Agricultural Chemistry 7, three hours, Professor Snyder and Assistants

Agriculture 5, three hours, Assistant Professor Bull

Dairy Husbandry 3, three hours, Professor Haecker

Botany 3, six hours, Professor Clements and Assistants

Economics 1, three hours, Professor Robinson

Vegetable Pathology 1, six hours, Professor Freeman

Second Semester

Agricultural Chemistry 8, three hours, Professor Snyder and Assistants

Farm Structures 4, three hours, Professor Wm. Boss

Agriculture 8 and 9, three hours, Mr. Wilson and Mr. Parker

Botany 3, six hours, Professor Clements and Assistants

Economics, elective, three hours, Professor Gray and Assistants

Animal Husbandry 9, three hours, Professor A. Boss and Assistants

SENIOR YEAR

First Semester

Agriculture 4, three hours, Assistant Professor Bull

Farm Structures 5, three hours, Professor Wm. Boss

Animal Husbandry 7, three hours, Professor A. Boss and Assistants

Comparative Physiology, six hours, Professor Sigerfoos

Elective, three hours

Elective, three hours

Second Semester

Horticultural Elective, three hours, Professor Green and Assistants

Veterinary Elective, three hours, Professor Reynolds

Agricultural Elective, three hours, Professor A. Boss and Assistants

Elective, three hours

Elective, three hours

Elective, three hours

SENIOR ELECTIVES

Greenhouse Management and Floriculture, three hours, Professor Green and Assistants

Landscape Gardening, three hours, Professor Green

Plant Breeding—Horticulture, three hours, Professor Green

Plant Breeding—Agriculture, three hours, Assistant Professor Bull

Systematic Pomology, three hours, Mr. Kohler
Agricultural Engineering, three hours, Professor Stewart
Chemistry Laboratory Courses, six hours, Professor Snyder and Assistants
Economic Entomology, three hours, Professor Washburn
Comparative Anatomy and Histology of Insects, six hours, Professor Washburn and Assistants
Elements of Bee Keeping, one hour, Professor Washburn
Anatomy and Body Nutrition, three hours, Professor Reynolds
Anatomy of Conformation of Type, three hours, Professor Reynolds
Diseases of Animals, three hours, Professor Reynolds
Advanced Meats and Judging, three hours, Professor A. Boss and Assistants.
Bacteriology, one hour, Dr. Beebe
Dairy Stock and Dairy Farm Management, three hours, Professor Haecker
Factory Dairying, three hours, Professor Haecker and Assistants
Farm Accounts, four hours, Mr. Vye
Farm Machinery, three hours, Mr. Bassett
General Forestry, three hours, Assistant Professor Cheyney
Research Work—Dairy Husbandry, Agriculture, Horticulture, Animal Husbandry, Veterinary

ACADEMIC ELECTIVES

Botany	Psychology
Economics	History
Literature	Education
Geology	Rhetoric
Zoology	

OUTLINE OF COURSE IN ANIMAL HUSBANDRY

Students who wish to specialize in Animal Husbandry are recommended to arrange their courses in the junior and senior years as follows:

JUNIOR YEAR

First Semester

Zoology 2, six hours, Professor Sigerfoos and Assistants
Animal Husbandry 12, three hours, Assistant Professor Gaumnitz
Agriculture 5, three hours, Assistant Professor Bull
Economics, elective, three hours
Dairy Husbandry 2, three hours, Professor Haecker
Animal Husbandry, elective, three hours, Professor Boss and Assistants

Second Semester

Zoology 2, six hours, Professor Sigerfoos and Assistants
Animal Husbandry 8, three hours, Professor A. Boss and Assistants
Farm Structures 9, three hours, Professor Wm. Boss
Economics, elective, three hours
Animal Husbandry 10, three hours, Professor A. Boss and Assistants
Elective, three hours

SENIOR YEAR

First Semester

Farm Structures 10, three hours, Professor Wm. Boss
Comparative Physiology, six hours, Professor Sigerfoos
Animal Husbandry 7, six hours, Professor A. Boss and Assistants
Animal Husbandry 11, three hours, Professor A. Boss or Professor
 Haecker
Elective, three hours
Elective, three hours

Second Semester

Veterinary Elective, three hours, Professor Reynolds
Animal Husbandry 14, three hours, Professor A. Boss and Assistants
Animal Husbandry 13, three hours, Professor A. Boss
Animal Husbandry 16, three hours, Professor A. Boss
Elective, three hours
Elective, three hours

JUNIOR AND SENIOR ELECTIVES FOR ANIMAL HUSBANDRY

COURSE

Anatomy, three hours, Professor Reynolds
Dissection, three hours, Professor Reynolds
Agricultural Economics, three hours, Mr. Parker
Foods, three hours, Professor Snyder
Stock Farm Management, three hours, Mr. Wilson
Animal Taxonomy, three hours, Professor Reynolds
Home Dairying, four hours, Professor Haecker
Dairy Stock and Dairy Farm Management, three hours, Professor Haecker
Diseases of Animals, three hours, Professor Reynolds
Animal Mechanics, three hours, Assistant Professor Gaumnitz
Bibliography of Agricultural Literature
Field Crops and Seeds, three hours, Assistant Professor Bull

Animal By-Products, three hours, Professor A. Boss
Advanced Meats and Judging, three hours, Professor A. Boss

OUTLINE OF COURSE IN FORESTRY

(Numbers after subjects indicate number of courses).

FRESHMAN YEAR

First Semester

Mathematics 1, three hours, half semester, Mr. Roe
German or French 1, five hours, Professor Schlenker and Assistants, or
Professor Benton and Assistants
Botany 1, six hours, Professor Clements and Assistants
Geology 1, three hours, Professor Hall
Rhetoric 1, three hours, Professor Lansing
Agricultural Chemistry 1, five hours, Professor Snyder and Assistants
Forestry 1, three hours, Assistant Professor Cheyney
Military Drill, three hours, Captain Sigerfoos, U. S. A.

Second Semester

Mathematics 3, half semester, three hours, Mr. Roe
German or French 1, five hours, Professor Schlenker and Assistants, or
Professor Benton and Assistants
Botany 1, six hours, Professor Clements and Assistants
Physiography, three hours, Mr. E. M. Lehnerts
Rhetoric 1, three hours, Professor Lansing
Agricultural Chemistry 2, three hours, Professor Snyder and Assistants
Military Drill, three hours, Captain Sigerfoos, U. S. A.

SOPHOMORE YEAR

First Semester

German or French 3, three hours, Professor Schlenker and Assistants, or
Professor Benton and Assistants
Rhetoric 2, three hours, Professor Lansing
Mineralogy 1, three hours, Professor Hall and Mr. Grout
Botany 2, six hours, Professor Clements and Assistants
Zoology 1, six hours, Professor Sigerfoos and Assistants
Drawing 1, four hours, Mr. A. Bull
Agricultural Chemistry 5, six hours, Professor Snyder and Assistants
Forestry 11, one hour, Assistant Professor Detwiler
Military Drill, three hours, Captain Sigerfoos, U. S. A.

Second Semester

- German or French* 3, three hours, Professor Schlenker and Assistants, or
Professor Benton and Assistants
Rhetoric 2, three hours, Professor Lansing
Forestry 24, three hours, Professor Green
Botany 2, six hours, Professor Clements and Assistants
Zoology 1, six hours, Professor Sigerfoos and Assistants
Drawing 4, six hours, Mr. A. M. Bull
Agricultural Chemistry 5, six hours, Professor Snyder and Assistants
Vegetable Pathology 2, six hours, Professor Freeman
Military Drill, three hours, Captain Sigerfoos, U. S. A.

JUNIOR YEAR

First Semester

- Entomology* 3, six hours, Professor Washburn
Botany 3, six hours, Professor Clements and Assistants
Agriculture 1, three hours, Assistant Professor Bull
Economics 1, three hours, Professor Robinson and Mr. Phelan
Forestry 3, three hours, Assistant Professor Detwiler
Forestry 7, three hours, Assistant Professor Cheyney

Second Semester

First Half

- Animal Husbandry*, Professor A. Boss and Assistants
Forestry 12, Assistant Professor Cheyney
Horticulture 3, Professor Green and Assistants
Farm Structures 3, Professor Wm. Boss
Farm Mechanics 2, Mr. Drew
Veterinary 5, Professor Reynolds
Farm Mechanics, Professor Wm. Boss
Entomology 3, Professor Washburn
Botany 3, half semester, Professor Clements and Mr. Huff
Dairy Husbandry, Professor Haecker and Assistants

Last Half at Itasca Park

April 15 to September 1.

- Forestry* 3, Assistant Professor Detwiler
Forestry 5, Assistant Professor Cheyney
Forestry 6, Professor Stewart
Forestry 18, Assistant Professor Detwiler
Forestry 20, Professor Stewart
Forestry 19, Assistant Professor Detwiler

SENIOR YEAR

First Semester

Forestry 10, three hours, Assistant Professor Cheyney
Forestry 9, three hours, Assistant Professor Cheyney
Vegetable Pathology 1, six hours, Professor Freeman
Agricultural Chemistry 12, three hours, Assistant Professor Hummel
Economics, elective, three hours, Professor Gray and Assistants

Second Semester

First Half

Forestry 8, Mr. Fullerton
Forestry 23, Assistant Professor Cheyney
Forestry 22, Assistant Professor Cheyney
Forestry 16, Assistant Professors Cheyney and Detwiler

Second Half at Itasca Park.

April 15 to June 1.

Forestry 17, Assistant Professor Cheyney
Forestry 4, Assistant Professor Detwiler
Forestry 15, Professor Green
Forestry 14, Professor Green
Forestry 13, Professor Stewart
Forestry 21, Professor Stewart
Forestry 24, Professor Green

OUTLINE OF COURSE IN HOME ECONOMICS

(Numbers after subjects indicate number of courses.)

FRESHMAN YEAR

Division "A"

For graduates of the School of Agriculture

First Semester

Mathematics 1, three hours, Mr. Roe
Geology 1, three hours, Professor Hall and Mr. Grout
German or French 1, five hours, Professor Schlenker and Assistants, or
Professor Benton and Assistants
Rhetoric 1, three hours, Professor Lansing
Botany 1, six hours, Professor Clements and Assistants

Second Semester

- Mathematics 2*, half semester, three hours, Mr. Roe
Drawing 2, half semester, four hours, Miss Clopath
German or French 1, five hours, Professor Schlenker and Assistants, or
 Professor Benton and Assistants
Rhetoric 1, three hours, Professor Lansing
Botany 1, six hours, Professor Clements and Assistants
Agricultural Chemistry 4, six hours, Mr. Wilhoit

FRESHMAN YEAR

Division B.

For graduates of approved High Schools or others of equal standing

First Semester

- Rhetoric 1*, three hours, Professor Lansing
Agriculture 11, three hours, Professor A. Boss and Assistants
Agriculture 1, three hours, Professor A. Boss and Assistants
Agricultural Chemistry 1, five hours, Professor Snyder
Horticulture 1, two hours, Professor Green and Assistants
Entomology 1, half semester, three hours, Professor Washburn
Domestic Science 1, four hours, Miss Shepperd
Domestic Art 1, four hours, Mrs. Blair
Drawing 1, four hours, Mr. A. Bull
Domestic Economics 1, three hours, Mrs. Boutell
Physical Training, two hours, Miss Whitridge

Second Semester

- Agricultural Chemistry 3*, six hours, Miss Craig
Horticulture 3, half semester, three hours, Professor Green and Assistants
Animal Husbandry 4, half semester, three hours, Mr. Drew
Domestic Science 1, four hours, Miss Shepperd
Domestic Art 1, four hours, Mrs. Blair
Drawing 2, half semester, four hours, Miss Clopath
Rhetoric 1, three hours, Professor Lansing
Mathematics 3, half semester, three hours, Mr. Roe
Horticulture 3, half semester, four hours, Mr. Cady
Dairy Husbandry 1, half semester, four hours, Professor Haecker and
 Assistants
Domestic Economics. 3, three hours, Dr. Moorhead
Animal Husbandry 5, half semester, one hour, Professor A. Boss
Physical Training, two hours, Miss Whitridge

SOPHOMORE YEAR

First Semester

Botany 1 (B), six hours, Professor Clements and Assistants
Zoology 1, six hours, Professor Sigerfoos and Assistants
German or French 3, three hours, Professor Schlenker and Assistants, or
Professor Benton and Assistants
Agricultural Chemistry 5, six hours, Professor Snyder and Assistants
Rhetoric 3, three hours, Professor Lansing
Domestic Art 2, four hours, Mrs. Blair
Domestic Science 2, four hours, Miss Shepperd

Second Semester

Botany (B) 1, six hours, Professor Clements and Assistants
Zoology 1, six hours, Professor Sigerfoos and Assistants
German or French 3, three hours, Professor Schlenker and Assistants, or
Professor Benton and Assistants
Agricultural Chemistry 5, six hours, Professor Snyder and Assistants
Rhetoric 3, three hours, Professor Lansing
Domestic Art 2, four hours, Mrs. Blair
Domestic Science 3, one hour, Miss Shepperd
Domestic Science 4, one hour, Dr. Beebe

JUNIOR YEAR

First Semester

Domestic Economics 2, three hours, Mrs. Boutell
Domestic Art 4, four hours, Mrs. Blair
Domestic Science 5, four hours, Miss Shepperd
Education 1, three hours, Assistant Professor Swift
Agricultural Chemistry 6, six hours, Professor Snyder and Assistants
Agricultural Chemistry 7, three hours, Professor Snyder and Assistants
Psychology 1, three hours, Professor Wilde and Assistants

Second Semester

Domestic Science 5, four hours, Miss Shepperd
Domestic Art 4, four hours, Mrs. Blair
Education 2, three hours, Assistant Professor Swift
Agricultural Chemistry 9, six hours, Professor Snyder and Assistants
Farm Structures 6, three hours, Professor Wm. Boss
Drawing 3, four hours, Miss Clopath
Domestic Art 3, three hours, Mrs. Blair

SENIOR YEAR

First Semester

Domestic Art 5, three hours, Mrs. Blair
Domestic Science 6, six hours, Miss Shepperd
Psychology 2, three hours, Professor Wilde and Assistants
Farm Structures 7, three hours, Professor Wm. Boss
English, elective, three hours, Professor Burton and Assistants
Elective, three hours

Second Semester

Domestic Science 6, six hours, Miss Shepperd
Domestic Art 6, six hours, Mrs. Blair
Agricultural Chemistry 13, three hours, Miss Craig
Horticulture, elective, three hours, Professor Green and Assistants
Elective, three hours
Elective, three hours

NORMAL COURSE

FIRST YEAR

Same as Freshman Year in course of Home Economics

SECOND YEAR

First Semester

Domestic Economics 2, three hours, Mrs. Boutelle
Domestic Science 5, six hours, Miss Shepperd
Domestic Art 2, four hours, Mrs. Blair
 Rhetoric 2, three hours, Professor Lansing
Agricultural Chemistry 7, three hours, Professor Snyder
Psychology 1, three hours, Professor Wilde and Assistants
Botany 1, six hours, Professor Clements and Assistants
Domestic Art 3, three hours, Mrs. Blair

Second Semester

Domestic Science 5, six hours, Miss Shepperd
Domestic Art 2, four hours, Mrs. Blair
 Rhetoric 2, three hours, Professor Lansing
Agricultural Chemistry 13, three hours, Miss Craig
Child Psychology, three hours, Professor Wilde and Assistants
Botany 1, six hours, Professor Clements and Assistants
Domestic Science 3, one hour, Miss Shepperd
Domestic Science 4, one hour, Dr. Beebe
Drawing 3, four hours, Miss Clopath

Courses of Study

AGRICULTURE

1. **AGRONOMY** ASSISTANT PROFESSOR BULL
Three credits (three hours per week) First semester
Open to freshmen registered in division B.
An elementary course in the study of farm management, crop rotation and the planning and platting of farms; 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; treatment of field crop diseases; plant selection and breeding methods.
2. **FARM DEVELOPMENT** MR. PARKER
Three credits (three hours per week) Second semester
Open to freshmen registered in division B.
It is proposed in teaching this subject to cover the elementary principles governing the science of agriculture. The work covers the origin, formation and cultivation of soils; the movement and control of soil moisture; subduing fields; a study of drainage, roads, fences, water supply; the relation of science to agriculture and farm life; a general consideration of farm practices and farming as a business.
3. **FARM MACHINERY** MR. BASSETT
Two credits, elective (four hours per week) Second semester
Open to freshmen registered in division B.
Practical suggestions and practice work are given in connection with the best methods of adjustment, handling and adaptation of the various kinds of machinery to the soil, weeds and seasons. Durability and convenience in manipulation are chief among the points considered.
4. **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, sillage crops, and to the production and preservation of all kinds of dry cured and ensilaged crops.
5. **THREMMATOLOGY** ASSISTANT PROFESSOR BULL
Three credits (three hours per week) First semester
Open to juniors. Given in alternate years.
Heredity, variation, law of breeding, the art of breeding, im-

provement 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 the literature of breeding.

6. **PLANT BREEDING** ASSISTANT PROFESSOR BULL
 Three credits, elective (three hours per week) First semester
 Open to juniors. Given in alternate years.
 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 hybridizing, 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 merchandising and the breeding of each of the various field crops grown in Minnesota.
7. **AGRICULTURAL ENGINEERING** PROFESSOR STUART
 Three credits, elective (six hours per week) Second semester
 Open as an elective to juniors and seniors.
 Subduing prairie and timber soils, land drainage, farm land mensuration and surveying; irrigation and irrigation works; roads, their location, maintenance, laws and construction, financial support; farm fences, buildings, implements and machinery.
8. **AGRICULTURAL ECONOMICS** MR. PARKER
 One and one-half credits, elective (three hours per week for nine weeks) Second semester
 Open to juniors.
 Labor, farm finances, markets, rentals, agricultural statistics, production, exports, wages, land laws, ownership, taxes, organizations.
9. **FARM MANAGEMENT** MR. WILSON
 One and one-half credits (three hours per week for nine weeks) Second semester
 Open to juniors.
 In this course are considered the planning of farms, crop rotation, tillage, and systems of farming. Special attention is given to revising and drafting farm plans and to arranging economic crop rotations, and application of business methods to farm operations.
10. **AGRICULTURAL PRACTICUMS**
 (Four hours per week)
 Opportunities to gain practical experience, 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.
7. **AGRICULTURAL ENGINEERING** PROFESSOR STEWART
 Opportunities to gain practical experience, to acquire greater
11. **FIELD AGRICULTURE** PROFESSOR A. BOSS AND ASSISTANTS
 (Three hours per week) First semester
 Open to Freshman girls in Div. E.
 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 in rotation and the business of farming.

AGRICULTURAL CHEMISTRY AND SOILS

1. **AGRICULTURAL CHEMISTRY**
(Five hours per week)
Open to freshmen registered in division B.
In agricultural chemistry, one term is given to the study of the elements and compounds which are of 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 agricultural chemistry. In the chemistry of foods, the composition of plant and animal bodies, the chemistry of the plant and of its food and growth, the chemistry of animal nutrition, digestibility and value of foods, and the laws 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.
In 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.
PROFESSOR SNYDER
First semester
2. **SOILS AND FERTILIZERS**
(Six hours per week)
Open to freshmen registered in division B.
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 sealing of soils, alkali soils, acid soils, humus and other 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 affecting 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.
PROFESSOR SNYDER
Second semester
3. **DOMESTIC CHEMISTRY**
(Six hours per week)
Open to freshmen registered in division B.
The combination of human foods to form balanced rations, dietary studies of families, cost and value of foods, losses in the cooking and preparation of foods, cereal food products, animal food products, adulterations of foods and their detection, fuels, soaps, dye stuffs and colors, composition of common household utensils, the household water supply, preparation of home-made baking powders, bakers' chemicals, the composition, food value and characteristics of tea, coffee, chocolate, cocoa, molasses, honey, vinegar and spices, the grading and testing of wheat flour and the chemistry of bread making, form the essential parts of this work.
MISS CRAIG
Second semester
4. **GENERAL CHEMISTRY**
Three credits (three hours per week)
Open to freshmen registered in division A.
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
MR. WILHOIT
Second semester

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 animal and plant life.

5. **AGRICULTURAL QUALITATIVE ANALYSIS** MR. WILHOIT
Six credits (six 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.

6. **AGRICULTURAL QUANTITATIVE ANALYSIS** PROFESSOR SNYDER
Three credits (six 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 determinations 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 10 or 11.

7. **HUMAN AND ANIMAL FOODS** PROFESSOR SNYDER
Three credits (three hours per week) First semester
Open to juniors. Given in alternate years.

Lectures. This course treats 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. Dietary 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 nutrition and the use of the literature upon the subject. Special attention is given to the economic production of foods and their utilization for human and animal food purposes.

8. **SOILS AND FERTILIZERS** PROFESSOR SNYDER
Three credits (three hours per week) Second semester
Open to juniors. Given in alternate years.

Lectures. This course treats of the relation of soils and their fertility to the production of crops, and includes a study of the sources of plant food and the influence of tillage and manures upon the chemical and allied physical and biological changes which take place in the soil in rendering plant food available. Rock disintegration and soil production, the various types of soil formed from different kinds of rocks and their agricultural value, and the inherent fertility of soils, form an essential part of the work. The control of the water in the soil, soil solutions and leachings, the presence of injurious acid compounds and alkaline salts, the various methods employed for the improvement of soils, soil organisms and their

influence upon fertility, the organic compounds of the soil and the part which they take in soil fertility the increase and decrease of the organic matter and the nitrogen of the soil as influenced by different methods of farming, manures, and the causes of soil exhaustion and means employed, the analyses of soils, and the application and interpretation of the results, uses of commercial fertilizers and green and farm fertilizers for conservation of fertility, adaptability of crops to soils and rotation of crops as affecting the fertility of the soil are some of the topics discussed. Soil judging, rating and scaling form a part of the work.

9. THE ANALYSIS OF FOODS (elective) PROFESSOR SNYDER
 Three credits (six hours per week) First or second semester
 Open to juniors and seniors.
 This work includes the determination of water, ash, starch, sugar, cellulose, pentosans, fats, protoids, and the different forms of nitrogen in food stuffs, the use of the calorimeter, and the polariscope 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.
 This course includes, also, 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, iodine absorption, specific gravity, and the saponification 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.
10. THE ANALYSIS OF SOILS AND FERTILIZERS (elective) PROFESSOR SNYDER AND MR. WILHOIT
 Three credits (six hours per week)
 Open to juniors and seniors.
- (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 soil, 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 Hilgard's elcctrator, and the sedimentation methods as modified by the use of centrifugal apparatus.
 Course 10 is intended for students who desire to make a specialty of the subject of soils.
11. SPECIAL PROBLEMS (elective) PROFESSOR SNYDER, ASSISTANT PROFESSOR HUMMEL AND MR. WILHOIT
 Seminar and laboratory work in the study of special problems in agricultural chemistry, as the analysis of water for irrigation purposes, the adulteration of foods, dietetics, and problems in agricultural technology.
12. CHEMISTRY OF FOREST PRODUCTS ASSISTANT PROFESSOR HUMMEL
 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, gums, creosote, wood alcohol, acetic acid, acetone, essential oils, charcoal, camphor, and medicinal products. The subjects of paint and methods 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.

13. DOMESTIC CHEMISTRY AND DIETETICS MISS CRAIG
 Three credits (six hours per week) Second semester
 Open to seniors.
 Lectures and laboratory practice. Advanced course. Courses
 7 and 9 required as preliminary preparation.

ANIMAL HUSBANDRY

1. STUDY OF BREEDS MR. SCHROEDER
 (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 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 the University farm for this purpose.
2. STOCK JUDGING MR. SCHROEDER
 (Four hours per week) Second semester
 Open to freshmen registered in division B.
 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 market classes of stock. 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.
3. FEEDING AND BREEDING PROFESSOR BOSS AND ASSISTANT
PROFESSOR GAUMNITZ
Second semester
 (Three hours per week)
 Open to freshmen registered in division B.
 Feeding, first nine weeks.
 The principles of feeding as applied to the production of horses, 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.
- ANIMAL BREEDING, last nine weeks
 Open to freshmen registered in division B.
 Students receive instruction in the principles that govern breeding; in 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.

4. **POULTRY** MR. DREW
(Three hours per week) 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; planning, building and arrangement of poultry
houses; managing incubators and brooders. A model poultry
house, containing pens of the most improved breeds, incu-
bator cellar, work-room, etc., has been provided, where ex-
perimental work and practical instruction are carried on.
5. **MEATS** ASSISTANT PROFESSOR GAUMNITZ
(One hour per week) 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 dif-
ferent classes of meat and to the best methods of curing and
preserving.
6. **STOCK JUDGING (elective)** 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 speci-
mens is a feature of this course. Students are drilled in judg-
ing from the standpoint of breed, type, form, stamina, quality,
breeding, capacity, suitability for feeding and for general and
specific production.
7. **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 arrange-
ments can be made.
8. **STOCK BREEDING** PROFESSOR BOSS
Three credits (three hours per week) Second semester
Open to juniors.
Discussion of the principles of stock breeding as affecting
breed maintenance and breed formation; standards of excellence
and comparison of standards of breeds; heredity and the
influences affecting it; prepotency, fecundity and their rela-
tion to successful breeding; the influence of nutrition on animal
growth and form, and the effect of artificial conditions, early
maturity, selection and pedigree, and a study of the early history
of breeds of live stock and of methods of breeders famous in
live stock improvement.
9. **LIVE STOCK FEEDING AND MANAGEMENT** PROFESSOR BOSS
Three credits (three hours per week) Second semester
Open to sophomores.
The principles of feeding as applied to economical production;
feeding rations, feed stuffs, methods of feeding, care and man-
agement of breeding and fattening stock, management of ani-
mals during pasture, yard and stall feeding for the block, selec-
tion of animals for the feed lot, and stabling 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.

10. **STOCK FARM MANAGEMENT** MR. WILSON
 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, and solution of confronting problems is made the leading feature.
11. **ANIMAL NUTRITION STUDIES** PROFESSOR BOSS
 Three credits (three hours per week) First semester
 Open to seniors.
 Original work in special live stock problems related to meat production followed by a thesis; sufficient original work must be done to form a reliable basis for conclusions.
12. **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.
13. **LIVE STOCK RECORDS AND RESEARCH** PROFESSOR BOSS
 Three credits (six hours per week) Second semester
 Open to seniors.
 This course will consist of reviewing literature upon different phases of live 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 experiment stations. Sufficient actual practice will be required to become familiar with live stock records and herd books.
14. **ANIMAL BY-PRODUCTS** PROFESSOR BOSS 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 economic use is considered.
15. **ADVANCED MEATS AND JUDGING** PROFESSOR BOSS AND ASSISTANT
PROFESSOR GAUMNITZ
 Three credits, elective (six hours per week) Second semester
 Open to juniors and seniors.
 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.
16. **ANIMAL MECHANICS** PROFESSOR REYNOLDS AND ASSISTANT
PROFESSOR GAUMNITZ
 Three credits (three hours per week) Second semester
 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.
17. **LIVE STOCK PRACTICUMS** MR. SCHROEDER
 Feeding and stable management of cattle, horses, sheep and swine, recording and calculating amounts of pasturage ob-

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 academic 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.

VEGETABLE PATHOLOGY AND BOTANY

1. **PLANT PATHOLOGY** PROFESSOR FREEMAN
Six credits (six hours per week) First and second semesters
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 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 detail studies in the histology of woods.

DAIRY HUSBANDRY AND ANIMAL NUTRITION

1. **DAIRY STOCK AND DAIRY FARM MANAGEMENT** PROFESSOR HAECKER
Three credits, elective (three hours per week)
The lectures cover a brief history of the dairy breeds. The fundamental principles of breeding for milk production, the rearing of

dairy stock with the object of developing the highest efficiency in the mature animal and the study of the gross anatomy of the dairy cow in its relation to milk production, form essential features of the course. One hour per week is given in tracing pedigrees and in practice work in the management, care and judging of dairy stock.

2. BUTTER MAKING PROFESSOR HAECKER AND ASSISTANTS
 (Four hours per week)
 The running of separators; ripening and churning of 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.

3. 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 nutrition and their relation to the economic production of animals and animal products form the basis of this course. Practice work is given in formulating and compounding rations, in the study of the comparative value of food stuffs and other problems relating to feeding.

4. FACTORY DAIRYING PROFESSOR HAECKER
 Elective Second semester
 Open to juniors.
 This is offered during the session of the dairy school, beginning November 18th. Lectures in the forenoon on dairy bacteriology, dairy chemistry, the care of milk and cream, lactic cultures, flavors, cleaning milk, cream ripening and churning, working and packing butter. In the afternoon, students are given two and a half periods' practice in the factory training rooms and in the dairy laboratory.

5. NUTRITION RESEARCH PROFESSOR HAECKER
 Three credits (elective) 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 and the first half of the second semester. The student is required to become familiar with the literature of some phase of animal nutrition, outline and conduct and investigation under the supervision of the instructors of the department, and prepare a suitable report of the investigation. The object of this course is to familiarize the student with the methods employed in the study of animal nutrition problems.

DOMESTIC ART

1. ELEMENTARY SEWING MRS. BLAIR
 (Four hours per week) First and second semesters
 Open to freshmen registered in division B.
 Instruction is given in hand-sewing, including the different stitches, hems, seams, gussets, 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. DESIGNS IN DRAFTING MRS. BLAIR
 Four credits (four hours per week) First and second semesters
 Open to 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 also given the first 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) First and second semesters
 Open to juniors.
 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 finishings 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

1. **HOME ECONOMICS** MRS. BOUTELLE
 (Three hours per week) First semester
 Open to freshmen registered in division B.
 This course deals with the problems of economics arising in the home; generic lines of expenditure; values; business methods; standards of living; constructive agencies for economic betterment in the home; lectures, problems and recitations.
2. **EVOLUTION AND ADMINISTRATION OF THE HOME** MRS. BOUTELLE
 Three credits (three hours per week) First semester
 Open to juniors.
 The home as a social and economic institution and its evolution from primitive conditions; evolution of industrial, social, religious and economic influences in the home; the relation of the home to civic life. The organization and maintenance of a home; the home as a place and an opportunity for the right development of the physical and spiritual natures; lectures, problems and recitations.
3. **DOMESTIC HYGIENE** DR. MOORHEAD
 (First nine weeks) 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 of and obedience to the laws of hygiene are essential to the preservation as well as the restoration of health.

DOMESTIC SCIENCE

1. **ELEMENTARY DOMESTIC SCIENCE** Miss SHEPPERD
(Four hours per week) First and second semesters
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, fruits, jellies, pickles, preserves, 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 bluing is studied. The use of hand and commercial laundry machinery is taught by means of demonstration, observation and reading, text-books, lectures, assigned readings and recitations.

2. **DOMESTIC SCIENCE** Miss SHEPPERD
Two credits (four hours per week) First semester
Open to sophomores.
The library reading and class room discussions are limited to reliable data, and the practical work aims to illustrate ways in which foods may be best prepared and served.

3. **DOMESTIC SCIENCE** Miss SHEPPERD
One credit (one hour 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. **BACTERIOLOGY** DR. BEEBE
One credit (one hour per week, nine weeks) Second semester
Open to sophomores.
Lectures once a week during the second semester of the sophomore year. Domestic bacteriology; bacteriology of the common infectious diseases.

5. **DOMESTIC SCIENCE** Miss SHEPPERD
Four credits (four hours per week) First and second semesters
Open to juniors.
Students practice teaching under supervision and independent practice in preparing and serving meals. The object of the former is to train students to teach successfully under varied conditions, thus enabling them to acquire ability to lead pupils to work rapidly, quietly, harmoniously and successfully. The object of the practice work is to ensure an understanding of approved methods and attain efficiency in performing and supervising such work. Special attention is given to methods of teaching. Students are required to elaborate syllabi of lessons on certain topics such as water, air, etc. General information concerning their class work in practice teaching is given in the form of an itemized account, i. e., kind and amount of materials used, number of students present, cost of lessons, etc. The practice teaching must cover at least twenty recitations. Library reading, observation, text book, lectures and discussions.

6. DOMESTIC SCIENCE MISS SHEPPERD
 Six credits (four hours per week) First and second 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.
- 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.

DRAWING

1. MECHANICAL DRAWING MR. A. M. BULL
 (Four hours per week) First semester
 Open to freshmen registered in Division B.
 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.
2. FREE-HAND DRAWING MISS CLOPATH
 (Four hours per week) one-half semester Second semester
 Open to freshmen.
 The study of nature forms, including drawings from plants, landscape, animals and from figures posed. The study of perspective and drawing from objects. Exercises in composition.
3. DESIGNING MISS CLOPATH
 Two credits (four hours per week) Second semester
 Open to juniors.
 Exercises in the various forms of decorative work. Adaptation of plant forms, stencils, lettering. Original designs in different styles for articles of household use. Lectures on composition and principles of design.
4. TOPOGRAPHICAL DRAWING MR. A. M. BULL
 Three credits (six hours per week) First semester
 Open to sophomores.
 Topographic drawing and mapping; exercises in lining and lettering, tracing and blue printing.
5. TOPOGRAPHICAL DRAWING MR. A. M. BULL
 Three credits (six hours per week) Second semester
 Open to sophomores.
 Topographical drawing and mapping, platting, landscape designing.

ECONOMICS

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. 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.

2. **ECONOMIC GEOGRAPHY** 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 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 largely 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.
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.
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 view point of public wants. Budget systems 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.

14. ECONOMICS OF AGRICULTURE

MR. COULTER

Three credits (three hours per week) Second semester
Open to those who have completed course 1 or course 2, and to others by special permission of the instructor.

Preliminary survey and classification of industries as extractive, manufacturing, and distributive; and comparison of the several extractive industries in the United States, viz., fishing, forestry, grazing, farming, and mining. Historic development of agriculture and comparison of existing systems, with reference to stage of economic development and geographic conditions. Transition in the United States from extensive to intensive and from general to specialized farming in relation to the law of decreasing returns. Markets, transportation facilities, and other causes affecting the value of land and the prices of farm products. The size, organization, labor-system, and ownership of farms as bearing on economic efficiency and social and political conditions. Lectures, assigned readings, reports on special topics and quiz.

23. ECONOMICS OF FORESTRY AND IRRIGATION

MR. COULTER

Three credits (three hours per week) First semester
Open to those 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.

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

1. GENERAL ENTOMOLOGY PROFESSOR WASHBURN
 (Three hours per week) First semester
 Open to freshmen registered in division B.
 Structure and classification of insects. The dissection of type, life history and habits of leading forms. Each student is required to make a collection of at least fifty insects.
2. ECONOMIC ENTOMOLOGY PROFESSOR WASHBURN AND MR. RUGGLES
 Three credits, elective (three hours per week) First semester
 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 PROFESSOR WASHBURN AND MR. RUGGLES
 Three credits (six hours per week) First semester
 The students in this course must have a thorough, practical training in elementary entomology and economic entomology in order to put into practical use in field work the principles to be learned in both of these courses. The student will be directed in a special study of insects affecting the forest and will be encouraged in doing field work, collecting, identifying, and in the life history of forest insects.
 Open only to students in the forestry course.
4. COMPARATIVE ANATOMY AND HISTOLOGY OF INSECTS MR. RUGGLES
 Three credits, elective (six hours per week)
 A detailed study of structure of representatives of different orders of insects.
5. ELEMENTS OF BEE KEEPING PROFESSOR WASHBURN
 One credit 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 (elective) PROFESSOR WASHBURN
 For graduate students only First or second semester

FARM STRUCTURES AND FARM MECHANICS

1. CARPENTRY MR. WHITE
 (Four hours per week) First semester
 Open to freshmen registered in division B.
 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, cup-boards, etc.

Each student is required to file his own saws, sharpen his planes, chisels, etc., and to lay out rafters for buildings.

2. **BLACKSMITHING** MR. DREW
 (Four hours per week) Second semester
 Open to freshmen registered in division B.
 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, whiffle-tree-irons, tongs, cold chisels, punches, in short to 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.
3. **CARPENTRY FOR FORESTERS** PROFESSOR W. BOSS
 Three credits Second semester
 Open to juniors.
 Lectures and practice work on care and use of tools used in lumbering; saw filing; construction of camp buildings, bridges, etc.
4. **FARM STRUCTURES** PROFESSOR W. 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 W. BOSS
 Three credits (three hours per week) First semester
 Open to seniors.
 The practical application of principles given in course 1. 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 W. 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 decorations.
7. **FARM STRUCTURES** PROFESSOR W. 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 convenience.

FORESTRY

1. GENERAL FORESTRY ASSISTANT PROFESSOR DETWILER
Three credits (three hours per week) First semester
Open to freshmen.
This course is intended to give the student an outline of the possibilities of forestry work and an idea of the forestry problems to be solved in this country. Considerable attention will be devoted to the sylvics of the trees suited to Minnesota climate; the establishment of nurseries; the planting and care of windbreaks and groves, especially on the prairies.
2. SYLVICS ASSISTANT PROFESSOR DETWILER
Three credits First semester
Open to juniors.
The study of the fundamental principles which form the basis of silviculture, including the relation of forests to soil, climate and other factors which influence tree growth. Methods of silvical research, characteristics and habits of important trees. Lectures and collateral reading.
3. SYLVICULTURE ASSISTANT PROFESSOR DETWILER
Four credits Second semester
Open to juniors.
Methods of crop production and reproduction; care and improvement of the forest; silvicultural practice in the United States and abroad. Special work in silvicultural studies and the making of forest descriptions. Lectures, assigned reading and field work.
4. FOREST PLANTING ASSISTANT PROFESSOR DETWILER
One credit.
Open to seniors. (In Itasca Park)
Preparation of planting plans and notes on results of planting. Practical instruction in seed collecting, nursery practice, sowing and planting. Lectures and field work.
5. MENSURATION ASSISTANT PROFESSOR CHEYNEY
Four credits (In Itasca Park)
Open to juniors.
Determination of the rate of growth and volume of single trees and of stands; construction of volume and yield tables. The measurement of logs and lumber. Compilation of statistics. Lectures, recitations and problems.
6. SURVEYING PROFESSOR STEWART
Four credits (In Itasca Park)
Open to juniors.
Theory of land surveying and drill in the use and the care of the transit, level, plane table, etc. The student will be made familiar with approved methods of field work, particularly in running boundaries, topographic surveying and reconnaissance. Lectures and field work.
7. PROTECTION ASSISTANT PROFESSOR CHEYNEY
Three credits First semester
Open to juniors.
Practical measures for the protection of forests against fire, insects, grazing, etc. Protection of water right and regulations of stream flow. Lectures and field work.
8. GAME PROTECTION AND FISH CULTURE
One credit. Second semester
Open to seniors (nine weeks)
Habits, range, usefulness and manner of protecting the important large and small game, fish and birds of the United States.

9. **FOREST MANAGEMENT** ASSISTANT PROFESSOR CHEYNEY
 Three credits First semester
 Open to seniors.
 This course includes forest valuation. The calculation of soil rent, forest rent and the value of growing stock; the values of even and uneven stands; the different methods of managing forest properties and the principles underlying them. Lectures, assigned reading and problems.
10. **LUMBERING** ASSISTANT PROFESSOR CHEYNEY
 Three credits First semester
 Open to seniors.
 History of logging in the United States, together with the different methods used in the different forest regions; cruising, location of camps, building of roads, felling trees, skidding and transportation of the logs from the woods to the mill. The marketing and utilization are treated elsewhere. In connection with this course, the student is obliged to hand in a lumbering report based on data collected by him at some lumbering camp. This requires an excursion of about two weeks. Lectures and collateral reading.
11. **FORESTS OF THE UNITED STATES AND WORLD** ASSISTANT PROFESSOR DETWILER
 One credit
 Open to sophomores.
 Closely follows forest physiography and metrology. Includes a brief description of the forests of the world including their distribution and chief characteristics. Detailed description of the forests of the United States with types and species of the different regions. Lectures and collateral reading.
12. **LUMBER GRADING** ASSISTANT PROFESSOR CHEYNEY
 (Nine weeks) Second semester
 Open to juniors.
 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.
13. **MAPPING** PROFESSOR STEWART
 Two credits
 Open to seniors. (In Itasca Park)
 Completion of a set of boundary, topographic, type, block and stand maps in connection with and based on data from working plans.
14. **ADMINISTRATION** ASSISTANT PROFESSOR DETWILER
 One credit
 Open to seniors. (In Itasca Park)
 A study of the organizations necessary for the management of forest properties; federal, state, corporation and private.
15. **FOREIGN FORESTRY** PROFESSOR GREEN
 One credit
 Open to seniors. (In Itasca Park)
 The development and present status of forestry in foreign civilized countries. Lectures.
16. **SEMINARY** ASSISTANT PROFESSORS CHEYNEY AND DETWILER
 Three credits First semester
 Open to seniors.
 This is not, as the term generally implies, a class for the prosecution of original research work, 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.

17. **WORKING PLANS** ASSISTANT PROFESSOR CHEYNEY
 One credit
 Open to seniors. (In Itasca Park)
 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, silvicultural plans, estimating, yield tables, maps and systems of management. Lectures and field work.
18. **THINNING** ASSISTANT PROFESSOR DETWILER
 Four credits
 Open to juniors. (In Itasca Park)
 This course is designed to teach the student the principles underlying thinning operations and the tending of forests. Besides the class room work, there will be two months of field lectures and actual practice in marking. Lectures and field work.
19. **PACKING**
 Open to juniors. (In Itasca Park)
 Demonstration and practice under direction in the packing of wagons, boats, canoes, pack animals and pack sacks. Field lectures and practice.
20. **ROAD BUILDING** PROFESSOR STEWART
 Open to juniors. (In Itasca Park)
 Elementary principles of the science of road building. Rough field methods of laying out and constructing wood roads and trails; building bridges, etc. Lectures and field work.
21. **ESTIMATING TIMBER**
 Two credits
 Open to seniors (In Itasca Park)
 Duties of the cruiser, his methods, and the value of his results. Particular attention will be given to the best methods for use in a forest reconnaissance. Lectures and field practice.
22. **MARKET** ASSISTANT PROFESSOR CHEYNEY
 One credit
 Open to seniors (first nine weeks) Second semester
 General studies of the lumber market. Conditions of the market at present and methods which would tend to its betterment and greater stability in the future. The demands of the market and how they are supplied.
23. **SAW MILLS** ASSISTANT PROFESSOR CHEYNEY
 One credit
 Open to seniors (first nine weeks) Second semester
 Capital invested, machinery used, methods, cost of operation, and output of portable and stationary mills. Studies will be made of the modern mills of Minneapolis.
24. **FOREST ECONOMICS AND FOREST LAW** PROFESSOR GREEN
 One credit
 Open to sophomores.
 The development of forestry in the United States and European countries; the forest conditions here and abroad and their effect upon the lumber industry; forest policies of different governments. Laws in regard to contracts, water rights, roads, fences, legal papers. Legal measures for the prevention of trespass and fire. Text book, lectures and recitations.

FRENCH

1. **BEGINNING FRENCH** ASSISTANT PROFESSORS ANDRIST AND FRELIN,
 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 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.
François *Advanced French Prose Composition*; modern texts
will be read, including some of the works of Coppée, Mérimée,
Daudet, Scribe, etc.

GEOLOGY

1. GENERAL GEOLOGY PROFESSOR HALL
Three credits (three hours per week) First semester
Open to juniors and seniors.
Comprises: (1) geodynamics, in which are set forth the phenom-
ena of the atmosphere, water, heat, gravity, and plants
and animals as geologic agents; (2) structural geology, where-
in 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 ASSISTANT PROFESSOR LENHERTS
Three credits (three hours per week) First semester
Open to juniors and seniors.
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 PROFESSOR LENHERTS
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 out-
lined 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 geog-
raphy of industries as they have grown up within the past
100 years and their dependence upon physiographic conditions;
a study of local industries effected 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 LENHERTS
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 tem-
perature, 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 condi-
tions 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 relations to geo-
logical history and industrial development. (b) A study of
the principles and facts of pre-Cambrian geology as exempli-
fied within the state and the extension of these into general
application. (c) The present problems of the state in agri-
culture, drainage, water power, mining, quarrying, etc., are
considered in some detail.

the work of the class room is illustrated by the 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
(Four hours per week) Second semester
Open to sophomores.
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 (elective)
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
Three credits (elective), (given in 1908-9) Second 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 (elective), (given in 1909-10) 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 varieties.
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.

MATHEMATICS

1. **SECOND PART HIGHER ALGEBRA** MR. ROE
(Three hours per week) First semester
Open to freshmen registered in division A.
For those not having an entrance credit in this subject.
2. **SOLID GEOMETRY** MR. ROE
(Three hours per week) First semester
For those not having an entrance credit.
3. **PLANE TRIGONOMETRY** MR. ROE
(Three hours per week) half semester Second semester
Open to sophomores.
Functions of plane trigonometry, use of logarithm tables and numerous applications.
4. **FARM ACCOUNTS** MR. VYE
Two credits, elective (four hours per week) Second semester
Open to freshmen registered in division B.
The work in accounts is applied to the transactions which the student meets in the various duties on 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.

Lectures are given on special features of farm business such as purchasing, selling, co-operation, banks, insurance, commercial, law and methods of obtaining accurate information concerning the farm.

PSYCHOLOGY

1. **INTRODUCTORY PSYCHOLOGY** PROFESSOR WILDE AND ASSISTANTS
Three credits (three hours per week) First semester
This course is 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. The work involves text books, lectures and essays.
2. **EDUCATIONAL PSYCHOLOGY** ASSISTANT PROFESSOR MINER
Three credits (three hours per week) 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.

PHYSICS

1. **AGRICULTURAL PHYSICS** PROFESSOR STEWART
Three credits (six hours per week) Second semester
Open to sophomores.
This work is carried on by class demonstrations, reference work, discussions and note book records, a part of the work being done by the student in the laboratory.
Among the questions treated are the molecular nature of matter, diffusion of liquids and gases, capillarity, etc.; the nature of force, specific gravity, the laws of motion, fluid pressure, weather forecasting, pumps, elevators, pulleys, the principles of draft in the horse, the various causes of draft in wagons and the fundamentals of electricity; rock-forming minerals, their physical properties and composition and their effect in the soil on texture and fertility; specific gravity determinations are made and pore-space calculated and tested and the bearings of these matters on productiveness are taken up.

RHETORIC

1. **RHETORIC** PROFESSOR LANSING
Six credits (three hours per week) First and second semesters
Open to all freshmen who have passed the entrance test in English. This course includes the study of formal rhetoric, the writing of compositions, and the study and analysis of masterpieces of prose.
2. **RHETORIC** PROFESSOR LANSING
Six credits (three hours per week) First and second semesters
Open to sophomores. The course consists of a study of the short story and of the essay and forms of public address. The writing of compositions and the keeping of a note book form a greater part of the work.

VETERINARY

1. **VETERINARY WORK** PROFESSOR REYNOLDS
(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 clinics, students are enabled to learn the elements of diagnosis for common diseases and forms of lameness.

2. **ANATOMY** PROFESSOR REYNOLDS
 One and a half credits (three hours per week) first nine weeks
 (elective) Second semester
 Open to juniors and seniors.
 Comparative anatomy of the digestive organs, dissection, collateral reading and recitation. Chauveau's *Comparative Anatomy* is used for reference and comparison.
3. **BODY NUTRITION** PROFESSOR REYNOLDS
 One and one half credits (three hours per week) nine weeks
 (elective) 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, sources 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. **ADVANCED ANATOMY** PROFESSOR REYNOLDS
 One and one-half credits (six hours per week) first nine weeks
 (elective) Second semester
 Open to juniors and seniors.
 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 3. 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) Second semester
 Open to juniors and seniors as an elective.
 This course covers causes, prevention, and deals with common and serious diseases of domestic animals.

ZOOLOGY

1. **GENERAL ZOOLOGY** PROFESSOR SIGERFOOS, ASSISTANT PROFESSOR
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. During the year 1908-9 the Protozoa and Crustacea will be the groups especially taken up.

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 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 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 semester's work is based upon a study of chordates, cartilaginous 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 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.

The School of Agriculture

FACULTY

- CYRUS NORTHROP, LL.D., *President.*
E. W. RANDALL, *Dean.*
DEXTER D. MAYNE, *Principal, Economics, Practicums.*
SAMUEL B. GREEN, B. S., *Horticulture, Forestry.*
J. A. VYE, *Secretary and Treasurer, Accounts.*
HARRY SNYDER, B. S., *Agricultural Chemistry, Soils.*
T. L. HAECCKER, *Dairy Husbandry, Animal Nutrition.*
M. H. REYNOLDS, M. D., V. M., *Veterinary Science.*
J. M. DREW, *Registrar, Blacksmithing, Poultry.*
ANDREW BOSS, *Agriculture, Animal Husbandry.*
WILLIAM BOSS, *Carpentry, Power Machinery.*
JUNIATA L. SHEPPERD, M.A., *Cooking, Laundering, Home Economy.*
MARGARET BLAIR, *Sewing, Household Art.*
MARY L. BULL, *Cooking, Laundering.*
JOHN A. HUMMEL, B. Agr., *Agricultural Chemistry.*
FREDERICK L. WASHBURN, M. A., *Zoology, Entomology.*
COATES P. BULL, B. Agr., *Agriculture.*
LEROY CADY, B. S. in Agr., *Horticulture.*
C. C. LIPP, D. V. M., *Comparative Physiology.*
EDITH SNELL, B. L., *Algebra, Geometry.*
D. A. GAUMNITZ, M. Agr., *Animal Husbandry.*
A. D. WILSON, B. S., in Agr., *Agriculture.*
A. G. RUGGLES, M. A., *Entomology.*
W. L. OSWALD, *Agricultural Botany.*
KARL A. MACHETANZ, B. A., *Director of Gymnasium, History.*
ALVAH M. BULL, *Drawing, Farm Buildings.*
ESTELLE COOK, *English.*
GRACE B. WHITRIDGE, *Physical Training.*
FANNIE C. BOUTELLE, *Preceptress, Social Culture.*
A. L. EWING, M.S., *Agricultural Physics.*
D. B. HOWELL, Ph. B., *Mathematics.*
E. C. PARKER, B. S., in Agr., *Agriculture.*
EDWARD SIGERFOOS, Ph. B., *Capt. 5th U. S. Infantry, Military Science and Tactics.*
E. G. CHEYNEY, A. B., *Forestry.*
L. B. BASSETT, *Farm Machinery.*
ETHEL E. BUSH, *English*
EDITH STAPLES, *Asst. in Sewing.*
JOSEPHINE CRAIG, *Domestic Chemistry.*
AGNES ERICSON, *Assistant in Chemistry.*
MARTHA B. MOORHEAD, M. D., *Lecturer in Domestic Hygiene.*
MINNIE CHERMAK, *Assistant in Cooking.*
MARY L. COFFIN, *Music.*
GERTRUDE V. COLLINS, *Farm Accounts.*
S. B. DETWILER, B. S., in Agr., *Forestry.*
W. H. FRAZIER, B. S., *Agricultural Chemistry.*
E. M. FREEMAN, Ph. D., *Agricultural Botany.*
AVIS HALL, *Assistant in Sewing.*
A. R. KOHLER, B. S. A., *Assistant in Vegetable Gardening.*
EVA MCCABE, *Assistant in Sewing.*
A. J. MCGUIRE, B. Agr., *Assistant in Dairying.*
C. SCHROEDER, B. S. in Agr., *Assistant in Animal Husbandry.*
BLANCHE STRUNK, *Assistant in Drawing.*
H. J. THOM, *Assistant in Blacksmithing.*

Committees, School of Agriculture

LIBRARY: Mayne, Reynolds, Snyder, McIntyre, 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 5th, 1908 and close March 24th, 1909. The fall term closes at 4:30 p. m., Wednesday, December 23rd, and the winter term begins Monday, January 4th, 1909.

Instruction begins promptly at the opening of each term, and students are required to be present the first day of the term and to remain until the close of the term.

Students are advised to correspond with the registrar of the school, J. M. Drew, St. Anthony Park, 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. Anthony Park, 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 7. 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 practical 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 11 and 12. Instruction is given in the work shop, 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, and 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 80 per cent of its graduates continue agricultural pursuits.

HOW TO GET TO THE SCHOOL.

Check all baggage to St. Paul or Minneapolis.

Monday and Tuesday, October 5th and 6th, 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. A charge of 25 cents is made 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.

ADMISSION.

All male students are required to have had six months' farm practice before entrance.

Parents are advised not to send pupils under fifteen years of age, unless they are unusually proficient in the common branches.

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.

HOME LIFE ON THE CAMPUS.

The life of the students while attending the School of Agriculture is subject to supervision.

Students residing in the school dormitories are not allowed to leave the grounds without permission.

The home life of each student is carefully guarded, and everything done to promote a healthful moral atmosphere.

The use of tobacco and of 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 and regulations to which they are required to subscribe.

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 in complete 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.

From 8:15 a. m. to 4:30 p. m. students not at recitations 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, February 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.

REQUIREMENTS FOR GRADUATION.

First—The completion of the prescribed course of study with an honorable standing in department.

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 the exception of an entrance fee of \$5 to residents, and \$10 to non residents, the school makes no charge.

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, chair and table.

No deductions in charges are made for absence of less than four 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 one dollar 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.

On entering school the student makes a payment of \$12 board; \$5 deposit; \$2 book rent and reading room; \$1 maintaining nurse; \$5 entrance fee; 2 reserve fund; 25 cents gymnasium fee; total \$27.25.

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.

An assignment of rooms will be made at 9 a. m., March 20th, 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 on hand 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.

STUDENTS' DEBATING SOCIETIES.

Societies for the purpose of improvement in elocution and debate, and for obtaining instruction in the form of lectures, give excellent opportunities for entertainment and culture.

Each student should associate himself with one of these societies as early in his course as possible.

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 seventy-five cents for the series. 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:

- Monday, October 21, "America Facing the Far East"....Dr. John M. Driver
- Friday, November 15, "O, Brave New World" of Texas (illus.)
Gilbert McClure
- Saturday, December 14, Music.....Lyric Glee Club
- Friday, November 22, "Seeing Things" (Illustrated).....Pitt Parker
- Thursday, January 9, "The Story of Dugan".....Judge Willis Brown
- Monday, February 3, Music.....Hungarian Orchestra
- Wednesday, March 11, "Sunshine and Awkwardness".....S. W. Gillilan

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 [5]

*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 [3]

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]

Gymnasium [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]

Gymnasium [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]

COURSE OF STUDY—Continued

THIRD (A) YEAR

FIRST TERM

Agricultural chemistry [7]		
	Forestry [3]	
Entomology and zoology [3]	Poultry [3]	
	Algebra [5] Optional	
Handling grain & machinery [1]	} or {	*Cooking [2]
*Veterinary science [2½]		*Sewing [2]
Gymnasium [1]		Music [2]
Music or military drill [2]		

SECOND TERM

Civics or geometry [4]		
	Plant propagation [3]	
Entomology and zoology [3]	Algebra [5] Optional	
Dressing and curing meats [1]	} or {	Meats [1]
*Stock judging [1]		Home economy [1]
Feeding [3]		*Cooking [3]
Soils and fertilizers [5]		Domestic chemistry [3]
*Veterinary science [2½]		*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.

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 includes 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 subject is taught with special reference to its bearing upon the every day problems that present themselves to the farmer and gardener. It is profusely illustrated with plants and flowers from the greenhouses and nursery. Some instruction is given in the use of the compound microscope. Students are thus enabled to study intelligently, in an elementary way, the tissues of plants. By this means they get a clear idea of the general principles of plant structure and vegetable physiology.

AGRICULTURAL CHEMISTRY.

In agricultural chemistry one term is given to the study of the elements and compounds which are of 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 chemistry of animal nutrition, digestibility and value of foods, and the laws 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 example, from his knowledge of the relation of weight to bulk in grains, soil 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 definite 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 thru 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 purposed in teaching this subject to cover the elementary principles governing soils, 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 business; and methods of farming.

ALGEBRA.

Algebra is optional during the third year. This work covers Wells' New Higher Algebra through simple equations. Special attention is given to literal notation, negative numbers, the equation and factoring.

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, to 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., and to lay out rafters for buildings.

CIVICS.

During the last term of the course students receive instruction in this science, and graduate with a good understanding 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 constitution and the power it confers, and the provisions for amendments, are taught. The more important principles of commercial law, including contracts, agency, partnership, corporations and commercial paper, receive attention. Instruction is also given in 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 it 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 adulterations and narcotics. 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 dissections. Important 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 curriculum. 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 preservation 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 is 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 processes and giving full instruction in regard to running farm separators and the manufacture of butter and cheese in the farm dairy.

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.

Dairy stock.—During the last half of the first term students receive instruction in regard to the characteristics of the various breeds of dairy cattle, their origin 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.

Feeding.—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 food stuffs.

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 home-made 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 restoration 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 buildings 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.

(C) Applicants for admission to the "C" class in English should be familiar with the inflections of nouns, pronouns and verbs, the definitions and classifications of phrases and clauses, and the common case constructions. The first year's work consists of the study of Mayne's "Modern Business English," with almost daily practice in writing the simpler forms of composition. Two periods a week are given to the study of one of the classics.

(B) The second year's work consists of Maxwell and Smith's Writing in English. Once a week a short essay is prepared and submitted for criticism.

(A) At the option of the English Department a series of literary programs will be presented in chapel by the members of the graduating class. The numbers include abstracts of leading magazine articles, biographical sketches, book reviews and selections from fiction. Special prominence is given to authors depicting American life.

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 injurious forms with special attention to insect pests found in Minnesota. The nature of different insecticides and methods of application are discussed. The student spends some time in becoming acquainted with the appearance and habits of beneficial 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 injurious and beneficial birds, are also studied.

FARM ACCOUNTS.

The work in accounts is applied to the transactions which the student meets in the various duties on 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 principles 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 cultivated 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.

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.

GEOMETRY.

Geometry is offered in the second term of the third year as an elective in place of civics to those who wish to prepare for a college course. This work covers the first two books of Wells' Essentials of Plane Geometry.

GYMNASIUM WORK.

The gymnasium is a large, well lighted, 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 methods of harvesting, shocking, stacking and storing of cereal grains; adaptation of the various kinds of machinery with reference to the soil, weeds and seasons are given; adjustment with special reference to durability, convenience in manipulation, etc.

HOME ECONOMY.

The lectures are a study not only of the just proportion between expenditure and income, but of definite proportion in the expenditures made for existence, comfort, culture and philanthropy. 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 considered from the 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.

The subject includes both housekeeping and home-making, and the instruction is based on the belief that housekeeping is a business as important as it is difficult, and that home-making is the noblest 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 cleansing by the use of chemicals, as removing grease spots, stains, etc., are given.

LIBRARY.

The agricultural library now contains ten thousand books and about seven thousand pamphlets, including reports and bulletins. Aside from the large number of pamphlets and other publications of the different agricultural institutions and societies, a large number of the most important technical and

agricultural magazines are kept on file, bringing together all the agricultural literature of any importance.

LITERARY SOCIETY WORK.

Any student belonging to a recognized literary society 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 instructor 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 Government 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 manoeuvres, 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 in 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 musical development and experience.

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 counteract and correct tendencies toward incorrect development, especially those resulting from the artificial life of civilization. The work of the beginning class is free hand, based upon Swedish principles, and directed especially to deep breathing, correct carriage and posture. The work of the advanced class includes light apparatus and aesthetic movements 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 illus-

trated by the orchards, nurseries, forest plantations, gardens and greenhouses on the grounds of the experiment station, and by visits 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, 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.

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, 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 terms' 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, 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 processes and the various cloth fibers.

Lectures are given on the utilitarian and art values of various textiles, and in connection with the selection of materials practical lessons in shopping are given. 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 affecting 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 intelligent 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 effects, 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.

Intermediate Year

For Graduates of the School of Agriculture who wish
to enter the College of Agriculture

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 preparation 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 TERM.	SECOND TERM.
Elementary algebra [5]	Higher algebra [5]
Plane geometry [5]	Solid geometry [5]
English [5]	English [5]
General History [4]	Economics [4]

The courses in mathematics for the intermediate year cover Wells' New Higher Algebra from simultaneous equations to logarithms; Downey's Higher Algebra, Part I. and Wells' Essentials of Plane Geometry, beginning with Book III. The work preliminary to these courses is done by the student in the A year in the School of Agriculture.

Students who have completed higher algebra and plane geometry in the A year of the School of Agriculture may be admitted to the freshman class in the College of Agriculture conditioned in solid geometry and English; these conditions must be removed during the freshman year.

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 characteris-

tic 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 1908-9 will open October 13, 1908 and close April 6, 1909. For further information address Crookston School of Agriculture, Crookston, Minn.

THE FARM STUDENTS' REVIEW.

The Farm Students' Review is a monthly agricultural paper owned and published by the Alumni 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 Experiment 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 Association are to foster and strengthen the ties between the School and its former students and to extend the work of the School and Experiment 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.*

E. W. RANDALL, *Dean.*

T. L. HAECKER, *Professor of Dairy Husbandry and Animal Nutrition.*

J. A. VYE, *Creamery Records and Accounts.*

HARRY SNYDER, B.S., *Dairy Chemistry.*

M. H. REYNOLDS, M.D., V.M., *Diseases of the Dairy Cow.*

J. M. DREW, *Forage, Farm Buildings.*

WILLIAM BOSS, *Instructor in Practical Engineering.*

H. L. RUSSELL, Ph.D., *Dairy Bacteriology.*

E. K. SLATER, *Creamery Management.*

H. T. SONDERGAARD, *Chief Instructor.*

I. O. DYBEVICK, *Instructor in Creamery.*

E. L. ALLEN, *Instructor in Cultures and Starters.*

A. W. PARKIN, *Instructor in Cheesemaking.*

C. B. MOAK, *Instructor in Dairy Laboratory.*

M. P. MORTENSON, *Assistant in Cultures and Starters.*

J. C. JOSLIN, *Assistant in Creamery.*

The next session of the Dairy School will open Monday, November 16th, 1908, 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. Recognizing 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.
- 2d. Practical work daily in the butter room.
- 3d. 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.

I.—LECTURES.

The course of 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 general 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, construction of silos, co-operative dairying, creamery and cheese factory management, judging and marketing dairy products, the chemistry of milk, dairy bacteriology, engineering, animal hygiene and treatment of the common diseases of the dairy cow.

II.—BUTTER MAKING.

The running of separators; ripening and churning of 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.

III.—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.

IV.—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.

V.—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, babbitting bearings, soldering, etc.

It is the aim to make this work as practical as possible. Questions of interest on the subject are freely discussed.

VI.—FACTORY BOOKKEEPING.

All the essential features of factory 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, in books provided, the actual one month's accounting of a creamery.

VII.—STARTERS AND CULTURES.

Since all students who are admitted to the school have had some experience 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 cheese factory.

To reach the school from either St. Paul or Minneapolis, take the Como-Hopkins or Como-Harriet street car and get off at Commonwealth avenue.

Address applications for admission to T. L. Haecker, St. Anthony Park, St. Paul, Minn.

Short Course for Farmers

FACULTY

- CYRUS NORTHROP, LL.D., *President.*
E. W. RANDALL, *Dean.*
SAMUEL B. GREEN, B.S., *Horticulture, Forestry.*
J. A. VYE, *Business Methods.*
HARRY SNYDER, B.S., *Agricultural Chemistry, Soils.*
T. L. HAECCKER, *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 Art.*

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. 15th, and will continue for four weeks, closing on Friday, Feb. 12th, 1909.

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.

A series of lectures especially fitted to the needs of farmers' wives will be given. The daily program will 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 naturally 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, a registration fee of \$5.00 will be charged.

Those taking this course should register and secure boarding places not later than Thursday, January 14th, as work will begin promptly at 8:15 on Friday, January 15th.

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, St. Anthony Park, Minn.

The course of lectures and study is outlined as follows:

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.

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.

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.

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.

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.

Agricultural chemistry: The chemistry of plant growth and the chemical principles involved in farm life and their application to the production of crops forms the basis of this work.

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.

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.

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.

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 weed seeds, poisonous plants, fungus diseases of plants and how to deal with them.

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; preparation 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.

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.

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 flock; feeding for eggs and for fattening; killing and dressing fowls, and packing for market; marketing eggs.

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.

Parliamentary practice: A debating club is made up of the members of the short course class and weekly meetings are held which give opportunity for learning how to conduct public meetings and for practice in public speaking.

Physics: 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 in to secure the necessary changes in the soil to produce the highest degree of plowing, hauling, etc.; horse power; farm drainage; weather forecasting.

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.*
JOHN W. OLSEN, *State Superintendent of Public Instruction.*
E. W. RANDALL, *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.*
ANDREW 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.*
E. C. PARKER, B. S. in Agr., *Assistant in Agriculture.*
S. B. DETWILER, B. S. in Agr., *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, is established 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 subject intelligently in the public 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 agricultural 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 Experiment Station 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 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.

The course is planned for three weeks commencing Monday, June 8th and closing Saturday June 27th. This will give those having regular summer school work the opportunity to attend this course and then take with them to the summer schools the knowledge and inspiration obtained.

It is expected that those entering this course will take all the work outlined in the program. This is not a requirement but the program is so arranged as to make it possible. The work given in the several subjects will be made as practical as possible and will combine lecture work, laboratory work, and field exercises.

The dormitories and dining hall on the grounds will be open for the use of those attending the summer course. The close association of a body of educators for three weeks cannot but be helpful in many ways.

EXPENSE.

The registration fee for the entire course or for any part of it, is \$3.00. This small fee is made possible only by the generous donation of services by the heads of departments of the School of Agriculture and by the cooperation of State Superintendent J. W. Olsen.

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.

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 State Superintendent Olsen, Dean James and other 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. Mr. Vye will also lecture on farm accounts and Mrs. Boutelle on domestic economics.

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 upon the mechanical condition of soils. 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 distinctive feature of this subject thus giving the principles of soil preparation, crop growth and farm management. all necessary furniture. except pillows, pillow cases sheets, quilts and

AGRICULTURAL CHEMISTRY.

The composition and comparative value of food materials, the changes which take place during their production, and the application 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 demonstrating the principle 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 the 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 actual 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.

This 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, including the shirt waist, and making. Lectures will be given upon 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 tentative cost will be compiled and considered. Results of experiments to ascertain the best means for introducing some work along domestic science lines into the rural schools will be studied.

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, breeding, feeding and marketing. This course will be given at the season when the incubator and brooders will be 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 upon the principles of soil fertility and the composition and uses of farm and commercial manures.

TENTATIVE PROGRAM.

Monday, June 8th, Registration.

	8:15	9:05	9:55	10:45	11:35	1:15	2:05	2:55	2:45
Tuesday, 9th ...	Agriculture	Fruit Gr.	Household Art Lec.	An. Hus. Cattle	CONFERENCE	Chem. Lec.	Chemical Laboratory		
Wednesday, 10th	"	"	"	"		Soils Lec. Blacksmith Lec.	Soils Lab.	Field Practicums	
Thursday 11th .	"	"	"	"			Blacksmith Shop Work		
Friday, 12th	"	"	Dom. Sc. Lec.	"		Carp. Lec.	Carpentry Shop Work		
Saturday, 13th .	"	"	"	Sheep		Dairy Lec.	Dairy Practicums		
Tuesday, 16th ...	"	Veg. Gard.	"	"		Chem. Lec.	Chemical Laboratory		
Wednesday, 17th	"	"	Entomology	Swine		Soils Lec. Blacksmith Lec.	Soils Lab.	Field Practicums	
Thursday, 18th .	"	"	"	"			Blacksmithing Shop Work		
Friday, 19th	"	"	"	Poultry		Carp. Lec.	Carpentry Shop Work		
Saturday, 20th...	"	"	"	"		Dairy Lec.	Dairy Practicums		
Tuesday, 23rd. ...	"	Forestry	Plant Diseases	Horses		Chem. Lec.	Chemical Laboratory		
Wednesday, 24th	"	"	"	"		Soils Lec. Blacksmith Lec.	Soils Lab.	Field Practicums	
Thursday, 25th..	"	"	"	"			Blacksmithing Shop Work		
Friday, 26th	"	"	"	"		Carp. Lec.	Carpentry Shop Work		
Saturday, 27th...	"	"	"	"	Dairy Lec.	Dairy Practicums			

The School of Agriculture

COPY OF LETTER FROM STATE SUPERINTENDENT OLSEN.

State of Minnesota,

DEPARTMENT OF PUBLIC INSTRUCTION,

St. Paul, January 24, 1908.

To Superintendents and Teachers of Minnesota:

The child needs that fundamental education that will aid him to find his individual place in life and teach him how to get the best out of living. He needs the special education that will thoroughly equip him for earning a livelihood when his school days are over.

In all our schools the tendency has been to make education too bookish. The country school has trained away from rather than toward the life of the farm. Of recent years practical science has been moving forward by leaps and bounds, but the knowledge acquired by it on its march has not reached the rural school to an extent adequate to the situation. Now, within the reach of every farmer's child there ought to be a school giving as good instruction and as much instruction in the general branches as is given by the city school, "but, instead of being colored with the activities of the city, it should have the equally useful and more delicious flavor of the soil."

County superintendents and others realize the imperative need for teachers who can with intelligence and real sympathy relate the instruction of the school to the natural interests and experience that environ the country boy and girl.

Through the generous enthusiasm of Dean Randall of the state college of agriculture and his staff, nearly all of whom offer their services free, it has been made possible to afford educators the opportunities outlined in this bulletin. While the primary object of the courses is to meet the present day needs of the rural schools, they are so suggestive and so comprehensive that they cannot but prove invaluable to the city teachers, principals and superintendents.

It is to be hoped that county superintendents, conductors and instructors of summer training schools and teachers generally will still further fit themselves for service at this unique training school. More delightful surroundings for a summer school than University Farm it would be hard to imagine. The situation of the school, midway between the business portions of St. Paul and Minneapolis, makes it readily accessible from either city, and no college in the country is better equipped as to modern conveniences and facilities for extensive observation and study.

Upon recommendation of the faculty those perfect in attendance will receive a credit in agriculture toward a first grade state certificate that will exempt them from examination in plane geometry or in physical geography as they prefer.

Please take notice that the instruction is not to be given by tutors or assistants, but almost wholly by the professors of the school, men and women of national reputation, whose service we can recompense only by accepting what they so generously contribute—knowledge that we may apply to good purpose, inspiration by which we may inspire others.

(Signed) J. W. OLSEN,
Superintendent.

The Agriculture Experiment Station

STATION OFFICERS.

J. A. VYE, *Secretary.*

EXPERIMENT CORPS.

E. W. RANDALL, *Director.*

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., V. M., *Veterinarian.*

ANDREW BOSS, *Agriculturist and Animal Husbandry*

FREDERICK L. WASHBURN, M. A., *Entomologist.*

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. Agr., *Assistant in Animal Husbandry.*

A. D. WILSON, B. S. in Agr., *Assistant in Agriculture.*

E. C. PARKER, B. S. in Agr., *Assistant in Agriculture.*

WM. ROBERTSON, B. S., *Superintendent, Crookston.*

C. C. LIPP, D. V. M., *Assistant in Veterinary Science.*

A. D. WILHOIT, M. A., *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. Anthony Park, and is one of the Divisions of the Department of Agriculture of the University of Minnesota, and the officers of the station are also profes-

sors 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 five regular, twenty-nine 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 25.)

EXPERIMENT FARM AT GRAND RAPIDS.

The legislature 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 16, 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 1907

GENERAL BULLETINS:

- No. 101 Forage Crops of High, Medium and Low Protein Content.
- No. 102. Soil Investigations.
1. Fertilizer Tests with Wheat and Corn.
 2. Influence of Fertilizers upon the Composition and Quality of Wheat.
 3. Comparison of Chemical Methods and Field Tests for Determining the Fertilizer Requirements of Soils.
- No. 103 Dissemination of Tuberculosis by the Manure of Infected Cattle.
- No. 104 Pork Production.
1. Hogging-off Corn vs. Yard Feeding.
 2. Field Management of Swine.
 3. Observations.
- No. 105 Importance of the Study of Entomology; Directions for Collecting and Studying Insects.

PRESS BULLETINS:

- No. 27 A Hint to Flax Growers.
- No. 28 The Fall Web Worm a Menace in Minnesota.
Autumn Remedies for the Stalk Borer in Flower Gardens.
- No. 29 Seed Corn Shortage.

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*
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, LL.M., *Minneapolis*
HOMER W. STEVENS, A.M., LL.M., *Librarian*

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.

SPECIAL LECTURERS FOR 1907-8.

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 so familiarize them with the fundamental principles of positive law 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 basal 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 the case 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 textbooks 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 a 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 courthouse 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.

REQUIREMENTS FOR ADMISSION

Graduates of universities or colleges, and students who have graduated from any normal school or State high school of Minnesota, or from similar institutions of equal grade in other states, may be admitted without examination upon presentation of their diplomas.

All other applicants must pass an examination in the studies required for admission to the freshman class of the College of Science, Literature and the Arts, which are as follows:

N. B.—*Time element, as indicated with each subject, is essential.*

English, Four years, including

- (a) Classics.
- (b) Principles of composition.
- (c) Practice in written expression.

Algebra, elementary, one year.

Geometry, plane, one year.

In addition to the above-named subjects, which are required for all courses, and for which substitutes cannot be accepted, applicants shall present evidence of preparation in *nine* year-credits, or their equivalent, to be chosen from the following list:

Algebra, higher, one half year

Geometry, solid, one half year

Latin,

Grammar, (one year credit)

Caesar, four books, (one year credit)

Cicero, six orations, (one year credit)

Vergil, six books, (one year credit)

Greek,

Grammar, (one year credit)

Anabasis, four books, (one year credit)

German,

Grammar, (one year credit)

Literature, (one year credit)

French,

Grammar, (one year credit)

Literature, (one year credit)

Spanish, (two years)

Grammar, one year

Literature, one year

History,

Ancient, to Charlemagne, one year

Modern, from Charlemagne, one year

England, one half year

Senior American, one half year

Civics, (one-half year credit)

Political economy, (one-half year credit)

Physics, (one year credit)

Chemistry, (one year credit)

Botany, (one-half or one year credit)

Zoology, (one-half or one year credit)

Astronomy, (one-half year credit)

Commercial Geography, (one-half or one year credit)

Geology, (one-half year credit)

Physiography, (one-half year credit)

N. B.—By a *year credit* is meant a full year's work upon one subject, five recitations per week, as given in an ordinary high school course.

Substantial equivalents may be substituted, and a business education, as well as experience in teaching, may be accepted in lieu of some of the less important subjects.

Applicants who have diplomas entitling them to admission without examination should present them to the dean of the college, and those who are to take examinations or enter as special students, should present

themselves to the dean, who will, upon proof of their qualification for admission, refer them to the registrar and accountant to whom they pay their matriculation fee and the first term's tuition.

SPECIAL STUDENTS

Persons who are not candidates for a degree may enter the College as special students by special permission of the faculty; but any undergraduate from a high school will be required before admission to present to the faculty a satisfactory record of his high school work and an honorable discharge from such high school. And all such students will be entitled to a certificate upon satisfactory examination in the subjects pursued by them, stating the time they have been members of the college and the subjects in which they have passed a creditable examination.

Such 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 be at least nineteen years of age, 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 a high school education or its equivalent, may enter the senior class without examination upon presentation of their certificates of admission, and shall be entitled to their degree upon a satisfactory showing at the final examination of the year upon the entire work of the three years.

ENTRANCE REQUIREMENT BEGINNING SEPTEMBER, 1909.

In addition to the preceding requirements for entrance as a regular student, there will be required, beginning September, 1909, one year of academic work, in the University of Minnesota, or in some other university or college of equal rank. This advanced work will be required of all students who wish to obtain the degree of Bachelor of Laws—whether they matriculate for the day or the evening work—but students with a high school diploma, will be admitted to the college without examination, as at the present time, receiving at the close of their course of study, a certificate indicating the subjects they have taken, and the character of their work.

And students who have not completed a high school course of study may enter the college upon satisfactory evidence that they are capable of doing the work in a satisfactory manner, and with profit to themselves, and they shall also receive a certificate showing the subjects they have taken, and the character of the work they have done.

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 and American Constitutional History, 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) Illustrative cases.	PROFESSOR FLETCHER
Personal Property and Sales (eight weeks) Illustrative cases.	ASSISTANT PROFESSOR WILLIS
Domestic Relations (four weeks) Illustrative cases.	PROFESSOR PAIGE
Common Law Pleading (three weeks) Text Books, Phillips.	PROFESSOR HICKMAN
Torts (nine weeks) Illustrative cases.	PROFESSOR PAIGE
Equity (Maxims) (six weeks) Illustrative cases.	DEAN PATEE
Commercial Paper (four weeks) Illustrative cases.	PROFESSOR PAIGE
Blackstone (Second Book) (four weeks) Lewis' or Cooley's Blackstone.	PROFESSOR PAIGE
Agency (three weeks) Illustrative cases.	PROFESSOR PAIGE
Criminal Law (five weeks) Illustrative cases.	PROFESSOR PAIGE

SECOND YEAR—MIDDLE

Wills and Administration (four weeks) Illustrative cases.	PROFESSOR PAIGE
Chattel Mortgages (three weeks) Illustrative cases.	PROFESSOR FLETCHER
Partnership (four weeks) Illustrative cases.	PROFESSOR PAIGE
Code Pleading (seven weeks) Phillips on Code Pleading and Illustrative Cases.	PROFESSOR HICKMAN
Liens (two weeks) Illustrative cases.	PROFESSOR FLETCHER
Bankruptcy (two weeks) Illustrative cases.	PROFESSOR FLETCHER
Bailments and Carriers (four weeks) Illustrative cases.	ASSISTANT PROFESSOR WILLIS
Private Corporations (five weeks) Illustrative cases.	ROBERT S. KOLLINER
Public Corporations (three weeks) Illustrative cases.	HOWARD S. ABBOTT
Insurance (three weeks) Illustrative cases.	ASSISTANT PROFESSOR WILLIS
Equity (Doctrines) (six weeks) Illustrative cases.	DEAN PATTEE
Damages (four weeks) Illustrative cases.	ASSISTANT PROFESSOR WILLIS
Real Property (twelve weeks) Illustrative cases.	PROFESSOR FLETCHER
Landlord and Tenant (two weeks) Illustrative cases.	JARED HOW

THIRD YEAR—SENIOR

Evidence (five weeks) Greenleaf on Evidence (Vol. I) and Illustrative cases.	PROFESSOR HICKMAN
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Trusts (three weeks)	PROFESSOR FLETCHER
Illustrative cases.	
Minnesota Real Property (four 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 the 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)	ASSISTANT 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.	
Constitutional Law (five weeks)	PROFESSOR FLETCHER
Illustrative cases.	
Equity (Doctrines and Remedies) (seven weeks)	DEAN PATTEE
Illustrative cases.	
Chattel Mortgages (two weeks)	PROFESSOR FLETCHER
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.	

THIRD YEAR COURSE FOR 1908-1909

Evidence (five weeks)	PROFESSOR HICKMAN
Greenleaf on Evidence and illustrative cases.	
Blackstone (four weeks)	PROFESSOR PAIGE
Lewis' or Cooley's Blackstone.	
Code Pleading (seven weeks)	PROFESSOR HICKMAN
Phillips on Code Pleading and illustrative cases.	
Real Property (eight weeks)	PROFESSOR FLETCHER
Illustrative cases.	
Minnesota Real Property (three weeks)	PROFESSOR PAIGE
Illustrative cases.	
Equity (eight weeks)	DEAN PATTEE
Illustrative cases.	
College Court Work throughout the year.	

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 law 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 theses 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 doctor's degree must be one evincing original investigation and special excellence.

Whether a class will be organized in this course during the academic year of 1908 and 1909 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

Examinations 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, conveying, drawing contracts and other like practices which comprise the daily work of the general practitioner, 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 within easy reach of both the federal and state courts. The United States courts are in session in St. Paul and Minneapolis during the greater part of the school year. The supreme court of Minnesota, 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. Pillsbury, are awarded for the best work in the rhetoric 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 year's 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.