The Bulletin *of the* University *of* Minnesota

Course in Occupational Therapy
College of Education

Vol. XXVII No. 15 April 23 1924

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COURSE IN OCCUPATIONAL THERAPY

Occupational therapy is practiced by teachers of some training and increasing experience in many hospitals throughout the country. Its beneficial influence has been well tested. The fact of its remedial value in the treatment of disease and in the establishment of convalescence is recognized and makes it of definite appeal to physicians and hospital administrators. Its possibilities in the restoration to economic efficiency of the more or less permanently disabled are engaging the interest of social workers and economists. Its educational value in the reconstruction of the injured and in the promotion of new vocational capacity is attracting the attention of educators and schools of education.

Efforts have been made to standardize courses of instruction for occupational therapists. It is probable that this will be best done through the mechanism of the state universities. Organized workers in this field are eager that the influence of teaching institutions may be invoked.

Through the College of Education, with the co-operation of the Medical School and of certain departments in the College of Science, Literature, and the Arts, the University of Minnesota offers a course of instruction covering a period of four years in occupational therapy. It will lead to the degree of bachelor of science.

REQUIREMENTS FOR ADMISSION

Credentials covering an acceptable four years high school course will be presented to the registrar; or, in lieu thereof, examinations may be taken in the required subjects.

Persons of twenty-one years of age or over, of promising ability, may be admitted as unclassed students subject to demonstration of their fitness for the work.

REGISTRATION

Students will register in the College of Education. An adviser, appointed by the dean of the college, will direct students in the arrangement of their courses of study. The adviser for the current year will be Dr. R. O. Beard, 208 Millard Hall.

FEES

The tuition fees will be those required in the College of Education, amounting to $20 in each quarter. A general deposit fee, the University Health Service fee, and other incidental charges are additional.

THE COLLEGE OF EDUCATION

THE FOUR-YEAR COURSE

FIRST YEAR

Fall Quarter

Course	Credits
English Rhetoric A	5
Animal Biology 1	5
French 1 or 3	5
or	
German 1 or 15	5-4
Preliminary Hygiene 4	0
	15-14

Winter Quarter

Course	Credits
English Rhetoric B	5
Animal Biology 2	5
French 2 or 9	5-3
or	
German 2 or 31	5-3
Ethics of Nursing 11	1
	16-14

Spring Quarter

Course	Credits
English Rhetoric C	5
Relationship of Hospital to Social Worker 157	1
French 3 or 10	5-3
or	
German 3 or 32	5-3
Hosp. and Hosp. Economics 159	1
History and Development of Arts and Crafts 72	2
	14-12

SECOND YEAR

Fall Quarter

Course	Credits
Sociology 1	5
Psychology 1	3
Fundamental Principles of Design 1	3
Sketch Drawing, etc. 7	1
Clay-Modeling 35	1
Elements Prev. Med. 53	3
	16

Winter Quarter

Course	Credits
Prin. and Pract. of Social Service 151	3
Psychology 2	3
Fundamental Principles of Design 2	3
Sketch Drawing, etc. 8	1
Cardboard and Paper Construction 32	1
Occupational Hygiene and Disease 73	2
	13

Spring Quarter

Course	Credits
Psychology 3	3
Fundamental Principles of Design 3	3
Sketch Drawing, etc. 9	1
Occupational Therapy 158	3
Electives	4-5
	14-15

THIRD YEAR

Fall Quarter

Course	Credits
Sociology 51	3
History 1 or 21	5
Principles of Harmony in Form and Color 20	3
Still Life 4	1
Composition 10	1
Elementary Weaving, Basketry, etc. 37	2
	15

Winter Quarter

Course	Credits
Sociology 52	3
Educational Psychology 55	3
History 2 or 22	5
Principles of Harmony in Form and Color 21	3
Still Life 5	1
Composition 11	1
	16

Spring Quarter

Course	Credits
Educational Sociology 3	3
Technique of Teaching 15	3
The High School 65	3
Principles of Harmony in Form and Color 22	3
Still Life 6	1
Composition 12	1
	14

Summer Quarter

Course	Credits
Advanced Basketry 39	3*
Advanced Weaving 40	3*
Field Work	3-6
	9-12

FOURTH YEAR

Fall Quarter

Course	Credits
Sociology 60	3
Practice Teaching 16	5
Art History and Appreciation 70	2
Allied Crafts 38	1
Elementary Pottery 41	2
Methods of Elementary Woodwork Ind. 10	2
	15

Winter Quarter

Course	Credits
Educational Diagnosis 111	4
Physiology 4	5
Mental Hygiene 61	1
Bookbinding 33	2
Application of Design in Needle Work 45	2
	14

Spring Quarter

Course	Credits
Technique of Teaching Adults 128	3
Application of Design to Fabrics 44	2
Metal Work 46	2
Types of Art Instruction 84	1
Field Work	6-8
	14-16

* During the third year (summer quarter) and in the fourth year opportunities will be given for practice work in the hospitals of the Twin Cities. This work will receive from 9 to 14 credits according to the hours a week devoted to it.

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The Graduate School

Announcement for the Years 1923-1925

Vol. XXVI No. 35 September 4 1923

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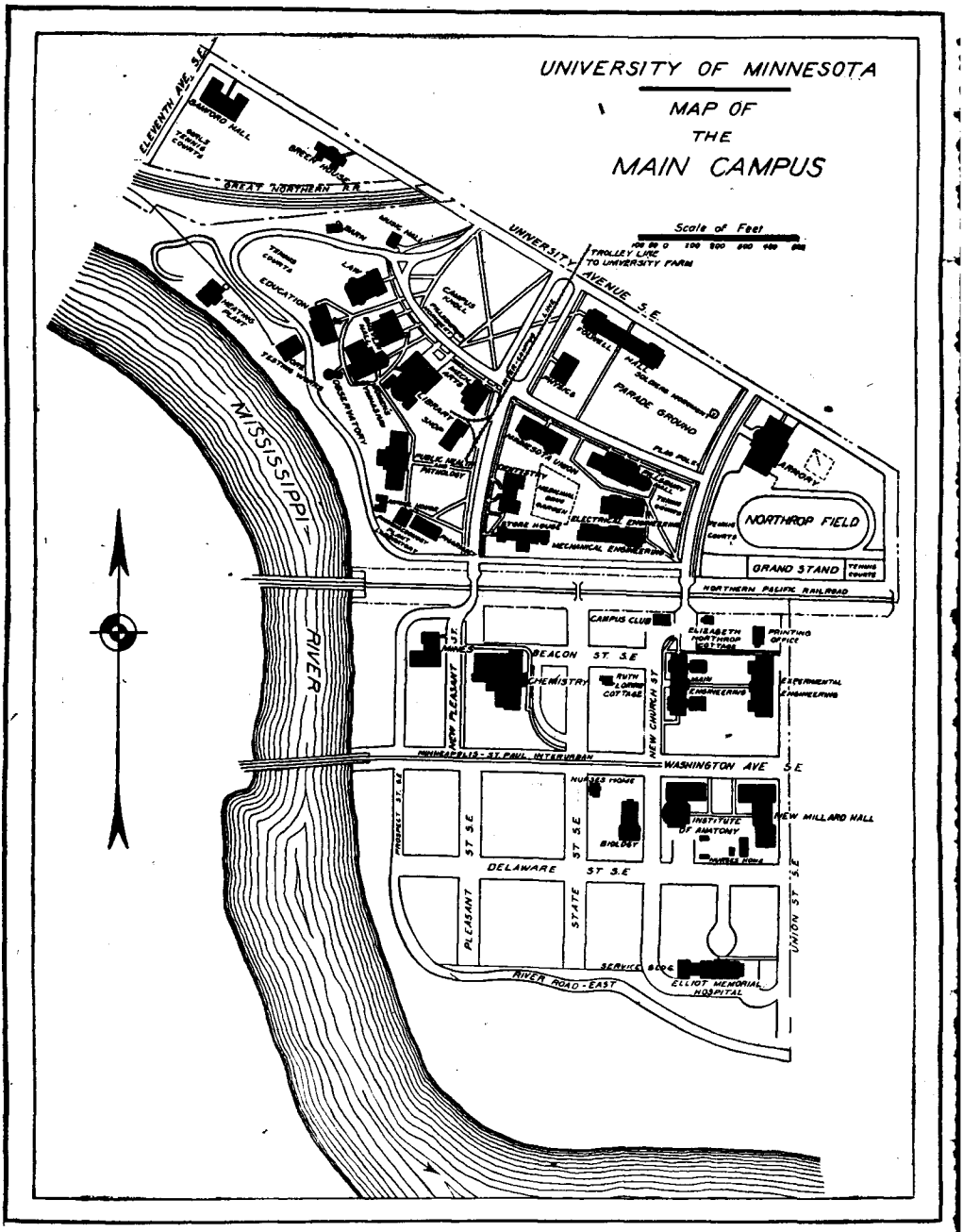
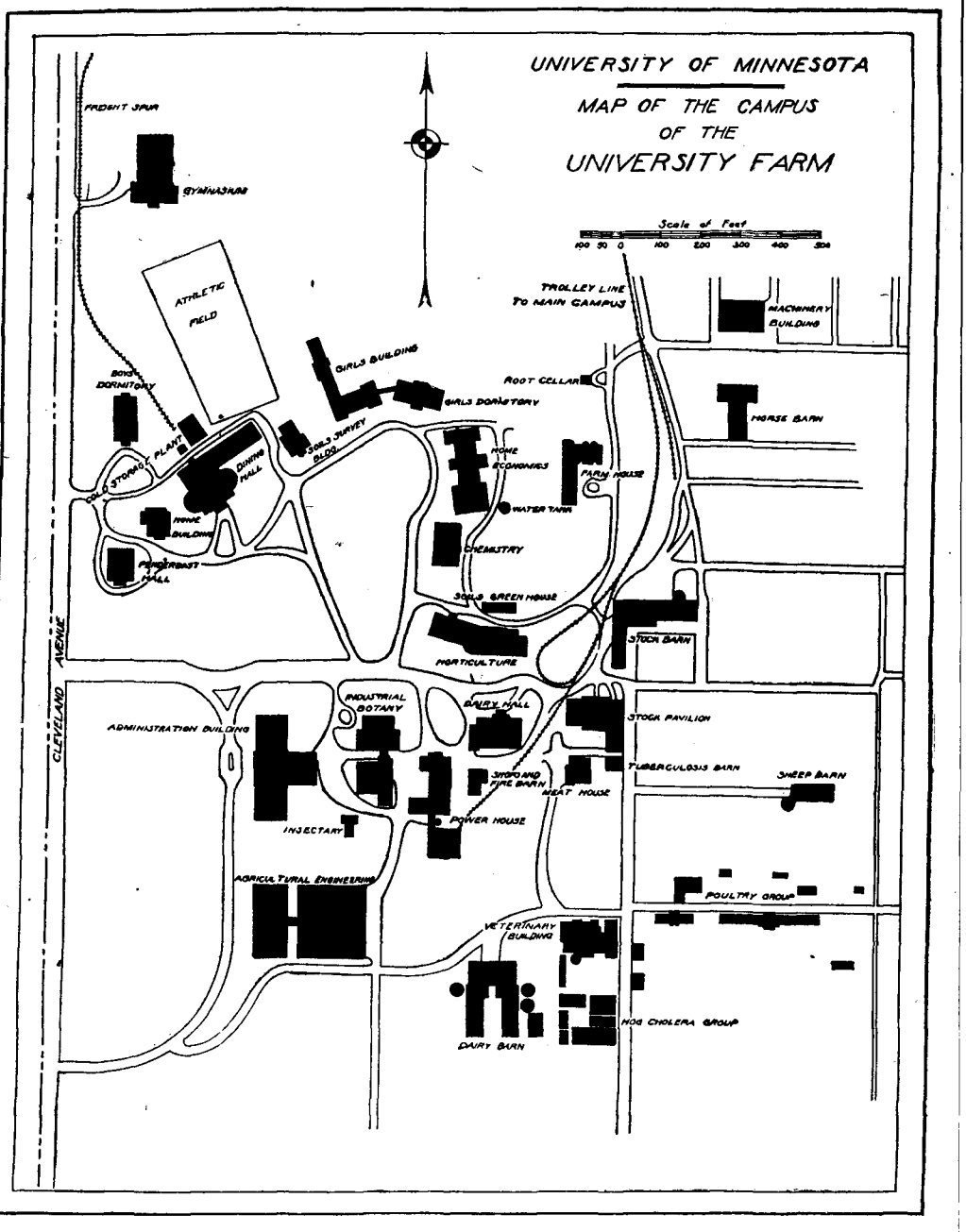


Area of Main Campus, 108.5 acres



Area of University Farm, 422.56 acres

1923

JULY

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JULY

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SEPTEMBER

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OCTOBER

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DECEMBER

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UNIVERSITY CALENDAR

1923-24

1923			
September	24–October 20		Registration of graduate students Physical examination for all students
September	26	Wednesday	Fall quarter begins, 8:30* a.m.
October	11	Thursday	Examinations in German and French for candidates for all advanced degrees
November	12	Monday	A legal holiday (Sunday, November 11, Armistice Day)
November	17	Saturday	Last day for filing subject-matter of Master's thesis
November	29	Thursday	Thanksgiving Day; a holiday
December	13	Thursday	Commencement Convocation
December	20	Thursday	Fall quarter ends, Christmas vacation begins, 5:20 p.m.
1924			
January	4	Friday	Christmas vacation ends, winter quarter begins, 8:30* a.m.
January	17	Thursday	Examinations in German and French for candidates for all advanced degrees
February	12	Tuesday	Lincoln's Birthday; a holiday
February	22	Friday	Washington's Birthday; a holiday
March	21	Friday	Winter quarter ends, spring vacation begins, 5:20 p.m.
April	2	Wednesday	Spring vacation ends, spring quarter begins, 8:30* a.m.
April	17	Thursday	Examinations in German and French for candidates for all advanced degrees
April	18	Friday	Good Friday; a holiday
May	9	Wednesday	Last day for filing thesis of candidates for all advanced degrees
May	29	Thursday	Last day for filing written examinations for candidates for all advanced degrees
May	30	Friday	Memorial Day; a holiday
June	2	Monday	Last day for oral examinations for candidates for all advanced degrees
June	7	Saturday	Last day for filing bond for publication of Doctor's thesis; last day for depositing binding fee for Master's degree
June	15	Sunday	Baccalaureate service

* First hour classes begin at 8:15 at University Farm.

June	18	Wednesday	Spring quarter closes
June	18	Wednesday	Fifty-second annual commencement
June	24	Tuesday	Summer Session, first term begins
July	4	Friday	Independence Day; a holiday
July	17	Thursday	Last day for filing thesis of candidates at summer convocation
July	31	Thursday	First term, Summer Session closes
August	1	Friday	Summer Session, second term begins
September	5	Friday	Second term, Summer Session closes

THE GRADUATE SCHOOL

ORGANIZATION

The Graduate School has exclusive control of all graduate work carried on in the University. The graduate faculty is composed of those properly approved and qualified to offer courses carrying graduate credit. It determines the general educational policy of the Graduate School, and recommends candidates for degrees. The administration of the Graduate School is committed to the dean and an Executive Committee of seven members. They are assisted by group committees representing allied lines of work grouped together for administrative purposes. The groups are as follows:

a. Social Sciences and Law
b. Physical Sciences, Mathematics, and Engineering
c. Biological Sciences
d. Philosophy and Education
e. Language and Literature
f. Medicine
g. Agriculture

ADMISSION

Any graduate holding a Bachelor's degree or its equivalent from a reputable college or university will be admitted to the Graduate School without examination, and may register for such graduate work as he may be found prepared to enter upon, but he will not thereby be admitted to candidacy for either of the higher degrees until his case has been duly considered and approved.

All inquiries concerning admission to the Graduate School should be addressed to the dean. The student is advised to obtain and fill out an application for admission before presenting himself for registration.

If the rating of the institution from which he received his first degree is such that he will need a year or more of additional work before beginning graduate work at the University of Minnesota, he is advised to enter one of the undergraduate colleges of the University and obtain the preliminary training and an acceptable Bachelor's degree.

College graduates who simply desire to take additional work of undergraduate grade without a view to preparation for an advanced degree should register as unclassed students in the college giving the work.

REGISTRATION

Full directions concerning registration will be found in a booklet issued by the registrar's office for the information of new students. The essential document is an official transcript of the student's college record.

FEES

	Annual
Tuition fee (except for clinical medicine)	$30.00
Credit hour tuition for students carrying less than full work	3.00
Deposit (first quarter in residence)	3.00
Incidental fee	
Minnesota Union or Shevlin Hall	3.00
Health fee	6.00
Special fees	
Chemistry deposit	5.00

Registration in the Graduate School includes the making out of the program and paying fees for the entire year (or for the balance of the year when registration occurs after the fall quarter).

Fees must be paid not later than one week following the approval of the registration by the dean of the Graduate School in order to avoid a $2 penalty fee.

FELLOWSHIPS AND SCHOLARSHIPS

Four graduate fellowships have been established by the late Thomas H. Shevlin, of Minneapolis. These are awarded one each in the College of Agriculture, Forestry, and Home Economics, the School of Chemistry, the Medical School, and the College of Science, Literature, and the Arts. Each fellowship yields $500 per annum. They are awarded annually. Candidates for these fellowships should file their applications before March 1 with the dean of the Graduate School.

Shevlin fellows will devote their entire time to the graduate work for which they are registered, and may not engage in private tutoring or be required to render any service to the University.

CALEB DORR RESEARCH FELLOWSHIPS IN AGRICULTURE, FORESTRY, AND HOME ECONOMICS

By the bequest of the late Caleb Dorr of Minneapolis, the income from twenty thousand dollars is available for graduate fellowships in the Department of Agriculture of the University of Minnesota. Usually two fellowships of $500 each will be awarded each year. The holders of these fellowships are exempt from all tuition fees. The basis of the award is scholarship and the prospect and promise of productive research.

Caleb Dorr Fellows will devote their entire time during the academic year (nine months) to the graduate work for which they are registered and may not engage in private tutoring or be required to render any service to the University.

Candidates for these fellowships should file their applications before March 15 with the dean of the Graduate School. Application blanks may be secured from the dean of the Graduate School or from the dean of the College of Agriculture, Forestry, and Home Economics.

THE ALBERT HOWARD SCHOLARSHIP

This scholarship, founded by Mr. James T. Howard, yields $240 annually. The holder is expected to do graduate work in Liberal Arts.

THE CLASS OF 1890 FELLOWSHIP

On the twenty-fifth anniversary of its graduation the class of 1890 founded a fellowship yielding $150 and exemption from tuition. This fellowship is open to graduates of the colleges of Science, Literature, and the Arts, and Engineering and Architecture desiring to pursue advanced work. Applications should be filed with the dean of the Graduate School before March 1.

DEPARTMENTAL SCHOLARSHIPS

Besides the above stipends there are about seventy scholarships assigned to various departments, yielding $225 and exemption from tuition and fees. The holders may be required to render service not to exceed ten hours a week in laboratory or office work, or not more than three hours in classroom assistance. Where these regulations are observed, a qualified holder of one of these scholarships may become a candidate for the Master's degree on the basis of one year's work in residence.

Other assistantships and teaching fellowships, some yielding as high as $1,000 are available, but the amount of work required is greater and the length of residence of the holder of one of these appointments would be increased proportionately.

Inquiries and requests for application blanks may be addressed to the dean of the Graduate School, or to the head of the department in question.

GRADUATE WORK IN MEDICINE

Work of graduate character done in the Summer Session of the University of Minnesota under a member of the graduate faculty may be counted for residence credit for advanced degrees. The course work for the Master's degree may be completed in four summer sessions or three summer quarters. Students working for the Master's degree in summer sessions must file the subjects of their theses before the completion of the first half of the required work. Theses of summer session students must be completed at least two weeks before the end of the session in which they take the degree.

An increasing amount of graduate work in fields of interest to high school teachers is being offered in the Summer Session. The courses for any session may be found in the bulletin of the Summer Session.

Students who desire graduate credit for work in the summer must register with the dean of the Graduate School.

GRADUATE WORK IN MEDICINE

Graduate work in the laboratory departments and in the clinical branches leading to advanced degrees is offered by the University of Minnesota. This work is under the direction of the Graduate School, and candidates for admission and degrees must meet the requirements

of the Graduate School as outlined in the preceding pages. The work is offered by members of the medical faculty in Minneapolis and by members of the graduate faculty on the Mayo Foundation at Rochester, Minnesota, where part or all of the residence work may be done. Several teaching fellowships supported by the University and others on the Mayo Foundation are open to qualified students pursuing graduate work in clinical medicine or in the laboratory branches. A special bulletin on graduate work in medicine is published and may be obtained from the registrar.

WORK IN THE LAW SCHOOL

Under certain properly approved conditions graduate students may offer courses in law as a minor for an advanced degree when their major work is in the Department of Political Science or Economics.

REQUIREMENTS FOR THE MASTER'S DEGREE

The degree of master of arts is, in general, conferred for advanced non-technical study; the degree of master of science for advanced technical study, such as agriculture, industrial chemistry, engineering, etc.

The requirements for the degree of master of arts or master of science are covered in general by the statement that these degrees may be earned by properly qualified students only by at least one full academic year's work in residence at this University (three quarters). Students who have not had adequate preparation in the specific chosen field of work, or who are doing outside work in excess of ten hours a week, will require more than one year to attain the Master's degree.

Upon entrance to the Graduate School, the candidate, with the approval of the dean, will select his adviser in the field of his major work. With the approval of his adviser and the dean, he will also select a minor, and will outline a study program for the year.

Program of study.—A full program for a student who expects to meet the requirements in one academic year must cover the necessary courses in the fields of the major and minor and the preparation of a satisfactory thesis. The work must be selected from graduate courses offered in this bulletin and must amount to not less than 6 or more than 9 credit hours each quarter. In addition, thesis work (or courses upon which the thesis is based) should be carried to make a total of not less than 15 hours per week for three quarters. A grade of B at least, must be obtained in any course offered as fulfilling the requirement in the major. A grade of C must be obtained in minor courses.

The major.—The major work must be in a department in which the candidate has had at least three years of work (18 semester or 27 quarter credits) if it be a department open to freshmen, or two years of work (12 semester or 18 quarter credits) if it be a department not open to freshmen. Part or all of this preliminary work may consist of designated prerequisite courses in the same or allied departments. Any special requirements will

be noted in the corresponding departmental statement. At the end of the year, a final written examination (in addition to the usual course examinations) will be given in the major as noted below.

The minor.—The minor subject must be selected in a department in which the candidate has had at least one year's work (6 semester or 9 quarter credits), or he must have had in a closely allied department a year's work (6 semester or 9 quarter credits), which is actually designated as a prerequisite to the minor subject. Any special requirements will be noted in the corresponding departmental statements.

The choice of the minor must be in a department whose work can be logically related to that of the department in which the student is doing his major work.

The group committee may in exceptional cases allow the minor subject to be taken in the same department as that of the major.

The language requirement.—A reading knowledge of a foreign language, modern or ancient, the language to be determined by the major department, is required of candidates for the Master's degree, unless exemption is made in individual cases with the approval of the Executive Committee of the Graduate School. When no other statement is made in the departmental announcement in this bulletin, a knowledge of either French or German is expected. The candidate shall present to the dean of the Graduate School, not later than the close of the second quarter of residence, a certificate of proficiency in the designated language, signed by the professor in charge of the corresponding language department or his representative.

Candidates for the Master's degree in any department in the language and literature group who register after September 1, 1922, will be required to have a reading knowledge of two foreign languages before they are recommended for the degree.

All examinations to meet the language requirement of the Graduate School, unless otherwise arranged with the language departments, shall be held on the days specified in the calendar at the beginning of this bulletin.

A candidate who fails in a language examination for an advanced degree shall not be given a second examination until the following quarter.

The Master's thesis.—Before the middle of the first quarter in residence the candidate should file at the office of the Graduate School the subject of his thesis. This subject must be approved by his adviser and by the corresponding group committee. It should be on a topic falling within the field of the major. It is expected that the candidate will devote approximately one half his time to the preparation of the thesis, including courses on which the thesis is based. The thesis must be written in acceptable English and show ability to work independently, and give evidence of power of independent thought both in perceiving problems and making satisfactory progress toward their solution. Familiarity with the bibliography of the special field and correct citation of authorities are expected.

The thesis is required to be in triplicate in order to facilitate its consideration. One copy must be upon the specially required linen stock

and the other two may be carbon copies on cheap paper. Samples in the dean's office of both the linen stock and carbon paper should be examined before the thesis is typewritten. The body of the thesis should be double spaced, but footnotes may be single spaced.

The thesis must be finished and three copies deposited in the office of the dean of the Graduate School at least six weeks before the candidate presents himself for his degree.

The thesis will be examined by a committee of three, appointed by the dean on the recommendation of the group committee. The student's adviser will, as a rule, be the chairman of this committee. Unanimous approval by this committee will be necessary for the acceptance of the thesis.

If the thesis is accepted, the candidate must deposit with the registrar, at least one week before commencement the sum of one dollar and fifty cents for binding one copy of this thesis, which will be cataloged and deposited in the University Library.

Examinations.—All candidates for this degree will meet the regular requirements as to examinations, topics, reports, etc., of the classes in which they are registered. A special examination in the field of the minor is not required, but this does not excuse the candidate from the regular course examinations. Besides the usual course examinations, where such are given, the candidate for the Master's degree must pass a final written examination in the major and after the acceptance of the thesis, a final oral examination.

The final written examination will be held not later than four weeks before the end of the quarter in which he takes his degree. It will cover the work of the candidate in the field of the major, and may include any work fundamental thereto. This examination will be held by his instructors in the major department, the adviser acting as chairman.

If the final written examination is satisfactory, and the thesis accepted, the final oral examination of the candidate will be held, not later than two weeks before the end of the quarter in which he takes his degree. The adviser will act as chairman of the examining committee, which will include all the instructors with whom the candidate has taken work, the thesis committee, and, ex-officio, the head or chairman of the department in which the major work is done. Any member of the graduate faculty may attend as a visitor, and due notice shall be sent by the chairman of the committee to all members of the graduate faculty in the major and minor departments. The final oral examination will cover all the work offered for the degree, and may include other work fundamental thereto. At the close of the examination, the committee will vote upon the candidate, taking into account all of his work. A majority vote is required for approval.

Candidates who are eligible for the "preliminary examination" for the Doctor's degree may substitute this examination for the final oral examination for the Master's degree, provided that all other requirements for the Master's degree have been met.

Reports.—Special blanks are provided for signed reports concerning the thesis and the final oral examinations. All reports must be filed in the office of the dean of the Graduate School at least one week before the end of the last quarter.

Candidates meeting the requirements as above outlined will be reported by the dean to the graduate faculty, who will by vote recommend to the Board of Regents those approved for degrees.

Candidates upon whom degrees are to be conferred are required to be present at commencement, unless especially excused by the dean of the Graduate School and the president of the University.

TABULAR SUMMARY OF REQUIREMENTS FOR THE MASTER'S DEGREE

Work	Under the Direction of	Date
Program, major and minor	Adviser and dean of the Graduate School.....	On entrance
Approval of thesis subject	Adviser and group committee	Middle of first quarter in residence
Language requirement	Adviser and language department	Before close of second quarter
Approval of candidacy....	Executive committee	Beginning of third quarter
Filing of thesis.....	Dean of the Graduate School	At least six weeks before graduation
Examination of thesis....	Thesis committee.....	Before admission to final oral examination
Final written examination in major	Major department members of the graduate faculty	Not later than four weeks before commencement and before final oral
Final oral examination on all work	Thesis committee; all candidate's instructors; head of major department....	Not later than two weeks before commencement
(Course examinations as required at the usual times.)		
Fee for binding thesis....	Registrar	One week before commencement

MASTER OF SCIENCE IN ENGINEERING OR ARCHITECTURE

The requirements and procedure for the degree of master of science in civil, mechanical, electrical, chemical, or architectural engineering or architecture will correspond to those outlined for this degree in other subjects. The major subject and thesis will lie in the field represented by the degree. The thesis will be filed and final written examination taken at least six weeks before graduation. The language requirement will be waived in all of these cases except chemical engineering, in which German is required.

THE ENGINEER DEGREES

Requirements.—The advanced professional degrees, civil engineer, mechanical engineer, electrical engineer, chemical engineer, and architectural engineer will be conferred upon the recommendation of the Graduate School faculty as a result of the satisfactory completion of the following requirements:

a. A Bachelor's degree, from an approved school in the corresponding branch of engineering.

b. One full academic year of graduate engineering study (three quarters) in residence at this University. Graduates of this University may be permitted to carry on this study *in absentia* under the direction of the faculty. Work done *in absentia* may not be substituted for the residence work required for the master of science.

c. Four years of engineering experience in positions of responsibility, subsequent to receiving the Bachelor's degree. (If the graduate study is done *in absentia,* five years of experience are required.)

d. A thesis of professional grade.

Candidates for the degree of chemical engineer must have a reading knowledge of German.

For graduates of this University, a Master's degree in the corresponding branch of engineering will be accepted as fulfilling the requirements of the year of graduate study.

The Engineer degree will not be granted in less than five years after the Bachelor's degree was received.

If the Bachelor's degree is in another branch of engineering than that in which the professional degree is sought, the student must complete the equivalent of the subjects required for the Bachelor's degree in the new field before admission to candidacy for the desired degree.

The Master's degree with the Engineer degree.—It is recommended that the student who is entering upon the graduate year's study in residence for the Engineer degree register for and obtain the Master's degree for this year's work, that is, the degree of master of science in the corresponding branch of engineering. The essential difference lies in the requirement of a thesis if the Master's degree is sought. However, the aggregate amount of work is intended to be the same in both cases, namely, from 15 to 18 credit hours per week for the three quarters. If the graduate study does not lead to the Master's degree, the student is not required to prepare a thesis as a part of the year's work. The Master's thesis, however, will not satisfy the requirement for the professional thesis which is intended to be related to the practical experience after the Bachelor's degree was received.

Plan of study.—Upon entrance to the Graduate School, the candidate, with the approval of the dean, will select his adviser in the field represented by the desired degree, in which field the major work and the thesis, if one be taken, will lie. With the approval of his adviser and the dean, he will also select a minor, and will outline a study program for the year.

If the student registers for the master's degree in engineering or architecture, he will conform to the requirements for that degree as regards major and minor work, thesis, examinations, etc.

If the graduate study during the year of residence or *in absentia* is towards the Engineer's degree only, it will be divided into major and minor work, of which the major will usually constitute about two thirds

and the minor one third of the total of 15 to 18 credit hours which will be carried each quarter.

Study in absentia.—Only graduates of this University will be permitted to undertake the graduate study *in absentia* towards one of the Engineer degrees. This permission must be obtained from the head of the department represented by the degree, who will usually act as the adviser, and from the dean of the Graduate School. It is not necessary that this study be coincident with the academic year; it may be undertaken at any time.

The proposed plan of study should be arranged with the approval of the adviser. The tuition fee of ten dollars per quarter will be charged for three quarters only, altho the study may, and generally will, extend over more than nine months. At least 1,500 actual hours of work should be performed as the equivalent of a year's study in residence.

The detailed requirements of reports and examinations will be established by the adviser. A separate written report must be submitted at the end of each quarter's work. A written examination covering the entire study, both major and minor, will be held at the close of the year's work. Under favorable circumstances this examination may be held in the place where the candidate resides.

Upon the satisfactory completion of the year's work, the proper credits will be recorded towards the engineering degree.

Study in residence.—The work will consist of regular courses offered in this bulletin and may include research if desired by the student, even tho the Master's degree be not sought.

Thesis.—At least six months before the Engineer degree is expected, the thesis subject must be approved by the adviser and the group committee. The thesis itself must be filed with the dean at least six weeks before the commencement at which the degree is to be obtained together with a deposit of one dollar and fifty cents to cover binding the thesis.

Statement of experience.—With the thesis, the candidate must file a detailed statement of his professional experience since receiving his Bachelor's degree. This should amount to at least four years, if the graduate study was in residence, or five if *in absentia*.

TABULAR SUMMARY OF REQUIREMENTS FOR THE ENGINEER'S DEGREE

Work	Under the Direction of	Date
Program, major and minor	Adviser and dean of the Graduate School.....	On registration
Quarterly reports if in absentia	Adviser	
Written examination	Adviser and major and minor staff.....	At end of year's study or later, as arranged
Thesis subject.....	Adviser and group committee	Six months before graduation
Experience statement.....	Adviser and major staff...	Six weeks before graduation
Filing thesis.....	Dean of Graduate School..	Six weeks before graduation
Fee for binding thesis....	Registrar	One week before graduation

Attendance at commencement.—Unless specifically excused for an important reason, the candidate will be present in person to receive the degree.

DOCTOR'S DEGREE

In the Graduate School, one Doctor's degree, doctor of philosophy (Ph.D.), is conferred by the University of Minnesota. This degree is granted, not on the basis of successful completion of a definite amount of prescribed work but solely in recognition of the candidate's high attainments and ability in this special field, to be shown, first, by the preparation of a thesis, and second, by successfully passing the required examinations covering both the general and the special fields of the candidate's subjects as detailed later.

Candidates for the Doctor's degree must devote at least three years[1] of graduate study to approved subjects. The first two years or the last year must be spent in residence at the University of Minnesota.

A member of the staff of instruction above the rank of instructor will not be permitted to enroll for a Doctor's degree at this University. There is no objection, however, to his registering for graduate work at this University and credit so obtained may be presented elsewhere.

PROGRAM OF WORK

First year.—Upon entrance to the Graduate School, the student shall select his adviser with the approval of the dean. With the approval of his adviser he shall submit to the dean a program covering his first year's work.

Second and third years.—Before beginning the work of the second year, the student shall submit to his adviser and the group committee for approval a tentative outline of his work for the second and third years, including both the major and minor subjects. This program is then to be submitted to the dean for final approval. During the second quarter of the second year he shall file with his adviser's approval the subject of his Doctor's dissertation.

Language requirements.—Before admission to the preliminary examination, the student must present to the dean of the Graduate School statements from the French and German departments, certifying that the applicant has a reading knowledge of those languages. The substitution of other foreign languages of greater service in the major field may

[1] This time requirement will be met in three years only by those students who devote all their time to graduate study. Students who merely devote the intervals of professional or other regular employment to graduate study will need to extend their total period of work over a longer period of time. Credit for such work will be given in proportion to the amount of time actually spent in the pursuit of graduate work.

be permitted by the executive committee on recommendation of the group committee. In addition, a knowledge of other languages may be required in certain cases, as the candidate's major department may prescribe. The student's adviser or his representative shall attend the language examinations and provide literature in the major field from which the test passages are selected. For the dates of these language examinations consult the calendar at the beginning of this bulletin.

THE MAJOR WORK

The major work must be in a department in which the candidate has had, in his undergraduate study, at least three years of work (18 semester or 27 quarter credits) if it be a department open to freshmen, or two years of work (12 semester or 18 quarter credits) if it be a department not open to freshmen. Part or all of this preliminary work may consist of designated prerequisite courses in the same or allied departments.

During the period of work for the Doctor's degree a student shall spend not less than two thirds of his time[1] on the major subject, including the work on the thesis. During the last two years, he shall carry an average of at least one course per quarter in his major outside the work from which this thesis is developed.

At the close of the second year's work, and before admission to the preliminary examination, the student must obtain the written recommendation of the major department members of the graduate faculty. Such written recommendations should state that in view of the work already done by the applicant, the department is convinced of his probable capacity and ability to meet all the requirements for the degree, including the thesis, the subject of which must be stated.

In the case of a student who comes for the last year of residence only, provision for the examination will be made by the dean and the major department.

THE MINOR WORK

The minor work must be selected in a department in which the student is prepared to pursue courses advanced enough in character to be included in the group designated "For Undergraduate and Graduate Students," and numbered 100 or above.

The choice of the minor must be in a department the work of which can be logically related to that of the department in which the student is doing his major work.

In exceptional cases, the dean and the group committee may allow the minor subject to be taken in the same department as that of the major or in two related departments.

[1] In estimating the distribution of time, a week of 15 credit hours may be assumed.

Not less than one sixth of the total work of the three years shall be devoted to the minor subjects and all of this work shall be completed and certified to by the department in which the minor is taken before admission to the preliminary examination.

THESIS

The thesis, for which the accumulation of material may well be started not later than the beginning of the second year, must give evidence of originality and power of independent investigation, and embody results of research, which form a real contribution to knowledge as well as exhibit mastery of the literature of the subject and familiarity with the sources of knowledge. The matter must be presented with a fair degree of literary skill.

Not later than six weeks before the commencement at which he expects to take the degree, the student shall deposit at the dean's office his thesis, typewritten, in triplicate copy to facilitate reading by the thesis committee. The requirements concerning form, copyrighting, and printing adopted in June, 1922, may be consulted in the Graduate School office.

The dean will appoint a thesis committee with the student's adviser as chairman. The duty of this committee will be to read the thesis and vote upon its acceptance. Unanimous approval by this committee will be necessary to such acceptance.

Printing of the thesis.—If the thesis be accepted, the student shall deposit with the registrar, not later than one week before graduation, a sufficient bond or such sum of money as is needed to print one hundred copies of the thesis for the use of the University and as many additional copies as the candidate may require for himself. If the thesis is to be published elsewhere, reprints will be acceptable, if bound with covers in the special form required by the University.

EXAMINATIONS

Preliminary.—After the language examination (see p. 16) and at least seven months before the degree is conferred, a preliminary examination of the student shall be given by a committee appointed by the dean and including the student's adviser as chairman, a representative of the group committee other than his adviser, the chairman or head of the major department, a representative of the minor department, and such other members as the dean may consider advisable. Certificates of proficiency in French and German and completion of the minor and the recommendation of the major department shall be required before admission to this examination. The examination shall cover graduate work previously taken by the student, and *may include any work fundamental thereto,* except the thesis and the field of definite specialization. This examination shall be in addition to the usual course examinations. It may be written or oral, or both, at the discretion of the committee. Only after the successful completion of this examination may the student be enrolled as a candidate for the Doctor's degree. Students failing to

pass this preliminary examination may be excluded from candidacy for the degree and in any case shall not be re-examined until at least one quarter has passed.

Final written.—After the thesis is presented, and at least four weeks before examination, there shall be a written examination in the major subject, to be given by the members of the graduate faculty in the major department. This examination shall cover all the work done in the major, and *may include any work fundamental thereto.*

Final oral.—After successful completion of the written examination and acceptance of the thesis and not less than two weeks before graduation, the final oral examination shall be given. This examination shall be conducted by a committee consisting of the adviser as chairman, of a majority of the members of the graduate faculty of the department in which the major work was done and at least three other members of the graduate faculty appointed by the dean. At least one member of this committee shall be from a group other than the one in which the major department is included. This examination has special reference to the thesis and the field of the candidate's special studies and shall not exceed three hours.

The date of the final oral examination shall be publicly announced and the examination shall be open to any member of the graduate faculty. Upon completion of the examination, a formal vote of the committee shall be taken, and an affirmative vote of at least two thirds of the members shall be necessary for recommendation of the candidate for the degree.

Reports.—Special blanks are provided for signed reports concerning the thesis and the final oral examinations. All reports must be filed in the office of the dean of the Graduate School at least one week before graduation.

Candidates meeting the requirements as above outlined will be reported by the dean of the graduate faculty, who will by vote recommend to the Board of Regents those approved for degrees.

Candidates upon whom degrees are to be conferred are required to be present at commencement, unless especially excused by the dean of the Graduate School and the president of the University.

TABULAR SUMMARY OF REQUIREMENTS FOR THE DOCTOR'S DEGREE

Work	Under the Direction of	Date
First Year		
Major	Adviser and dean of the Graduate School	On registration
Minor		
Second Year.		
Tentative program of entire second and third year's work	Adviser, group committee, and dean of Graduate School	Before beginning work of second year
Major, including thesis	As for tentative program	
Minor	Adviser and minor department	Before admission to preliminary examination
Language	Adviser and language department	
Recommendation	By major department	
Preliminary examination	Special committee	Seven months before degree is to be conferred
Third Year		
Major, including thesis	Advisers, group committee, and dean of Graduate School	
Filing of thesis	Dean	Six weeks before taking the degree
Examination of thesis	Thesis committee	Before admission to final oral examination
Final written examination	Major department members of the graduate faculty	Four weeks before taking degree and before final oral examination
Final oral examination	Advisers, majority of members of major department, and other members appointed by dean of Graduate School	Not later than two weeks before taking the degree
Bond for publication of thesis	Registrar	Not later than one week before taking the degree

DESCRIPTION OF COURSES

EXPLANATIONS

A *dagger* (†) indicates that all quarters of a course must be completed before credit is received for any quarter.

AGRICULTURAL BIOCHEMISTRY

Professors Ross Aiken Gortner, Clyde H. Bailey, Leroy S. Palmer; Associate Professor John J. Willaman; Assistant Professors Cornelia Kennedy, Clarence A. Morrow.

Prerequisites.—For major work, credit in general chemistry and qualitative analysis, in organic chemistry, in quantitative analysis, and at least ten quarter credits in biological science. The work presented as prerequisite must be satisfactory to the instructor with whom the student wishes to work.

For minor work, credit in general chemistry and qualitative analysis, in organic chemistry, and 10 quarter credits of biological science. Minors should be arranged only after consultation with the instructors concerned.

Candidates for the Master's degree must have a reading knowledge of German or French. (In special cases, where other languages are needed for the development of the thesis, Russian, Italian, or the Scandinavian languages may be substituted.)

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

101f-102w. Agricultural Quantitative Analysis. Includes estimation of inorganic and organic constituents of biological products, proximate analysis of foods and feeding stuffs, and the use of special apparatus. Prerequisite: quantitative analysis. Three credits each quarter. V, VI, VII; MWF; 7Ch. Mr. Morrow.

103s. Dairy Chemistry. Lectures and laboratory work on the physical, colloidal, and chemical properties of milk and dairy products, and of the processes involved in the manufacture of dairy products. V, VI, VII; MWF; 7Ch. Mr. Palmer.

108s. Chemistry of Wheat and Wheat Products. A lecture course, with collateral library reference work, on the chemical technology of the production and milling of wheat and its conversion into food. Prerequisite: organic chemistry. Three credits. I; MWF; 201Ch. Mr. Bailey.

109s. Selected Flour Laboratory Methods. A laboratory course in which particular attention is given to recently developed methods for testing wheat products. Less extensive than 110. Designed for men with commercial laboratory experience. Prerequisite: Course 101-102 or

Chemistry 131-132, parallel 108. Three credits. V, VI, VII, VIII; MW; 7Ch. MR. BAILEY.

110s,su.[1] FLOUR LABORATORY METHODS. A laboratory course. Analysis of wheat and its products. Designed to train students for research in the cereal industry. Prerequisites: Course 101-102 or food analysis. Five credits. V, VI, VII, VIII; MWF; 7Ch. MR. BAILEY.

111f,su-112w,su. PHYTOCHEMISTRY. An advanced course dealing with the colloidal state, and the chemistry of proteins, carbohydrates, glucosides, tannins, fats, plant acids, enzymes and pigments, and their physicochemical relations to the vital processes involved in growth and nutrition. Prerequisites: organic chemistry, biology, 1 year. Three credits each quarter. III; MWF; 201Ch. MR. GORTNER.

113f,su-114w,su-115s. BIOCHEMICAL LABORATORY METHODS. A laboratory course paralleling the lectures in 111-112. Prerequisite: quantitative analysis, parallel 111-112. Two or 3 credits each quarter. V, VI, VII, VIII; TTh; 7Ch. MR. MORROW.

116w. ADVANCED ANIMAL NUTRITION. Recent developments in animal nutrition, covering the field of proteins, mineral metabolism, vitamines, and the relation of nutrition to disease. Prerequisite: Course 15 or equivalent. Two credits. III; TTh; 351Ch. MR. PALMER, MISS KENNEDY.

117f,w,s,su. LABORATORY PROBLEMS IN ANIMAL NUTRITION. A laboratory course on methods used in nutrition studies. (Because of limited laboratory facilities, students planning to register for this course should obtain permission from the instructors before registration.) Prerequisite: Course 116. Three to 5 credits. Ar. MR. PALMER, MISS KENNEDY.

118f,w,s,su. LABORATORY PROBLEMS IN BIOCHEMISTRY. Special laboratory work in the preparation and isolation of pure compounds, and in special methods of identification or determination of biochemical products. Prerequisites: Courses 111-112, 113-114; or 103 or 110. Three or 5 credits. MR. GORTNER, MR. BAILEY, MR. PALMER, MR. WILLAMAN, MISS KENNEDY, MR. MORROW.

COURSES PRIMARILY FOR GRADUATE STUDENTS

201f,w,s. SEMINAR. Regular meetings for the discussion of methods of research, formulation of research problems, and reviews of current literature. Required of all majoring in this division and of all minoring for the Doctor's degree. One credit. MR. GORTNER.

203f,w,s,su. RESEARCH PROBLEMS. Special work on particular research problems other than the student's major thesis. Facilities are provided

[1] Offered in alternate summers. Not offered in 1924.

for biochemical investigations and for advanced studies in plant, animal, or human nutrition. Three or 5 credits. MR. GORTNER, MR. BAILEY, MR. PALMER, MR. WILLAMAN, MR. MORROW.

205f,w,s,su. SPECIAL TOPICS IN BIOCHEMICAL LITERATURE. Library work followed by the preparation of written reports upon either the historical development or the current literature of special biochemical problems. A reading knowledge of German is necessary and of French desirable. Prerequisite: Course 206, 207, or 208. Three credits. MR. GORTNER, MR. BAILEY.

206f. COLLOIDS. Lectures dealing with the colloidal state, the preparation and properties of colloidal solutions, and the relation of these to biochemical processes. Prerequisite: Course 111-112, or physical chemistry. Three credits. II; MWF; 351Ch. MR. GORTNER.

207f. ENZYMES.[1] Lectures dealing with the nature of enzyme action, including methods of preparation and investigation of enzymes, their physical and chemical properties and their methods of action. Prerequisites: Course 111-112, or physiologic chemistry. Three credits. III; MWF; 351Ch. MR. WILLAMAN.

208w. PROTEINS.[1] Lectures on the composition, structure, biochemical reactions, and functions of the protein and amino acids with special emphasis upon those which are concerned in plant growth and metabolism, animal food, and industrial processes. Prerequisite: Course 111-112, or advanced organic chemistry. Three credits. II; MWF; 351Ch. MR. WILLAMAN.

209w. CARBOHYDRATES.[2] A lecture and library course on the synthesis, structure, reactions, and functions of carbohydrates, with especial reference to those which are of plant or animal origin and which play a rôle in biochemical or industrial processes. Prerequisite: Course 111-112, or advanced organic chemistry. Three credits. II; TThS; 351Ch. MR. WILLAMAN.

212w,su. SPECIAL TOPICS IN NUTRITIONAL CHEMISTRY. A course comprising lectures, independent library study, and oral presentation by students, of special assigned topics in animal nutrition. A reading knowledge of German is essential and French desirable. Prerequisite: Course 116. Three credits. MR. PALMER.

AGRONOMY AND FARM MANAGEMENT

Professors ANDREW BOSS, HERBERT K. HAYES; Associate Professors ALBERT C. ARNY, FRED GRIFFEE.

Prerequisites.—In agronomy, for major work, Courses 121, 122, 131, 132, or their equivalents, and a reading knowledge of German or French.

[1] Offered in alternate years. Offered in 1923-24.
[2] Offered in alternate years. Not offered in 1923-24.

For minor work, two years of botany, one year of zoology, and the elementary courses in farm crops.

In farm management, for major work, Courses 102, 103, and 104, or their equivalents, and at least 6 credits in elementary and agricultural economics. For minor work, at least 12 credits in the elementary agricultural sciences (Farm Crops 1, Soils 4, and Animal Husbandry 3-4). Exemption from the language requirement for the Master's degree may be made in individual cases.

In plant-breeding, for major work, Courses 121, 122, 131, 132, or their equivalents, and a reading knowledge of German or French. With the approval of the adviser, courses in agricultural biochemistry, botany, farm crops, horticulture, plant pathology, and plant physiology, may be accepted as major work. For minor work, two years of botany, one year of zoology, and the elementary courses in farm crops. Students majoring in plant breeding are required to continue study during at least one summer. Exemption is made if similar training has been obtained at some other institution.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

In Agronomy

121f. CEREAL CROPS. An advanced study of the cereal crops. Structure, group classification, improvement, growing, and utilization. Brief score card practice and a limited amount of placing on intrinsic value included. Prerequisites: Farm Crops I, botany, 10 credits. Three credits. VI, VII; TTh; 2 Ad(F). MR. ARNY.

122w. CORN AND POTATO CROPS. A study of the corn and potato crops similar to that outlined for cereal crops. Prerequisites: Farm Crops I; botany, 10 credits. Three credits. V, VI, VII; TTh; 2 Ad(F). MR. ARNY.

123s. FORAGE AND FIBER CROPS. A study of the forage crops through assigned reading, laboratory and field work. Prerequisites: Farm Crops I, botany, 10 credits. Three credits. V, VI, VII; TTh; 2 Ad(F). MR. ARNY.

133w. JUDGING AND GRADING FARM CROPS. Prerequisites: Agronomy, Farm Management, and Plant Breeding I, 121, 122. Course 122 may be concurrent. VIII; TTh; 2 Ad(F). MR. ARNY.

In Farm Management

102f,w,s. FARM MANAGEMENT I: ORGANIZATION. The business side of farming and farm organization and equipment is emphasized. Prerequisites: Farm Crops I, Economics 5, Soils 4. Three credits. II; MWF; 24 Ad(F). MR. BOSS.

103w,s. FARM MANAGEMENT II: ORGANIZATION. A continuation of Course 102 with special attention to farm operation. Prerequisites: same as above with Agronomy, Farm Management, and Plant-Breeding 102. Three credits. I; MWF; 24 Ad(F). MR. BOSS.

104s. FARM MANAGEMENT III. A methods course, covering cost of production studies, farm business analysis, farm practice and farm management literature. Prerequisites: Agronomy, Farm Management, and Plant-Breeding 102 and 103. Three credits. II; MWF; 18 Ad(F). MR. BOSS.

In Plant-Breeding

131f,w. PRINCIPLES OF GENETICS. Given in co-operation with the Division of Horticulture. Designed to familiarize students with underlying principles of breeding. Prerequisites: Botany, 10 credits; or animal biology, 10 credits. Three credits. I; ThS; I, II; T; 24 Ad(F). MR. GRIFFEE, MR. BEAUMONT.

132s,su. FARM CROPS PLANT BREEDING. Applied genetics is emphasized. Prerequisites: Agronomy, Farm Management, and Plant-Breeding 131. Three credits. I; ThS; I, II; T; 4 Ad(F). MR. GRIFFEE.

COURSES PRIMARILY FOR GRADUATE STUDENTS

In Agronomy

209Ar. RESEARCH IN FARM CROPS. It is desirable that students remain during one summer to work out research problems. Prerequisites: 9 credits in farm crops. MR. ARNY.

213f,w. FARM CROPS SEMINAR. Weekly meetings for the discussion of current literature and for reports of thesis problems. Prerequisites: 9 credits in farm crops. Maximum of 3 credits. MR. ARNY.

214Ar. SPECIAL TOPICS IN FARM CROPS LITERATURE. Technique in conducting experimental work and interpreting results. Library work, including the making of abstracts, reviews, and bibliographies. Prerequisites: Agronomy, Farm Management, and Plant-Breeding 121, 122, 123, and a reading knowledge of German. Maximum of 6 credits. MR. ARNY.

In Farm Management

205f. FARM BUSINESS ANALYSIS. Special and intensive work in studying the various factors entering into farm organization. Prerequisites: 9 credits in farm management. Three credits. Ar. MR. BOSS.

207w. COST OF PRODUCTION STUDIES. Prerequisites: 9 credits in farm management. Three credits. Ar. MR. BOSS.

215w,216s. ADVANCED FARM ORGANIZATION. Analysis of farm organization and the application of survey factors and cost factors in organizing the business of farming. Prerequisites: 12 credits in farm management. Three credits. Ar. MR. BOSS.

In Plant-Breeding

201Ar. RESEARCH IN PLANT-BREEDING. May be taken as a major or minor work. Prerequisites: Agronomy, Farm Management, and Plant-Breeding 131, 132. MR. HAYES.

203f,w,s. PLANT-BREEDING SEMINAR. History, recent genetic theories, and a discussion of research problems. Weekly meetings throughout the year. Prerequisites: Agronomy, Farm Management, and Plant-Breeding 131. 3 credits. MR. HAYES.

211w. TOPICS IN PLANT-BREEDING. Emphasis is given to field plot technique, the results of inbreeding and outbreeding, and the results of selection and crossing as a means of improving crop plants. Practice in outlining the correct mode of attack for special plant breeding problems. Prerequisites: Agronomy, Farm Management, and Plant-Breeding 132. Minimum of 3 credits. Maximum of 6 credits. MR. HAYES.

217f. ADVANCED GENETICS. Current genetic literature. Linkage, genetic stability, chromosomal aberrations, and the probable errors of Mendelian ratios will be emphasized. Prerequisites: Agronomy, Farm Management, and Plant-Breeding 131, or Horticulture 109. Minimum of 3 credits. Maximum of 6 credits. MR. HAYES.

ANATOMY

Prerequisites.—The Institute of Anatomy offers excellent facilities to students who wish to take advanced work or to pursue investigations in anatomy.

The prerequisite work for all students for major or minor in the Department of Anatomy includes general zoology (animal biology), 6 credits, and advanced zoology or elementary courses in anatomy (including histology, embryology, and neurology), 6 credits. In addition each student desiring a major in anatomy must have had the elementary courses in that branch of anatomy in which he desires to specialize—gross anatomy, histology, embryology, or neurology.

For staff and the description of courses, see the special bulletin on graduate work in medicine.

ANIMAL BIOLOGY

Professors HENRY F. NACHTRIEB, HAL DOWNEY, JOHN B. JOHNSTON, WILLIAM A. RILEY, ARTHUR G. RUGGLES, CHARLES P. SIGERFOOS; Associate Professors ELMER J. LUND, ROYAL N. CHAPMAN; Assistant Professors HARRY H. KNIGHT, DWIGHT E. MINNICH, OSCAR W. OESTLUND.

Prerequisites.—For major work, Course 1-2 and at least 18 credits of advanced work approved by the department; for minor work, Course 1-2 or the equivalent.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

107s. PROTOZOOLOGY. Lectures, references, and laboratory work on the structure and life histories of Protozoa. Three credits. I, II; MWF; 211,213AB. MR. SIGERFOOS.

109f,110w,111s. GENERAL PHYSIOLOGY. A thoro survey of fundamental physiological processes in organisms. Based on Bayliss's *Principles of General Physiology*. Laboratory, lectures, and reading. Fifteen credits. V-VIII; MWF; 10AB. MR. LUND.

117f-118w-119s.† ECOLOGY OF INSECTS. General principles of ecology with special reference to the insects of Minnesota. Lectures, laboratory, assigned reading, and field work. Nine credits. V-VII; TTh; 202AB. MR. CHAPMAN.

124su. ADVANCED ECOLOGY. Similar to Course 117-118-119 with special field work. Five credits. Ar. 202AB. MR. CHAPMAN.

125f-126w-127s.† ADVANCED ENTOMOLOGY. Morphology and classification of insects, with lectures on the history of entomology. Nine credits. III, IV; TThS; 204AB. MR. OESTLUND.

130w. BIOLOGY AND TAXONOMY OF THE APHIDIDAE. Intensive study of the natural history, bibliography, and classification of the Aphididae. Three credits. III, IV; MWF; 204AB.

139-140.† HISTOLOGY AND DEVELOPMENT OF INSECTS. Lectures and laboratory work on the histology, embryonic and postembryonic development of insects. Six credits. II, III, IV; T and ar.; 324AD(F). MR. RILEY.

144f-145w-146s. ANIMAL PARASITES AND PARASITISM. Lectures and laboratory work. Origin and biological significance of parasitism; the structure, life history, and economic relations of representative parasites. Second term devoted primarily to the relation of insects to diseases of man and animals. Nine credits. V-VII; WF; 202AB. MR. RILEY.

149f-150w-151s.† BLOOD OF VERTEBRATES. A comparative study of blood and blood-forming organs of vertebrates. A portion of time to be devoted to research. Nine credits. Ar.; 201,211AB. MR. DOWNEY.

181f-182w.† GENERAL EMBRYOLOGY. Principles and laws of animal development in connection with origin and development of germ cells, sex chromosomes, fertilization, cleavage, etc. Six credits. V, VI; MWF; 201,211AB. MR. NACHTRIEB.

183s.† GENETICS AND EUGENICS. Facts and theories of heredity and the application of the laws governing natural inheritance for the improvement of the race. Three credits. IV; MWF; 211AB. MR. NACHTRIEB.

197f-198w-199s. PROBLEMS. Advanced work in some special line. Nine or 18 credits. Hours and days arranged. MR. NACHTRIEB, MR. DOWNEY, MR. JOHNSTON, MR. RILEY, MR. SIGERFOOS, MR. LUND, MR. CHAPMAN, MR. MINNICH, MR. OESTLUND.

COURSES PRIMARILY FOR GRADUATE STUDENTS

201-204. RESEARCH IN ENTOMOLOGY. Hours and days arranged. MR. RILEY, MR. CHAPMAN, MR. KNIGHT, MR. OESTLUND, MR. GRAHAM.

205-208. RESEARCH IN ECONOMIC ENTOMOLOGY. MR. RUGGLES, MR. GRAHAM.

209-212. RESEARCH IN ECONOMIC VERTEBRATE ZOOLOGY. MR. WASHBURN.

213-216. RESEARCH IN BIOLOGICAL OXIDATIONS. MR. LUND.

217-218-219. RESEARCH IN THE PHYSIOLOGY OF THE LOWER ORGANISMS WITH SPECIAL REFERENCE TO THE PROTOZOA. MR. LUND.

225-228. RESEARCH OF THE GROSS AND MICROSCOPIC ANATOMY OF THE GANOIDS. MR. NACHTRIEB.

229-232. RESEARCH IN ANIMAL HISTOLOGY. MR. DOWNEY.

233-236. RESEARCH IN VERTEBRATE CONNECTIVE TISSUE WITH SPECIAL REFERENCE TO THE CELLULAR ELEMENTS. MR. DOWNEY.

237-238. RESEARCH IN VERTEBRATE HEMATOLOGY. MR. DOWNEY.

245-248. COMPARATIVE NEUROLOGY. A study in the structure and functions of the nervous system of vertebrate animals and of the evolution of the chief nervous mechanisms. Prerequisites: two years in comparative or human anatomy. MR. JOHNSTON.

249-252. RESEARCH IN NEUROLOGY. MR. JOHNSTON.

253-254. DYNAMICS OF PROTOPLASM AND CELLS. Physical and chemical interpretation of the structure of living protoplasm, and vital processes such as permeability, secretion, enzyme action, regeneration, stimulation, and energy transformation in the living cell. Research accompanied by lectures. MR. LUND.

257-260. SENSORY PHYSIOLOGY OF INVERTEBRATES. MR. MINNICH.

261-264. RESEARCH IN PARASITOLOGY AND MEDICAL ENTOMOLOGY. MR. RILEY.

265-268. RESEARCH IN INSECTICIDES.

ANIMAL HUSBANDRY

Professors WALTER H. PETERS, EVAN F. FERRIN; Assistant Professors PHILLIP A. ANDERSON, H. W. VAUGHAN.

Prerequisite.—Students majoring in this division are exempted from the language requirement for the Master's degree.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

101f. ADVANCED LIVESTOCK-JUDGING. Three credits. VI, VII; MWF; center arena, St(F). MR. FERRIN.

102s. HORSE HUSBANDRY. Stud farm management; the selection of foundation stock and the breeding, feeding, and marketing of horses. Horsepower; factors determining a horse's efficiency for work. Three credits. II; TTh; 3St(F) and V, VI, VII; F, center St(F). MR. PETERS.

103s. BEEF CATTLE HUSBANDRY. The management of purebred and grade herds of beef cattle, sales and shows, building equipment, labor, with practical exercises. Three credits. III; MW; 3St(F) and V, VI, VII; T; BB. MR. VAUGHAN.

104s. SHEEP HUSBANDRY. Similar in method to 103, with practice in shearing, blocking, feeding, and caring for lambs. Three credits. IV; WF; 3St(F) and V, VI, VII; M; center St(F). MR. ANDERSON.

105s. SWINE HUSBANDRY. Topics of 103 as applied to swine production, marketing, costs, feeding, etc. Three credits. III; TS; 3St(F) and V, VI, VII; Th; center St(F). MR. FERRIN.

106w. ADVANCED MEATS. Practice work in dressing animals and cutting carcasses; also a study of the chemical composition of meat. Three credits. V, VI, VII; WF; Meat Shop. MR. ANDERSON.

107s. MEAT PROBLEMS. The wholesale cuts and grades of meat, the packing industry and utilization of by-products, special problems and visits to meat-packing establishments. IV; TS; and V, VI, VII; W; Meat Shop. MR. ANDERSON.

108s. SEMINAR. Special assignments and review of investigations pertaining to the livestock industry. Three credits. II; MWF; 3St(F). MR. PETERS.

COURSES PRIMARILY FOR GRADUATE STUDENTS

201. ADVANCED STUDY OF LIVESTOCK-BREEDING. Studies of the methods followed in the building up of breeds of livestock and distinguished blood lines within the breeds. Review of scientific literature on livestock-breeding. Three to 10 credits. MR. PETERS.

202. ADVANCED LIVESTOCK-FEEDING. A study of experimental results bearing upon feeding questions and review of scientific literature applicable to them. Three to ten credits. MR. FERRIN.

203. THE MARKETING OF LIVESTOCK. A study of the methods used in the principal markets of the world. Three credits. MR. VAUGHAN.

204. ADVANCED STUDY OF THE BREEDS OF LIVESTOCK. A study of the history, development, characteristics, and blood lines in any of the leading breeds of livestock. Three credits. MR. PETERS, MR. FERRIN, MR. ANDERSON, MR. VAUGHAN.

205. EXPERIMENTAL METHODS. Theory, plan, and conduct of experimental work in animal husbandry. Factors affecting results, sources of error, interpretation of data. Three credits. MR. FERRIN.

ANTHROPOLOGY[1]

Professors ALBERT ERNEST JENKS,[2] WILSON D. WALLIS.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

108s. PHILIPPINE PEOPLES. Comparative study of the four large ethnic and cultural groups in the Philippine Islands; policy of the insular government as it affects American home interests in the Orient. II; MWF; 25F. (Not given in 1923-24.) MR. JENKS.

110. PHYSICAL ANTHROPOLOGY AND AMALGAMATION. MR. WALLIS.

112f. THE AMERICAN NEGRO. Development of the American negro; his characteristics, conditions, and developing tendencies. Negro and immigrant adjustments. Prerequisites: three courses. Three credits. IV; MWF; 15F. (Not given in 1923-24.) MR. JENKS.

113f. THE AMERICAN PEOPLE—OLDER IMMIGRANTS. Characteristics, contributions, and distribution of the older immigrant peoples in America, their modification and importance. Prerequisites: three courses. Three credits. III; MWF; 15F. (Not given in 1923-24.) MR. JENKS.

114w. THE AMERICAN PEOPLE—NEWER IMMIGRANTS. Prerequisites: three courses. Three credits. III; MWF; 15F. (Not given in 1923-24.) MR. JENKS.

115s. AMERICAN PEOPLE—AMERICANISMS AND ASSIMILATION. Essential and unique historical Americanisms. Conditions and facts of assimilation. Prerequisites: three courses. Three credits. III; MWF; 15F. (Not given in 1923-24.) MR. JENKS.

116s. AFRICAN ETHNOLOGY. Prerequisites: Anthropology 51 or 62. Three credits. MR. WALLIS.

[1] Courses in Americanization alone may not be offered as a major for an advanced degree.

[2] On leave, 1923-24.

121w. ADVANCED PHYSICAL ANTHROPOLOGY. Prerequisites: physical anthropology, anatomy, or comparative anatomy. Three credits. MR. WALLIS.

123f-124w. PROBLEMS IN ANTHROPOLOGY. An advanced course of method and independent research. Six credits. (Not given in 1923-24.) MR. JENKS.

128f,s. TECHNIQUE OF TEACHING ADULTS. Methods of teaching adults—the foreign-speaking, the illiterate, the fatigued. Prerequisites: three courses. Three credits. I; MWF; F. (Not given in 1923-24.)

129w. METHODS OF AMERICANIZATION. Practical methods of Americanization in use in the United States. Prerequisite: Course 128. Three credits. I; MWF; F. (Not given in 1923-24.) MR. JENKS.

130s. ORGANIZATION AND ADMINISTRATION OF AMERICANIZATION WORK. Existing Americanization organizations of federal, state, municipal, and neighborhood groups. Methods of organizing new groups. Prerequisite: Course 128. Three credits. I; MWF; F. (Not given in 1923-24.) MR. JENKS.

131f-132w-133s. SUPERVISED AMERICANIZATION WORK. Practical field work among foreign peoples in our vicinity. Prerequisites: three courses. Nine credits. VI; T and ar.; 12F. (Not given in 1923-24.)

141f-142w-143s. PRINCIPLES OF ADULT ELEMENTARY EDUCATION. Prerequisite: Course 128. II; MWF; 12F. (Not given in 1923-24.)

150f-151w-152s. FIELD PROBLEMS IN AMERICANIZATION. An advanced course of method and independent research. Prerequisite: Course 128. Six credits. IV; MWF; 12F. (Not given in 1923-24.)

160f. PRIMITIVE ETHICS. Ethical ideas and moral standards of primitive peoples. Prerequisites: Anthropology 51, or Ethics 3. Three credits. MR. WALLIS.

162s. PRIMITIVE RELIGION. Religious ideas and practices of primitive peoples. Prerequisites: Anthropology 51, or 62, or Philosophy 102. Three credits. MR. WALLIS.

COURSES PRIMARILY FOR GRADUATE STUDENTS

204f-205w-206s. SEMINAR IN ANTHROPOLOGY. Individually directed research. Prerequisites: three courses. Three credits each quarter. Ar. 12F. MR. WALLIS.

ARCHITECTURE

Professors FREDERICK M. MANN, LEON E. ARNAL.

COURSES

119f,w,s. SPECIAL RESEARCHES IN ARCHITECTURAL HISTORY. Prerequisite: completion of undergraduate architectural history. Five credits or less per quarter. III; MW; 320ME. MR. MANN.

139f,w,s. ADVANCED ARCHITECTURAL DESIGN. Prerequisite: completion of undergraduate design. Ten credits or less per quarter. VI, VII, VIII, IX; MTWThF; I, II, III, IV; S; 317ME. MR. ARNAL.

ASTRONOMY

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

The Astronomical Observatory contains a ten and one-half inch refracting telescope furnished with a third lens for converting it into a photographic telescope; a five-inch star camera; a filar micrometer; a spectroscope by Brashear; a meridian circle and zenith telescope; a Repsold photographic measuring machine; a chronograph, and astronomical clocks.

Prerequisites.—For major work, Course 51-52-53 and Mathematics 50; for minor work, Mathematics 50 and 3 credits in astronomy.

Exemptions from the language requirement for the Master's degree may be made in individual cases.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

101f-102w-103s. PRACTICAL ASTRONOMY. Theory and use of astronomical instruments; astronomical photography, with measures of plates; study of method of least squares. Prerequisite: Mathematics 50. Three to 6 credits. III; MWF. 124F. MR. LEAVENWORTH.

111f-112w-113s. CELESTIAL MECHANICS. Prerequisite: Mathematics 51. Three credits. Ar. MR. BEAL.

140w. METHOD OF LEAST SQUARES. Applied especially to engineering, physics, and astronomy. Prerequisite: Mathematics 51. Three credits. II; TThS; 124F. MR. LEAVENWORTH.

COURSES PRIMARILY FOR GRADUATE STUDENTS

201f-202w-203s. ADVANCED PRACTICAL ASTRONOMY. Prerequisite: Astronomy 101-102. Three credits. MR. LEAVENWORTH.

204f-205w-206s. ASTROPHOTOGRAPHY. Prerequisite: Astronomy 102. Three credits. MR. LEAVENWORTH.

208f-209w-210s. CALCULATION OF ORBITS. Prerequisite: Mathematics 51. Three credits. MR. BEAL.

BOTANY

Professor C. Otto Rosendahl, Josephine E. Tilden; Associate Professors Frederic K. Butters; Rodney B. Harvey; Assistant Professor William S. Cooper.

Note.—For courses in plant pathology and mycology, see Department of Plant Pathology.

Prerequisites.—For major work, 36 quarter credits in botany; for minor work, 20 credits.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

107w. Morphology and Taxonomy of Bryophytes. Structure and classification of liverworts and mosses. Prerequisites: Courses 7 and 62. Five credits. Ar. 106AB.

108w. Morphology and Taxonomy of Pteridophytes. An intensive study of lycopods, ferns, and their allies. Prerequisites: Courses 7 and 62. Five credits. Ar. 4AB. Mr. Butters.

110w. Morphology and Taxonomy of Gymnosperms. An intensive study of cycads, conifers, and their allies. Prerequisites: Courses 7 and 63. Five credits. Ar. 4AB. Mr. Butters.

113f-114w-115s. Advanced Taxonomy. Special attention is given to the taxonomy of different natural groups of angiosperms. Prerequisites: 15 credits including Course 7. Nine credits. VI, VII; MWF; 213AB. Mr. Rosendahl.

118w. Cytology. A study of the origin, development, structure, and functions of the plant cell and its various constituents. Prerequisites: 18 credits. Three credits. VI, VII, VIII; TTh; 213AB. Mr. Rosendahl.

123-124f-125w-126s. Morphology and Taxonomy of the Algae. Advanced studies in selected groups. Prerequisites: 15 credits including Course 12 for each course. Three credits for each course. VI, VII, VIII; TTh; 104AB. Miss Tilden.
Any of the above courses may be taken separately.
(123 not offered in 1922-1923.)

127s. Anatomy of Vascular Plants. The microscopic structure of vascular plants with particular attention to the development and evolution of the vascular system in the root, stem, and leaf. Prerequisites: 18 credits. Five credits. III, IV; MTWFS; 213AB. Mr. Butters.

131f. Field Ecology. A survey of the local plant communities and successions, and a study of the general principles of plant association and succession. Prerequisite: Course 21. Five credits. Ar. Ar. G. Mr. Cooper.

132w. ECOLOGICAL ANATOMY. The individual plant and its parts as related to environment; special plant forms and structures, their causes and significance. Prerequisite: Course 21. Five credits. III, IV; MTWFS; G. MR. COOPER.

133s. FOREST GEOGRAPHY OF NORTH AMERICA. Preliminary discussion of the principles of plant distribution followed by a detailed study of the forest regions of North America. Prerequisite: Course 21. Five credits. VI, VII; MWF; G. MR. COOPER.

141. PHYSICAL PHASES OF PLANT PHYSIOLOGY. The intake and translocation of materials, and the energy relations of the plant. Prerequisites: Course 22 and general organic chemistry. Five credits. I, II; MTWThF; G. MR. HARVEY.

142w. PLANT METABOLISM. The synthesis of plant food, its transformation and utilization by the plant. Prerequisites: Course 22 and general organic chemistry. Five credits. I, II; MTWThF; G. MR. HARVEY.

143s. PLANT METABOLISM AND GROWTH. A continuation of Course 142, dealing with respiration, growth, and movement. Prerequisites: Course 22 and general organic chemistry. Five credits. I, II; MTWThF; G. MR. HARVEY.

144f or s. PLANT MICROCHEMISTRY. A study of the location of materials of physiological importance in the plant and their relation to physiological processes. Prerequisites: Course 22 and general organic chemistry. Five credits. Ar. Ar. G. MR. HARVEY.

COURSES PRIMARILY FOR GRADUATE STUDENTS

201-202-203. RESEARCH PROBLEMS IN THE MORPHOLOGY OF VASCULAR PLANTS. MR. BUTTERS.

205-206-207. RESEARCH PROBLEMS IN THE TAXONOMY OF ANGIOSPERMS. MR. ROSENDAHL.

209-210-211. RESEARCH PROBLEMS IN ALGAE. MISS TILDEN.

213-214-215. RESEARCH PROBLEMS IN EMBRYOLOGY. MR. BUTTERS.

217-218-219. SPECIAL RESEARCH PROBLEMS IN THE TAXONOMY AND DISTRIBUTION OF ALGAE. MISS TILDEN.

221-222-223. RESEARCH PROBLEMS IN ECOLOGY. MR. COOPER.

224. RESEARCH METHODS IN PLANT PHYSIOLOGY. MR. HARVEY.

225-226-227. RESEARCH PROBLEMS IN PLANT PHYSIOLOGY. MR. HARVEY.

229-230-231. RESEARCH PROBLEMS IN CYTOLOGY. MR. ROSENDAHL.

233-234-235. SEMINAR. Students may register for one-hour seminar credit per quarter in any of the above research subjects.

CHEMISTRY

Professors PAUL H. M.-P. BRINTON, GEORGE B. FRANKFORTER, WILLIAM H. HUNTER; Associate Professors EVERHART P. HARDING, FRANK H. MACDOUGALL, M. CANNON SNEED; Assistant Professors LILLIAN COHEN, ISAAC W. GEIGER, LAWRENCE M. HENDERSON, LLOYD H. REYERSON, LEE I. SMITH.

In addition to the completion of the prescribed work, the candidate for a higher degree is expected to show a maturity acquired by intensive personal study of the literature and of the methods of chemistry.

Prerequisites.—(a) Chemistry as a major subject: All candidates who choose chemistry as a major subject for the Doctor's degree must offer the following courses or their equivalent as prerequisites: at least 12 quarter credits in general inorganic chemistry and qualitative analysis, at least 10 credits in quantitative analysis, and at least 10 credits in organic chemistry. All candidates must present at least one year of college physics or one year of college mathematics. (b) Chemistry as a minor subject: It is not possible to state exactly those courses which will be required in each case. If the major is not chosen in chemistry, the usual prerequisites will be at least 12 credits of general inorganic chemistry and qualitative analysis and 5 credits of quantitative or 5 credits of organic chemistry.

Students may not select two branches of chemistry as major and minor subjects except with the approval of the graduate faculty in the School of Chemistry.

The choice of the particular courses to be presented in fulfillment of a minor will be made after consultation with the student's adviser. Either Analytical Chemistry, Courses 120-121 or Organic Chemistry, Courses 135-136-137 will be acceptable as a minor for the Master's degree, or for not more than one half of a minor for the Doctor's degree, if the student is not taking major work in chemistry.

Language requirements.—Candidates for the Master's degree must have a reading knowledge of German or French; German is preferred. For the Doctor's degree both are required.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

GENERAL INORGANIC CHEMISTRY

101s. HISTORY OF CHEMISTRY. The theories of chemistry from the period of the ancients, with particular emphasis on modern theories and laws. Prerequisite: Course 36. Two credits. MISS COHEN.

102w. ADVANCED QUALITATIVE ANALYSIS. Includes an analysis of minerals, alloys, paints, and the methods of detecting some of the rarer elements. Prerequisite: Course 21. Two or three credits. MR. SNEED.

103f-104w-105s. ADVANCED INORGANIC CHEMISTRY. A discussion of valence, the periodic system, and the chemistry of the elements—their laws, theories, and compounds. Prerequisites: Courses 21, 36. Three credits per quarter. Lect., IV; TThS; 111C. MR. SNEED.

Analytical Chemistry

120w-121s. Quantitative Analysis. General principles, methods, and procedure both gravimetric and volumetric. Typical problems; laboratory practice. Prerequisite: Course 13. Five credits per quarter. Lect. VI; M; 325C. Rec. VI; F; 315C. Lab. VI-IX; MWF; 310C. Mr. Geiger, Mr. Sarver.

123f. Advanced Analytical Chemistry. Analytical methods for the determination of the common constituents of iron ore, iron, and steel are discussed and compared, with emphasis upon the general principles involved. Typical problems with laboratory practice. One lecture and seven laboratory hours per week. Prerequisite: Course 21 or 27 or 28. Three credits. Lect. VI; T; 315C. Lab. VII-IX; T; VI-IX; Th. Mr. Sarver.

124w. Advanced Analytical Chemistry. A survey of the methods of analytical chemistry applied to the analysis of minerals and ores. One lecture and 7 laboratory hours per week. Prerequisite: Course 21 or 123. Three credits. Lect. VI; T; 315C. Lab. VII-IX; T; VI-IX; Th. Mr. Brinton, Mr. Geiger, Mr. Sarver.

125s. Advanced Analytical Chemistry. Selection may be made to meet the particular needs of the student from the following: silicate analysis, non-ferrous alloy analysis, water analysis, problems in electroanalysis, etc. One lecture and 7 laboratory hours per week. Prerequisite: Course 21 or 123. Three credits. Lect. VI; T; 315C. Lab. VII-IX; T; VI-IX; Th. Mr. Sarver.

127f-128w-129s. Chemistry of the Rare Elements. Chemical relations and general reactions of rarer elements not considered in general courses. Analyses of commercially important ores and compounds of these elements are made. One lecture and 6 laboratory hours per week. Prerequisite: Course 21. Three credits per quarter. Mr. Brinton.

227f-228w-229s. Selected Topics in Analytical Chemistry. Analytical problems of an advanced nature presenting special difficulties will be selected for study and investigation in the laboratory, in the library, and by conference. Open only to graduate students who have had 18 credits of quantitative analysis, and who have a reading knowledge of French and German. Two, 3, or 4 credits per quarter. Mr. Brinton.

Organic Chemistry

131s. Organic Analysis. Practice in the identification of organic compounds, and the modern methods of qualitative organic analysis. Prerequisite: Course 37. Three credits. Mr. Lauer.

132w. THE RISE AND DEVELOPMENT OF ORGANIC CHEMISTRY. Includes biographical and other phases necessary to a complete discussion of the subject. Prerequisite: Course 37. Two credits. MR. FRANKFORTER.

133f. REAGENTS IN ORGANIC CHEMISTRY. Their limits of applicability, methods of use, and types of substances with which they react. May be accompanied by appropriate laboratory work in Chemistry 138. Prerequisite: Course 37. Three credits. MR. SMITH.

134f. THE TERPENES. Includes the bicyclic compounds and their important substitution products. May be accompanied by appropriate laboratory work in Chemistry 138. Prerequisite: Course 37. Two credits. MR. FRANKFORTER.

135f-136w-137s. ORGANIC CHEMISTRY. Full discussion of aliphatic and aromatic series with preparation of some of the more important compounds; other work of special nature will also be required. Offered to graduate students taking their minor in chemistry. Prerequisite: Course 13. Five credits per quarter. Lect. III; MWF; 325C. Lab. VI-VIII; TTh; 390C. MR. HUNTER.

138f,w,s. ADVANCED ORGANIC CHEMISTRY LABORATORY WORK. Students may also register for this course who desire appropriate laboratory work for other advanced courses. Prerequisite: Course 37. Two to five credits. Lab. ar; 390C.

139f,w,s. ADVANCED ORGANIC CHEMISTRY LABORATORY WORK. An introduction to research work. These advanced laboratory courses may be taken under any member of the Division of Organic Chemistry. Prerequisite: Course 37. Two to five credits. Lab. ar; 390C.

191f-192w-193s. ADVANCED ORGANIC CHEMISTRY. An introduction to the literature of organic chemistry. Structure, reaction mechanism, and relation of physical properties to constitution. May be accompanied by appropriate laboratory work in Chemistry 138-139. Prerequisite: Course 37. Three credits per quarter. III; TThS; 325C. MR. HUNTER.

231f-232w-233s. ORGANIC CHEMISTRY SEMINAR. One hour a week. Open only to students taking research in organic chemistry. One credit. MR. HUNTER.

PHYSICAL CHEMISTRY

140f-141w-142s. PHYSICAL CHEMISTRY. A general survey of the subject. Three lectures and one recitation. Laboratory work three to six hours per week. Prerequisites: two years college dentistry, 1 year college physics. Three, four, or five credits, depending on the amount of laboratory work. Lect. IV; MWF. Rec. IV; S. Lab. VI-VIII; WF. MR. MACDOUGALL.

143f,w. PHYSICAL CHEMISTRY. Designed chiefly for medical and biological students. Prerequisite: Course 32. Four credits. MR. HENDERSON.

243f-244w-245s. THERMODYNAMICS AND CHEMISTRY. Prerequisites: Course 142 and calculus. Three credits per quarter. MR. MACDOUGALL.

246f-247w-248s. KINETIC THEORY AND ATOMISTICS. Kinetic theory of gases and liquids, crystal structure, structure of atom, quantum theory. Prerequisites: Course 142 and calculus. Three credits per quarter. Lect. II; TThS. (Not offered in 1923-24.) MR. MACDOUGALL.

149s. PRINCIPLES OF COLLOIDAL CHEMISTRY. Prerequisites: Course 141 and calculus. Two credits. (Not offered in 1923-24.) MR. REYERSON.

150s. APPLICATION OF COLLOIDAL CHEMISTRY. Prerequisite: Course 141. Two credits. MR. REYERSON.

151s. RADIOCHEMISTRY. The occurrence, methods of isolation, and physicochemical properties of the radioactive substances, together with a brief consideration of the chemical, geological, and biological bearing of the subject. Prerequisite: Course 141. Two credits. (Not offered in 1923-24.) MR. HENDERSON.

152f,w,s. LABORATORY COURSE IN RADIOCHEMISTRY. To accompany or follow Course 151. Credits arranged. MR. HENDERSON.

253f-254w-255s. ADVANCED PHYSICAL CHEMISTRY LABORATORY. To accompany or follow any of the advanced courses in physical chemistry. Prerequisite: Course 142. Credits arranged. MR. MACDOUGALL.

156w. APPLICATIONS OF PHYSICAL CHEMISTRY TO ORGANIC CHEMISTRY. Illustrations of the use of physicochemical methods in organic research. Prerequisites: Courses 130 and 142. Three credits. MR. HENDERSON.

157f-158w-159s. COLLOID CHEMISTRY LABORATORY. Credits and hours to be arranged. Must be preceded or accompanied by Physical Chemistry 149 or 150. MR. REYERSON.

250f-251w-252s. PHYSICAL CHEMISTRY SEMINAR. One hour a week. For students taking advanced courses in physical chemistry. One credit. MR. MACDOUGALL, MR. HENDERSON, MR. REYERSON.

TECHNOLOGICAL CHEMISTRY

161f-162w-163s. FOOD ANALYSIS. Prerequisite: Course 21. Three credits per quarter. Lect. IV; T; 215C. Lab. II-III, VI-IX; F; 217C. MR. HARDING.

164w. EXACT GAS ANALYSIS. Prerequisite: Course 21. One or two credits. MR. HARDING.

166s. MICROCHEMISTRY. Chemical methods and the microscope applied to minute quantities of substances and the examination of food materials, fibers, etc. Prerequisite: Course 21. One or two credits. MR. HARDING.

167f. GAS AND FUEL ANALYSIS. The chemical analysis and colorimetry of solid and gaseous fuels and methods of testing municipal gas. Prerequisite: Course 21. Three credits. Lect. I; S; 215C. Lab. I-III; TTh; 10C. MR. HARDING.

168w. PETROLEUM AND PETROLEUM PRODUCTS. Examination and testing principally of gasoline, illuminating and lubricating oils. Prerequisite: Course 21. Three credits. Lect. I; S; 215C; I-III; TTh; 10C. MR. HARDING.

169s. GENERAL TECHNICAL ANALYSIS. Includes a large range of topics: textiles and paper, paints and varnishes, asphalt and tars, boiler waters, soaps, edible oils and fats, and various other food materials and food products. Prerequisite: Course 21. One, two, or three credits. MR. HARDING.

COURSES PRIMARILY FOR GRADUATE STUDENTS

301f-302w-303s. RESEARCH WORK IN INORGANIC CHEMISTRY. Credits to be arranged. MR. SNEED, MR. HENDERSON, MR. REYERSON.

321f-322w-323s. RESEARCH WORK IN ANALYTICAL CHEMISTRY. Credits to be arranged. MR. BRINTON, MR. GEIGER.

331f-332w-333s. RESEARCH WORK IN ORGANIC CHEMISTRY. Credits to be arranged. MR. FRANKFORTER, MR. HUNTER, MR. SMITH.

341f-342w-343s. RESEARCH WORK IN PHYSICAL CHEMISTRY, INCLUDING WORK IN ELECTROCHEMISTRY, RADIOCHEMISTRY, AND COLLOIDS. Credits to be arranged. MR. MACDOUGALL, MR. HENDERSON, MR. REYERSON.

361f-362w-363s. RESEARCH WORK IN TECHNOLOGICAL CHEMISTRY. Credits to be arranged. MR. HARDING.

CHEMICAL ENGINEERING

Professors CHARLES A. MANN, GEORGE B. FRANKFORTER; Assistant Professor GEORGE H. MONTILLON.

Prerequisites.—Before being admitted to major work in chemical engineering, the student should have received the Bachelor's degree in chemical engineering or its equivalent. If he has not met this requirement, it will be necessary for him to pursue such additional preparatory studies as may be prescribed by the adviser.

The student selecting chemical engineering as a minor must present as prerequisites mathematics including integral calculus, physics, analytical and organic chemistry, and mechanical drawing.

Requirements.—For the degree of master of science in chemical engineering, the major subject and the thesis must be taken in chemical engineering.

Students may not select chemical engineering in combination with any branch of chemistry as major and minor subjects except with the approval of the group committee.

The candidate for the Master's or the Doctor's degree with chemical engineering as a major must have completed, as undergraduate or graduate, a year's work in physical chemistry, such as, for example, Courses 140f-141w-142s, or their equivalent.

For the requirements for the professional degree of chemical engineer, see page 14.

Languages.—Candidates for the Master's degree in chemical engineering must have a reading knowledge of German or French; German is preferable in this field. For the Doctor's degree, both are required.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

171s. CHEMICAL MACHINERY. Principles and materials of construction, operation and uses of chemical machinery. Lectures and recitations. Laboratory work in operating and testing. Visits to chemical plants. Prerequisites: Courses 21, 36. Four credits. I; MTWThF; 111C. MR. MANN.

172f. INDUSTRIAL INORGANIC CHEMISTRY. Operations common to chemical industries, marketing of products, utilization of by-products, trade journals. Lectures and recitations. Prerequisite: Course 171. Four credits. I; MTWThF; 111C. MR. MANN.

173w. INDUSTRIAL ORGANIC CHEMISTRY. Similar to above but covering organic field. Lectures and recitations. Prerequisite: Course 172. Four credits. I; MTWThF; 111C. MR. MANN.

174f. CHEMICAL MANUFACTURE. (Inorganic.) Manufacture of technical products on a scale large enough to afford data for the determination of cost of manufacture. Use of semi-plant scale equipment and technical trade journals. Laboratory. Prerequisite: Course 171. Two or more credits. MR. MANN, MR. MONTILLON.

175w. CHEMICAL MANUFACTURE. (Organic.) Similar to above but covering the organic field. Laboratory. Prerequisite: Course 171. Two or more credits. MR. MANN, MR. MONTILLON.

176f-177w. APPLIED ELECTROCHEMISTRY. Application of the electric current to chemical processes. Laws and phenomena of electrochemistry, batteries, electroplating, electric furnace construction and operation, and

electrolytic and electric furnace products. Prerequisite: Course 142. Four credits per quarter. Lect. III; MWF; 111C. Lab. VI-VIII; Th. MR. MANN, MR. MONTILLON.

178s. CHEMICAL ENGINEERING CALCULATIONS. Problems in drying, evaporation, filtration, and general chemical processes. Prerequisite: Course 173. Three credits. Lect. III; MWF; 111C. MR. MONTILLON.

179s. ADVANCED APPLIED ELECTROCHEMISTRY. The more recent developments in this field. Prerequisites: Courses 142, 176, 177. Four credits. MR. MANN, MR. MONTILLON.

180f-181w-182s. DESIGN OF CHEMICAL EQUIPMENT AND PLANTS. Based on collected data on the subject. Classroom and laboratory work. Prerequisite: Course 173. Two credits per quarter. VI-VIII; MF. MR. MANN, MR. MONTILLON.

183f. CHEMISTRY OF EXPLOSIVES. History, development, manufacture, and uses. Lectures, required reading, and reports. Prerequisite: Course 173. Four credits. MR. FRANKFORTER.

184s. ORGANIC DYESTUFFS. The technical chemistry of commercial dyes and their intermediates. Class and laboratory. Prerequisite: Course 173. Five credits. MR. FRANKFORTER.

185s. ADVANCED CHEMICAL MANUFACTURE. Problems in the manufacture of special chemicals on a large scale, using the industrial chemistry laboratory. Prerequisites: Courses 174, 175. Three credits. MR. MANN, MR. MONTILLON.

186s. GAS MANUFACTURE AND DISTRIBUTION. Prerequisites: Chem. 21 and 27. Three credits. MR. MONTILLON.

271f-272w-273s. SEMINAR. Presentation and discussion of papers concerning the newer developments in chemical industries. One credit. MR. MANN, MR. MONTILLON.

COURSES PRIMARILY FOR GRADUATE STUDENTS

371f-372w-373s. RESEARCH WORK IN CHEMICAL ENGINEERING—INDUSTRIAL INORGANIC AND INDUSTRIAL ORGANIC CHEMISTRY—APPLIED ELECTROCHEMISTRY, ELECTRIC FURNACE WORK, AND CHEMICAL MANUFACTURE. Credits to be arranged. MR. MANN, MR. FRANKFORTER.

CIVIL ENGINEERING

Professors FREDERIC H. BASS, ALVIN S. CUTLER, FREDERICK M. MANN, JOHN I. PARCEL, FRANK B. ROWLEY; Assistant Professors FRED C. LANG, GEORGE A. MANEY.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

For prerequisites see bulletin of College of Engineering and Architecture.

121f. RAILWAY ENGINEERING. Design and construction of railroad buildings and tracks. Method of computing earthwork, and estimates and reports. Three credits. MR. CUTLER.

122w. RAILWAY ENGINEERING. Train resistance, grades, curvature, distance, rise and fall, as factors in location and operation of railroads. Train-loading, acceleration, retardation; locomotives and equipment. Operating costs governing grade revision. Three credits. MR. CUTLER.

123s. RAILWAY ENGINEERING. Lectures, office work, and field inspection. Design and operations of various types of yards and terminals, and terminal facilities. Signalling and interlocking. Three credits. MR. CUTLER.

124w. TRANSPORTATION. Operating problems of railway, highway, ocean, and inland waterway transportation. Typical design and equipment. Cost and value of service, valuation, regulation, present systems, and organizations. Three credits. MR. CUTLER.

125s. TRANSPORTATION. Specific illustrative problems: Twin City and Mississippi Valley traffic situation, Mississippi River experiment, New York Barge Canal, Great Lakes traffic, St. Lawrence River project, Panama Canal status. Rapid transit, motor transport. Aerial transport. Three credits. MR. CUTLER.

131f. BRIDGE ANALYSIS. Stresses in simple span railway bridge trusses of the larger type. Four credits. MR. MANEY.

132w. BRIDGE DESIGN. Design and detail drawing of railway plate girder viaduct. Three credits. MR. MANEY.

133s. BRIDGE DESIGN. Complete design and detail drawing of railway pin truss span. Three credits. MR. MANEY.

134s. STATICALLY INDETERMINATE STRUCTURES. General theory deflections and statically indeterminate stresses and their application to continuous girders, frames, swing bridges, redundant members. Three credits. MR. PARCEL, MR. MANEY.

146f,w,s. CEMENT AND CONCRETE LABORATORY. Laboratory technique and experimental investigation of special problems in cement, concrete, and reinforced concrete. Three credits. MR. LAGAARD.

161f. HYDROLOGY. Rainfall, evaporation, transpiration, percolation, runoff. Flood and low water flows of streams. Storage problems. Three credits. MR. BASS.

162w. WATER SUPPLY ENGINEERING. Sources of supply. Laboratory methods of testing water; wells, surface water intakes, conduits and pipe lines, distribution systems, and purification plants. Selection of pumping machinery and motive power. Three credits. MR. BASS.

163s. SANITARY ENGINEERING. Quantities of sewage and storm water; precipitation and run-off. Sanitary sewer system for a small community; storm water system for a city district. Steam pollution and sewage disposal. Three credits. MR. BASS.

164w-165s. WATER POWER. Types of low, medium, and high head developments. Details of developments. Types of dams. Turbine settings and characteristics. Three credits. MR. BASS.

171f. BUILDING SANITATION. The location and orientation of buildings; lighting, ventilation, water supply, plumbing, sewage, and refuse disposal. Two credits. MR. BASS.

COURSES PRIMARILY FOR GRADUATE STUDENTS

221f-222w-223s. RAILWAY ADMINISTRATION. An analysis of railway organization and methods of management and operation. Principles of valuation and rate-making. Three credits. MR. CUTLER.

224. RAILWAY TERMINALS AND YARDS. A continuation of Course 123. Three credits. MR. CUTLER.

261s. WATER AND SEWAGE PURIFICATION. Continuation of Course 163. Design of water purification and sewage disposal. Three to five credits. MR. BASS.

262. WATER SUPPLY PROBLEMS. Continuation of Course 162. Three to five credits. MR. BASS.

251s. HIGHWAY LABORATORY. Investigation in co-operation with State Highway Department. Three to five credits. MR. LANG.

252. HIGHWAY ADMINISTRATION. Problems of highway administration and finance. Three to five credits. MR. LANG.

271. BUILDING SANITATION. A design course in the sanitation of buildings. Heating and ventilating, plumbing, lighting. Housing problems. Three to five credits. MR. BASS, MR. ROWLEY.

272. CITY-PLANNING. The physical elements of the city; topography, drainage, geology. Public works and structures. Street arrangements; rapid transit; railroad terminals. City-districting. Subsurface structures. Esthetic features of the city; the civic center; parks; boulevards; public buildings. Three to five credits. MR. BASS, MR. MANN.

234f-235w-236s. ADVANCED STRUCTURAL DESIGN. Fundamental theory of stresses applied to special problems. Relative economy in design. Comparative study of specifications. Three to five credits per quarter. MR. PARCEL.

237-238. STRUCTURAL LABORATORY. Similar to 234, but dealing mainly with experimental problems in structural steel. Strain gauge study of actual stress distribution in beams, columns, and riveted joints. Three to five credits per quarter. MR. MANEY, MR. LAGAARD.

245f-246w-247s. ADVANCED REINFORCED CONCRETE ANALYSIS. Critical review of the literature of reinforced concrete and study of the advanced theory. Study of test data and analysis of stresses in reinforced concrete structures. Three to five credits per quarter. MR. MANEY, MR. LAGAARD.

280f-281w-282s. CIVIL ENGINEERING RESEARCH. Original work along lines of plain and reinforced concrete, structural steel, hydraulics, municipal and transportation problems. Investigations, reports, tests, designs. Five credits per quarter. MR. BASS, MR. CUTLER, MR. PARCEL, MR. LANG, MR. MANEY, MR. LAGAARD.

COMPARATIVE LITERATURE

Professor OSCAR W. FIRKINS.

COURSES

101-102-103.† DRAMA. An outline of the history of drama, including the drama of to-day. Lectures and readings. III; TThS; 113F. MR. FIRKINS.

105-106-107.† PRINCIPLES OF CRITICISM. Lectures and readings. VI; MWF; 113F. MR. FIRKINS.

110. THE INTERNATIONAL ROMANTIC MOVEMENT IN EUROPE (1775-1825). II; TThS; 113F. MR. FIRKINS.

203. THE ARTHURIAN LEGEND: from Geoffrey of Monmouth to Tennyson and Wagner. MR. FIRKINS.

206. FRENCH AND ENGLISH LITERARY CRITICISM: from the sixteenth century to the present time. MR. FIRKINS.

COMPARATIVE PHILOLOGY

Professor FREDERICK KLAEBER; Associate Professor SAMUEL KROESCH.

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

As a matter of course, candidates for the Master's degree must have a knowledge of Latin and German; candidates for the Doctor's degree must have a knowledge of Greek also.

Students are advised to confer with the department before selecting courses.

COURSES FOR UNDERGRADUATES AND GRADUATE STUDENTS

101f-102w. GENERAL INTRODUCTION TO THE SCIENCE OF LANGUAGE. Prerequisite, one of the following groups: (1) five years' foreign language, four may be in high school and one in college; (2) two years' foreign language. Three credits. IV; 205F. MR. KLAEBER.

103f. UNIVERSAL LANGUAGE. Comparison of families of languages grammatically and lexically. Movement for creation of an international language. Prerequisites same as for Course 101. Three credits. IV; TS; 205F. MR. KLAEBER.

105s. THE LIFE OF WORDS. Etymology, and semasiology. Growth of vocabulary; change of words in form and meaning. Prerequisites same as for Course 101. Three credits. VI; TTh; 205F. MR. KLAEBER.

108f. COMPARATIVE PHONETICS. A study of speech sounds and the nature of their production with especial reference to English, French, and German. Open to students of the modern languages. Prerequisites: 2 credits in other than elementary courses. This course is identical with German 108. Three credits. Hours to be arranged. MR. KROESCH.

109f-110w-111s. HISTORY OF THE GERMAN LANGUAGE. Identical with German 109-110-111. Nine credits. Hours to be arranged. MR. KLAEBER.

141f-142w-143s. HISTORICAL GRAMMAR OF THE ENGLISH LANGUAGE. I. Sounds and spelling. II. Accidence and syntax. Nine credits. Hours to be arranged. MR. KLAEBER.

COURSES PRIMARILY FOR GRADUATE STUDENTS

202. COMPARATIVE GRAMMAR OF THE GREEK, LATIN, AND GERMANIC LANGUAGES. A general survey of the field of Indo-Germanic philology will be included.

203-204. GOTHIC. The relation of Gothic to other Germanic dialects will be particularly emphasized. Study of the grammar, reading of texts, discussion of problems. MR. KLAEBER.

205. URGERMANISCHE GRAMMATIK. Lectures and study of standard works. MR. KLAEBER.

207-208. OLD SAXON. Old Saxon grammar; interpretation of the *Heliand* and *Genesis*. MR. KLAEBER.

209-210. OLD HIGH GERMAN. Braune's *Althochdeutsche Grammatik;* Braune's *Althochdeutsches Lesebuch*. This course is identical with German 209-210. MR. KLAEBER.

211-212. RESEARCH SEMINAR. Competent graduate students will be advised and assisted in research along special lines. MR. KLAEBER.

DAIRY HUSBANDRY

Professors CLARENCE H. ECKLES, JOSEPH R. KEITHLEY; Assistant Professor ALLAN B. RAYBURN.

Students taking their major in dairy husbandry may be exempted from the language requirements for the Master's degree.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

101f. MILK PRODUCTION. Problems of the dairy farmer with laboratory work. IV; MTWFS; 39DH. MR. ECKLES.

102s. MARKET MILK. Lectures and laboratory work. IV; MW; II, III; Th; 39DH. MR. KEITHLEY.

103w. DAIRY STOCK-FEEDING. Application of the principles of nutrition to special problems of feeding the dairy cow and growing the young animals. III; MWF; 30DH. MR. ECKLES.

104f. ADVANCED STUDY OF DAIRY BREEDS. Practice in comparative judging; selection and valuation; visits to purebred herds. VI, VII, VIII; MW; 40DH. MR. RAYBURN.

105f-106w-107s. SEMINAR. Special investigation and study of selected topics. Reports on assigned subjects and reviews recent scientific investigations. II; S; 30DH. MR. ECKLES.

111f. DAIRY PRODUCTS I. The chemical, bacteriological and economic problems in the manufacture and marketing of butter and ice cream. Laboratory exercises. I; MW; II, III; Th; 39DH. MR. KEITHLEY.

112s. DAIRY PRODUCTS II. Similar to 111f with special application to cheese, condensed milk, and milk powder. Laboratory exercises. IV; TF; VI, VII; T; 39DH. MR. KEITHLEY.

COURSES PRIMARILY FOR GRADUATE STUDENTS

202f-203w-204s. RESEARCH IN DAIRY HUSBANDRY. Facilities offered for study and investigation of subjects pertaining to dairy cattle. Students are allowed to assist at times with investigations under way in the experiment station. Arranged to meet the needs of the individual student. 30DH. MR. ECKLES.

205f-206w-207s. DAIRY PRODUCTS. Opportunity and facilities are offered for the study and investigation of problems concerning common dairy products. The work is arranged to meet the needs of the individual student. MR. KEITHLEY.

ECONOMICS

Professors GEORGE W. DOWRIE, JOHN D. BLACK, ROY G. BLAKEY, FREDERIC B. GARVER, NORMAN S. B. GRAS, ALVIN H. HANSEN, BRUCE D. MUDGETT; Associate Professors H. BRUCE PRICE, CLARE L. ROTZEL, J. WARREN STEHMAN, HOLBROOK WORKING; Assistant Professors ERNEST A. HEILMAN, WALTER R. MYERS, JOHN J. REIGHARD; Professorial Lecturer J. FRANKLIN EBERSOLE; Instructor HARRY J. OSTLUND.

Candidates for higher degrees will be accepted as majors in economics in the following fields: money and banking, public finance, economic theory, economic history, labor statistics, agricultural economics (marketing, land economics, farm finance, economics of agricultural production, agricultural prices); in accounting only for the Master's degree.

GENERAL ECONOMICS

Prerequisites.—For major work, 27 quarter credits for those offering Economics 1-2, or Economics 20-21, or their equivalent; 18 quarter credits for those not presenting one of these courses or an equivalent. These credits should include Money and Banking, Statistics, and Accounting. Candidates not presenting these fundamental courses upon registration in the Graduate School may be required to complete them in addition to the regular course requirements for the degree.

Majors and minors.—Major and minor work for the Master's degree may both be taken in economics if the candidate presents a program of courses properly complementing each other and not too closely related, if approved by the Executive Committee of the Graduate School. Agricultural economics, economic history, and accounting will usually be considered satisfactory as majors or minors distinct from general economics.

Required courses.—All candidates for advanced degrees must complete Economics 103-104, or Economics 203-204-205, or the equivalent of either. Other courses will be required according to the field in which the candidate is working. Ordinarily at least one full graduate seminar must be carried throughout the year.

Language requirement.—Candidates for the Master's degree in economics are required to have a reading knowledge of a foreign language only when the thesis is written in the following fields: money and banking, public finance, economic theory, economic history, and labor.

AGRICULTURAL ECONOMICS

Prerequisites.—For major work 18 quarter credits. If, however, these credits do not include courses in Money and Banking, Statistics, and Accounting, these may be required in addition to the regular course requirements for the degree. Farm Management II and III may be included as economics prerequisites.

Majors and minors.—Upon approval of the graduate faculty, candidates doing their graduate work in agricultural economics may take their minor in general economics.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

103f-104w. VALUE AND DISTRIBUTION. Six credits. VII; MWF; 102B. MR. GARVER, MR. WORKING.

105s. HISTORY OF ECONOMIC IDEAS. Three credits. VIII; MWF; 102B. MR. GARVER.

106w. LAND ECONOMICS. Land as a factor of production; rural and urban land utilization; rents and land values; land classification; land exchange. Three credits. II; TThS. MR. BLACK.

106s. LAND ECONOMICS. Three credits. VII-VIII½; TTh; 202B. MR. BLACK.

107s. LAND TENURE. Property in land; tenancy; farm labor; evolution of the tenure classes. Three credits. VII; MWF. MR. BLACK.

108w. MARKETING OF FARM PRODUCTS. Three credits. VIII; MWF; 102B. MR. PRICE.

112f. BUSINESS STATISTICS. Three credits. II; TThS; 202B. MR. MUDGETT.

113w-114s. THEORY OF STATISTICS. Six credits. II; TThS; 213B. MR. MUDGETT.

115f-116w-117s. ECONOMICS OF AGRICULTURAL PRODUCTION. Two credits. IV; TS. MR. BLACK.

118f-119w-120s. ECONOMIC HISTORY OF EUROPE AND THE UNITED STATES, 1750 TO THE PRESENT. (See History 113-114-115.)

121f-122w-123s. ECONOMIC HISTORY OF EUROPE, 1300-1750. (See History 116-117-118.)

126f. PRINCIPLES OF CO-OPERATION. Three credits. I; TThS. MR. BLACK.

127w-128s. MARKETING ORGANIZATION AND MANAGEMENT. Principles of accounting and business organization applied to the organization and management of proprietary and co-operative marketing business units. Six credits. III; MWF. MR. PRICE.

131f-132w-133s. COST ACCOUNTING. Nine credits. (1) II; TThS; 109B(f,w) 303B(s). (2) III; TThS; 109B(f,w) 303B(s). MR. OSTLUND.

134f. INCOME TAX ACCOUNTING. Three credits. II; MWF; 202B. MR. REIGHARD.

135w-136s. AUDITING. Six credits. II; MWF; 209B. MR. REIGHARD.

137f-138w-139s. ACCOUNTING PRACTICE AND PROCEDURE. Nine credits. (1) III; MWF; 109B(f,w) 303B(s). (2) IV; MWF; 102B. MR. HEILMAN.

143f-144w, 143w-144s. THE FINANCIAL SYSTEM. Eight credits. Fall to winter. Lecture IV; T; Lit.Th. (1) VIII; MTW; 209B. (2) II; MWF; 109B. (3) III; MWF; 202B. (4) II; TThS; 213F. (5) III; TThS; 209B. (6) VI; MWF; 209B. (7) III; MWF; 302D. (8) II; MWF; 322F. Winter to spring, Lecture IV; S; 202B. (1) III; MWF; 105F. (2) IV; MWF; 105F. (3) VII; MWF; 213B. MR. DOWRIE and others.

145s. FOREIGN EXCHANGE. Three credits. II; TThS; ar. MR. MYERS.

146f. INVESTMENTS. Three credits. IX; MTW; 209B. MR. EBERSOLE.

147s. BANK ADMINISTRATION. Three credits. IX; MTW; 209B. MR. EBERSOLE.

149w,s. BUSINESS CYCLES. American business conditions since 1890 with regard to the great cycles of alternate prosperity and depression and financial panics. Critical examination of all the available business barometers designed to forecast similar conditions. Three credits. Winter, IX; MTW; 209B. Spring, VIII; MTW; 209B. MR. EBERSOLE.

150s. ADVANCED FARM FINANCE. Three credits. MR. DOWRIE.

153w. THE TRUST PROBLEM. Three credits. II; MWF; 213B. MR. STEHMAN.

154s. PUBLIC UTILITIES. Three credits. I; MWF; 102B. MR. REIGHARD.

155s. CORPORATION FINANCE. Three credits. Lect. III; S. Mu.Aud. (1) II; TTh; 2F. (2) III; TTh; 102B. (3) III; MW; 202B. (4) IV; MW; 209B. (5) VI; TTh; 102B. (6) VII; TTh; 102B. MR. STEHMAN.

156f. ADVANCED CORPORATION FINANCE. Three credits. (1) I; TThS; 209B. (2) II; TThS; 213B.

161f,w. LABOR PROBLEMS AND TRADE UNIONISM. Three credits. Fall. Lect. IV; MW; 202B. (1) IV; F; 202B. (2) IV; F; 209B. (3) I; F; 213B. Winter. III; TThS; 302D. MR. HANSEN.

162w. THE LABOR MOVEMENT IN AMERICA AND ENGLAND. Three credits. IV; MWF; 202B. MR. HANSEN.

167w. PERSONNEL ADMINISTRATION. Managerial policy, for various types of organization, on labor. Special attention to job analysis. Employment incentives, and regularization of employment. Three credits. II; TThS; 209B. MR. HANSEN.

168s. ADVANCED PERSONNEL ADMINISTRATION. Special attention to employee-training, joint relations, health and safety, and methods of personnel research, e.g. by analysis of labor turnover. Three credits. II; TThS; 209B. MR. HANSEN.

169s. THE LABOR AND SOCIALIST MOVEMENT IN EUROPE. Three credits. IV; MWF; 202B. MR. HANSEN.

176f,s. COMMERCIAL POLICIES. Theory of international commerce; free trade, reciprocity, subsidies, preferential treatment, the open door, international finance, commercial treaties, foreign politics, and other governmental and organized efforts to affect trade. American problems emphasized. Three credits. I; MWF; 202B. MR. BLAKEY.

177w. FOREIGN TRADE. Three credits. I; MWF; 202B. MR. BLAKEY.

180f-181w-182s. SEMINARS FOR SENIORS AND GRADUATES. Intensive study of problems in respective fields of specialization. In 1922-23 seminars will be offered in the following:

No.	Title	Hour	Day	Building
A.	Accounting	V½-VI	TTh	301B
B.	Business Finance	VIII	MTW	213B
C.	Marketing	VI-VII	TTh	213B
D.	Labor	Ar	Ar	Ar
E.	Statistics	Ar	Ar	Ar
F.	Marketing of Farm Products	Ar	Ar	Ar
G.	Prices of Farm Products	Ar	Ar	Ar

191f-192w. PUBLIC FINANCE. Six credits. III; MWF; 209B. MR. BLAKEY.

193s. STATE AND LOCAL TAXATION. Three credits. III; MWF; 209B. MR. BLAKEY.

COURSES FOR GRADUATE STUDENTS

203f-204w-205s. SEMINAR IN ECONOMIC THEORY. Intensive study of a limited field in economic theory. Individual investigation, reports, and group discussion. The topic for 1923-24 will be in the theory of interest. Nine credits. VIII½-IX; TTh; 104B. MR. GARVER.

210f-211w-212s. SEMINAR IN ECONOMIC HISTORY. (See Department of History.) MR. GRAS.

219f-220w-221s. SEMINAR IN AGRICULTURAL ECONOMICS. Topics and hours to be arranged. MR. BLACK, MR. PRICE, MR. WORKING.

EDUCATION

Professors MELVIN E. HAGGERTY, EARL HUDELSON, LEONARD V. KOOS, WILFORD STANTON MILLER, MERVIN GORDON NEALE, ASHLEY V. STORM, FLETCHER H. SWIFT; Associate Professor LEO J. BRUECKNER; Assistant Professors WILLIAM P. DYER, ALBERT M. FIELD, ROSS L. FINNEY, FRANK W. LATHROP, MARVIN J. VAN WAGENEN.

Prerequisites.—For major work, at least 6 quarter credits in psychology and in addition to this a total of not less than 18 quarter credits of undergraduate work in education.

Exemption from the language requirement for the Master's degree may be made in individual cases.

Departmental conferences.—Every alternate Monday all graduate students majoring in education are expected to meet with the departmental staff from 7:30 to 9:00 p.m. for conference regarding subjects of original investigation. This work carries no credit.

NOTE.—Candidates for the University teacher's certificate may offer Course 101, 102, or 103 in place of Education 1.

SUGGESTED COURSES FOR ALL CANDIDATES FOR DEGREES

208f. METHODS OF EDUCATIONAL RESEARCH. Suggested for all candidates for degrees. Two credits. III, IV; S; 113Ed. MR. SWIFT.

EDUCATIONAL ADMINISTRATION

113w-114s. HIGH SCHOOL CURRICULUM. Four credits. II; TTh.

119s. ELEMENTARY SCHOOL CURRICULUM. Prerequisites: Education 1 and 3. Three credits. I; TThS; ar. MR. BRUECKNER.

119Tf-120Tw. ELEMENTARY SCHOOL CURRICULUM. (Same as above for teachers.) Two credits. I, II; S; 113Ed. MR. BRUECKNER.

123s. SUPERVISION OF HIGH SCHOOL INSTRUCTION. A course combining consideration of principles and their application to improving high school instruction in the academic and special subjects. Prerequisites: 10 hours in education. Three credits. VIII; TThF; ar. MR. KOOS.

124f. EDUCATIONAL ADMINISTRATION. The organization and administration of state and city school systems with interpretations. Three credits. IX; MWF; 205Ed. MR. NEALE.

125w-126s. CITY SCHOOL ADMINISTRATION. For superintendents and principals. Prerequisite: Education 124. Six credits. III, IX; MWF; 205Ed. MR. NEALE.

160f-161w-162s. THEORY OF SUPERVISION. Purpose, technique, conditions, and testing of supervision. Prerequisites: Education 11 or equivalent. Six credits. III, IV; S; ar. MR. BRUECKNER.

164w. PROBLEMS OF HIGH SCHOOL ADMINISTRATION. Prerequisites: Education 1 and 3. Three credits. VIII; TThF. MR. KOOS.

167s. JUNIOR HIGH SCHOOL. A study of the special purposes of this institution and the appropriate reorganizations to achieve them; the history of the movement. Prerequisites: Education 1 and 3. Three credits. III; MWF. MR. HUDELSON.

167f-168w. JUNIOR HIGH SCHOOL. (Same as above.) Prerequisites: Education 1 and 3. Four credits. III, IV; S; 112Ed. MR. KOOS.

173w. CITY SCHOOL FINANCE, PART I. A study of municipal school funds and their expenditure with special reference to their relations to other municipal funds and costs. Three credits. VII; MWF. MR. SWIFT.

174w. PUBLIC SCHOOL FINANCE. A critical study of problems of federal and state aid to public schools. Students are strongly advised to take as preparation or in conjunction with this course Economics 191f-192w Public Finance, and Education 126f-127w Methods of Educational Research. Two credits. II; MWF; 205Ed. MR. SWIFT.

175s. CITY SCHOOL FINANCE. Analysis of unit costs on various bases; comparative cost accounting systems, budgets, financial records, and reports. Three credits. VII; MWF; ar.

178f-179w. SCHOOL SURVEYS. Literature and methods of school surveys. Six credits. VIII; MWF.

205f-206w-207s. SEMINAR IN EDUCATIONAL ADMINISTRATION. Prerequisites: Education 124, 125-126, 160-161-162. Ar.; 111Ed.

215f-216w-217s. SEMINAR IN PUBLIC EDUCATION IN THE UNITED STATES. The following may be considered typical problems: school support, school supervision, administration units. Prerequisites: Education 1 or 101-102-103 and 3. Six credits. IX, X; W. MR. SWIFT.

218f-219w-220s. SEMINAR IN SECONDARY SCHOOL PROBLEMS. Six credits. IX, X; Th; 111Ed. MR. KOOS.

222-223-224. RESEARCH PROBLEMS IN SECONDARY EDUCATION. 6 credits; open to graduate students. Hours arranged. MR. HUDELSON.

THEORY AND PRACTICE OF TEACHING

193f. FOUNDATIONS OF SECONDARY SCHOOL METHODS. A study of the investigations which form the bases of the technique of high school instruction, and the application of their results to high school subject-matter and to high school classroom procedure. Prerequisite: Education 15. Open to seniors and graduates. Three credits. VIII; MWF. MR. HUDELSON.

195w. PROBLEMS OF HIGH SCHOOL ENGLISH TEACHING. An intensive study of various means of adapting subject content to high school pupils; observations; classroom experiments; conferences with classroom teachers; pupil advisory work; submission of proposals of special methods. Prerequisite: Education 15 and 21. Open to seniors and graduates. Three credits. III, IV; S; 112Ed. MR. HUDELSON.

EDUCATIONAL PSYCHOLOGY

106f-107w-108s. ADVANCED EDUCATIONAL PSYCHOLOGY. Advanced work in genetic psychology, origin and nature of human organism, development and control of instincts. Methods of measuring rate of learning; typical learning experiments. Group and individual differences, and their relations to educational practice. Prerequisite: Education 55 or equivalent. Nine credits. III; MWF. MR. VAN WAGENEN.

111s. EDUCATIONAL DIAGNOSIS. The typical educational problems involving the nature and use of educational scales, standard tests, and programs of remedial educational procedure based on the results of the test. Prerequisite: Education 55 or equivalent. Three credits. II; MWF. MR. VAN WAGENEN.

111Tf-112Tw. EDUCATIONAL DIAGNOSIS. (Same as above for teachers.) Four credits. I, II; S. MR. VAN WAGENEN.

126f. STATISTICAL METHODS. This course is ordinarily required of all candidates for advanced degrees. Two credits. IX, X; T. MR. VAN WAGENEN.

127w-128s. ADVANCED STATISTICAL METHODS. Prerequisite: Education 126. Four credits. IX, X; T. MR. VAN WAGENEN.

134f-135w-136s. MENTAL TESTS AND MENTAL DIAGNOSIS. A laboratory course in the study of individual differences by means of mental tests. Methods of treating superior and subnormal children. Prerequisite: Education 55 or equivalent. Six credits. VII, VIII; MW. MR. MILLER.

138w-139s. EXPERIMENTAL EDUCATION. A laboratory course in the use of experimental methods, particularly in the field of the psychology of learning. Prerequisite: Education 55 or equivalent. Four credits. IX, X; MW. (Not offered in 1923-24.)

143-144-145. INDIVIDUAL MENTAL EXAMINATION. For teachers of subnormal children. Demonstration and practice in mental diagnosis. Prerequisite: Education 55 or equivalent. Six credits. I, II; S.

146f-147w-148s. PRACTICE COURSE IN MENTAL EXAMINATION. For teachers of subnormal children. Conducted in co-operation with the public schools. Results studied in relation to medical and school data. Prerequisite: Education 134-135-136. Three credits. Ar.

149f-150w-151s. PSYCHO-EDUCATIONAL CLINIC. Conducted in co-operation with the Department of Sociology and the Medical School clinics in pediatrics and nervous and mental diseases. Students will receive systematic instruction in giving psychological examinations and in scientific interpretation of data. Prerequisite: Education 134-135-136. Three to 9 credits. 11:30-1:30; MWF; Millard Hall.

153f-154w-155s. RESEARCH PROBLEMS IN EDUCATIONAL PSYCHOLOGY. Prerequisites: Advanced courses necessary to pursue problems. Consult instructor. Credits and hours arranged. MR. HAGGERTY, MR. MILLER, MR. VAN WAGENEN.

184f-185w-186s. MENTAL DEFICIENCY. Survey of mental deficiency in children and adults. Physical traits including study of brain defects, causes and heredity; psychology of mental deficiency; social problems of feeblemindedness. Subject treated with reference to the training of defectives. Prerequisite: Education 55 or equivalent. Six credits. III, IV; S.

197f-198w-199s. SEMINAR: PROBLEMS OF SUBNORMALITY. Review of the important literature and original investigation. Two credits. IX, X; F.

201f-202w-203s. SEMINAR IN EDUCATIONAL PSYCHOLOGY. A research course for graduate students. Required of all students writing theses in educational psychology. Six credits. IX-X; M; 203Ed. MR. HAGGERTY.

HISTORY OF EDUCATION

101f. FOUNDATIONS OF MODERN EDUCATION. Emphasizes the more important elements in modern education derived from the Hebrews, Greeks, Romans, Middle Ages, and Renaissance. Prerequisites: psychology, 6 credits and 6 credits in the Department of History. Three credits. VIII; MWF; 205Ed. MR. SWIFT.

102w. HISTORY OF MODERN SECONDARY AND HIGHER EDUCATION IN EUROPE AND AMERICA. Prerequisites: psychology, 6 credits and 6 credits in the Department of History. Three credits. VIII; MWF; 205Ed MR. SWIFT.

103s. HISTORY OF MODERN ELEMENTARY EDUCATION. Emphasis upon the rise of state systems and upon the history of modern educational reform. Prerequisites: same as for Courses 101 and 102. Three credits. VII; MWF; 205Ed. MR. SWIFT.

129w-130s. EDUCATIONAL CLASSICS. Prerequisite: Education 1 or 101-102-103. Six credits. IX; MWF; 205Ed. MR. SWIFT, MISS ALEXANDER.

131w-132s. COMPARATIVE SCHOOL SYSTEMS. A survey of the existing school systems of France, England, Germany, Denmark, with special reference to educational conditions in the United States. Prerequisite: Education 1 or 101-102-103. Six credits. III; MWF; 102Ed. (Not offered in 1923-24.) MISS ALEXANDER.

187f-188w-189s. SEMINAR IN EDUCATIONAL SOCIOLOGY. The selection of problems to be determined in part by the student's interest. Prerequisites: Education 1 or 101, 102, 103 and 3. Six credits. I, II; S; ar. MR. FINNEY.

211-212-213. SEMINAR IN HISTORY OF EDUCATION. Problems to be selected somewhat upon the basis of students' interest. Prerequisites: Education 101-102-103 or its equivalent and 6 credits in the Department of History. Six credits. IX, X; F. MR. SWIFT.

Ind.150f-151w-152s. SEMINAR IN VOCATIONAL EDUCATION. Survey of studies in the field, individual and group investigation, reports, and criticisms. Required of all students writing theses in this special field. 7:30 p.m.; T; 202Ed. MR. PROSSER.

Ind.172. ADMINISTRATION OF INDUSTRIAL EDUCATION—EVENING SCHOOLS. Development of after training of adults. General vs. unit-course organization. Costs. Prerequisite: Ind.171. Two credits. IX, X; T; 202Ed. MR. PROSSER.

Ind.173. ADMINISTRATION OF INDUSTRIAL EDUCATION—PART-TIME CLASSES. A study of the new movement for part-time education. Typical schools, comparative state legislation and plans, Minnesota's problems. Prerequisite: Ind.172. Two credits. IX, X; T; 202Ed. MR. PROSSER.

HOME ECONOMICS EDUCATION

141. PROBLEMS IN HOME ECONOMICS EDUCATION. Prerequisites: Home Economics 42, Education 55. Three credits. VI; MWF. MISS CLARA BROWN, MISS MCNEAL.

AGRICULTURAL EDUCATION

Prerequisites.—For major or minor work, 18 credits in agricultural education and preparation in agricultural subjects satisfactory to the Department of Agricultural Education.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

131f,w,s. METHODS IN TEACHING HIGH SCHOOL AGRICULTURE. Prerequisite: Agricultural Education 11. Five credits. III; MTWThF; 317Ad. MR. FIELD.

151w,s. ORGANIZATION AND MANAGEMENT. Organization and management of work in secondary schools, particularly of Minnesota, with special reference to agricultural work, courses of study, programs, equipment, laboratory and class management, extension work, plots, and co-ordination of work. Prerequisite: Agricultural Education 11, 21. Five credits. IV; MTWFS; 317Ad. MR. STORM, MR. DYER.

153f,s. CONSOLIDATED RURAL SCHOOLS. To prepare principals to meet the problems peculiar to consolidated rural schools. Prerequisite: Agricultural Education 11. Three credits. I; TThS; 317Ad. MR. DYER.

154f,w. RURAL EDUCATION AND COMMUNITY LIFE. The rural school as a community center for educational, social, and recreational work. Prerequisite: Agricultural Education 11. Three credits. II; TThS; 317Ad. MR. DYER.

155s. CONSOLIDATED RURAL SCHOOL PROBLEMS. Opportunity for intensive study and research in special problems of administration and supervision of village and consolidated rural schools. Prerequisites: 11, 153, or equivalent. Three credits. Ar. MR. DYER.

171su. PROBLEMS IN PROCEDURE. For agriculture teachers. Emphasizes working out problems in detail in order that the processes as formulated can be used in teaching the following year by those enrolled. Prerequisites: 131, 41, 42. Three credits. MR. LATHROP.

176s. ADVANCED VISUAL PRESENTATION. Based on Course 75. Further work in design and construction of charts and lantern slides. Special study of motion picture machines. Actual practice in effective use of visual aids in lecture and recitation. Prerequisite: 75. Three credits. Ar.

191f-192w-193s. SEMINAR IN AGRICULTURAL EDUCATION. Individual investigation and research; review and interpretation of current educational literature. Prerequisite: Agricultural Education 11. Two credits each. MR. STORM, MR. FIELD.

COURSES PRIMARILY FOR GRADUATE STUDENTS

201f-202w-203s. ADVANCED SEMINAR. Study of the broader administrative problems and policies in the field of agricultural education. Opportunity for independent investigation and research. One to 2 credits per quarter. 209Ad(F). MR. STORM, MR. FIELD.

221f-222w-223s. GRADUATE PROBLEMS. Making investigations, gathering data, and formulating plans regarding agricultural education. Three credits. 209Ad(F). MR. STORM, MR. DYER, MR. FIELD.

Agri. Educ.241f. OPERATION OF VOCATIONAL AGRICULTURE. Problems involved in the state and local activities in conducting vocational agriculture. It includes a study of federal and state laws and regulations, courses of study, duties of the state supervisor, reports, records, and conferences. Two credits. MR. STORM, MR. FIELD.

Agri. Educ.242w,243s. ORGANIZATION AND ADMINISTRATION OF TEACHER-TRAINING FOR VOCATIONAL AGRICULTURE. Development of teacher-training institutions, agricultural college curricula, professional needs of high school teachers, professional courses and their content, equipment, itinerant teacher-training, practice teaching, teacher evaluation. MR. STORM, MR. FIELD.

ELECTRICAL ENGINEERING

Professors GEORGE D. SHEPARDSON, FRANK W. SPRINGER, WILLIAM T. RYAN; Assistant Professors CYRIL M. JANSKY, JR., EDWIN R. MARTIN; Instructor JOHN H. KUHLMANN.

Prerequisites.—For major work, Courses 121 to 126 or their equivalent; for minor work, 6 credits in physics, also integral calculus.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

111f-113w-115s. ELECTRICAL MACHINERY. Prerequisite: one year in college physics, three credits per quarter. 9:30; MWF. MR. SPRINGER.

112f-114w-116s. ELECTRICAL MACHINERY LABORATORY. To be taken with Course 111-113-115. Lectures and practice. Prerequisite: Physics 41-42. Two credits per quarter. MR. SPRINGER, MR. MARTIN.

121f-123w-125s. ALTERNATING CURRENTS. Prerequisite: Electrical Engineering 115. Three credits per quarter. 10:30 or 11:30; MWF. (Two sections.) MR. RYAN.

122f-124w-126s. ALTERNATING CURRENT LABORATORY. To be taken with Course 121-123-125. Prerequisite: Electrical Engineering 116. Two credits per quarter. MR. SPRINGER.

132f-134w-136s. ELECTRICAL DESIGN. Prerequisite: Electrical Engineering 115. To be taken with Course 121-123-125. Two credits per quarter. MR. KUHLMANN.

141f. CENTRAL STATIONS. Operation, design, and construction of electric power generating stations. Prerequisite: Electrical Engineering 115. Two credits. 10:30; ThS. MR. RYAN.

142w. ELECTRICAL TRANSMISSION. Prerequisite: Electrical Engineering 141. Two credits. 10:30; ThS. MR. RYAN.

144w. RAILWAY ELECTRICAL ENGINEERING. Prerequisite: Electrical Engineering 115 or 45. Two credits. 11:30;MW. MR. MARTIN.

145s. STEAM RAILROAD ELECTRIFICATION. Prerequisite: Electrical Engineering 144. Two credits. 11:30; MW. MR. MARTIN.

151f. ELECTRIC LIGHTING. Lectures, problems, and laboratory practice. Prerequisite: one year in college physics. One credit. MR. MARTIN.

152f. PHOTOMETRIC LABORATORY. Photometric studies of incandescent and arc electric lamps, gas and oil lamps. Bench and radial photometers and illuminometers. To be taken with Electrical Engineering 151. One credit. MR. MARTIN.

161f. RADIO COMMUNICATION. Phase relations in high frequency circuits. Mathematical theory of damped wave transmission and receiving circuits. Inductance and capacity measurements using damped waves. The electron tube as a detector and amplifier. Signal Corps apparatus. Prerequisite: registration in Electrical Engineering 121. Three credits. 8:30; ThS. Laboratory sections. MR. JANSKY.

162w. RADIO COMMUNICATION. Theory and measurement of logarithmic decrement. Undamped wave transmitting and receiving circuits. Heterodyne reception. The arc, high frequency generator, and electron

tube as sources of high frequency power. High frequency measurements, using undamped waves. Prerequisite: Electrical Engineering 161. Three credits. 8:30; ThS. Laboratory sections. MR. JANSKY.

163s. RADIO COMMUNICATION. Mathematical theory of the electron tube and its use in the radio circuit. Design of electron tube oscillator and amplifier circuits. Radio telephony, modulation, carrier frequencies. Direction-finding apparatus and selective circuits for interference elimination. Prerequisite: Electrical Engineering 162. Three credits. 8:30; ThS. Laboratory sections. MR. JANSKY.

164f. TELEGRAPH AND TELEPHONE APPARATUS. Theoretical and experimental study of apparatus used for signaling, telegraphy, and telephony. Lectures and laboratory. Prerequisite: to be taken with Course 121. Two credits. MR. SHEPARDSON, MR. SWENSON.

165w-166s. TELEGRAPH AND TELEPHONE CIRCUITS. Theoretical and experimental study of telegraph and telephone circuits and the phenomena of long line transmission. Prerequisite: Course 164. Two credits per quarter. MR. SHEPARDSON.

167f-168w-169s. RADIO STATION OPERATION. For men already proficient, licensed radio operators. Open only to a limited number by permission. One credit per quarter. MR. JANSKY.

183f-184w-185s. ELECTRICAL LABORATORY. Efficiency tests and special problems. Prerequisite: Electrical Engineering 126. Credits as arranged. MR. SHEPARDSON, MR. SPRINGER.

186w or s. HIGH TENSION-TESTING. Low frequency pressure up to 320,000 volts and high frequency to several million volts applied to the study of dielectric phenomena, testing of high tension equipment, etc. Prerequisite: Electrical Engineering 124. Two credits. MR. SPRINGER.

191f-192w-193s. JOURNAL-READING. Weekly discussion of current electrical periodicals. Prerequisite: Electrical Engineering 115 or equivalent. No graduate credit. MR. SHEPARDSON.

COURSES PRIMARILY FOR GRADUATE STUDENTS

221f. TRANSIENT ELECTRICAL PHENOMENA. Mathematical study of the electric circuit containing resistance, inductance, and capacity. Abnormal currents and voltage upon switching circuits containing iron core inductances. Prerequisite: Electrical Engineering 121. Two credits. MR. JANSKY.

223w. TRANSIENT ELECTRICAL PHENOMENA. Current and voltage distribution in circuits containing distributed resistance, inductance, and capacity. Distortion in telephone lines and its correction. Prerequisites: Electrical Engineering 221. Two credits. MR. JANSKY.

225s. TRANSIENT AND HIGH FREQUENCY PHENOMENA. Transient phenomena in coupled circuits. Distribution of current and flux in conductors at high and low frequencies. Change of resistance with frequency. Theoretical study of special problems. Prerequisites: Electrical Engineering 223. Two credits. MR. JANSKY.

232f-234w-236s. ELECTRICAL DESIGN. Special problems. Prerequisites: Electrical Engineering, 125, 136. Credits as arranged. MR. RYAN, MR. KUHLMANN.

237s. ELECTRIC POWER TRANSMISSION DESIGN. Preparation of detailed plans and specifications for the construction of high voltage transmission lines and distributing systems. Economic, electrical, and mechanical principles and calculations. MR. RYAN.

251w-253s. ILLUMINATING ENGINEERING. Lectures and laboratory work. Methods of determining location, kind, and quality of lights for obtaining desired illumination. Prerequisite: Electrical Engineering 151. Two credits per quarter. MR. SHEPARDSON.

281w-282s. ADVANCED HIGH FREQUENCY MEASUREMENTS. Vector treatment of circuit networks. Bridge circuits for the measurement of resistance, inductance, and capacity at audio and radio frequencies. Prerequisite: Electrical Engineering 126. Two credits per quarter. MR. JANSKY.

284f-285w-286s. PRECISE ELECTRICAL ENGINEERING MEASUREMENTS. Lectures and laboratory work. Open to a limited number subject to approval. Prerequisites: Electrical Engineering 123, 124. One or two credits. MR. SPRINGER.

275f-276w-277s. ELECTRICAL ENGINEERING RESEARCH. Investigation of special problems in laboratory or library. Prerequisite: Electrical Engineering 126. Two to four credits per quarter. MR. SHEPARDSON, MR. SPRINGER, MR. RYAN, MR. MARTIN, MR. JANSKY, MR. KUHLMANN.

291f-292w-293s. GRADUATE SEMINAR. Discussions of problems and results of research work. One credit per quarter. MR. SHEPARDSON, MR. JANSKY.

294f-295w-296s. ELECTRICAL IGNITION AND AUTOMOBILE ELECTRICAL ACCESSORIES. The study of ignition apparatus; characteristics of automobile accessories, such as generators, starters, controllers, etc. Laboratory and lectures. Prerequisite: Electrical Engineering 121 or equivalent. Two credits per quarter. MR. SPRINGER.

G.E.111s. VALUATION OF PUBLIC UTILITY PROPERTIES. Factors affecting value, depreciation, taxation, and regulation of public utility properties. Elements of engineering economics; cost analysis, economic investigations, rate-making. Open only to seniors and graduates. One credit. MR. RYAN and nonresident lecturers.

G.E.124w. ENGINEERING RELATIONS. Lectures, assigned reading, and discussions on the human side of engineering. Relations of the engineer to employer, employees, customers, and public. Engineering code of ethics. Bridging between college and business. Practical training of engineering graduates. Open only to seniors and graduates. MR. SHEPARDSON and nonresident lecturers.

ENGLISH

Professors JOSEPH M. THOMAS, RICHARD BURTON,[1] FREDERICK KLAEBER (Comparative Philology), ELMER E. STOLL; Associate Professors JOSEPH W. BEACH,[2] CECIL A. MOORE; Assistant Professors KEMP MALONE, LAURENCE MASON, CHARLES W. NICHOLS, MARTIN B. RUUD, THOMAS M. RAYSOR, HAZELTON SPENCER, EMERSON G. SUTCLIFFE.

Before registering for graduate courses, students should consult with the director of graduate work for the department, Professor Stoll.

Before the acceptance of the subject for a thesis candidates for the M.A. or the Ph.D. degree must have given evidence to the department that they speak and write English with propriety.

REQUIREMENT FOR MASTER OF ARTS DEGREE

1. *Prerequisite.*—For major work, not less than 27 credit hours in the subject, including satisfactory introductory courses in Old English and either Chaucer or Shakespeare.

If English is offered as a minor, not less than 27 credit hours in the subject.

2. A candidate is not permitted to count toward the degree more than one course running through the year (or its equivalent) the primary purpose of which is practice in writing.

REQUIREMENTS FOR DOCTOR OF PHILOSOPHY DEGREE

1. *Delimitation of the field.*—The general field of English is divided into two periods (1) Early English and (2) Modern English. The boundary line between these periods may be drawn anywhere between 1500 and 1550 according to the requirements of the candidate's program. A candidate may select as his major subject either the Early English or the Modern English period.

2. The candidate will be examined as to his knowledge of the whole field of English literature, but much more thoroly in that portion of the field covered by his major. Special emphasis will be laid, in the final examination, on one particular period or one particular type (such as drama, lyric, or essay) with which he is presumed to be especially familiar. This particular period or type would naturally be that connected with his thesis.

[1] Absent on leave, fall and winter quarters.
[2] Absent on leave, 1923-24.

3. The candidate must have completed, before examination, advanced courses in Chaucer and Shakespeare.

4. A good reading knowledge of Latin is in all cases desirable, and in some cases may be indicated by the candidate's adviser as indispensable.

COURSES IN ENGLISH

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

101f. INTRODUCTION TO MIDDLE ENGLISH. An outline of Middle English grammar, including the interpretation of selected texts. Prerequisites: English 6 and 50. Two credits. VI; TTh; 205F. MR. KLAEBER.

103s. BEOWULF. An introduction to the Old English poem, with reading of considerable portions of the text. Prerequisites: either Course 6 or 8 and 50. Three credits. VI; MWF; 205F. MR. KLAEBER.

105w-106s.† EIGHTEENTH-CENTURY POETRY. From Pope to Burns, with special reference to the rise and growth of naturalism and romanticism. Prerequisites: Courses 6 and 8 or either 6 or 8 and one other course numbered above 5. Six credits. VII; MWF; 205F. MR. MASON.

107w-108s.† EIGHTEENTH-CENTURY PROSE. Special study of fiction and the essay. Prerequisites: Courses 6 and 8 or either 6 or 8 and one other course numbered above 5. Six credits. VII; MWF; 204F. (Not given in 1923-24.) MR. MOORE.

109f-110w.† THE ROMANTIC POETS OF THE NINETEENTH CENTURY. From Wordsworth to Keats. Prerequisites: Courses 6 and 8 or either 6 or 8 and one other course numbered above 5. Six credits. III; TThS; 204F. MR. RAYSOR.

123f-124w-125s. STUDIES IN VICTORIAN NOVELISTS. GEORGE MEREDITH; or, in alternate years, Thomas Hardy and Henry James. Hardy and James in 1922-23. Prerequisites: Courses 6 and 8 or either 6 or 8 and one other course numbered above 5. Nine credits. 4 to 6 o'clock; T; 205F. (Not given in 1923-24.) MR. BEACH.

129s. MODERN DRAMA. Contemporary drama from 1870 to the present. Prerequisites: Course 8 and one other course numbered above 5. Four credits. II; MWThF; 301F. MR. BURTON.

133f. BALLADS. Prerequisites: Courses 6 and 8, or either 6 or 8 and one other course numbered above 5. Three credits. III; MWF; 204F. MR. RUUD.

136s. ADVANCED SHAKESPEARE. Shakespeare's development traced to the end. A careful analysis of four plays. Problems in the interpretation of Shakespeare's dramatic methods. Prerequisites: Course 8 and one other course numbered above 5. Open without further prerequisites to students receiving B in Course 8. Four credits. I; TThFS; 205F. MR. STOLL.

140s. ADVANCED CHAUCER. The more important of Chaucer's poems aside from *The Canterbury Tales;* the source and chronology of Chaucer's work. Prerequisites: Course 6 and one other course numbered above 5. Open without further prerequisites to students receiving B in Course 6. Four credits. II; TWThS; 205F. MR. MALONE.

141f-142w-143s.† HISTORICAL GRAMMAR OF THE ENGLISH LANGUAGE. This course is identical with Comparative Philology 141-142-143. Prerequisites: Courses 6 and 8, or either 6 or 8 and one other course numbered above 5. Six credits. MR. KLAEBER.

146f-147w.† THE METRICAL ROMANCES. The more important Middle English romances; an introduction to the great stories of love and chivalry current in the Middle Ages, particularly those connected with Arthur and the Round Table. Prerequisites: Course 6 and one other course numbered above 5. Six credits. VII; MWF; 205F. (Not given in 1923-24.) MR. MALONE.

148f-149w.† ARTHURIAN ROMANCES. Prerequisites: Course 6 and one other course numbered above 5. Six credits. VIII; MWF; 205F. MR. MALONE.

150f. VICTORIAN POETRY. The poetry of the Victorian era, aside from Browning's and Tennyson's. The principal names are: Matthew Arnold, the Rossettis, Fitzgerald, Morris, Swinburne, and Meredith. Prerequisites: Courses 6 and 8, or either 6 or 8 and one other course numbered above 5. Four credits. VII; MTWF; 205F. MR. STOLL.

151. RECENT POETRY. Poetry in England and America since the death of Queen Victoria. The main tradition and tendencies now prevailing. Prerequisites: Courses 6 and 8, or either 6 or 8 and one other course numbered above 5. Four credits. (Not given in 1923-24.) MR. BEACH.

152w. PRE-ELIZABETHAN DRAMA. Prerequisites: Course 8 and one other course numbered above 5. Four credits. III; TThFS; 205F. MR. MALONE.

155s. THE AMERICAN NOVEL. The history of the American novel from the beginning to the present. Prerequisites: Course 6 or 8 and 44-45. Four credits. (Not given in 1923-24.) MR. MOORE.

COURSES PRIMARILY FOR GRADUATE STUDENTS

201f. OLD ENGLISH. Comparative study of Anglo-Saxon (Old English) grammar and reading of prose texts. Once a week, two hours. Three credits. MR. KLAEBER.

202w-203s. OLD ENGLISH POETRY. Critical reading of poems. Once a week, two hours. Six credits. MR. KLAEBER.

208. PIERS THE PLOWMAN. A study of critical problems relating to the text and authorship. Three credits.

209f-210w-211s. THE MIDDLE ENGLISH LYRIC. (Not given in 1923-24.)

213f-214w-215s. SEMINARY IN EIGHTEENTH-CENTURY DRAMA. Special attention will be given to the rise and progress of sentimental comedy and domestic tragedy. Nine credits. (Not given in 1923-24.) MR. MOORE.

218. SEMINARY IN THE RESTORATION DRAMA. The drama from the Restoration to the rise of sentimental comedy. Special attention given to the comedy of manners (from Etherege to Farquhar) and its relation to the life of the time. Nine credits. (Not given in 1923-24.) MR. STOLL.

220f-221w-222s. SEMINARY IN MEDIEVAL DRAMA. Nine credits. 4 to 6 p.m.; W; 302F. MR. RUUD.

225-226-227. SEMINARY IN ELIZABETHAN DRAMA. Elizabethan and Jacobean dramatists, from Lyly to Shirley. Problems assigned may involve Shakespeare, and in general his contemporaries will be studied less for their own sakes than for the light they shed upon him. Nine credits. (Not given in 1923-24.) MR. STOLL.

228-229-230. SEMINARY IN EIGHTEENTH-CENTURY NOVEL. The rise and development of the novel as a form of literature; the use made of the novel as a medium for religious, social, and political theory. Nine credits. (Not given in 1923-24.) MR. MOORE.

231f-232w-233s. SHAKESPEARE'S TRAGIC AND COMIC ART. Nine credits. 4 to 6 p.m.; M; 302F.

234f-235w-236s. SEMINARY IN MIDDLE ENGLISH LITERATURE. In 1924-25 the literary monuments will be studied with reference to the mythological and foklore material which they contain. Nine credits. (Not given in 1923-24.) MR. MALONE.

For courses in Comparative Literature see page 44.

COURSES IN RHETORIC

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

100w-101s.† VERSIFICATION. The nature of poetry and a detailed analysis of English meters and the various English verse forms. The theory accompanied by criticism of current poetry and practice in writing verse. Open to those who have taken Course 11-12-13 or 15-16-17, and who have taken or are taking nine hours in the historical study of English poetry. Six credits. (Not given in 1923-24.) MR. NICHOLS.

111w-112s. ESSAY-WRITING. Practice in writing didactic, biographical, critical, informal essays. Extended composition. Individual aid in gathering of material, planning of papers, and criticism of essays. Analysis of a considerable body of modern essays. Prerequisites: Rhetoric 15-16, or 18-19, or 47-48. Six credits. III; MWF; 304F. MR. SUTCLIFFE.

115f-116w-117s. DRAMATIC TECHNIQUE. Principles of plotting, characterization, climax, dialog, and scenario-making. Writing of three plays—two original, one dramatized short story. Required readings, laboratory work, criticisms of local productions. Open to those who have taken Course 11-12-13 and have taken or are taking English 129. Nine credits. (Not given in 1923-24.) 304F.

119f-120w-121s. SEMINARY IN WRITING. Open to advanced students who write with facility and who desire personal direction. Criticism of manuscripts submitted. Open with special permission to seniors and graduates who have completed Course 18-19 or 47-48, and nine additional credits in rhetoric. Nine credits. VI, VII; Th; 304F. MR. THOMAS.

COURSES PRIMARILY FOR GRADUATE STUDENTS

201f-202w-203s. SEMINARY IN RHETORIC. (Graduate seminary but open to seniors taking the Honors Course.) For those who are specializing in rhetoric and composition. Prerequisites: Course 18-19 or 47-48 and 9 additional credits in rhetoric. Nine credits. MR. THOMAS.

ENTOMOLOGY AND ECONOMIC ZOOLOGY

Professors WILLIAM A. RILEY, ARTHUR G. RUGGLES, FREDERIC L. WASHBURN; Associate Professor ROYAL N. CHAPMAN; Assistant Professors HARRY H. KNIGHT, OSCAR W. OESTLUND.

Prerequisites.—Eighteen credits in animal biology and entomology.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

117f-118w-119s. GENERAL ECOLOGY OF INSECTS. General ecology with special reference to the insects of Minnesota. Frequent field trips. Lectures, laboratory, and field work. V-VII; TTh; 208-210AB. MR. CHAPMAN.

124su. ADVANCED ENTOMOLOGY. Similar to 117-118-119 with special field work. MR. CHAPMAN.

125f-126w-127s. ADVANCED GENERAL ENTOMOLOGY. Morphology and classification of insects with lectures on the history of entomology. Lectures and laboratory. III, IV; TThS; 208-210AB. MR. OESTLUND.

130w. BIOLOGY AND TAXONOMY OF THE APHIDIDAE. Intensive study of the natural history, bibliography, and classification of the Aphididae. Additional work is offered under Course 175. III, IV; MWF; 208-210AB. MR. OESTLUND.

139-140. HISTORY AND DEVELOPMENT OF INSECTS. Lectures and laboratory work on the histology, embryonic and postembryonic development of insects. Individual work along these lines is available to properly qualified students under Course 197. II-IV; TTh, and ar.; 321 Adm. (F). MR. RILEY.

144f-145w-146s. ANIMAL PARASITES AND PARASITISM. Lectures and laboratory work. Second term devoted primarily to the relation of insects to diseases of man and animals. V-VII; WF; 208-210AB. MR. RILEY.

150su. INSECTICIDES AND THEIR ACTION. Ar; Insectary (F).

197f,w,s,su. INTRODUCTION TO RESEARCH. Preparation for investigational work in lines of entomology, parasitology, or economic zoology. Summer work should be planned when possible. MR. RILEY, parasitology, insect morphology; MR. RUGGLES, general economic entomology; MR. WASHBURN; economic vertebrate zoology, insecticides; MR. KNIGHT, MR. OESTLUND, systematic entomology.

COURSES PRIMARILY FOR GRADUATE STUDENTS

201-204. RESEARCH IN ENTOMOLOGY. MR. RILEY, MR. CHAPMAN, MR. KNIGHT, MR. OESTLUND.

205-208. RESEARCH IN ECONOMIC ENTOMOLOGY. MR. RUGGLES, MR. GRAHAM.

209-212. RESEARCH IN ECONOMIC VERTEBRATE ZOOLOGY. MR. WASHBURN.

261-264. RESEARCH IN PARASITOLOGY AND MEDICAL ENTOMOLOGY. MR. RILEY.

265-268. RESEARCH IN INSECTICIDES.

EXPERIMENTAL ENGINEERING

Professors FRANK B. ROWLEY, WILLIAM E. BROOKE, JOHN J. FLATHER, WILLIAM F. HOLMAN; Associate Professors JACOB O. JONES, JOHN H. ROWEN, CHARLES F. SHOOP; Assistant Professors MAURICE B. LAGAARD, FRED C. LANG, GEORGE A. MANEY, GEORGE C. PRIESTER, BURTON J. ROBERTSON.

NOTE.—Experimental work relating to various branches of engineering may be carried on in the Experimental Engineering laboratories. The following courses are offered by the departments indicated. Work of a special character, such as advanced research, may be arranged through consultation with the director, Professor Rowley.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

M. M. 141f,w,s. MATERIALS-TESTING LABORATORY. Investigation of the physical properties of various metals and engineering materials. One credit. MR. BROOKE, MR. HOLMAN, MR. PRIESTER.

M. M. 143f,w,s. HYDRAULIC LABORATORY. Experimental and demonstrational work. One credit. MR. JONES, MR. BOEHNLEIN.

M. M. 192w. HYDRAULIC MOTORS LABORATORY. An experimental study of the characteristics of the hydraulic ram, centrifugal pump, reaction turbine, and impulse wheel. Three credits. MR. JONES.

M. M. 193s. HYDRAULIC MEASUREMENTS. A detailed study of the current meter, Venturi meter, weir, orifice, traveling screen, chemical method of gaging, etc. Three credits. MR. JONES.

M. E. 181w. ADVANCED GENERAL LABORATORY. Indicator practice, valve-setting, separating and throttling calorimeters, tests of steam engines, gas engines, pumps, air compressors, blowers, turbines, boilers, and power plant. Four actual hours. MR. ROWLEY, MR. SHOOP.

M. E. 182f. ADVANCED STEAM LABORATORY. Tests of steam turbines, flow of steam through nozzles and pipes. Tests of compounds and triple expansion engines, condensers, superheaters, and boilers. Two credits. MR. SHOOP.

M. E. 183w. POWER AND GAS ENGINE LABORATORY. Tests of gas, gasoline, and hot air engines, gas producers. Power and lighting plants. Two credits. MR. ROWLEY, MR. ROBERTSON.

M. E. 184s. ADVANCED ENGINEERING LABORATORY. Opportunity will be offered for carrying on investigations in connection with tests of complete power plants, refrigerators, air compressors, blowers, and fans. Also automobile testing and gas engine investigations. Two credits. MR. ROWLEY, MR. SHOOP, MR. ROBERTSON.

COURSES PRIMARILY FOR GRADUATE STUDENTS

C. E. 237w-238s. STRUCTURAL LABORATORY. Similar to Course 243, but dealing mainly with experimental problems in structural steel. MR. LAGAARD, MR. MANEY.

C. E. 243w-244s. CEMENT AND CONCRETE LABORATORY. Laboratory technique and experimental investigation of special problems in cement, concrete, and reinforced concrete. MR. LAGAARD.

C. E. 251. HIGHWAY LABORATORY. Investigations in co-operation with State Highway Department. MR. LANG.

C. E. 263. HYDRAULIC LABORATORY. Study of special hydraulic problems in laboratory, drafting room, and field.

M. E. 287-288-289. RESEARCH IN MECHANICAL ENGINEERING. Courses may be elected which involve investigations in connection with steam and gas engines, heating, and ventilating. Reports, special problems, and related tests. Three to 9 credits. MR. ROWLEY, MR. FLATHER, MR. ROWEN, MR. SHOOP.

FORESTRY

Professors EDWARD G. CHEYNEY, JOHN H. ALLISON; Associate Professor JOHN P. WENTLING.

Prerequisites.—For major work, 27 credits in forestry, three quarters of botany or equivalent. For minor work, 9 credits in the department.

Exemptions from the language requirement for the Master's degree may be made in individual cases.

The choice in subject must be made by the candidate and approved by the chief of the division and instructor. The facilities of the forest experiment stations at Cloquet and Itasca are available to students taking this work.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

101w. ADVANCED DENDROLOGY. A continuation of Course 3-4 with special studies in classification and distribution of the timber species of the world. Prerequisites: 10 credits in botany and 8 credits in dendrology. Three credits. W; ar. MR. WENTLING.

106w. INVESTIGATIVE METHODS IN FORESTRY. The fundamental principles upon which sylviculture is based, methods used at experiment stations in solving problems in forestation, protection, and management. Prerequisites: 9 credits in sylviculture. Three credits. I; MWF.

107f. USES OF WOOD I. The economic hard and soft woods, both foreign and domestic from standpoint of regions of production, distribution centers, qualities, amounts, and prices in relation to the wood-using industries. Lectures, reading, reports. Prerequisite: 33-34. Three credits. IV; MWF; 303Hr.

108w. USES OF WOOD II. A continuation of Course 107 dealing with the industries and the woods they use. Kinds, grades, qualities, properties, requirements for each product. Use, re-use, distribution of product. Regions of production and relation to other industries. Lectures, reading, reports. Prerequisite: 33-34. Three credits. IV; MWF; 303Hr. MR. WENTLING.

109s. USES OF WOOD III. The actual use of wood in the industries. At least six hours per week must be spent in actual study in a factory. Complete reports and collateral reading. Prerequisite: 107-108. Three credits. VI, VII, VIII, IX; WF. MR. WENTLING.

110f-111w. MECHANICAL AND PHYSICAL PROPERTIES OF WOOD. Study of strength as related to density, quality, etc. Wood stresses, failures, and methods of testing timbers. 6 credits. Prerequisites: 33-34. WF. MR. WENTLING.

112. ADVANCED FOREST MENSURATION. Continuation of Course 10 with special emphasis on tree forms, the development of the formula used in study of volume and growth of trees. MR. HANSEN.

113w. ADVANCED FOREST BY-PRODUCTS. A detailed study of production of wood pulp and paper products, naval stores, tannins, oils, wood distillation products, etc. Lectures, reading, reports. Prerequisites: 33-34, Chem. 3 or 10 and Chem. 36. Ar. 302Hr.

119f. ADVANCED WOOD STRUCTURE I. A detailed study of the elements and structure of native and foreign economic woods. Preparation, sectioning, and mounting of typical sections. Reference reading and reports. Six hours per week. Prerequisites: Courses 33-34. Three credits. MR. WENTLING.

120w. ADVANCED WOOD STRUCTURE II. Study of wood structure in relation to seasoning, mechanical failures, penetration or preservatives, variation in strength, etc. Six hours per week. Prerequisite: Course 119. Three credits. MR. WENTLING.

COURSES PRIMARILY FOR GRADUATE STUDENTS

201-202. RESEARCH PROBLEMS IN SCIENCE AND PRACTICE OF SYLVICULTURE. MR. WENTLING.

203-204. RESEARCH PROBLEMS IN MANAGEMENT AND WORKING PLANS. MR. ALLISON.

205-206. LUMBER MARKETS AND PRICES. MR. CHEYNEY.

207f-208w-209s. RESEARCH IN WOOD TECHNOLOGY. MR. WENTLING.

GEOLOGY AND MINERALOGY

Professors WILLIAM H. EMMONS, FRANK F. GROUT, CLINTON R. STAUFFER; Assistant Professors JOHN W. GRUNER, GEORGE M. SCHWARTZ; Instructor GEORGE A. THIEL.

Prerequisites.—For major work in:

General geology and economic geology, Courses 1, 9 or 10, 21, 22; a knowledge of general chemistry. Course 105 must be carried along with other graduate work.

Petrology, Courses 1, 3, 21, 22, elementary chemistry and physics.

Paleontology, Courses 1, 11, or 91-92-93. Animal biology is a desirable antecedent.

Exemptions from the language requirements for the Master's degree may be made in individual cases. Students who are deficient in modern languages are advised to take a language along with their graduate work. Examinations in French and German are required of candidates for service on the United States Geological Survey.

COURSES

101f. PRINCIPLES OF STRATIGRAPHY. Origin and structure of sedimentary deposits; the interpretation of these in relation to paleogeography; field work in connection with Cambrian and Ordovician problems. Three credits. MR. ALLISON.

105f. ELEMENTS OF ROCK STUDY. Prerequisite: Course 22 or 25. Three credits. VI, VII; TTh; 110P. MR. GROUT.

106w. PETROGRAPHY. The identification and study of minerals and rocks by topical methods; the study of igneous rocks, crystalline schists, and metamorphic rocks. The origin and classification of rocks. Prerequisite: Course 105. Three credits. VI, VII; TTh; 110P. MR. GROUT.

107f-108w-109s. PALEONTOLOGIC PRACTICE. The collection, preparation, and study of materials, with a view to gaining a working knowledge of groups of fossils, and the use of literature. Prerequisite: Course 59. Nine credits. V, VII; MWF; 105P. MR. STAUFFER.

111f. ORE DEPOSITS. The nature, distribution, and genesis of ore deposits of the United States; relations of ore deposits to geologic structure; the deformation and superficial alteration of ore deposits. Prerequisites: Courses 10, 105. Three credits. I; TThS; 110P. MR. EMMONS.

112w. GEOLOGY OF PETROLEUM. First part treats deposits of metals, giving special attention to those outside of the United States. Second half treats the nature, origin, and distribution of petroleum and discusses the various oil fields of the world. Prerequisite: Course 111. Three credits. I; TThS; 110P. MR. EMMONS.

113s. PROBLEMS IN ORE DEPOSITS. Field excursions, map work, lectures on field and laboratory methods. Prerequisite: Course 112. Three credits. V, VIII; Th; 110P. MR. EMMONS.

124w-125s. STRUCTURAL AND METAMORPHIC GEOLOGY. The conditions, processes, and results of metamorphism; structural features resulting from deformation under varying conditions of load. Prerequisites: Courses 9 or 10, 105. Six credits. VI; MWF; 200aP. MR. SCHWARTZ.

127. GEOLOGY OF THE LAKE SUPERIOR REGION. Structure and correlation of districts. Interpretation of field notes and survey reports. Practical problems. The use of geologic bibliographies and literature. Prerequisites: 124-125. MR. THIEL.

131f-132w-133s. ADVANCED PETROLOGY. Advanced optical methods. Regional and genetic studies. Petrographic reports. Prerequisite: Course 106. Nine credits. Hours to be arranged. 200P. MR. GROUT.

137w. TESTING ECONOMIC MINERALS. Laboratory tests of coal, clay, oil, building stone, and metallic ores. Prerequisites: Courses 1, 105. Three credits. T; 200P. MR. GROUT.

140w-141s. APPLIED PETROGRAPHY. Determination of ore and gangue minerals, microscopic studies of paragenesis of ores and other mineral associations. Practical problems in mining and geology, settled by microscopic and optical examination. Prerequisite: Course 131. Six credits. Hours to be arranged. 200P. MR. GROUT, MR. GRUNER.

144w-145s. CONSTRUCTION AND INTERPRETATION OF GEOLOGIC MAPS. Methods of geological examination; study and problems in construction and interpretation of geological maps. Prerequisite: Courses 9 or 10. Six credits. Hours to be arranged. 104P. MR. ALLISON.

150s. FIELD GEOLOGY. Detailed, systematic work, conforming to official surveys. Reports to be written week before college opens. For prerequisites see members of the department. Credits arranged. MR. EMMONS, MR. SCHWARTZ.

151f-152w-153s. ADVANCED GENERAL GEOLOGY. Geologic processes and their results; development of the North American continent. Prerequisite: Course 9. Nine credits. III; MWF; 104P. MR. STAUFFER.

166f-167w. MINERALOGRAPHY. Methods of studying opaque minerals and application of the methods to problems in ore genesis and history. Prerequisite: Course 111. Six credits. Hours to be arranged. 103P. MR. SCHWARTZ.

COURSES PRIMARILY FOR GRADUATE STUDENTS

211f-212w-213s. ADVANCED PALEONTOLOGY. Selected groups of fossils. Class work supplemented by reference reading and thesis. Three credits. MR. STAUFFER.

214. SEMINAR IN ORE DEPOSITS. Three credits. MR. EMMONS.

215s. GEOLOGY AND ORE DEPOSITS OF THE WESTERN HEMISPHERE. Open to graduate students and to those undergraduates who have had Course 111. Offered in spring quarter, 1924. Three credits. MR. EMMONS.

216s. GEOLOGY AND ORE DEPOSITS OF THE EASTERN HEMISPHERE. Prerequisites same as for Course 215. Offered in spring quarter 1925. Three credits. MR. EMMONS.

220. GLACIAL GEOLOGY. Hours to be arranged. The drift sheets, glacial lakes, the gorge of St. Anthony Falls, the dalles of the St. Croix, and other problems. Lectures, reference reading, and field work.

241. FIELD COURSE IN GEOLOGY. To be arranged with individual students upon application to the department. Credit will be given for field work done satisfactorily as prescribed in the joint announcement of various universities.

243-244. RESEARCH COURSE IN GEOLOGY. Advanced work in general geology; chiefly individual work on selected subjects. Data and collections of material gathered in the course of field work studied under instructor. Methods follow standards of federal and state surveys. MR. EMMONS, MR. GROUT, MR. STAUFFER.

246. PRE-CAMBRIAN GEOLOGY. The problems of pre-Cambrian correlation and structure; the pre-Cambrian stratigraphy of North America. Given in alternate years. Three credits.

251-252. ORIGINAL PROBLEMS. Morphology and physical measurements of minerals. Three credits each. MR. GRUNER.

253-254. RESEARCH COURSE IN ORE DEPOSITS. Methods of Course 243-244 applied to ore deposits. Three credits each. MR. EMMONS, MR. GROUT, MR. GRUNER, MR. SCHWARTZ.

263-264. RESEARCH COURSE IN PETROLOGY. Methods of Course 243-244 applied to petrology. Three credits each. MR. EMMONS, MR. GROUT.

GERMAN

Professor CARL SCHLENKER; Associate Professors OSCAR C. BURKHARD, SAMUEL KROESCH; Assistant Professor JAMES DAVIES.

Prerequisites.—For major work, 27 Senior College quarter credits or equivalent. For minor work, 18 Senior College credits or equivalent. For courses in Germanic Philology see the statement of the Department of Comparative Philology.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

100f-101w-102s. MIDDLE HIGH GERMAN. Phonology, morphology, and syntax. Nine credits. VI; MWF; ar. MR. KROESCH.

107f. HISTORICAL GERMAN GRAMMAR. Phonology, inflection, word formation, syntax. Intended primarily for prospective teachers of German. Three credits. MR. KROESCH.

108w. COMPARATIVE PHONETICS. A study of speech sounds and the nature of their production, with special reference to English, French, and German. Open to students in the modern languages. Three credits. MR. KROESCH.

109f-110w-111s. HISTORY OF THE GERMAN LANGUAGE. Lectures, discussions; assigned readings. This course is identical with Comparative Philology 109-110-111. Nine credits. MR. KLAEBER.

150f-151w-152s. DIE NOVELLE. A study of the technique and development. Assigned readings and reports. Nine credits. (Not offered in 1923-24.) MR. BURKHARD.

153f-154w-155s. ASPECTS OF GERMAN LITERATURE OF THE NINETEENTH CENTURY. The subject of the course will be announced from year to year. Subject for 1923-24, *Realism*. Nine credits. VI, VII, VIII; Th; 208F. MR. BURKHARD.

160f-161w-162s. LYRIC POETRY OF THE EIGHTEENTH AND NINETEENTH CENTURIES. Nine credits. VI, VII, VIII; M; 209F. MR. DAVIES.

COURSES PRIMARILY FOR GRADUATE STUDENTS

225f-226w-227s. LITERARY PROBLEMS. Subject for 1923-24: The Classic Period. Nine credits. VI, VII, VIII; W; 208F. MR. SCHLENKER.

GREEK

Professor CHARLES ALBERT SAVAGE.

Prerequisites.—For major work, Courses 105, 106 or 107, 108, or their equivalent. For minor work, Courses 51 (Philosophy), 52 (Oratory), 53 (Dramatic Poetry), or their equivalent.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

105f. LYRIC POETRY. Selections from the elegiac, iambic, lyric, and bucolic poets. Three times a week. Prerequisites: Greek 51 and 53, or 52 and 53. Three credits. Ar. 112F. MR. SAVAGE.

106w. ADVANCED DRAMA. Aeschylus, Sophocles, or Aristophanes. Special attention given to the development of the drama, and to the literary form of dramatic representation of the plays read. Three times a week. Prerequisite: Greek 53 or 105 or equivalent. Three credits. Ar. 112F. MR. SAVAGE.

107w. ADVANCED PROSE. Selections from the Greek historians, or from Plato, or from the orators. Alternates with Course 106. Equivalent prerequisites. Ar. 112F. MR. SAVAGE.

108s. ADVANCED EPIC POETRY. A course of rapid reading in the *Iliad* or the *Odyssey*. Three times a week. Prerequisite: Greek 105 or 106. Three credits. Ar. 112F. MR. SAVAGE.

COURSES PRIMARILY FOR GRADUATE STUDENTS

201-202-203. ORATORY (advanced). A study of the development of oratorical style among the Greeks; selected readings. Twice weekly, one, two, or three quarters. MR. SAVAGE.

204-205-206. DRAMATIC POETRY (advanced). The reading and critical study of representative Greek plays. Twice weekly, one, two, or three quarters. Alternates with 201-202-203. MR. SAVAGE.

207-208-209. SEMINAR IN PHILOSOPHY OR ORATORY. Once a week, one, two, or three quarters. MR. SAVAGE.

210-211-212. HISTORY (advanced). Selected readings from Greek historians. Once a week, one, two, or three quarters. Alternates with 207-208-209. MR. SAVAGE.

HISTORY

Professors GUY STANTON FORD, SOLON J. BUCK, WILLIAM STEARNS DAVIS, NORMAN SCOTT BRIEN GRAS, ALBERT BEEBE WHITE; Associate Professors AUGUST CHARLES KREY, LESTER BURRELL SHIPPEE; Assistant Professor GEORGE M. STEPHENSON; Professorial Lecturer SAMUEL B. HARDING; Instructor LAWRENCE STEEFEL.

Prerequisites.—Of the four fields in which general survey courses in history are usually given, namely, ancient, American, English, and European, students entering upon graduate work in history will usually be expected to have covered two or three courses, with credit not exceeding 18 hours. For the other 9 hours, they should have a more advanced course in one of these fields and a second course in some field of history in which intensive work is done with the beginnings of investigation. In meeting these requirements consideration will be given to work done from the historical point of view in others of the social sciences, especially political science. The department attaches considerable importance to adequate preparation in the foreign languages, which may be used by the student in the course of advanced and research work. An especially good equipment here will be taken into consideration in weighing the student's preparation for graduate work.

AMERICAN HISTORY

112s. HISTORY OF AMERICAN IMMIGRATION. Settlement and development of typical racial stocks in America. Contributions of European immigrants to American life. Attention to political history. Prerequisites: 20 credits in social science group. Four credits. VI; MWThF; 111Lib. MR. STEPHENSON.

125w. (Pol. Sci.) AMERICAN DIPLOMATIC HISTORY. Prerequisites: 20 credits in social science group, including 10 credits in political science or History 5-6. Three credits. III; MWF; 102MA.

127s. (Pol. Sci.) AMERICAN FOREIGN RELATIONS. Such topics as the Monroe Doctrine, freedom of the seas, the open door, arbitration, disarmament, will be considered with particular reference to the future policy of the United States. Prerequisites: 20 credits in social science group, including 10 credits in political science or History 5-6. Three credits. III; MWF; 102MA.

141f. THE WEST IN AMERICAN HISTORY TO 1815. Prerequisites: 20 credits in social science group, including History 5-6. Three credits. VIII; MWF; 112Lib. MR. BUCK.

142w. THE WEST IN AMERICAN HISTORY, 1815-65. This course, while offered separately, follows, and is calculated to form a natural sequence to History 141. Prerequisites: 20 credits in social science including History 5-6. Three credits. VIII; MWF; 112Lib. MR. SHIPPEE.

144-145.† HISTORY OF MINNESOTA. The settlement and development—political, economic, and social—of a typical American commonwealth. Prerequisites: 15 credits in social science including History 5-6. Six credits. (Not offered in 1923-24.) MR. BUCK.

146w-147s.† CONSTITUTIONAL HISTORY OF THE UNITED STATES. The evolution of American constitutional government through legislation, judicial interpretation, administrative rule, and custom. Prerequisites: 15 credits in history or 10 credits in history and 10 in social science including 5 credits in political science. Six credits. IV; MWF; 112Lib. MR. SHIPPEE.

153s. THE WEST IN AMERICAN POLITICS SINCE 1865. An intensive study of independent parties and radical or progressive political movements. Prerequisites: 25 credits in history including History 5-6. Five credits. VII, VIII; WF; 218aLib. MR. BUCK.

154. SELECTED TOPICS IN THE HISTORY OF MINNESOTA. Students taking this course are expected to do a portion of their work in the library of the Minnesota Historical Society. Prerequisites: 25 credits in history including History 5-6. Five credits. (Not offered in 1923-24.) MR. BUCK.

155f. UNITED STATES, 1850-1865. Consideration is given to social and economic questions as well as political issues. Prerequisites: 25 credits in history including History 5-6. Five credits. VII, VIII; MW; 218aLib. MR. SHIPPEE.

156. THE RECONSTRUCTION PERIOD. This course follows History 155 as a natural sequence. Prerequisites: 25 credits in history, including History 5-6. Five credits. (Not offered in 1923-24.) MR. SHIPPEE.

166f. SELECTED TOPICS IN THE HISTORY OF IMMIGRATION. Competent students will be guided in research. Prerequisites: 25 credits in social science and consent of instructor. Five credits. VII, VIII; TTh; Ar. MR. STEPHENSON.

208f-209w-210s. SEMINAR IN AMERICAN HISTORY. Graduate students only. Ar. MR. BUCK, MR. SHIPPEE, MR. STEPHENSON.

See also History 113-114-115† under Economic History; History 121-122† under English History, and History 111 under European History.

Ancient History

103f. The Near East, Old Orient. Origin of Egyptians, Babylonians, Assyrians, and Persians, and main features of their political history and civilization. History of the Hebrews discussed so far as it bears upon general oriental problems. Prerequisites: 20 credits in social science group. Five credits. VIII; MWF; 111Lib. Mr. Davis.

105w. History of Rome. Prerequisites: 20 credits in social science group. Five credits. III; MTThFS; 111Lib. Mr. Davis.

133f. Political History of Greece. With special reference to the reaction upon cultural progress. Prerequisites: 20 credits in history or a major in Greek or Latin. Five credits. III; MTThFS; 111Lib. Mr. Davis.

134w. Ancient Civilization, Greece. Social and intellectual life of Greece. Prerequisites: 20 credits in history, or a major in Greek or Latin. Three credits. VII; MWF; 111Lib. Mr. Davis.

135s. Ancient Civilization, Rome.* Social and intellectual life of Rome. The course will begin with a survey of political history. Prerequisites: 20 credits in history, or a major in Greek or Latin. Three credits. VIII; MWF; 111Lib. Mr. Davis.

Economic History

113-114-115.† Economic History of Europe and the United States, 1750 to the Present. The industrial revolution and significant results for transportation, agriculture, tariff, and labor. Prerequisites: 20 credits in history or economics, or both. Nine credits. (Not offered in 1923-24.) Mr. Gras.

116f-117w-118s.† Economic History of Europe, 1300-1750. Prerequisites: 20 credits in history or economics, or history and economics combined. Nine credits. II; TThS; 111Lib. Mr. Gras.

169s. Economic History of the United States since the Civil War or Some Other Specified Period. Prerequisites: 25 credits in history or economics, or history and economics combined. Five credits. (Not offered in 1923-24.) Mr. Gras.

205-206-207. Seminar in Economic History. Ar. Mr. Gras.

English History

109s. English History, 1815-1920. Emphasis placed upon party history, the colonies, foreign relations, the social democratic movement, and especially British foreign policy preceding the World War. Prerequisites: 20 credits in social science group. Six credits. IV; MTWFS; 125F. Mr. Harding.

* Permission of instructor necessary if student has not taken 134.

121w-122s.† English Backgrounds and the American Colonies. Studies in the transfer of English civilization, and its early modifications and development in America. Some account taken of the contrasting French settlements. Prerequisites: 20 credits in history or political science. Six credits. II; TThS; 112Lib. Mr. White.

162f. The Beginnings of Parliament. From the Norman Conquest to the reign of Edward I, based wholly on original sources. Prerequisites: 25 credits in history including History 3-4; knowledge of at least high school Latin. Five credits. VIII-IX; TTh; 218aLib. Mr. White. See also courses in Economic History.

European History

101f-102w.† The French Revolution and Napoleonic Era. Prerequisites: 20 credits in social science including 10 credits in history. Reading knowledge of French desirable. Six credits. I; TThS; 111Lib. Mr. Harding.

104s. The Near East, Modern. The Saracen Empire, Turkey, the Balkan States, and European diplomacy in the East since the beginning of the Middle Ages. Prerequisites: 20 credits in social science group including 10 credits in history. Five credits. III; MTThFS; 111Lib. Mr. Davis.

107f-108w. Europe, 1848-1914. Prerequisites: 20 credits in social science; if History 1-2 is not offered as a prerequisite, consent of instructor must be obtained. A reading knowledge of French and German will be helpful. Eight credits. VII; MTThF; 111Lib. Mr. Steefel.

111w. European Background of American Immigration. The movement of population from Europe to America in the nineteenth century, with the emphasis on the economic, political, social, and religious forces. Prerequisites: 20 credits in social science group. Four credits. VI; TWThF; 111Lib. Mr. Stephenson.

119s. The Renaissance and Reformation. Especial emphasis upon the work of individual men and upon ideas rather than upon politics and institutions. Prerequisites: 20 credits in history. Five credits. IV; MTWFS; 111 Lib. Mr. Krey.

120f. Medieval Civilization. A study of the social and intellectual development of Europe from the period of the German migration to the end of the thirteenth century. Prerequisites: 20 credits in history. Five credits. IV; MTWFS; 112Lib. Mr. Krey.

131f-132w.† The Formation and Fall of the Modern German Empire. The principal emphasis is on the period since 1848. The work of Bismarck and the Empire under William II. Prerequisites: 20 credits in social science, including 10 credits in history. Six credits. (Not offered in 1923-24.) Mr. Ford.

157w-158s. SELECTED TOPICS IN NINETEENTH-CENTURY HISTORY. Discussion based on a wide range of reading. Prerequisites: 25 credits in social science including History 107-108 or 101-102. A reading knowledge of French or German will be required. Six credits. VII, VIII; TTh; 218aLib. MR. FORD.

164w. STUDIES IN THE CRUSADES. Prerequisites: 25 credits in history; knowledge of at least high school Latin. Five credits. VIII, IX; TTh; 218aLib. MR. KREY.

201f-202w-203s. HISTORICAL BIBLIOGRAPHY AND CRITICISM. Required of candidates for advanced degrees in history who do not present evidence of similar training elsewhere. I; S; 112Lib. MR. FORD, MR. WHITE, and others.

HOME ECONOMICS

Professor WYLLE B. MCNEAL; Associate Professors ALICE BIESTER, MARION WELLER; Assistant Professors ETHEL PHELPS, ALICE CHILD, AMY P. MORSE, NOLA TREAT, EDLA ANDERSON.

Prerequisites.—For major work, 27 credits including Courses 13, 22, and 45 in home economics or their equivalent, 10 credits in general chemistry, 5 credits in organic chemistry, 5 credits in quantitative analysis, and 15 credits in biological science. For minor work 9 credits in the department and any additional prerequisite work needed to pursue the courses selected.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

103f,w,s. DIETETICS. The fundamental principles of human nutrition as applied to the feeding of individuals and groups under conditions of health, and under such pathological conditions as are chiefly dependent upon dietetic treatment. Three to five credits. Prerequisite: Course 108. Fall, spring, VI, VII; MTWThF; 203, 207HE. Winter, Sec. 1, VI, VII; MTWThF; 203, 207HE. Sec. 2, I, II; MTWThF; 203, 207HE. MISS BIESTER, MISS ANDERSON.

105f,w,s. EXPERIMENTAL COOKERY. An intensive study of problems in foods and food preparation with individual laboratory problems. Three credits. Prerequisites: Courses 22, 23. I, II; MWF; 207HE. MISS CHILD.

106f,w,s. EXPERIMENTAL COOKERY. Same as 105 except that additional work will be required. Five credits. I, II; MWF; 207HE. Extra hours arranged. MISS CHILD, MISS KOLSHORN.

108f,w,s. NUTRITION II. A study of metabolism including work on tissues, blood, and urine. Five credits. Prerequisite: Course 23. Fall, spring, III, IV; MTWFS; 211, 213HE. Winter, Sec. 1, III, IV; MTWFS;

211,213HE. Sec. 2, I, II; MTWThF; 211, 213HE. MISS ANDERSON, MISS MCMAHON.

109s. ADVANCED NUTRITION. A study of selected quantitative methods applicable to investigations relating to digestion and metabolism. Five credits. Prerequisites: Course 108, Agr. Biochem. 2. Lect. III; TS; 106HE; Lab. VI-IX; TTh; 311HE. MISS BIESTER, MISS ANDERSON.

122w,s. ADVANCED TEXTILES. An experimental study of textile problems such as shrinkage and other laundering results; textile legislation and special economic problems. Three credits. Prerequisites: Course 3, Agr. Biochem. 3, Econ. 5 or parallel. Winter, VI-VIII; TTh; 307, 311HE. Spring, VI, VII; MWF; 307, 311HE. MISS WELLER, MISS PHELPS.

123w,s. CLOTHING ECONOMICS. General consideration of the economic problems in clothing production; women's responsibility for conditions in textiles and clothing industries; study of the budget for clothing and household textiles; hygiene and standardization of dress. Two credits. Prerequisites: Course 13, Econ. 5. III; TTh; 313HE. MISS WELLER.

131f,w,s. HOME MANAGEMENT: HOUSE PLANNING AND EQUIPMENT. House plans and kitchen arrangements studied from viewpoint of the home maker. Study of principles underlying selection and arrangement of house furnishing and equipment, including such subjects as walls, rugs, furniture, hangings, and accessories. Special problems for graduate students. Five credits. Prerequisites: Courses 52, 53. Fall, winter, III, IV; MTWFS; 401HE. Spring, I, II; MTWThF; 401HE. MISS MORSE.

110s. SPECIAL PROBLEMS IN DIETETICS. An intensive study involving assigned readings, discussions, and field work. Three credits. Prerequisite: Course 103. Lect. VIII; MW; 213HE. Lab. One full afternoon; ar. MISS BIESTER, MISS ANDERSON.

111s. SPECIAL FOOD PROBLEMS. A continuation of experimental cookery involving more advanced problems. Three credits. Prerequisites: Course 105, Agr. Biochem. 2. VI, VII, VIII; TTh; 207HE. MISS CHILD.

112s. SPECIAL FOOD PROBLEMS. Same as 111s. Five credits. Prerequisites: Course 105, Agr. Biochem. 2. VI, VII, VIII; TTh. Extra hours arranged. 207HE. MISS CHILD.

126s. PROBLEMS AND APPLICATION OF QUANTITATIVE METHODS IN TEXTILE ANALYSIS with special reference to establishing standards for fabrics. Three credits. Prerequisites: Course 122, Agr. Biochem. 2. Hours and days arranged. 311HE. MISS PHELPS.

134s. BUDGET PROBLEMS. An intensive study of problems relating to individual and family budgets involving readings, discussions, and field work. Three credits. Prerequisites: Courses 34, 35, 103, 123. Economics 90 or parallel. VII; MW. Lab. To be arranged.

151s. INSTITUTION MANAGEMENT PROBLEMS. Organization; service; institution-planning, decoration, and equipment; budgets, and the study of different types of institutions. Four credits. Prerequisites: Course 61, 63. IV; WF; 106HE. III, IV; S; 106HE. MISS TREAT.

203w-204s. HOME ECONOMICS PROBLEMS. Opportunity is offered for the investigation of selected problems in home economics. Five credits. Hours and days arranged. MISS MCNEAL.

205-206-207. HOME ECONOMICS SEMINAR. A critical study of selected topics and recent advances in home economics involving outside reading, oral and written reports. Two credits each. Hours and days arranged. MISS BIESTER.

HORTICULTURE

Professors WILLIAM H. ALDERMAN, HERBERT K. HAYES; Associate Professors WILFRID G. BRIERLEY, LEROY CADY; Assistant Professor WILLIAM T. TAPLEY.

Prerequisites.—For major work, 15 credits; for minor work, 9 quarter credits in the department in addition to two years in botany and one year in entomology.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

107f. ORCHARD MANAGEMENT. A detailed study of the various operations in orchards and berry fields. Operating costs and profits. Lectures, laboratory, and individual problems. Prerequisite: Horticulture 6, botany, 9 credits. Three credits. IV; TS. VI, VII; W; 210Hr. MR. BRIERLEY.

109f,w. PRINCIPLES OF GENETICS. Same as Agronomy and Farm Management 131. Lectures and laboratory work designed to familiarize the student with the underlying principles of breeding. Heredity, variation, biometry, and evolution are emphasized. Prerequisites: botany, 9 credits or animal biology, 9 credits. Three credits. Lect. I; ThS; 102Hr. MR. BEAUMONT,* MR. WILCOX. Lab. Sec. 1. I, II; T; 212Hr. Sec. 2. III, IV; T; 212Hr. Sec. 3. VI, VII; W; 212Hr. MR. BEAUMONT, MR. WILCOX.

110w. HORTICULTURAL CROP-BREEDING. Applied genetics is emphasized. Methods of breeding each of the important horticultural crops with special attention to experiment station investigations and to the methods used by plant breeders. Prerequisite: Horticulture 109 or Agronomy 131. Three credits. III; TThS; 215Hr. MR. BEAUMONT.

* Mr. Beaumont will teach in the fall quarter and Mr. Wilcox in the winter quarter.

111f. SYSTEMATIC POMOLOGY. A study of fruit varieties. Lectures, laboratory, and a survey of the literature. Prerequisites: Horticulture 6, botany, 9 credits. II; TTh; VI, VII; Th; 8Hr. MR. BRIERLEY.

131f. ADVANCED VEGETABLE PRODUCTION. A study of the business of vegetable-gardening. Special problems for investigation and research, reviews and reports on recent literature. Prerequisite: Horticulture 32, botany, 9 credits. Three credits. III; TTh. III, IV; S; 210Hr. MR. TAPLEY.

132f. SYSTEMATIC OLERICULTURE. The origin, botany, varieties, and types of the different vegetables, their characteristics and adaptation to different cultural and market conditions, identification and classification studies, judging, and exhibiting. Prerequisite: Horticulture 32, botany, 9 credits. III; MW; V, VI; Th; 102Hr. MR. KRANTZ.

133f. COMMERCIAL TRUCK-GROWING. Truck-growing centers of the United States, cultural methods used in producing various truck crops, special machinery and equipment, market methods, shipping points. Adaptation of truck crops to Minnesota, commercial production for canneries; handling; shipping to market. Prerequisite: Horticulture 32, botany, 9 credits. Three credits. IV; MWF. MR. TAPLEY.

135w. POTATO PRODUCTION. A study of the origin, botany, regional distribution, economic importance, group classification, standardization of varieties according to soil, climate, and markets. Identification, exhibiting, judging, cultural methods, seed selection and certification, marketing and utilization. Prerequisite: Horticulture 6 or 32, botany, 9 credits. III; MW; VI, VII; Th; 102Hr. MR. KRANTZ.

151f. ADVANCED FLORICULTURE. Lectures, assigned readings, laboratory, and special problems dealing with the culture, botany, and history of florists' plants and methods of greenhouse management. Prerequisites: Horticulture 50, botany, 9 credits. Three credits. Ar. MR. CADY.

190f-191w-192s. SPECIAL PROBLEMS. A study of problems based upon the work given in the preceding courses. Two to 4 credits per quarter. MR. ALDERMAN.

193f-194w-195s. HORTICULTURAL SEMINAR. Reports and discussions of problems and investigational work. Required of graduate students. One credit per quarter. Horticultural staff.

COURSES PRIMARILY FOR GRADUATE STUDENTS

201f-202w-203s-204su. FRUIT-GROWING RESEARCH. Special problems in fruit culture or disposal. Students will be required to continue the work over at least one summer to arrange for concentration on problems at the most appropriate season. Open to those who have specialized in fruit-growing. Three to 6 credits per quarter. MR. ALDERMAN, MR. BRIERLEY.

209f-210w-211s-212su. FRUIT-BREEDING RESEARCH. Consists of (a) some thesis problem, (b) development of laboratory technique in breeding. Work involves reading in genetics, cytology, biometry. Students required to continue work over one summer. Open to limited number specializing in fruit-breeding. Three to 6 credits per quarter. MR. ALDERMAN, MR. HAYES.

213f-214w-215s, or Agronomy and Farm Management 203f,w,s. PLANT-BREEDING SEMINAR. History of plant-breeding, application of recent genetic theories to crop improvement and a discussion of research problems. Weekly meetings throughout the year. Prerequisite: Horticulture 109. Maximum of 3 credits. MR. HAYES.

231f-232w-233s-234su. VEGETABLE-GROWING RESEARCH. Special problems in vegetable culture. Students will be required to continue the work over at least one summer. Open to those who have specialized in vegetable-growing. Three or 6 credits per quarter. MR. TAPLEY.

242w. METHODS AND INTERPRETATION OF HORTICULTURAL RESEARCH. A critical analysis of the more important horticultural investigations, together with a study of methods and organization of research work in horticulture. Two credits. MR. ALDERMAN.

243w. ADVANCED TOPICS IN HORTICULTURE.

LATIN

Professor JOSEPH B. PIKE;[1] Assistant Professor ROBERT V. CRAM.

Prerequisites.—Any four of Courses 21-53, and 6 credits in addition selected from standard courses. A reading knowledge of French, German, or Greek is required of candidates for the Master's degree.

The degree of master of arts: For a major in Latin, Course 211-212-213, and in addition one course each quarter selected from Courses 121-133. The student will be expected to choose for his thesis some problem connected with one of these courses. Besides, a minor is to be carried throughout the year in one of the following departments: Comparative Philology, English, German, Greek, History, Romance Languages, or Scandinavian. For a minor in Latin, Course 211-212-213 or one course each quarter selected from Courses 121-133.

Candidates for the degree of doctor of philosophy in Latin will be expected to spend at least three years in preparation and will carry each quarter in addition to one seminar course and one of the courses listed below, one course in advanced Greek (i.e., in advance of two years of preparatory Greek). A knowledge of Greek and Roman history, Greek and Roman literature, and a special knowledge of a particular Latin author, or group of authors, will be required. In addition to the particular author or authors assigned the candidate will be expected to have read in the original the following list of Latin authors:

[1] Absent on leave, 1923-24.

Caesar: A considerable portion of the Gallic War and the Civil War.
Catullus: All except LXIII-LXVIII.
Cicero: Fourteen orations (*e.g.*, Roscius Amerinus, Verres Actio Prima, Imperium Pompeii, Catilinarians I-IV, Murena, Archias, Milo, Marcellus, Ligarius, Deiotarus, Philippics II; Cato Maior, Laelius, Tusculan Disputations, Book I.
Horace: All.
Juvenal: Satires I, III, IV, VII, VIII, X, XI.
Livy: Books I, II, XXI, XXII.
Lucretius: Books I-III, V.
Martial: At least one half.
Ovid: About four thousand verses of the Metamorphoses.
Plautus: Amphitruo, Aulularia, Captivi, Menaechmi, Miles Gloriosus, Mostellaria, Rudens, Trinummus.
Pliny the Younger: At least one half.
Quintilian: Book X, C. I.
Suetonius: Iulius, Augustus, Tiberius, Nero, Domitian.
Tacitus: Annals I-VI or XI-XVI.
Terence: Adelphoe, Andria, Hautontimorumenus, Phormio.
Virgil: All except the minor poems.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

121. ADVANCED VERGIL. Selection from Books 7-12 of the *Aeneid*. Prerequisites: any two of Courses 51-53 or an equivalent. Three credits. II; MWF; 109F. MR. CRAM.

122w. CICERO'S LETTERS. Prerequisites: any two of Courses 51-53 or an equivalent. Three credits. II; MWF; 101F. (Not offered in 1923-24.) MR. PIKE.

123s. MEDIEVAL LATIN. Selected documents illustrating the conflict between church and state in the Middle Ages. Selections from *History of the Franks*, by Gregory of Tours. Prerequisites: any two of Courses 51-53 or an equivalent. Three credits. II; MWF; 109F. (Not offered in 1923-24.) MR. PIKE.

131f. JUVENAL. Selection from Juvenal's work. Prerequisites: any two of Courses 51-53 or an equivalent. Three credits. Alternates with Course 121. II; MWF; 107F. (Not offered in 1923-24.) MR. PIKE.

132. SENECA'S EPISTLES. Prerequisites: any two of Courses 51-53 or an equivalent. Three credits. Alternates with Course 122. II; MWF; 107F. MR. CRAM.

133. PETRONIUS AND MARTIAL. Prerequisites: any two of Courses 51-53 or an equivalent. Alternates with Course 123. Three credits. II; MWF; 107F. MR. CRAM.

201f-202w-203s. TACITUS. (Graduate seminar, but open to students who register for honors in Latin.) Prerequisites: seven years of Latin or any two of Courses 51-53. Three credits. VII and VIII; Th; 108F. MR. CRAM.

221-222-223. GRADUATE SEMINAR. Three credits. Ar. MR. CRAM.

MATHEMATICS AND MECHANICS

Professors WILLIAM E. BROOKE, WILLIAM H. BUSSEY, HANS H. DALAKER, WILLIAM F. HOLMAN, DUNHAM JACKSON, WILLIAM H. KIRCHNER, FRANCIS P. LEAVENWORTH (Astronomy); Associate Professors RAYMOND W. BRINK, WILLIAM L. HART, JACOB O. JONES, ROYAL R. SHUMWAY, ANTHONY L. UNDERHILL; Assistant Astronomer WILLIAM O. BEAL; Instructor GLADYS GIBBENS.

Professor R. W. Brink is chairman of the group. Students majoring in mathematics should consult him.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

Courses offered by members of the faculty of the College of Science, Literature, and the Arts.

106f. DIFFERENTIAL EQUATIONS. Three credits. III; MWF; 105F. MR. HART.

107w-108s. ADVANCED CALCULUS. Three credits per quarter. III; MWF; 105F. MR. BRINK.

111f-112w-113s. CELESTIAL MECHANICS. Three credits per quarter. MR. BEAL. (This course is identical with Astronomy 111-112-113.)

140w. METHOD OF LEAST SQUARES. Three credits. MR. LEAVENWORTH. (This course is identical with Astronomy 140.)

Courses offered by members of the faculty of the College of Engineering and Architecture.

127f,w,s. TECHNICAL MECHANICS. Five credits. MR. WILCOX.

128f,w,s. STRENGTH OF MATERIALS. Five credits. MR. HOLMAN.

129f,w,s. HYDRAULICS. Four credits. MR. JONES, MR. BOEHNLEIN.

150w. ADVANCED MATHEMATICS FOR ELECTRICAL ENGINEERS. Three credits. MR. HERRMANN.

151f-152w-153s. DIFFERENTIAL EQUATIONS AND ADVANCED CALCULUS APPLIED TO ENGINEERING PROBLEMS. Three credits per quarter. MR. DALAKER, MR. HARTIG.

161f-162w-163s. ADVANCED TECHNICAL MECHANICS. Three credits per quarter. MR. WILCOX.

171f-172w-173s. AERODYNAMICS. Three credits per quarter. MR. BOEHNLEIN.

180s. ADVANCED STRENGTH OF MATERIALS. Three credits. MR. PRIESTER.

191f. HYDRAULIC MOTORS AND PUMPS. Three credits. MR. JONES.

COURSES PRIMARILY FOR GRADUATE STUDENTS

Courses offered by members of the faculty of the College of Science, Literature, and the Arts.

206f-207w-208s. THEORY OF FUNCTIONS OF REAL AND COMPLEX VARIABLES. Three credits per quarter. MR. HART.

281f-282w-283s. ADVANCED THEORY OF FUNCTIONS. Three credits per quarter. MR. JACKSON.

Courses offered by members of the faculty of the College of Engineering and Architecture.

261f-262w-263s. FUNCTIONS OF A COMPLEX VARIABLE. Three credits per quarter. MR. DALAKER.

271f-272w-273s. ADVANCED DYNAMICS. Routh's *Dynamics,* Vol. II. Three credits per quarter. MR. BROOKE.

277f-278w-279s. ADVANCED STATISTICS. Three credits per quarter. MR. BROOKE.

The following courses have been offered from time to time in the past, and similar courses, or other courses of corresponding grade, will be provided at any time when there is sufficient demand for them.

Courses offered by members of the faculty of the College of Science, Literature, and the Arts.

DIFFERENTIAL GEOMETRY.
PROJECTIVE GEOMETRY.
MODERN HIGHER ALGEBRA.
THE MATHEMATICS OF SMALL VIBRATIONS.
THE THEORY OF NUMBERS.
THE GALOIS THEORY OF EQUATIONS.
HIGHER PLANE CURVES.
ADVANCED DIFFERENTIAL EQUATIONS.
EXTERIOR BALLISTICS.
THE CALCULUS OF FINITE DIFFERENCES.
MODERN THEORIES OF INTEGRATION.
APPROXIMATION BY POLYNOMIALS AND TRIGONOMETRIC SUMS.
THEORY OF LINEAR DIFFERENTIAL AND INTEGRAL EQUATIONS.

Courses offered by members of the faculty of the College of Engineering and Architecture.

ADVANCED DESCRIPTIVE GEOMETRY.
PERSPECTIVE.
VECTOR ANALYSIS.

MODERN ANALYSIS.
FOURIER'S SERIES AND SPHERICAL HARMONICS.
ADVANCED DYNAMICS, Vol. I, Routh's *Dynamics*.
MATHEMATICAL THEORY OF ELASTICITY.
HYDRODYNAMICS.
ADVANCED TOPICS IN FUNCTIONS.

Beginning with the year 1924-25 a course in the Mathematical Theory of Statistics will be offered by members of the faculty of the College of Science, Literature, and the Arts.

MECHANICAL ENGINEERING

Professors JOHN J. FLATHER,* WILLIAM S. HOLMAN, FRANK B. ROWLEY; Associate Professors JOHN V. MARTENIS, CARL SHIPLEY, CHARLES F. SHOOP.

Industrial Engineering

120w. INDUSTRIAL PLANTS. Factory organization and construction for economical manufacture. Organization of the industry. Location and type of buildings, power development. Layout of plant. Routing systems and machine layout. Heating and ventilating requirements. Distribution of power; internal transportation. Lectures, recitations, and drawing room practice. Three credits. Open to seniors with 15 or 16. MR. FLATHER, MR. SHIPLEY.

121s. PRODUCTION METHODS. Principles and practice involved in economical production. Standardization. Requirements for uniformity and interchangeability. Jigs, fixtures, and special equipment; gages and inspection systems. Division of labor. Lighting, heating, and sanitation. Conveying, handling, and stores control. Fatigue elimination. Three credits. Open to seniors with 15 or 16. MR. SHIPLEY.

223f. INDUSTRIAL MANAGEMENT. General principles. The Taylor system; wage, bonus, and profit-sharing systems. Maintenance and depreciation. Purchasing. Allocation of cost, overhead, and machine burden. Graphical representation. Prerequisite: 121. MR. FLATHER.

224w. INDUSTRIAL MANAGEMENT LABORATORY. Planning department. Time and motion studies; rate-setting. Instruction cards. Production control. Shop practice with investigations in local factories. Lectures, assigned reading, practice, and reports. Three credits. Prerequisite: 223f. MR. SHIPLEY.

225s. INDUSTRIAL MANAGEMENT. Labor administration. Foreman-training. Training the worker; job analysis. Employment and turnover; the human element, service departments. Stabilization of labor. Lectures, reading, shop visits, and reports. Three credits. Prerequisite: 224. MR. FLATHER.

* On leave of absence, 1923-24.

226f. SAFETY ENGINEERING. Safety of the worker; fire and other hazards; prevention of industrial accidents. Compensation laws. Fire prevention: construction; automatic sprinkler systems. Effect of safety on production. Factory sanitation. Safety organization. Lectures, assigned reading, factory inspections, and reports. Prerequisite: 121. Three credits. MR. SHIPLEY.

227w-228s. INDUSTRIAL ENGINEERING PROBLEMS. Special investigations of practical problems and suggested methods of procedure. Lectures, assigned reading, shop visits and reports. Three credits. Prerequisite: 223, 224, 225 or registered in 223, 224, 225. Graduates only. MR. FLATHER, MR. SHIPLEY.

Machine Design

131f-132w-133s. ADVANCED ENGINEERING DESIGN. Original design, including machinery for changing size and form, cranes, pumping, transmission machinery, and engineering appliances. Lectures, problems, and drawing room practice. Three credits per quarter. Prerequisite: 35. MR. FLATHER, MR. ROWEN, MR. GAUVREAU.

Steam Engineering

135f. STEAM ENGINE DESIGN. Calculations and working drawings for a high speed automatic or Corliss steam engine. Theoretical diagrams, inertia forces; determination of details. Senior option. Three credits. Prerequisite: 42 or equivalent. MR. FLATHER, MR. ROWEN.

144f. HEAT ENGINES. Elementary thermodynamics. Properties of steam; types and details of steam engines; valve gears; governors; compound engines. Condensers and air pumps. Courses 144, 145, 146 are arranged for students in electrical engineering, and are accompanied by three hours' work in laboratory each week. Three credits. Prerequisite: M.&M. 26. MR. ROWLEY, MR. ROBERTSON, MR. RHAME.

145w. HEAT ENGINES. Continuation of Course 144. Combustion and fuels; boilers, smoke prevention. Selection of engines and boilers. Courses 144, 145, 146 are arranged for students in electrical engineering and are accompanied by three hours' work in the laboratory each week. Three credits. Prerequisite: 144. MR. ROWLEY, MR. ROBERTSON, MR. RHAME.

146s. HEAT ENGINES. Elementary study of steam turbines and gas engines. Courses 144, 145, 146 are arranged for students in electrical engineering and are accompanied by three hours' work in laboratory each week. Three credits. Prerequisite: 145. MR. ROWLEY, MR. ROBERTSON, MR. RHAME.

147w. HEAT ENGINES. Elementary thermodynamics. Properties of steam; calorimeters; pyrometry; types and details of steam engines; valve gears; governors; compound engines. Condensers and pumps. Combustion, and fuels; evaporation; steam boilers, smoke prevention. Includes four hours' work in laboratory per week. Four credits. Prerequisite: M.&M. 26. MR. SHOOP, MR. TUVE.

148s. HEAT ENGINES. Elementary study of steam turbines and gas engines; gas producers. Refrigeration. Air compressors. Includes four hours' work in laboratory per week. Three credits. Prerequisite: 147. MR. SHOOP.

149f,w,s. HEAT ENGINES. A brief course for students in civil engineering and the course in architectural engineering includes four hours' laboratory per week. Four credits. Prerequisite: M.&M. 26. MR. TUVE.

151s. THERMODYNAMICS. The mechanical theory of heat as applied to steam oil, gas, and hot air engines and allied power plant machinery and accessory equipment, including compressors, injectors, reheaters, and refrigerating apparatus. Three credits. Prerequisites: M.&M. 127, 128, 129. MR. SHOOP, MR. ROWEN.

152w. STEAM TURBINES. Theory and practice applied to various types. Thermodynamics and mechanical analysis of problems involved in the design of nozzles, blades, rotors, bearings, and governors. Condition of operation; systems of transmission; lubrication; economy; field of service. Laboratory investigation. For seniors. Three credits. Prerequisite: 151. MR. SHOOP, MR. ROWEN.

181w. ADVANCED GENERAL LABORATORY. Indicator practice, valve-setting, separating and throttling calorimeters, tests of steam engines, gas engines, pumps, air compressors, blowers, turbines, boilers, and power plant. Four actual hours. Prerequisite: 84. MR. ROWLEY, MR. SHOOP, MR. ROBERTSON.

182f,w. ADVANCED STEAM LABORATORY. Tests of steam turbines, flow of steam through nozzles and pipes. Tests of compound and triple expansion engines, condensers, superheaters, and boilers. Two credits. Prerequisite: 151. MR. SHOOP, MR. TUVE.

251f. ADVANCED THERMODYNAMICS. Expansion of Course 151. Theories of heat as applied to combustion and kinetic engines. Reversible changes of state of wet and superheated vapors. Non-reversible flow and efflux of wet and superheated vapors, throttling through orifices, valves, flow into receivers, communicating vessels. Critical points, liquefaction and mixtures of gases. Gas cycles. Treatment of imperfect gases. Three credits. Prerequisite: 151. MR. SHOOP.

Heating, Ventilation, and Refrigeration

153f. HEATING AND VENTILATING. Principles of heating and ventilation. Construction and operation of heating apparatus. Furnaces, steam, hot water, vapor, vacuum, and fan systems of heating; ventilation. Lectures, recitations, and designs. For seniors.—Required of senior architectural engineers. Four credits. Prerequisites: M.&M. 127, 128, 129. MR. MARTENIS.

154s. HEATING AND VENTILATING. Same as Course 153 with the omission of design problems. Arranged for students in the course in Architecture. Two credits. Prerequisite: M.&M. 92. MR. MARTENIS.

156s. COMPRESSED AIR AND REFRIGERATOR MACHINERY. (a) Air compressors and motors; power transmission by compressed air. (b) Principles of refrigeration. Various types of refrigerating machines, refrigerants applications to ice-making, cold storage, cooling of air, liquids, and solids. Lectures and recitations. Three credits. Prerequisite: 151. MR. ROWEN.

255f,w,s ADVANCED HEATING AND VENTILATING. An advanced course for graduates. To be taken in connection with research work in the laboratory, Course 287. Three credits. Prerequisite: 153. MR. ROWLEY.

257w. MECHANICAL EQUIPMENT OF BUILDINGS. Appliances used; heating, ventilating, plumbing systems; piping for fire protection, compressed air, gas, and vacuum cleaning; elevators. Choice of systems. Theory and practice of designing and detailing lay-outs. Equipment designs for various types of buildings. Three credits. Prerequisite: Phys. 43. MR. ROWLEY, MR MARTENIS.

Automotive and Aeronautical Engineering

150f. GAS ENGINES AND PRODUCERS. Laws of gases; gas cycles. Otto, semi-Diesel, and Diesel engines. Mechanism of various types. Carburetion, governing, cooling, lubrication. Principles of design. Gas producers; types, suction, pressure, blast furnace. By-products recovery. Three credits. Prerequisites: 41, 43. MR. ROWLEY.

183f,w. POWER AND GAS ENGINE LABORATORY. Tests of gas and gasoline engines and gas producers. Power and lighting plants. Two credits. Prerequisite: registration in 150. MR. ROWLEY, MR. SHOOP.

136f,w. GAS ENGINE DESIGN. Calculations and working drawings of a gas motor for heavy duty tractor, truck, marine, or other service. Theoretical diagrams and details of parts. Senior option. Three credits. Prerequisite: registration in 150. MR. ROWLEY, MR. GAUVREAU.

137w. ADVANCED GAS ENGINE DESIGN. Continuation of Course 136. Three credits. Prerequisite: 136. MR. GAUVREAU.

141w. AUTOMOBILE AND MOTOR TRUCK ENGINES. Continuation of 150 with special reference to automobile and motor truck engines. Theoretical consideration of engine parts and accessories, carburetion of various fuels; the Diesel principle as applied to small high speed engines. Lectures, recitations, and problems. Three credits. Prerequisite: 150. MR. ROWLEY. MR. GAUVREAU.

142s. AUTOMOBILE AND MOTOR TRUCKS. Theory and design of the automobile and motor truck chassis, including frames, brackets, clutches, transmission, axles, steering gears, and springs. Lectures, recitations, and problems. Three credits. Prerequisite: 141. MR. GAUVREAU.

231f,232w,233s. AUTOMOBILE AND MOTOR TRUCK DESIGN. A course covering the theory and design of the automobile and motor truck engine and chassis in which the design of the complete engine, transmission and chassis is carried out. Three credits each quarter. Lectures and drawing room work. Graduates only. MR. GAUVREAU.

237s. GAS TRACTOR DESIGN. Selection of wheel sizes; horsepower weight and drawbar pull. Bearing pressures; ratios and strength of gearing. Details of principal parts. Senior option. Three credits. Prerequisite: 136. MR. ROWLEY, MR. GAUVREAU.

293f,w,s. AERONAUTICAL ENGINEERING. Design of aerial propellers, aeroplane engines. Application of theory of propellers and gasoline engines to aeroplanes. Includes calculations and drawings for high-speed, multi-cylinder, light-weight engine; balancing reciprocating parts; uniform torque; theoretical diagrams. Three credits. Prerequisite: 150. MR. GAUVREAU.

294f,w,s. AEROPLANE DESIGN. Calculations and drawings for a given aeroplane; stability, strength, propulsion, and motive power required. Three credits. Prerequisite: 136. MR. GAUVREAU.

281f,282w,283s. AUTOMOBILE-TESTING AND RESEARCH. Dynamometer and road tests including overall efficiency of cars and motor trucks, transmission efficiencies, performance of cars at various speeds, fuel consumption, effect of road surface on traction, efficiencies, and general performances. Special research problems. Three credits each quarter. Graduates only. MR. ROWLEY.

295s. MOTOR TRUCK TRANSPORTATION. Problems involving motor truck transportation, capacity of trucks, trailers, drawbar pull. Efficiencies. Effect of road surface. Freight-handling. Analysis of costs of truck operation and maintenance. Relative costs of transportation. Three credits. Prerequisite: 142. (Not offered in 1923-24.)

Power Plant Engineering

162f. POWER PLANT MACHINERY. Advanced study and application of engines, stokers, boilers; coal-handling equipment and accessories. Lectures, recitations. Three credits. Prerequisite: M.E. 43. MR. ROWEN.

163w. POWER ENGINEERING. Principles of thermodynamics applied to power plant equipment. Three credits. Prerequisite: M.E. 162. MR. ROWEN.

164s. ELEMENTS OF POWER PLANT DESIGN. Problems in design of power plant elements such as condensers, air pumps, boilers, turbines, piping, and separators. Three credits. Prerequisite: M.E. 163. MR. ROWEN.

166s. WATER TURBINES. The theory of operation, design, construction, and regulation of water turbines. Turbine-testing; characteristics, selection of type. Cost of turbines and water power. Senior option. Three credits. Prerequisite: M.&M. 129. MR. ROWEN.

265f-266w. POWER PLANT DESIGN. Problems, designs, and estimates for power plants and central stations. Selection of motive powers, relative advantages of steam and producer gas plants, choice of engines and boilers; pumps, shafting, piping, and accessories. Three credits per quarter. Prerequisite: M.E. 164. MR. ROWEN.

267s. POWER PLANT MANAGEMENT. Operation and maintenance of boilers, engines, gas producers, gas engines, steam turbines, and accessory apparatus. Smoke prevention. Flue gas analysis. Power plant finance. Daily logs and power cost. Three credits. Prerequisite: M.E. 164. MR. ROWEN.

Railway Mechanical Engineering

271f. RAILWAY TECHNOLOGY. The practical details of construction of locomotives. A systematic course of visits to the various railroad shops in the vicinity. Lectures and recitations. One credit. Prerequisites: M.&M. 127, 128, 129. MR. MARTENIS.

272f-273w-274s. RAILWAY DESIGN AND LOCOMOTIVE CONSTRUCTION. Locomotive and car details; the locomotive boiler, linkages, and assembled parts. Construction of locomotives: frames, springs, equalizing arrangements, running gear, brakes, trucks, lubrication. Engine details; heat insulation, cylinder proportions. Lectures and assigned reading. Four credits per quarter. Prerequisite: 271, or registration in 271. (Not offered in 1923-24.)

278s. LOCOMOTIVE ROAD TESTS. Tests on locomotives and trains. Dynamometer car and drawbar pull. Three credits. Prerequisite: 271, 272. MR. FLATHER and assistants. (Not offered in 1923-24.)

General Courses and Research

190f-191w-192s. SEMINAR. Same as Course 93. Arranged for seniors. One credit per quarter. MR. FLATHER, MR. ROWLEY, MR. ROWEN.

290f-291w-292s. SEMINAR. Same as Course 93. Arranged for graduate students. One credit per quarter. MR. FLATHER, MR. ROWLEY, MR. ROWEN.

184s. ADVANCED ENGINEERING LABORATORY. Opportunity will be offered for carrying on investigations in connection with tests of power plants, refrigerators, air compressors, blowers, and fans. Also automobile-testing and gas engine investigations. Two credits. Prerequisites: 182, 183. MR. ROWLEY, MR. SHOOP.

287f-288w-289s. MECHANICAL ENGINEERING RESEARCH. Courses may be elected which involve investigations in connection with fuels, lubricating oils, steam and gas engines, heating and ventilating, and other problems as selected. Reports, special problems, and related tests. Three credits per quarter. Prerequisite: 181 or registration in 181. MR. FLATHER, MR. ROWLEY, MR. ROWEN, MR. SHOOP.

MEDICINE

(Including General Medicine, Dermatology, and Nervous and Mental Diseases)

The graduate work in the Department of Medicine is designed to prepare students for practice of the specialty of internal medicine, research in the problems of general medicine, and for the specialty of nervous and mental diseases, as the case may be, and to train men as teachers in their respective fields. Prospective students who have had no special work in addition to that of the undergraduate course in physiology, physiologic chemistry, therapeutics, experimental medicine, or pathology are advised to devote a year or more to these subjects before entering the regular three-year graduate course. Throughout the course it is recommended that a minor be carried in one or more of the following departments: Physiology, Pharmacology, Pathology, Immunology, and Pediatrics. For students specializing in nervous and mental diseases, minors in anatomy and psychology are especially valuable, and for those desiring it, work would be arranged in the Department of Ophthalmology and Oto-Laryngology, giving a special opportunity to study lesions of the eye occurring in systematic disorders. In the Medical School, during at least the third year of the three-year fellowship, the fellow acts as an officer of the clinic with definite responsibility in the care of patients in the University Hospital.

For courses of study see special bulletin of graduate courses in medicine.

METALLOGRAPHY

Professor OSCAR E. HARDER; Instructors R. L. DOWDELL, C. M. REASONER.

Prerequisites.—For major work, adequate preparation in the sciences fundamental to metallography (chemistry, physics, geology, technical subjects), the general requirements being fulfilled. For minor work, the prerequisites to the courses to be pursued.

Exemption from the language requirements for the Master's degree may be made in individual cases.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

150f. METALLOGRAPHY FOR ELECTRICAL ENGINEERS. Principles of metallography, including pyrometry, thermal analysis, constitution diagrams, microscopic and photomicrographic technique; study of typical alloys with special reference to electrical resistance, conductivity, magnets, etc. Laboratory work and demonstrations. Two lectures, three laboratory hours per week. Three credits. I; MW; 315M. VI, VII, VIII; M; 307M. MR. HARDER, MR. DOWDELL.

151w. ADVANCED METALLOGRAPHY FOR ELECTRICAL ENGINEERS. Continuation of 150. Two lectures, three laboratory hours per week. Prerequisite: Course 150. Three credits. I; MW; 315M. VI-VIII; M; 307M. MR. HARDER, MR. DOWDELL.

153f-154w-155s. METALLOGRAPHY. (Long course for metallurgical engineers.) Theory of metallic alloys. Metallographic technique. Properties of metals and alloys. Metallography of iron and steel and commercial alloys. Technical metallography. Three lectures, four laboratory hours per week each quarter. Prerequisites: Chemistry 28, Physics 43s. Five credits per quarter. VI or VII; MWF; 305M. VI-IX; T; 307M. MR. HARDER, MR. DOWDELL.

156f. METALLOGRAPHY FOR MECHANICAL ENGINEERS. Similar to 150 but specially arranged for students in mechanical engineering. Two lectures, three laboratory hours per week. Three credits. III; ThS; 112M. VI-VIII; W or F; 307M. MR. HARDER, MR. DOWDELL, MR. REASONER.

157w. ADVANCED METALLOGRAPHY FOR MECHANICAL ENGINEERS. Continuation of 156. Two lectures, three laboratory hours per week. Three credits. Prerequisite: Course 156. III; ThS; 112M. VI-VIII; W or F; 307M. MR. HARDER, MR. DOWDELL, MR. REASONER.

160f. METALLOGRAPHY FOR CHEMICAL STUDENTS. Principles of metallography, including constitution diagrams, preparation and standardization of thermocouples, preparation and thermal analysis of alloys, microscopic examination and making of photomicrographs; typical alloys systems as iron-carbon (steel and cast iron), some non-ferrous

alloys. Prerequisite: Chemistry 20. Two lectures and 3 laboratory hours per week. Three credits. II; MW; 112M. VI-VIII; Th; 307M. Mr. HARDER, MR. DOWDELL.

161w. ADVANCED METALLOGRAPHY FOR CHEMICAL STUDENTS. Metallography and heat treatment of iron and steel, including alloy steels, commercial uses of various steels, and engineering specifications. Prerequisite: Course 160. Two lectures and three laboratory hours per week. Three credits. II; MW; 112M. VI-VIII; Th; 307M. MR. HARDER, MR. DOWDELL.

162s. ADVANCED METALLOGRAPHY FOR CHEMICAL STUDENTS. Metallography of the non-ferrous metals with a study of the constitution diagrams, properties, and uses of important commercial alloys. Prerequisite: Course 160. Two lecture and three laboratory hours per week. Three credits. II; MW; 112M. VI-VIII; Th; 307M. MR. HARDER, MR. DOWDELL.

163f-164w-165s. ADVANCED METALLOGRAPHY. Technical and scientific research. The study of steel rails, automobile and locomotive parts, tool steels, etc. Special problems in metallography with outside reading. Seminar work in the recent advances in metallography. Prerequisites: Courses 151, 155, 157, or equivalent. Credits and hours to be arranged. 305M. MR. HARDER.

COURSES PRIMARILY FOR GRADUATE STUDENTS

201f-202w-203s. ADVANCED METALLOGRAPHY FOR GRADUATE STUDENTS. Intended primarily for research work. Credits and hours to be arranged. 305M. MR. HARDER.

OBSTETRICS AND GYNECOLOGY

For staff and courses of study offered, see special bulletin of graduate work in medicine.

OPHTHALMOLOGY AND OTO-LARYNGOLOGY

For staff and courses of study offered, see special bulletin of graduate work in medicine.

PATHOLOGY

Prerequisites.—Graduate students who desire to take their major or minor work in pathology must present credits in the following subjects: physics, 8 credits; general and organic chemistry, 12 credits; zoology, 6 credits; and a reading knowledge of German.

In addition, students who elect their major work in pathology must present credits for the equivalent of the first two years' work of the Medical School of this University.

For staff and courses of study offered, see special bulletin of graduate work in medicine.

PEDIATRICS

For staff and courses of study offered, see special bulletin of graduate work in medicine.

PHARMACOLOGY AND THERAPEUTICS

For staff and courses of study offered, see special bulletin of graduate work in medicine.

PHILOSOPHY

Professors NORMAN WILDE, DAVID F. SWENSON; Assistant Professor GEORGE P. CONGER.

Prerequisites.—For a major, 18 credits; for a minor, 9 credits.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

100f. HISTORY OF RELIGIONS. Prerequisite: 10 credits. Three credits. II; TThS; 322F. MR. CONGER.

101w. PSYCHOLOGY OF RELIGION. Prerequisite: 10 credits. Three credits. II; TThS; 322F. MR. CONGER.

102s. PHILOSOPHY OF RELIGION. Prerequisite: 10 credits. Three credits. II; TThS; 322F. MR. SWENSON.

103s. ESTHETICS. Prerequisite: 10 credits. Three credits. II; MWF; 322F. MR. SWENSON.

120w. SCANDINAVIAN PHILOSOPHY. Prerequisite: 10 credits. Three credits. 2-3:20; TTh; 316F. MR. SWENSON.

124f. POLITICAL AND SOCIAL ETHICS. Prerequisite: 20 credits in any social science, or 10 in philosophy. Five credits. I; T-S; 322F. MR. WILDE.

129w. MODERN POLITICAL THOUGHT. Prerequisite: 10 credits in philosophy, or 20 credits in any social science. Five credits. I; T-S; 322F. MR. WILDE.

135f-136w. THE PHILOSOPHY OF PLATO. Prerequisite: 10 credits. Six credits; VIII; MWF; 316F. MR. SWENSON.

141f-142w. METAPHYSICS. Prerequisite: 10 credits, including Philosophy 2. Six credits. II; MWF; 316F. MR. SWENSON.

161f-162w-163s. SEMINAR IN PHILOSOPHY. Individual investigation, topics to be determined after consultation with the department. Prerequisite: 20 credits. Nine credits. MR. WILDE, MR. SWENSON, MR. CONGER.

PHYSICS

Professors HENRY A. ERIKSON, JOHN T. TATE, ANTHONY ZELENY; Associate Professor LOUALLEN F. MILLER; Assistant Professors GREGORY BREIT, JOSEPH VALASEK, JOHN H. VAN VLECK.

Prerequisites.—For major work, differential and integral calculus and two years of physics of college grade. For minor work, one year of college physics.

A student majoring in physics is required to take Courses 101 to 111 and 102 to 112 inclusive unless excused by the department upon satisfactory evidence through examination at entrance. A course of general reading as outlined by the department in each individual case is also required.

For the Master's degree a reading knowledge of French or German is required. It is desirable that this requirement be fulfilled before graduate work is begun.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

101f-103w-105s-107f-109w-111s. THEORETICAL PHYSICS. Designed to supplement the general course and to prepare the student for the more specialized graduate courses. Four lectures a week. Prerequisites: Courses 21, 31, 41, Mathematics 51. Twelve credits. IV; MTWF; 2Ph. MR. TATE.

102f-104w-106s-108f-110w-112s. EXPERIMENTAL PHYSICS. Comprehensive course extending through two years; laboratory technique and standard methods of precise measurements. This course may be begun any quarter. Two three-hour sessions a week. Prerequisites: Courses 22, 32, 42. Three credits per quarter. (1) V-VII; MW; 2Ph. (2) V-VII; TTh; 2Ph. MR. TATE, MR. ZELENY, MR. MILLER, MR. VALASEK, MR. POWER.

115f-117w-119s. ELEMENTS OF MATHEMATICAL PHYSICS. Standard methods involved in the mathematical analysis of physical problems. Three lectures a week. Prerequisites: Course 105, Mathematics 51. Nine credits. MR. VAN VLECK.

114f-116w-118s. ELEMENTARY PHYSICAL INVESTIGATION. Two three-hour session a week. Nine credits. Prerequisites: Course 106, Mathematics 51. Under direction of individual members of staff.

122s. PYROMETRY AND HEAT. Prerequisites: Courses 22 and 42. Three credits. One lecture and two three-hour sessions in the laboratory a week. V-VIII; TTh; 9Ph. MR. MILLER.

132w. APPLIED OPTICS. Experimental work on special optical problems. Prerequisite: Course 32. Two three-hour laboratory periods a week. Three credits. VII-VIII; TTh; 3Ph. MR. VALASEK.

142f. ELECTRICAL MEASUREMENTS. Prerequisite: Course 42. Three credits. Three two-hour laboratory sessions a week. See engineering program. MR. ZELENY.

146w. ELECTRICAL MEASUREMENTS OF PRECISION. Three two-hour laboratory periods a week. Prerequisite: Course 142. Three credits. MR. ZELENY.

145w-147s. RADIOACTIVITY MEASUREMENTS. Prerequisites: Course 106, Mathematics 51. Nine credits. V-VI; TTh; 15Ph. MR. ERIKSON.

COURSES PRIMARILY FOR GRADUATE STUDENTS

201f. ADVANCED ANALYTICAL MECHANICS. Kinematics of particles and of rigid bodies; the general principles of dynamics and their application to the motion of particles and of rigid bodies. Application to non-mechanical problems. Three lectures a week. Prerequisite: Physics 101-103-105, Mathematics 51. Three credits. MR. VAN VLECK.

203w. THEORY OF ELASTICITY. Analysis of strain and stress; equations of wave motion; applications to sound and to electromagnetic oscillations. Three lectures a week. Prerequisite: Physics 201. Three credits. MR. VAN VLECK.

205s. HYDRODYNAMICS. Equations of Euler and Lagrange. Application to special types of fluid motion; motion of viscous fluid. Three lectures a week. Prerequisite: Physics 201. Three credits. MR. VAN VLECK.

221f. THERMODYNAMICS: KINETIC THEORY OF GASES. Classical thermodynamics and applications to special problems: statistical mechanics; relation to thermodynamics; theory of effusion, specific heats, dissociation, viscosity, conduction of heat, diffusion, transfer problems in general. Three lectures a week. Prerequisites: Physics 101-103-105; Mathematics 51. Three credits. MR. VAN VLECK.

223w. THEORY OF THERMAL RADIATION. Application of thermodynamics and statistical mechanics to thermal radiation; Planck's quantum hypothesis and applications to specific heats and allied problems. Three lectures a week. Prerequisites: Physics 221. Three credits. MR. VAN VLECK.

225s. THEORIES OF ATOMIC STRUCTURE. The quantum theories and their application to the study of X-rays, radioactivity, resonance and ionization potentials, photo-electricity; spectrum series and fine structure; resonance spectra; Stark effect. Three lectures a week. Prerequisites: Physics 221-223. Three credits. MR. VAN VLECK.

231f-233w-235s. THEORETICAL OPTICS. Geometrical optics and optical instruments. Theory of interference, diffraction, and polarization. Electron theory of dispersion, absorption, double refraction, optical rotation, magneto- and electro-optics. Radiation and its transformation

and resonance radiation. Theory of moving media. Three lectures a week. Prerequisites: Physics 101-103-105. Mathematics 106-107-108. MR. VALASEK.

241f-243w. MATHEMATICAL THEORY OF ELECTRICITY AND MAGNETISM. Fundamental mathematical theorems and processes of analysis applicable to potential theory; electric images; polarized media; magnetism; magnetic shells and their relation to electric currents; current flow in waves and infinite media; dynamical theory of electromagnetism. Three lectures a week. Prerequisites: Physics 101-103-105. Mathematics 106-107-108. Six credits. MR. BREIT.

242f-244w. THEORY OF ELECTRIC OSCILLATIONS. Fundamental laws of electrodynamics; free and forced vibrations in electrical circuits, tuning, damping; theory of radio instruments; energy losses in coils, condensers, etc.; electron tubes and circuits containing them; electromagnetic radiation. Three lectures a week. Prerequisites: Physics 101-103-105, Mathematics 106-107-108. Six credits. MR. BREIT.

245s. FUNDAMENTALS OF ELECTRON THEORY. The Maxwell Lorentz equations; solutions in terms of retarded potentials; equations expressing conservation of energy and momentum; electromagnetic mass; systems in uniform rectilinear motion; radiation from electrons. Three lectures a week. Prerequisites: Physics 241-243. Three credits. MR. BREIT.

246s. MEASUREMENTS OF ELECTRICAL OSCILLATIONS. Determination of characteristic curves of electron tubes; use of wave meter; measurement of high frequency resistance; verification of the laws of oscillating circuits in general. Three two-hour laboratory sessions a week. Prerequisites: Physics 242-244. Three credits. MR. BREIT.

247f. THEORY OF RELATIVITY. Historical survey; the special theory; Minkowski's four dimensional analysis; application to electromagnetic theory; determination of equations of motion of electrons and applications to gravitation; the general theory; theory of tensors; Einstein's law of gravitation with application. Three lectures a week. Prerequisites: Physics 241-243-245, Mathematics 106-107-108. Three credits. MR. BREIT.

248w-249s. ELECTRON THEORY OF MATTER. Conduction of electricity in metals and allied phenomena; electromagnetic theory and heat radiation; thermionics; atomic structure; theory of diamagnetism; theory of paramagnetism; Weiss's theory of ferromagnetism. Three lectures a week. Prerequisite: Physics 247. Six credits. MR. BREIT.

252f-254w-256s. RESEARCH. Under the special direction of individual members of the staff.

261f-263w-265s. SEMINAR. Study of present-day problems in physics. One hour a week. Open to those who are doing graduate work in physics. Three credits. MR. TATE.

PHYSIOLOGY AND PHYSIOLOGIC CHEMISTRY

Prerequisites.—The Department of Physiology is well equipped for the various types of physiologic investigation. The library facilities are good.

For a minor in physiology, general zoology, general and organic chemistry, and college physics are prerequisites. (In exceptional cases high school physics may be accepted.) For a major, physical chemistry is desirable.

In addition, each student majoring in physiology or physiologic chemistry must have had the general courses, Physiology 100, 101, 103, 104, or the equivalent.

For staff and courses of study offered, see special bulletin of graduate work in medicine.

PLANT-BREEDING

Plant-breeding may be elected as a field for either major or minor work. For prerequisites for specialization and statement of courses of study see announcement under Agronomy and Farm Management.

PLANT PATHOLOGY AND BOTANY

Professors EDWARD M. FREEMAN, ELVIN C. STAKMAN; Assistant Professor JULIAN G. LEACH.

NOTE.—For courses in botany including plant physiology see Department of Botany.

Prerequisites.—The minimum requirement is (a) three years (27 credits) in botany, one year (9 credits) of which shall be mycology; (b) general bacteriology one quarter (4 credits) or some equivalent; (c) one year (9 credits) in plant pathology—preferably two years (18 credits).

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

105f-106w-107s. MYCOLOGY. Morphology, taxonomy, and biology of fungi. Lecture, laboratory, greenhouse, and field work. Prerequisites: Botany 7 and 11 or equivalent. Three credits per quarter. I, II; MWF; 1, 32 PP. MISS DOSDALL.

108f. METHODS. Plant pathological methods, including mycological and bacteriological technique. Lectures, laboratory, field, and greenhouse work. Special problems. Prerequisites: Course 1 or 10 and Bacteriology 6. Three credits per quarter. Ar. 1, 2PP. MR. LEACH.

110w. PRINCIPLES OF PATHOLOGY. Comparative biology of plant pathogens; pathological plant anatomy, parasitism, biologic specialization, resistance, and immunity. Prerequisites: Course 1 or 10 and Bacteriology 6. Three credits. III, IV; MWF; 1, 2PP. MR. STAKMAN.

111w,su. DISEASES OF FIELD CROPS. Symptomatology, etiology, and practical methods of control. Laboratory, lecture, and field work. Prerequisite: Course 1 or 10. VI, VII; MWF; 1, 2PP. MR. STAKMAN.

112s. DISEASES OF FRUIT CROPS. Especially those important in Minnesota. Laboratory, lecture, and greenhouse work. Three credits. VI, VII; MWF; 1, 2PP. (Given in alternate years; not offered in 1923-24.) MR. LEACH.

113s. DISEASES OF VEGETABLE CROPS. Diseases of potatoes and other vegetable crops. Lecture, reference, laboratory, and greenhouse work. Three credits. VI, VII; MWF; 1, 2PP. (Given in alternate years; offered in 1923-24.) MR. LEACH.

114w. ADVANCED FOREST PATHOLOGY. Wood rots, including a study of the deterioration of wood products caused by fungi. Lectures, laboratory, and greenhouse work. Three credits. VIII, IX; MWF; 1, 2PP. (Given in alternate years; offered in 1923-24.) MR. STAKMAN, MR. LEACH.

COURSES PRIMARILY FOR GRADUATE STUDENTS

203f-204w-205s. SPECIAL PROBLEMS. Special assignment of work in laboratory and field problems in pathological research. MR. FREEMAN, MR. STAKMAN.

207f-208w-209s. RESEARCH IN MYCOLOGY. Research work along following suggested lines: taxonomy of natural groups; fungous flora of particular regions, localities, or habitats; investigation of fungi involved in special industrial or natural processes; morphology or physiology of special forms. Prerequisite: Course 105-106-107. For minor or major. Three credits per quarter. MR. FREEMAN, MR. STAKMAN.

211. HISTORY OF PLANT PATHOLOGY. Development of important mycological, pathological, and physiological researches; historical basis of modern science of plant pathology. Two credits per quarter. MR. STAKMAN.

213. SEMINAR. Assigned topics with special reference to current pathological problems. Historical review of literature on special problems and critical study of current literature. Two credits per quarter. MR. STAKMAN.

POLITICAL SCIENCE

Professors CEPHAS D. ALLIN, FREDERIC H. BASS (Engineering), JEREMIAH S. YOUNG, ROY G. BLAKEY (Economics), SOLON J. BUCK (History), ALVIN H. HANSEN (Economics), S. B. HARDING (History), NORMAN WILDE (Philosophy); Associate Professors WILLIAM ANDERSON, JOHN M. GAUS, LESTER B. SHIPPEE (History); Assistant Professors MORRIS B. LAMBIE, HAROLD S. QUIGLEY.

Prerequisites.—For major work, 18 credits; for minor work, 13 credits.

Professional courses.—The attention of those who are preparing themselves for the public service is called to the special training courses outlined in the bulletin of the College of Science, Literature, and the Arts. Further information may be had from the chairman of the department.

Bureau for Research in Government.—This bureau is organized to conduct and direct special investigations into practical political and administrative problems, national, state, and local. Mr Anderson will act as director, but all members of the staff will take part in the work of the bureau. Advanced and graduate students are strongly urged to take advantage of its facilities.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

107-108. EUROPE, 1848-1914. Identical with History 107-108.

109. ENGLISH HISTORY, 1815-1920. Identical with History 109-110. MR. HARDING.

111. MUNICIPAL FUNCTIONS. III; TThS; 4F. MR. ANDERSON.

113. MUNICIPAL PROBLEMS. A specialized course in modern legal, administrative and functional problems of cities. II; MWF; 213B. MR. ANDERSON.

115. MUNICIPAL CORPORATIONS. III; TThS; 204F. MR. ANDERSON.

117. MUNICIPAL ENGINEERING. Identical with Civil Engineering 53.3. MR. BASS.

121-122. INTERNATIONAL LAW. With especial attention to diplomatic and consular practice. IV; MWF; 15F. MR. ALLIN.

123. INTERNATIONAL ORGANIZATION. Systems of international relations. International administrative organizations, and political guarantees of the past with a detailed study of the League of Nations. VII; MWF; 15F. MR. QUIGLEY.

124. PROBLEMS IN INTERNATIONAL LAW. Intensive study of the solution of selected international controversies by national and international courts, arbitration tribunals, and diplomatic conferences. (Not offered in 1923-24.)

125. AMERICAN DIPLOMATIC HISTORY. Principles and policies guiding American diplomacy in its stages of development as well as to the methods pursued and the personalities of American diplomats. III; MWF; 15F.

127. AMERICAN FOREIGN RELATIONS. Such topics as the Monroe Doctrine, freedom of the seas, the "open door," arbitration, and disarmament will be considered with particular reference to the future policy of the United States. III; MWF; 15F.

131. PUBLIC ADMINISTRATION. Sources of administrative power; administrative areas; organization of departments; personnel, and related civil service problems including classification, training, appointment, promotion, salary determination and superannuation; the budget; purchasing; control over administration; public service as a career. VII; MWF; 25F. MR. LAMBIE.

133. PROBLEMS OF PUBLIC ADMINISTRATION. Organization of departments and distribution of functions relating to particular problems of public administration including public health, finance, education, public works, safety, welfare, commerce, and agriculture. VII; MWF; 25F. MR. LAMBIE.

136f. FAR EASTERN POLITICS. The principal factors in the social and political life of Japan and China; their relations with each other and with western powers. VII; MWF; 15F. MR. QUIGLEY.

137w. FAR EASTERN DIPLOMACY. VII; MWF; 15F. MR. QUIGLEY.

141. PROBLEMS IN STATE GOVERNMENT AND CONSTITUTIONAL LAW. A selected group of current problems in state government will be studied intensively in their constitutional and political aspects. VI; MWF; 213MA. (Not offered in 1923-24.)

145. LEGISLATIVE POWER AND METHODS. Source and scope of the legislative power; methods used by legislative bodies; current political questions; formulation and defense of legislative bills. II; TThS; 102MA. (Not offered in 1923-24.) MR. YOUNG.

146-147.† CONSTITUTIONAL HISTORY OF THE UNITED STATES. Identical with History 146-147. MR. SHIPPEE.

151. CONSTITUTIONAL LAW: THE AMERICAN FEDERAL SYSTEM. Judicial interpretation of the constitution; power of judicial review; separation of governmental powers; relation of state and national governments; construction of national powers; jurisdiction of courts. Ar.

152. CONSTITUTIONAL LAW: FUNDAMENTAL RIGHTS AND IMMUNITIES. Privileges and immunities of citizenship; protection of civil and political rights; the obligation of contracts; due process of law and equal protection of the law. Ar.

153. THE WEST IN AMERICAN POLITICS SINCE 1865. Identical with History.

155. COMPARATIVE ADMINISTRATIVE LAW. Administration as a science; analysis of the administrative systems of the United States, England, France, and Germany with special reference to the law of officers, the merit system, and special administrative tribunals. II; TThS; 311F. MR. YOUNG.

157. POLICE POWER. Nature of the police power; constitutional aspects of social and economic legislation, including safety, order, morals, and protection against business fraud and oppression; the fundamental rights under the police power. II; TThS; 102B. MR. YOUNG.

158. GOVERNMENT AND BUSINESS. Governmental powers; protection against fraud and oppression; restraint of trade and manipulation of prices; protection of debtors; business affected with a public interest; combination of laborers; corporations; compulsory benefits; conservation of natural wealth; vested rights; confiscatory legislation. II; TThS; 124F. MR. YOUNG.

161. COMPARATIVE FEDERAL GOVERNMENT. Ancient and modern federal unions. IV; MWF; 15F. MR. ALLIN.

165. LAW AND CUSTOM OF THE ENGLISH CONSTITUTION. Legal and political aspects of the English constitution. II; MWF; 15F. MR. ALLIN. 153. MR. BUCK.

166. GOVERNMENT OF THE BRITISH EMPIRE. Organization, working and international status of the Imperial and Dominion governments. II; MWF; 15F. MR. ALLIN.

167. BRITISH POLITICS. Parties, party leaders, and policies. The relation of English and imperial policies. II; MWF; 15F. MR. ALLIN.

169. THE LABOR AND SOCIALIST MOVEMENT IN EUROPE. Identical with Economics 169. MR. HANSEN.

181. MODERN POLITICAL THOUGHT. Same as Philosophy 129. I; TWThFS; 322F. MR. WILDE.

185. POLITICAL AND SOCIAL ETHICS. Same as Philosophy 124. I; TWThFS; 322F. MR. WILDE.

191-192. PUBLIC FINANCE. Identical with Economics 191-192. MR. BLAKEY.

193. STATE AND LOCAL TAXATION. Identical with Economics 193. MR. BLAKEY.

COURSES PRIMARILY FOR GRADUATE STUDENTS

201-202-203. SEMINAR IN PUBLIC LAW. MR. YOUNG AND OTHERS.

211-212-213. SEMINAR IN MODERN GOVERNMENT AND POLITICAL THEORY. MR. ALLIN AND OTHERS.

221-222-223. SEMINAR IN LOCAL GOVERNMENT AND ADMINISTRATION. MR. ANDERSON AND OTHERS.

NOTE.—A student registered in a seminar course will be expected to complete a satisfactory piece of research before receiving credit for the course. The Bureau for Research in Government is designed to give all possible assistance in the conducting of such research, but is not intended to relieve the student of his personal responsibility.

PSYCHOLOGY

Professors RICHARD M. ELLIOTT, WILLIAM S. FOSTER, DONALD G. PATERSON; Associate Professors KARL S. LASHLEY, HERBERT WOODROW; Lecturer HARRY M. JOHNSON.

Prerequisites.—For either major or minor work, 12 credits.

101f-102w†-103s. EXPERIMENTAL PSYCHOLOGY. The theory and technique of the leading methods of experimental investigation in human psychology. Individual minor research problems in the third quarter. One lecture, four laboratory hours per week. Six or nine credits. VII; MWF; VIII; WF; 116Psy. MR. FOSTER, MR. JOHNSON.

108f-109w.† ADVANCED GENERAL PSYCHOLOGY. The laws of the normal, adult mind, based upon the study of experimental results. Lectures, recitations, and reports. Six credits. VIII; M. IX; MW; 116Psy MR. WOODROW, MISS LUDGATE.

114w-115s.† HUMAN BEHAVIOR. An analysis of the development and organization of human behavior. Consciousness or mind, as a property of the living body, is discussed in its dependence upon response. Six credits. II; TThS; 109Psy. MR. ELLIOTT.

121f-122w†-123s. NEUROPSYCHOLOGY. The functions of the nervous system in behavior. Neural basis of reflex, instinct, and habit. Physiology of motivation. Individual investigation of special problem in third quarter. One lecture and five laboratory hours per week. Six or nine credits. VII; VIII; MWF; 109Psy. MR. LASHLEY.

124f. PSYCHOLOGY OF LEARNING. Critique of current theories concerning the nature of the learning process. Problems and methods bearing upon the physiology of learning. Not open to students who take Neuropsychology. Three credits. IV; MWF; 109Psy. MR. LASHLEY.

125f-126w.† PSYCHOLOGY OF INDIVIDUAL DIFFERENCES. Experimental and statistical study of the influence of sex, race, immediate ancestry, and environment in the causation of individual differences in mental traits. Each student participates in investigation of problems and in analysis of results. Six credits. II; MWF; 109Psy. MR. WOODROW.

127s. SOCIAL PSYCHOLOGY. An examination of the behavior of men in groups, and of some important social institutions, as determined by human motives and traditions. Three credits. II; MWF; 109Psy. MR. BIRD.

144w-145s.† ABNORMAL PSYCHOLOGY. Systematic review of psychiatry in relation to normal behavior. Types of social maladjustment; delinquency, criminality, fanaticism. Psychology of creative ability. The organization of personality as revealed by studies in psychopathology. Six credits. IV; MWF; 109Psy. MR. LASHLEY.

COURSES PRIMARILY FOR GRADUATE STUDENTS

200f-201w.† SEMINAR IN THE HISTORY OF PSYCHOLOGY. Selected topics from the history of psychology. Open to advanced students with permission of the instructor. Three or six credits in proportion to work done. MR. FOSTER. (Not offered in 1923-24.)

205s. ADVANCED DIFFERENTIAL PSYCHOLOGY. Three credits. MR. PATERSON.

206-207-208. RESEARCH IN ANIMAL BEHAVIOR.

210f-211w-212s. RESEARCH PROBLEMS. Laboratory investigations. Open to graduate students only. MR. ELLIOTT, MR. FOSTER, MR. LASHLEY, MR. PATERSON, MR. WOODROW, MR. JOHNSON.

215f-216w-217s.† SEMINAR IN PHYSIOLOGICAL PSYCHOLOGY. Fortnightly meetings attended by teaching staff and advanced students for discussion of some of the fundamental problems of behavior and for reports of research in progress in the laboratory. Three credits. Alternate Th. 7:15-9:15 p.m. MR. LASHLEY.

220f-221w-222s.† JOURNAL CLUB AND SEMINAR. Advanced students meet every other week for reports on current publications and discussion of contemporary trends in psychology and related sciences. Attendance of graduate students who are candidates for degrees is required. One credit per quarter.

ROMANCE LANGUAGES

Professors EVERETT W. OLMSTED, FRANCIS B. BARTON, IRVILLE C. LECOMPTE, COLBERT SEARLES; Associate Professor RUTH S. PHELPS[1]; Assistant Professors JOSEPH E. GILLET, EUGENE F. PARKER, GUSTAVE VAN ROOSBROECK[1]; Instructor ARTURO TORRES-RIOSECO.

[1] Absent on leave 1923-24.

Prerequisites.—For major work, 27 Senior College credits or equivalent; for minor work, 18 Senior College credits or equivalent. Candidates for Master's degree must also have a reading knowledge of at least one other modern language. Candidates for the Doctor's degree must have had at least two years' work in Latin, and are required to take also the course in medieval Latin in the Latin Department. A reading knowledge of a second Romance language and of German is also required.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

FRENCH

100w-101s. DICTION FRANÇAISE. Dissertations littéraires par le discours. Leçons sur des textes en prose et en vers. Exercices oraux de diction, de syntaxe, et de vocabulaire. VIII; MWF; 227F.

103-104-105.† FRENCH SYNTAX AND COMPOSITION. Special studies in characteristic problems of French syntax. V; F; 203F. MR. BARTON.

115-116-117.† FRENCH LITERATURE: SEVENTEENTH CENTURY. Influence of the literary salons. Development of French prose. Perfection of French dramatic art by Corneille, Racine, and Molière. Reading, discussions, reports based upon collateral reading. III; TThS; 201F. MR. SEARLES.

118-119-120.† FRENCH LITERATURE: EIGHTEENTH CENTURY. Philosophic movement: Bayle, Fontenelle, Montesquieu, Voltaire, l'Encyclopédie, Rosseau. Literature: poetry, tragedy, comedy, novel. Reading, discussions, reports, based upon collateral reading. III; MWF; 110F. MR. PARKER.

121-122-123.† FRENCH LITERATURE: SIXTEENTH CENTURY. Forerunners of the Renaissance: Marot and l'Ecole Lyonnaise. The Renaissance movement and the reformation, Rabelais, Calvin and the Pléiade and its successors; Montaigne; the situation at the close of the century. (Not offered in 1923-24.)

141-142-143.† REALISTIC NOVEL: NINETEENTH CENTURY. A study of realism with especial reference to the novel. Flaubert, Maupassant, Zola, etc. Alternates with 159-160-161. VII; TTh; 203F. MR. LECOMPTE.

150-151-152.† FRENCH DRAMATIC LITERATURE. A study of the development of dramatic literature in France from the classical period to the present time. Alternates with 153-154-155. III; TTh; 203F. MR. OLMSTED.

153-154-155.† FRENCH LYRIC POETRY. Principles of French prosody. A study of the evolution of French lyric poetry. Alternates with 150-151-152. (Not offered in 1923-24.) MR. OLMSTED.

159-160-161.† FRENCH CRITICISM. A study of the masters of French criticism. Alternates with 141-142-143. (Not offered in 1923-24.) MR. LECOMPTE.

171-172-173.† EXPLICATION DES TEXTES. An analytical and critical study of French texts, in which particular attention is given to style, thought, and diction. The course is conducted in French. (Not offered in 1923-24.)

174-175-176.† LECTURES IN FRENCH. Le Roman français contemporain. IX; TTh; 201F. (Not offered in 1923-24.) MR. VAN ROOSBROECK.

191-192-193.† RESEARCH METHODS AND MATERIAL. (Not offered in 1923-24.) MR. VAN ROOSBROECK.

SPANISH

100-101-102.† SPANISH ORAL DICTION. Oral dissertations on assigned subjects. Exercises in diction, syntax, and vocabulary.

103-104-105.† SPANISH SYNTAX. Special studies in characteristic problems of Spanish syntax. VI; T; 230F. MR. TORRES.

115-116-117.† SPANISH LITERATURE: SEVENTEENTH CENTURY. Alternates with 156-157-158. IV; TS; 227F. (Not offered in 1923-24.)

141-142-143.† SPANISH NOVEL. The development of Spanish fiction from the picaresque novel to that of the present day. (Not offered in 1923-24.)

150-151-152.† SPANISH DRAMATIC LITERATURE. A general survey of Spanish dramatic literature with especial attention to the Golden Age. (Not offered in 1923-24.)

156-157-158.† SPANISH LITERATURE: SIXTEENTH CENTURY. Alternates with 115-116-117. (Not offered in 1923-24.)

159-160-161.† CERVANTES. A study of his life and works. Attention will be centered upon *Don Quixote* and the *Novelas Exemplares*. IV; TS; 227F. MR. GILLET.

174-175-176.† LECTURES IN SPANISH. Subjects to be announced. IX; TTh; 202F. MR. TORRES.

ITALIAN

159-160-161.† DANTE, PETRARCH, BOCCACCIO. An introduction to their works. The three cantiche of the *Divina Commedia* are read, one each year in rotation, together with a number of the canzoni, and sonnets of Petrarch, and portions of the *Decameron*. IV; MW; 213F. MR. MALONE.

162-163-164.† DANTE IN ENGLISH. Lectures; reading and discussion of the *New Life*, and two cantiche of the *Divine Comedy* not read in 159-160-161. Private reading of one other work. IV; F; 213F. MR. MALONE.

COURSES PRIMARILY FOR GRADUATE STUDENTS

201f-202w-203s. OLD FRENCH PHONOLOGY AND MORPHOLOGY. Lectures on the origin and development of the French language, with practical exercises and reports on assigned topics. Six credits. MR. LECOMPTE.

204f-205w-206s. READING IN OLD FRENCH LITERATURE. An introductory course in the reading of Old French. Different types of literature will be read and their origin and development discussed. A certain amount of collateral reading required. Three credits. MR. LECOMPTE.

207f-208w-209s. OLD PROVENÇAL. Reading in early provençal literature with special attention to the poetry of the troubadours. Six credits. MR. LECOMPTE.

222f-223w-224s. SEMINAR IN MODERN FRENCH LITERATURE. Six credits. VIII; IX; Th; 203F. MR. SEARLES.

241f-242w-243s. OLD SPANISH PHILOLOGY. Two credits. MR. GILLET.

244f-245w-246s. OLD SPANISH LITERATURE. Every year a different genre is studied, such as the epic. Subject to be decided by agreement of students. Two credits. MR. GILLET.

250f-251w-252s. SPANISH SEMINAR. Six credits. VIII, IX; F; 203F. MR. OLMSTED.

259f-260w-261s. RESEARCH IN ROMANCE LANGUAGES. Credit depends upon amount of work accomplished.

SCANDINAVIAN

Professors GISLE BOTHNE, ANDREW A. STOMBERG.

Prerequisites.—For major work, 18 credits; for minor work, 6 credits in the department. All required foreign language credits for the Master's degree in this department may be in either Norwegian, Swedish, or Danish.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

101f-102w-103s. MODERN NORWEGIAN LITERATURE. From 1814 to the present day. Prerequisites: Scandinavian 1-2 and 3-4. Nine credits. II; TThS. MR. BOTHNE.

104f-105w-106s. MODERN SCANDINAVIAN HISTORY. Knowledge of Scandinavian not required. Nine credits. IV; MWF. MR. STOMBERG.

107f-108w-109s. MODERN SWEDISH LITERATURE. The Swedish novel. Study of a selected list of Swedish classics. Nine credits. V; MWF. MR. STOMBERG.

117w-118s. EARLIER NORWEGIAN LITERATURE. Prerequisite: Scandinavian 102. Five credits. III; TS. MR. BOTHNE.

110w. IBSEN. Prerequisite: Scandinavian 101-102-103. Three credits. MR. BOTHNE.

111f-112w-113s. OLD NORSE (ICELANDIC). Grammar and reading. Gunnlaug's Saga Ormstungu. Six credits. V; TTh. MR. BOTHNE.

114f. STRINDBERG. Prerequisite: Scandinavian 107f-108w-109s. Three credits. MR. STOMBERG.

131f-132w-133s. DANISH LITERATURE OF THE NINETEENTH CENTURY. From Oehlenschläger to the present time. Nine credits. MR. BOTHNE.

134f-135w. THE LANDSMAAL MOVEMENT AND LITERATURE. From Aasen to Garborg. (Not offered in 1923-24.) MR. BOTHNE.

136s. BJÖRNSON. A study of his activity as a central figure in modern Norway. MR. BOTHNE.

COURSES PRIMARILY FOR GRADUATE STUDENTS

201-202-203. SEMINAR IN HISTORY OF SCANDINAVIAN LANGUAGES. MR. BOTHNE.

204-205-206. ETYMOLOGICAL STUDIES. MR. BOTHNE.

209-210. SEMINAR IN MODERN SWEDISH LANGUAGE AND LITERATURE. The course is based upon Schuck and Warburg's *Illustrated Svensk Litteraturhistoria* and includes a study of special authors. Nine credits. MR. STOMBERG.

215-216-217. SEMINAR IN NORWEGIAN LITERATURE. The various phases of the cultural development of modern Norway are discussed. The complete works of Björnson or Ibsen are especially studied. Also Holborg and the eighteenth century. MR. BOTHNE.

SOCIOLOGY AND SOCIAL WORK

Professors F. STUART CHAPIN, LUTHER L. BERNARD; Associate Professor MANUEL C. ELMER; Assistant Professors ROSS L. FINNEY, GUSTAV A. LUNDQUIST; Special Lecturers FRANK J. BRUNO, EMIL G. STEGER, WILLIAM W. HODSON.

Prerequisites.—For major work, 18 quarter credits; for minor work, 12 credits.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

100f. SOCIAL PSYCHOLOGY. Primarily for sociology students. The social attitudes; their development and modification under social pressures; the interactions of individuals and groups. II; TThS; 9F. MR. BERNARD.

101w. SOCIAL ORGANIZATION. The organization and structure of social groups; the selection of group types and values; the disorganization and reorganization of institutions; purposive social organization. II; TThS; 9F. MR. BERNARD.

102s. SOCIAL CONTROL. Nature, purpose, and methods of social control; institutional and non-institutional controls; the evolution of sanctions in social control; the revision of the social controls under the influence of modern science. II; TThS; 9F. MR. BERNARD.

103. SOCIOLOGY OF CONFLICT. (Not offered in 1923-24.)

110w. METHODS OF COMMUNITY ORGANIZATION AND SOCIAL WORK IN SMALL TOWNS AND COUNTRY. Concrete problems and methods are emphasized. VIII, IX; Th; 9F. MR. BERNARD.

112f. THE RURAL SOCIAL SURVEY. VIII; MWF.

114s. RURAL SOCIAL INSTITUTIONS. A detailed study of the problems of organization and efficiency of selected rural institutions, especially religious, educational, civic, and recreational. I; MWF; 105Ag. Eng. MR. LUNDQUIST.

115f. THE RURAL CHURCH AS A SOCIAL INSTITUTION. VII; MWF.

119f. THE FAMILY. The evolution of the family; its various forms and their relation to other social institutions; the service of the family in social evolution; contemporary problems of the family (standards of living, birth rate, feminism, etc.). III; MWF; 9F. MR. ELMER.

120f. SOCIAL PROGRESS. A study of the basis for social progress in human nature; analysis of fundamental social institutions with regard to their contributions to human advance; necessary social readjustments to convert drift into progress. II; MWF; 9F. MR. BERNARD.

121w. ADVANCED STATISTICAL METHODS. VII; TThS; 5F. MR. CHAPIN.

122w-123s. METHODS OF SOCIAL INVESTIGATION. Methods of gathering and presenting community facts; social statistics; social surveys. Lectures, problems, and field work. VIII; MWF; 9F. MR. ELMER.

126-127. SETTLEMENT AND COMMUNITY CENTER WORK. (Not offered in 1923-24.)

128s. CHARITABLE ADMINISTRATION. A technical study of methods of organizing charitable agencies, of financing them, and of making the public aware of their work. Lectures and practice work. VIII, IX; Th; 5F. MR. STEGER.

130s. ADVANCED SOCIAL CASE WORK. An intensive study of social case work as the basis of practical dealing with problems of dependency and defectiveness. Lectures and conferences. VIII, IX; T; 15F. MR. BRUNO.

132s. JUVENILE COURTS AND PROBATION. Primarily a course in probation practice work, but prefaced by lectures on social and legal aspects of the juvenile court and probation. (Not offered in 1923-24.)

133f. HEALTH ASPECTS OF CASE WORK. A course open only to students who are properly grounded in case work and who wish to specialize in medical social work. IX and ar; WF and ar; 5F.

134s. LEGAL PROTECTION OF THE CHILD. A study of the relation of law to child welfare. A survey of existing children's protective legislation, of its administration and its future development. IX; MWF; 5F. MR. HODSON.

135s. FIELD PRACTICE IN LEGAL PROTECTION OF THE CHILD. Designed to meet the individual needs of students taking 134. Ar. Ar.

138w-139s. MENTAL CASE WORK. A study of mental abnormality and its treatment through case work. Lectures and clinical instruction. IX; Th and ar; 9F. MRS. MUENZINGER.

140w. HISTORY OF SOCIAL THEORY. From the time of the Greeks, with special reference to the more recent development of sociology. The theories are related to their social backgrounds. II; MWF; 5F. MR. BERNARD.

141s. CONTEMPORARY SOCIAL THEORY. An intensive study of developments in the social theory of the late nineteenth and the twentieth centuries. II; MWF; 9F. MR. BERNARD.

152s. PROBLEMS OF INSTITUTIONAL ADMINISTRATION. (Not offered in 1923-24.)

180f-181w-182s. SEMINAR IN EDUCATIONAL SOCIOLOGY. IX, X; M; Ed. MR. FINNEY.

COURSES PRIMARILY FOR GRADUATE STUDENTS

200f-201w-202s. SEMINAR IN APPLIED SOCIOLOGY. MR. ELMER.

204f-205w-206s. SEMINAR IN SOCIAL THEORY. MR. BERNARD.

206f-207w-208s. SEMINAR: STATISTICAL THEORY IN RELATION TO SOCIAL THEORY AND PRACTICE. (Not offered in 1923-24.) MR. CHAPIN.

209f-210w-211s. SEMINAR: THE THEORY OF SOCIAL EVOLUTION. MR. CHAPIN.

215f-216w-217s. SEMINAR IN RURAL SOCIOLOGY.

221f-222w-223s. GRADUATE FIELD TRAINING. Twelve hours per week each semester.

SOILS

Professor FREDERICK J. ALWAY; Associate Professor CLAYTON O. ROST.

Prerequisites.—For major work, at least two years of work in chemistry, including both quantitative analysis and organic chemistry, and one year of work in general physics. Those students who have not had courses in the elements of geology and mineralogy will be expected to take Geology 1 and 21 during the first year of graduate work. A reading knowledge of French or German is required for the Master's degree. In certain cases where some other modern foreign language would be more valuable in connection with the thesis it may be substituted.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

101f. CHEMICAL ANALYSIS OF SOILS. A laboratory course on the chemical examination of soils, including both fusion and extraction methods for mineral nutrients. Prerequisites: Soils 4 and 5 and quantitative analysis. Five credits. 1:30-5:20; MWF; 156Ch. MR. ROST.

102f,w,s. SPECIAL PROBLEMS IN SOILS. Individual laboratory or field work upon some special soil problem in soil physics, soil chemistry, or soil management. Arrangements must be made in advance. Prerequisites: Soils 4 and 5, and other courses according to problem selected. Three to 5 credits, according to work. 156Ch. MR. ALWAY, MR. ROST.

104s. SOIL-SURVEYING. Field practice in surveying soils and the preparation of soil maps. Prerequisites: Soils 4 and 5. Three credits. MR. MCMILLER.

105w. MINNESOTA SOILS. Detailed study of the soils of Minnesota. Origin, formation, and classification; physical and chemical characteristics; moisture relations; response to manures, fertilizers, and soil amendments; naturally unproductive types and their reclamation. Lectures and laboratory. Prerequisites: Soils 4 and 5. Three credits. III; TThS; 251Ch. MR. ALWAY.

106w. PEAT SOILS. Formation, chemical composition, physical properties, classification, and reclamation. Lectures, laboratory, and greenhouse work. Prerequisites: Soils 4 and 5. Two credits. III; WF; 251Ch. MR. ALWAY.

107w. FERTILIZERS AND MANURES. Sources, composition, and uses of the various fertilizers, manures, and soil amendments. Lectures and laboratory work. Prerequisites: Soils 4 and 5. Two credits. IV; TS; 251Ch. MR. ROST.

108w. PHYSICAL PROPERTIES OF SOILS. A laboratory course on the determination of physical constants of soils, including mechanical composition, moisture equivalent, and hygroscopic coefficient. Prerequisites: Soils 4 and 5. Three credits. 1:30-5:20. TTh; 156Ch. MR. MCMILLER.

COURSES PRIMARILY FOR GRADUATE STUDENTS

201w. CLASSIFICATION OF SOILS. Study of the various systems of classification which have been proposed. Individual work, with assigned readings and conferences. Open only to those graduates who have a reading acquaintance with French and German. Prerequisites: Soils 4, 5, 101, and 108. Three credits. MR. ALWAY.

202f,w,s. RESEARCH IN SOILS. The investigation in the field, in the laboratory, or in both, of soil problems. The particular problem which a student may select will depend upon his previous training in agronomy, botany, chemistry, geology, and physics. Credit, according to work. MR. ALWAY.

203w. SEMINAR IN SOILS. Review of current literature; presentation and discussion of papers on research; study of methods of investigation of soils. Required of graduate students. No credit. VII; T; 251Ch. MR. ALWAY.

SURGERY

(Including divisions of General Surgery, Experimental Surgery, Orthopedic Surgery, Urology, and Dental Surgery.)

For staff and courses of study offered, see special bulletin of graduate work in medicine.

VETERINARY MEDICINE

Professors CLIFFORD P. FITCH, MYRON H. REYNOLDS.

Prerequisites.—For major work, 12 credits; for minor work, 6 credits in the department.

COURSES

101w-102s. ADVANCED ANATOMY OF DOMESTIC ANIMALS. Advanced study of the structures involved in the type, conformation, and nutrition of the common farm animals. Dissection of farm animals, including a study of the osseous, muscular, and other principal anatomical structures. MR. KERNKAMP.

103f-104w. ADVANCED COMPARATIVE PHYSIOLOGY. An advanced course in physiology of the domestic animals, including laboratory work with special emphasis on animal nutrition. MR. HEWITT.

201f-202w-203s-204su. PROBLEMS IN ANIMAL SANITATION. Losses to animal husbandry from disease. Causes and prevention of such losses. Organization of sanitary control work. MR. REYNOLDS.

205f-206w-207s-208su. VETERINARY PATHOLOGY AND BACTERIOLOGY. Advanced problems. Specially adapted to meet the needs of graduate students. Offered as major or minor work. Credits to be arranged. MR. FITCH.

The Bulletin *of the* University *of* Minnesota

The Graduate School

Announcement of Graduate Work in Medicine in the Medical School and the Mayo Foundation

1924-1926

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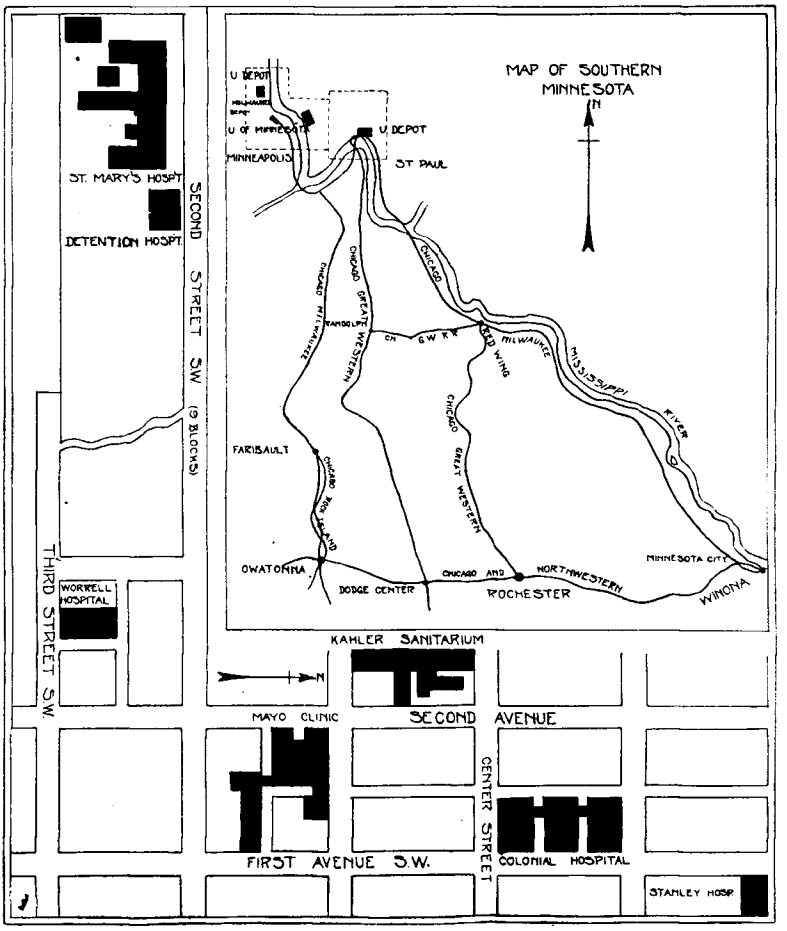

Map of a portion of Rochester showing clinics and hospitals serving the Mayo Foundation for teaching purposes.

1924

JULY

Su	Mo	Tu	W	Th	Fr	Sa
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AUGUST

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SEPTEMBER

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OCTOBER

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DECEMBER

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1925

JANUARY

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FEBRUARY

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MARCH

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APRIL

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JUNE

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JULY

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AUGUST

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SEPTEMBER

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UNIVERSITY CALENDAR

1924-1925

1924			
September	22-October 18		Registration of graduate students Physical examinations for all students
September	29	Monday	Fall quarter begins, 8:30* a.m.
October	9	Thursday	Examinations in German and French for candidates for all advanced degrees
November	4	Tuesday	Election Day; a holiday
November	11	Tuesday	Armistice Day; a holiday
November	22	Saturday	Last day for filing thesis subject of candidate for the Master's degree
November	27	Thursday	Thanksgiving Day; a holiday
December	18	Thursday	Commencement convocation
December	20	Saturday	Fall quarter ends, Christmas vacation begins, 5:20 p.m.
1925			
January	5	Monday	Christmas vacation ends, winter quarter begins, 8:30* a.m.
January	8	Thursday	Examinations in German and French for candidates for all advanced degrees
February	12	Thursday	Lincoln's birthday; a holiday
March	21	Saturday	Winter quarter ends, spring vacation begins, 5:20 p.m.
March	30	Monday	Spring vacation ends, spring quarter begins, 8:30* a.m.
April	9	Thursday	Examinations in German and French for candidates for all advanced degrees
April	10	Friday	Good Friday; a holiday
May	9	Saturday	Last day for filing theses of candidates for all advanced degrees
May	30	Saturday	Memorial Day; a holiday
June	1	Monday	Last day for written examinations for candidates for all advanced degrees
June	2	Monday	Last day for oral examinations for candidates for all advanced degrees
June	6	Saturday	Last day for filing bond for publication of Doctor's thesis; last day for depositing binding fee for Master's thesis
June	13	Saturday	Spring quarter closes
June	14	Sunday	Baccalaureate service

* First hour classes begin at 8:15 at University Farm.

June	15	Monday	Fifty-third annual commencement
June	22	Monday	Summer Session, first term begins, 8 a.m.
July	4	Saturday	Independence Day; a holiday
July	17	Friday	Last day for filing thesis of candidates at summer convocation
August	1	Saturday	Summer Session, first term closes
August	3	Monday	Summer Session, second term begins
September	5	Saturday	Summer Session, second term closes

* First hour classes begin at 8:15 at University Farm.

GRADUATE WORK IN MEDICINE

ORGANIZATION

The graduate work in medicine in the Medical School and the Mayo Foundation is a part of the work of the Graduate School of the University. Its management is entrusted by the Board of Regents to a committee composed as follows:

The President of the University, Lotus Delta Coffman, Ph.D., LL.D.
The Dean of the Graduate School, Guy Stanton Ford, Ph.D.
The Dean of the Medical School, Elias Potter Lyon, Ph.D., M.D., D.Sc.
The Director of the Mayo Foundation, Louis B. Wilson, M.D.
Clarence Martin Jackson, M.S., M.D., of the Medical School
Jennings C. Litzenberg, B.S., M.D., of the Medical School
Arthur C. Strachauer, M.D., F.A.C.S., of the Medical School
S. Marx White, B.S., M.D., of the Medical School
Donald C. Balfour, M.D., of the Mayo Foundation
William F. Braasch, B.S., M.D., of the Mayo Foundation
Melvin S. Henderson, M.D., of the Mayo Foundation
Leonard G. Rowntree, M.D., D.Sc., of the Mayo Foundation

GENERAL INFORMATION

The graduate work in medicine here outlined is not intended for those seeking brief practitioners' or review courses. Opportunities of this kind are to be found in the bulletin of the Medical School.

History.—In the fall of 1914, the University of Minnesota began graduate work in various fields of medicine and surgery in addition to that already offered for some time in the laboratory branches. The conditions laid down for this work as regards admission, residence, thesis, and examinations were those already applied by the Graduate School in approving all candidates for graduate degrees.

The training of medical graduates for special work in pathology, clinical medicine, and surgery by means of internships, residencies, and assistantships had been developed in the Mayo Clinic at Rochester, until in 1912 definite three-year services in these subjects for graduates in medicine, who had previously had one year's internship in a general hospital, were provided. These services were designated "fellowships," a term intended to cover internships, assistantships, residencies, and so forth. In order to perfect the organization and place the work on a permanent basis, February 9, 1915, a corporation, the Mayo Foundation for Medical Education and Research, was founded by William J. and Charles H. Mayo. On June 9, 1915, the University of Minnesota and the Mayo Foundation for Medical Education and Research entered into an agreement, by the terms of which the funds and income of the Mayo Foundation for Medical Education and Research are devoted, under the direction of the regents of the University of Minnesota, to the promotion of graduate work in medicine and to research in this field. On September 13, 1917, the funds and income of the Mayo Foundation were transferred entirely to the regents of the University.

Purpose.—In an age of specialization with the development of graduate work in all fields and phases of the sciences, letters, and arts, such educational work needs no elaborate justification. In a subject like medicine, intimately connected with established fields of research such as biology, chemistry, anatomy, physiology, pathology, and bacteriology the need for scientific research and for the training of scientific specialists, investigators, and teachers is as great as in any subject, and of as vital importance.

The possibilities of such work hitherto have suffered less from neglect than they have from the lack of organization, standardization, and certification by the educational institutions which have found it possible and advisable to put such applied subjects as agriculture, education, engineering, and commerce upon a scientific basis, and have freely recognized the accomplishments of trained students by the granting of higher earned degrees in these fields. In medicine in the United States, the leading specialists in practice and the trained productive investigators have usually been developed by long years in internships, minor teaching positions, hospital residencies, or personal apprenticeships to other specialists. A few have obtained their

special training in general practice, gradually narrowing to a particular field. Many men in both groups have broadened themselves by visits to other laboratories and clinics for observation and by longer or shorter periods of foreign study. A much larger body of clinical specialists of varying attainments have been developed by so-called postgraduate or polyclinic medical courses or by the simple and convenient method of self-proclamation.

Taken as a whole, by such undirected processes graduate students are apt to waste time on unessentials and to acquire very inadequate knowledge of many of the essentials. In clinical branches such processes fail to provide any sure protection to the public against the untrained specialist or to open any avenue to the public's confidence for the properly trained specialist. And medical education, if it is to advance, must at least be able to supplement a faculty of skilled practitioners with men trained to carry forward the frontiers of medical science.

The objects of this graduate work in medicine are accordingly the training for medical practice of fully equipped and properly certified specialists and of investigators and teachers of medicine.

Standards.—In graduate work in medicine the University of Minnesota, in order to secure results and safeguard scientific standards, adopted those general policies and methods already indicated by the established graduate work in other sciences. The development has depended upon the maintenance of real standards of admission, the supply of qualified advisers to graduate students, the provision of adequate laboratory, clinical, and library equipment, and the institution of rigid tests in course and examinations in residence, with evidence of the power of productive research on the part of the student as evidenced in a thesis.

In doing this work the University of Minnesota is not seeking to multiply the opportunities for securing simply technical training through practitioners' courses. The graduate work is definitely intended to provide opportunities in three years of work for the well-prepared serious-minded student to fit himself in the science, as well as in the art, of some special field of medicine or surgery. Entrance upon the work and continuance in it, as well as the holding of scholarships or fellowships in the Medical School or on the Mayo Foundation, will be strictly conditioned upon evidences of power and growth along scientific lines. The value of technical or mechanical skill as a practitioner or operator has its place, but will be subordinated to, and measured by, the power and product of the brain that guides the hand. From the standpoint of both the University and the prospective student it is highly important that this distinction in purpose be kept clearly in mind.

By the present arrangement of courses in arts, science, and medicine a properly prepared student may enter the University, and in seven years secure the usual doctorate degree in arts, in science, or in medicine. The object of the plan pursued at this University since 1914 is to provide three years of additional work on the basis of the degree of doctor of medicine,

and leading to the special degree of master of science (M.S.) or doctor of philosophy (Ph.D.) in medicine, in surgery, in pathology, etc.

In clinical branches the degree of master of science is intended primarily to indicate scientific proficiency. To be recommended for this degree the candidate must have given evidence by two or three years of residence that he is competent to begin the practice of a clinical specialty in a scientific manner without the supervision of others. The doctorate of philosophy in clinical subjects will be given only to those men who have given evidence not only of proficiency at least equal to that required for the Master's degree, but who in addition present evidence of well-marked ability to advance medical science.

Work in public health.—By the choice of appropriate studies students may prepare themselves to follow various careers in public health work. Graduate students with the proper qualification may prepare themselves to serve as specialists in certain fields of public health work or they may procure a thoro general training with a certain amount of practical experience in public health.

Such undergraduate and graduate students as satisfactorily fulfill the requirements of the University will be granted appropriate degrees.

Further inquiries concerning the above mentioned courses and curricula should be addressed to Dr. H. S. Diehl, Millard Hall, University of Minnesota.

Laboratory equipment.—The laboratory equipment for the prosecution of graduate work in medicine is located in Minneapolis, St. Paul, Rochester, and Pokegama.

The laboratory branches are well housed in excellently equipped buildings on the campus at Minneapolis and at Rochester. Anatomy, chemistry, pathology, and bacteriology are in modern University buildings especially designed for them. Physiology, physiologic chemistry, and pharmacology are located in Millard Hall, a modern building of the best type. The laboratories for experimental medicine and surgery and extensive animal quarters are also in this building. The University museums of anatomy, pathology, and surgery contain a large number of specimens available for teaching purposes.

In Rochester, the laboratories of general pathology, pathologic anatomy, clinical pathology and bacteriology, physiologic chemistry, roentgenology, photography are in the Mayo Clinic Building, as is also the pathologic working museum, which contains over 150,000 specimens. The Institute of Experimental Medicine provides facilities for all experimental work in physiology, pathology, bacteriology, and surgery.

Laboratories of surgical pathology are at St. Mary's, Colonial, Worrell, and Kahler hospitals. The metabolic laboratory is at the Kahler Hospital. Electrocardiographic laboratories are maintained in the Clinic Building and in the Kahler Hospital. A laboratory of physiologic chemistry is at St. Mary's Hospital. A farm for experimental animals is maintained outside the city.

Clinical equipment.—The University owns and controls Elliot Memorial Hospital with its service building. This provides a clinic of 200 beds, and has the accumulated hospital records of ten years. Approximately 100 beds will be added in 1925 by the completion of the George Chase Christian Memorial Cancer Institute and the Todd Memorial Hospital. The Out-Patient Department of the hospital is housed in Millard Hall and received 15,747 new patients and 66,127 patients' visits during the year ending June 30, 1921.

The State Hospital for the Crippled and Deformed at Phalen Park, St. Paul, offers the University full participation in its clinical opportunities.

The city hospitals of Minneapolis and the City and County Hospital of St. Paul, representing in all some 1,400 beds, exhibit every phase of clinical service in their wards and amphitheaters. This material, and also that of the new Miller hospital, St. Paul, is available for graduate work.

In Rochester, St. Mary's, Colonial, Worrell, Curie, Alfred, and Kahler hospitals and the Damon Sanitarium have an aggregate of about 1,500 beds with twelve operating rooms for general surgery and six for diseases of the organs of the special senses. All patients are examined clinically in the Mayo Clinic Building and its annexes. In 1923, 56,320 patients were examined. In addition more than 475,000 clinical histories are on file and available for investigative studies. During 1923, 20,543 operations were performed.

Consent for post-mortems is obtained with about 85 per cent of patients dying in the clinic.

The working museum contains more than 150,000 pathologic specimens. All case histories and specimens are classified and arranged so as to be readily available for scientific research.

Arrangements have been made whereby fellows or other graduate students in medicine may divide their time, part of their work being taken in the Mayo Foundation at Rochester, and part in the Medical School at Minneapolis and St. Paul.

Libraries.—Besides the University Library and the departmental libraries, there are at the disposal of the student the general medical and biological libraries in the new University Library and the Mayo Clinic Building, and the collections of the Hennepin County and Ramsey County Medical Societies. Current issues and complete files of the most important medical periodicals are available either in Minneapolis or Rochester.

Methods of study.—Every attempt is being made to establish the graduate work in medicine on a true University basis. Little class work is done. No short cramming courses are offered. The Mayo Foundation lectures at Rochester and frequent special lectures at the Medical School, are given by men who are enthusiastically interested in their particular topics, but each lecturer presumes that his hearers are already well grounded in the fundamentals of his subject. Attendance at these lectures is purely optional with the graduate student. No quizzes are held and no examinations are given on these lectures. The same is true of the clinical and laboratory

demonstrations and departmental seminars. Everything is done to impress the graduate student that his residence is an opportunity for him to find out things for himself and not a period in which he will be instructed by undergraduate methods. The student's work is carefully graded by his immediate chief, whose duty it is to determine the student's ability by daily intercourse with a smaller number of students rather than by class quizzes and formal examinations. Students holding fellowships who do not evince strong personal initiative will not be recommended for annual reappointment, or may be asked to resign their fellowships before the end of their period of appointment. In the arrangement of work the best opportunities will be consistently given to the best qualified men. Low-grade and mediocre men will not be permitted to continue to fill appointments to the exclusion of high-grade men. Work which receives a grade below B will not be counted for graduate credit in the major field, nor if below C in the minor.

Registration and number of students.—All students entering upon graduate work in medicine will register with the dean of the Graduate School. Students who begin their residence work in Rochester may fulfill the preliminary requirements by registering there with the director of the Mayo Foundation.

The number of graduate students who will be registered for work is determined by the clinical opportunities. This limitation applies to those doing their major work in clinical medicine and surgery and not to those majoring in the laboratory departments.

Tuition.—The tuition fee for the graduate work in clinical medicine and surgery for those not holders of fellowships or otherwise entitled to exemption is $60 per quarter. For students in the fundamental laboratory branches, the tuition fee is $10 per quarter. Extra fees may be charged to cover the cost of materials and supplies for exceptional laboratory experimentation. The fees for graduate work in the Summer Session are stated in the special Summer Session bulletin. Fellows, scholars, and members of the teaching or scientific staff are exempt from tuition.

Fellowships and scholarships.—Teaching fellowships in the Medical School are now established as follows: in surgery, 2; in internal medicine, 2; in obstetrics, 2; in ophthalmology and oto-laryngology, 2; in mental and nervous diseases, 2; and in pediatrics, 3. These include fellowships in the Minneapolis General Hospital. Three fellowships are also available in the University Health Service. They carry a stipend of $600 the first year, $750 the second, and $1,000 the third. These teaching fellows are required to devote their entire time (excepting an annual vacation of three weeks) to graduate work, including a small amount of teaching.

Similar teaching fellowships have been established in the fundamental laboratory department of the Medical School as follows: in anatomy (including histology and embryology), 3; in physiology and physiologic chemistry, 1; in pathology, 1; in pharmacology, 1. These fellowships carry a stipend of $900 the first year, $1,200 the second, and $1,500 the third year.

They require a small amount of teaching, the remainder of the time being devoted to graduate work leading to advanced degrees.

In addition, there are at Minneapolis 5 scholarships, without stipend, carrying free tuition with opportunity for graduate study in any of the clinical departments.

The attention of prospective medical graduate students is also called to the Shevlin Fellowship in medicine yielding $500 and tuition. Applications should be in the hands of the dean of the Graduate School before March 1.

The Mayo Foundation carries the following fellowships: in clinical and experimental surgery, 63; in orthopedic surgery, 6; in ophthalmology, 4; in rhinology and oto-laryngology, 8; in dental surgery, 6; in clinical and experimental medicine, 45; in neurology, 2; in dermatology, 4; in urology, 6; in roentgenology, 4; in pathology, 4; in bacteriology, 2; in chemistry, 2. The fellowships in clinical branches pay $600 the first year, $750 the second year, and $1,000 the third year. The fellowships in pre-clinical branches pay $900 the first year, $1,200 the second year, and $1,500 the third year. They require full time with an annual vacation of two weeks. During residence in a hospital $25 per month is deducted from the stipend for board and room.

Nominations for fellowships on the Mayo Foundation are made each quarter, beginning with July 1, for residence to begin six months later or as vacancies occur. In the Medical School appointments are made as vacancies occur.

The Miller Hospital Clinic, St. Paul, supports four clinical fellowships, one each in surgery, medicine, ophthalmology and oto-laryngology, and obstetrics and gynecology. Appointments are made as vacancies occur. Apply through the Graduate School.

All appointments are made for one year and are renewable annually for a period of three years upon the basis of satisfactory progress in the work pursued. Requests for blanks for application for fellowships and scholarships should be addressed to the dean of the Graduate School, University of Minnesota, Minneapolis, Minnesota, or to the director of the Mayo Foundation, Rochester, Minnesota.

Assistantships.—A few qualified assistants, such as traveling fellows from other universities, officers of the medical corps of the United States Army, Navy, or Public Health Service, et al., designated as special students and not candidates for degrees may be accepted at Rochester in laboratory and clinical branches for short periods. The number is necessarily limited in order not to interfere with the work of the resident fellows. Correspondence concerning this work should be directed to the director of the Mayo Foundation, Rochester, Minnesota.

Several of the departments in the Medical School (including Anatomy, Physiology, and Pathology) have paid assistantships which may furnish means of self-support while the holder is pursuing graduate work. For further information, address the dean of the Medical School.

Clinical and class work for visiting or resident practitioners.—In order that there may be no misunderstanding, it should be stated that the graduate work for a limited number, described above, in no way changes or modifies the opportunities for observation hitherto extended visiting physicians and surgeons by the Mayo Clinic in Rochester, or the arrangements offered in Minneapolis by the Medical School for practitioners who wish to attend such undergraduate medical classes as may be of profit to them without interfering with the regular work of the staff and students of the Medical School. Inquiries concerning these opportunities should be addressed to the dean of the Medical School, Millard Hall, Minneapolis, Minnesota.

Summary of requirements.—The various steps involved in the requirements for the degree of doctor of philosophy (Ph.D.) in any one of the clinical or laboratory departments are briefly summarized on pages 17 and 18. The requirements for the Master's degree (M.A. or M.S.) are also indicated. Further information concerning graduate work in general may be found in the general Graduate School bulletin.

Requirements for advanced degrees in medicine.—1. Selection. In the selection of graduate medical students, and in making appointments to fellowships for medical graduate work, preference will be given, other things being equal, to students who have an unusually good training in the fundamental medical sciences (i.e., anatomy, physiology, pathology, etc.) through which they should make their approach to the specialty which they wish to take as a major subject.

2. Admission. All graduate students are admitted by the dean of the Graduate School. Entrance upon work for the advanced degrees of master of science (M.S.) or doctor of philosophy (Ph.D.) in the clinical departments of medicine is limited to those who have: (a) the Bachelor's degree in arts or science, or its equivalent;* (b) the degree of doctor of medicine from acceptable institutions (i.e., those in Class A of the American Medical Association); and (c) one year's experience as an intern in an approved hospital or as an assistant in a laboratory in an acceptable medical school. In the fundamental laboratory sciences (anatomy, physiology, bacteriology, pathology, and pharmacology) properly prepared students may be admitted without (b) and (c) as candidates for the Master's degree (M.A. or M.S.) or the Doctor's degree (Ph.D.).

3. Licensure. Graduate students working in any field of clinical medicine must be licensed to practice in Minnesota within six months after beginning their work in either the Medical School or the Mayo Foundation.

Upon entrance to the Graduate School, the candidate, with the approval of the dean, will select his adviser in the field of his major work. With the approval of his adviser and the dean, he will outline a study program for the year, and if possible for the period of residence.

* Students who have completed at least two years of pre-medical collegiate work, making an equivalent of the seven years combined Arts-Medicine Course at the University of Minnesota, are eligible for admission as graduate students.

The study program for the entire three years must be submitted at the beginning of the second year. This program requires approval of the student's adviser, by the dean, and by the Medical Group Committee.

4. Residence. For the Doctor's degree (Ph.D.) at least three full years of successful graduate study are required, including certain special requirements noted below. For the Master's degree (M.S.) in clinical subjects, two or three years are required. For the Master's degree in the laboratory sciences a minimum of one year of residence is required.

5. Language requirements. A reading knowledge of French and German in the field of the candidate's major must be certified by the professors in charge of these languages at least one year before the Doctor's degree is conferred, and before admission to the preliminary examination. The candidate's adviser or his representative is expected to attend this examination and to furnish appropriate literature for the test. For the Master's degree in the laboratory sciences, a reading knowledge of one foreign language is also required, which must be certified before the end of the second quarter of the year in which the candidate expects to present himself for the degree. For the Master's degree (M.S.) in the clinical branches, the language certificate is optional.

6. Minor. With the approval of his adviser and the dean of the Graduate School, each student upon entrance selects a minor, which must be logically related to his major subject, and (for the Doctor's degree) must be completed by the end of the second year. The minor is preferably a laboratory subject in some other department, and should amount to not less than one sixth of the total work for the degree. At least one sixth of the work offered for the degree in a clinical subject should consist of graduate work in the fundamental laboratory branches, which will serve as a basis for the proposed clinical specialization. This fundamental work should be concentrated in the first part of the course so far as possible. The final examination in the minor for the Doctor's degree is included in the preliminary examination, as noted below. For the Master's degree no special examination is required in the minor, aside from the usual course examinations,

7. Major. The major is that department in which the student desires to specialize. Together with the thesis, it should occupy at least two thirds of the total work for the degree. At least one year before attaining the Doctor's degree, the following procedure is required in order that the candidate may become eligible for the preliminary examination. In addition to the completion of the minor work and of the language requirement, he must have the written approval of the department committee (which includes the graduate faculty members) of the major subject. The statement of the department committee should include the subject of the special problem for the thesis, and should certify as to the ability of the candidate to meet all requirements for the degree sought. It should be based on the quality of the candidate's daily work in residence.

8. Certificate of proficiency. Each candidate in a clinical field must have a certificate of proficiency signed by all members of the faculty with whom he has served, stating that in their opinion he is competent to begin the practice of medicine in his major field in a scientific manner without the supervision of others.

9. Admission to candidacy. For the Master's degree, students who have met the language requirement, whose daily work in residence as indicated by quarterly grades has been satisfactory, and whose thesis subject has been properly approved, are admitted to candidacy at the end of the second quarter by vote of the Executive Committee of the Graduate School. For the Doctor's degree, the student is required to pass a preliminary examination, as noted below, before admission to candidacy.

10. Preliminary examination. At least one calendar year before the Doctor's degree is conferred, a preliminary examination of the student shall be given by a committee appointed by the dean and including the student's adviser as chairman, a representative of the Medical Graduate Committee (other than the adviser), the head of his major department, a representative of the minor, and such additional members as the dean may consider necessary. Certificates of proficiency in French and German, completion of the minor work, and the recommendation of the major department shall be required before admission to this examination. The examination is in addition to the usual course examinations. It shall cover the graduate work previously taken by the student, *and may include any work fundamental thereto.* The field of the candidate's specialization and the thesis are reserved for the final examination. The examination is both oral and written, the latter being arranged by faculty representatives from both Minneapolis and Rochester. Only after the successful completion of this examination may the student be enrolled as a candidate for the Doctor's degree. Students failing to pass this preliminary examination shall not be re-examined until at least one quarter has passed.

11. Thesis. Each candidate for an advanced degree (Master's or Doctor's) must submit a thesis. For the Master's degree, the subject of the thesis should be filed with the dean of the Graduate School by November 15. The subject must be approved by the adviser and by the Medical Graduate Committee. The topic should be within the field of the major, and the thesis should represent approximately half of a year's work of the student. The thesis must be written in acceptable English. It must show ability to work independently and give evidence of power of independent thought both in perceiving problems and in making satisfactory progress toward their solution. Familiarity with the bibliography of the special field and correct citation of authorities are expected.

The Master's thesis must be typewritten in triplicate, one copy on a special form of linen stock, the other two as carbon copies. Samples of the paper required should be examined in the dean's office. The three copies of the thesis must be filed in the dean's office not later than six weeks before graduation. The thesis will be examined by a committee appointed by the

dean, on recommendation of the Medical Graduate Committee. Unanimous approval by the thesis committee is necessary for the acceptance of the thesis. If the thesis is accepted, the candidate must deposit with the registrar, at least one week before commencement, the sum of one dollar for binding one copy of the thesis, which will be cataloged and deposited in the University Library.

For the Doctor's degree, a more elaborate thesis is required. The subject is to be stated in the written department recommendation, which precedes the preliminary examination at the end of the second year. The accumulation of material for the thesis should be started much earlier. The thesis must give evidence of originality and power of independent investigation. It must embody results of research forming a real contribution to knowledge and must exhibit a mastery of the literature of the subject and a familiarity with the sources of knowledge. The matter must be presented with a fair degree of literary skill. The kind of work required in theses for advanced degrees in medicine is exemplified in the volume, *Papers from the Mayo Foundation and the Medical School,* published by W. B. Saunders Company, Philadelphia, 1921.

The thesis must be typewritten in triplicate, to facilitate reading by the thesis committee. The three copies must be filed in the dean's office not later than six weeks before graduation together with a summary or abstract. The dean will appoint a thesis committee with the student's adviser as chairman. Unanimous approval by this committee will be necessary for the acceptance of the thesis. If the thesis is accepted, the candidate must deposit with the registrar, not later than one week before commencement, a sufficient bond to cover the costs of printing as laid down in the regulations adopted June 12, 1922. A copy will be furnished on request.

12. Final written examination. In addition to the usual course examinations in all subjects where such are given, the candidate for the Master's degree must pass a final written examination in the field of the major. (No *special* final examination is required in the minor.) The final written examination will be held not later than four weeks before commencement. It is given by the members of the graduate faculty in the major department, the adviser acting as chairman. This examination shall cover all the work done in the major, and may include any work fundamental thereto.

For the Doctor's degree, a final written examination in the major subject is similarly given, after the thesis is presented and at least four weeks before commencement.

13. Final oral examination. If all other requirements for the degree have been met, including the final written examination and the acceptance of the thesis, the final oral examination will be held not less than two weeks before commencement.

For the Master's degree, the adviser will act as chairman of the examining committee, which will include all the instructors with whom the student has taken work, the thesis committee, and ex-officio, the head or chairman of the department in which the major work is done. Any mem-

ber of the graduate faculty may attend as a visitor, and written notice shall be sent by the chairman of the committee to all members of the graduate faculty in the major and minor departments. The final oral examination will cover all the work offered for the degree, and may include other work fundamental thereto. All final examinations for the higher degrees in medicine will include questions on the history of medicine with special reference to the candidate's major field. At the close of the examination, the committee will vote upon the candidate, taking into account all of his work. A majority vote is required for approval.

For the Doctor's degree, the committee conducting the final oral examination will consist of the adviser as chairman, of a majority of the members of the graduate faculty in the major department, and of at least three other members of the graduate faculty appointed by the dean. At least one member of this committee shall be from a group other than the one in which the major department is included. This examination is to cover the special field of knowledge represented by the major work, including the thesis problem, and shall not exceed three hours. The date of the final oral examination for the doctorate shall be publicly announced, and the examination shall be open to any member of the graduate faculty. Upon completion of the examination, a formal vote of the committee shall be taken and an affirmative vote of at least two thirds of the members shall be necessary for recommendation of the candidate for the degree.

14. Recommendation by the faculty. The dean will report to the graduate faculty the names of those who have completed the requirements for the Master's and Doctor's degrees, and those duly approved will be recommended by the faculty to the Board of Regents of the University. Unless excused by the dean of the Graduate School and the president of the University, all candidates are required to be present at commencement when the degrees are conferred.

A tabular summary of requirements for the Master's degree follows:

Work	Under the Direction of	Date
Program, major and minor	Adviser and dean of the Graduate School	On entrance.
Approval of thesis subject.	Adviser and group committee	November 15.
Language requirement	Adviser and language department	Before close of second quarter.
Approval of candidacy	Executive committee	Beginning of third quarter.
Filing of thesis	Dean of the Graduate School.	Six weeks before graduation.
Examination of thesis	Thesis committee	Before admission to final oral examination.
Final written examination in major	Major department members of the graduate faculty	Not later than four weeks before commencement and before final oral.
Final oral examination on all work	Thesis committee; all instructors; head of major department	Not later than two weeks before commencement
(Course examinations as required at the usual time.)		
Fee for binding thesis	Registrar	One week before commencement.

(For the Master's degree in clinical subjects, the dates refer to the last year.)

See tabular summary of requirements for the Doctor's degree below.

Work	Under the Direction of	Date
First Year		
Major	Adviser and dean of Graduate School	
Minor		
Second Year		
Tentative program of entire second and third years' work	Adviser, Medical Graduate Committee, and dean of Graduate School	Before beginning work of second year.
Major, including thesis	As for tentative program	
Minor	Adviser and minor department	Before admission to preliminary examination.
Language	Adviser and language department	One calendar year before degree is to be conferred.
Recommendation	By major department	
Preliminary examination	Special committee	
Third Year		
Major, including thesis	Adviser, Medical Graduate Committee, and dean of Graduate School	
Filing of thesis	Dean	Six weeks before graduation.
Approval of thesis	Thesis committee	Before admission to final oral examination.
Final written examination in major	Major department members of the graduate faculty	Four weeks before commencement and before final oral examination.
Final oral examination	Adviser, majority of members of major department, and other members appointed by dean of Graduate School	Not later than two weeks before commencement.
Bond for publication of thesis	Registrar	Not later than one week before commencement.

DESCRIPTION OF COURSES

The various divisions are grouped under the following departments:

1. Anatomy (including histology and embryology).
2. Physiology and Physiologic Chemistry.
3. Pharmacology and Therapeutics.
4. Pathology.
5. Bacteriology and Immunology.
6. Medicine (including general medicine, dermatology, and mental and nervous diseases.
7. Pediatrics.
8. Surgery (including general surgery, experimental surgery, orthopedic surgery, urology, and dental surgery).
9. Obstetrics and Gynecology.
10. Ophthalmology and Oto-Laryngology.
11. Radiology.
12. Preventive Medicine and Public Health.

In each department the work is described in two separate groups: A—that given in the Medical School, and B—that given in the Mayo Foundation. All courses are numbered for purposes of registration. The courses given in the Mayo Foundation are given the special prefix M. The suffixed f, w, s, and su indicate fall, winter, spring, and summer quarters, respectively. The hyphen denotes courses continuous through the quarters indicated. Suffixed letters separated by commas indicate the repetition of the course in the corresponding quarters. The courses numbered between 100 and 200 are less advanced in character, and in some cases are open as electives to properly qualified undergraduates. The courses above 200 are primarily graduate in character, of the more advanced or research type.

ANATOMY

A. COURSES OFFERED AT THE MEDICAL SCHOOL

Professors Clarence M. Jackson, M.S., M.D., John B. Johnston, Ph.D., Thomas G. Lee, B.S., M.D., Richard E. Scammon, Ph.D.; Associate Professor Andrew T. Rasmussen, Ph.D.

The Institute of Anatomy offers excellent facilities to students who wish to take advanced work or to pursue investigations in anatomy.

The prerequisite work for all students who desire a major or minor in the Department of Anatomy includes general zoology (animal biology), 6 semester hours, and advanced zoology or elementary courses in anatomy (including histology, embryology, and neurology), 6 semester hours. In addition, each student who desires a major in anatomy must have had the elementary courses in that branch of anatomy in which he desires to specialize—gross anatomy, histology, embryology, or neurology. Students majoring in clinical subjects who desire a minor in anatomy must have had the courses in anatomy usually required of medical students (including Courses

103, 107, and 111). A reading knowledge of either French or German is required of students who desire a major in anatomy for the Master's degree, and a reading knowledge of both French and German is required of those who are candidates for the Doctor's degree.

Courses for Undergraduate and Graduate Students

103s,su. Human Histology. A microscopic study of the various tissues and organs. Prerequisites: Anatomy 5-6, or equivalent. 9 credits. Mr. Scammon.

107s,su. Human Embryology. The development of the human body. Prerequisites: Anatomy 5-6, or equivalent. 6 credits. Mr. Scammon.

111f,su. Human Neurology. A study of the gross and microscopic structure of the central nervous system and sense organs of man. Prerequisites: Anatomy 103 and 107, or Animal Biology 9-10. 6 credits. Mr. Rasmussen.

112f,w,s. Comparative Neurology of Vertebrates. Prerequisites: Anatomy 111, or Animal Biology 27. Mr. Johnston.

121f,s. Anatomical Technique. Lectures and laboratory work upon the principles and practice of microtechnique. Prerequisites: Anatomy 103, or Animal Biology 9-10. 3 credits. Dr. Lee.

129f-130w-131s. Topographic Anatomy. Based upon a study of cross sections of the human body. Lectures and laboratory work. Prerequisites: Anatomy 5-6-7. 2 credits (or more) each quarter. Dr. Jackson.

133f,su. Anatomy of the Fetus and Child. A survey of prenatal and postnatal development. Fourth, fifth, or sixth year medical, or graduate students. Limited to sixteen students. Prerequisites: Courses 5-6-7, 107. 3 credits. Mr. Scammon.

134w. Anatomy of the New-Born. A detailed laboratory study of the anatomy of the new-born. Fourth, fifth, or sixth year medical, or graduate students. Prerequisites: Course 133, or equivalent. 3 credits. Mr. Scammon.

135f,su. Physical Development of Childhood. Lectures, with study of illustrative material. Primarily for students in the College of Education; open to medical or graduate students by permission of instructor. 2 credits. Mr. Scammon.

137f-138w-139s-140su. Implantation and Placentation. A study of the implantation of the ovum, the formation of the placenta, and the earliest stages of development in man and mammals. Prerequisites: Anatomy 102 or equivalent. 3 credits (or less). Dr. Lee.

149w. Experimental Neurology. A study of the morphology of the central nervous system by experimental methods. Prerequisites: Course 111. 3 credits (or more). Mr. Rasmussen.

153f-154w-155s-156su. Advanced Anatomy. Individual topics for advanced work in gross anatomy, histology, embryology, or neurology will be assigned to students who have completed the elementary courses in the corresponding subjects. Special courses are arranged for clinical gradu-

ate students. Dr. Jackson, Mr. Johnston, Dr. Lee, Mr. Scammon, Mr. Rasmussen.

157f. Histology and Embryology of the Eye, Ear, Nose, and Throat. 3 credits. Mr. Scammon.

160f-162w-163su. Seminar in Growth of Children. A study with graphic analysis of data on physical development of children of school age. Prerequisites: Course 135, or equivalent. Hours and credits to be arranged. Mr. Scammon.

Courses Primarily for Graduate Students

201f-202w-203s-204su. Research in Anatomy. Qualified students may undertake the investigation of problems in anatomy, including histology, embryology, and neurology. Special facilities are offered to graduate students in the clinical departments for work upon problems in applied anatomy. Dr. Jackson, Mr. Johnston, Dr. Lee, Mr. Scammon, Mr. Rasmussen.

205f-206w-207s. Anatomical Seminar. Reviews of the current literature and discussion of research work being carried on in the department. Reading knowledge of French and German required. Dr. Jackson.

B. COURSES OFFERED IN THE MAYO FOUNDATION (ROCHESTER)

As yet no facilities are provided for advanced work in anatomy in the Mayo Foundation. Mayo Foundation fellows desiring to take such work for one or more quarters may avail themselves of the opportunities at the Medical School.

Limited facilities for dissection under the supervision of Dr. Thomas Byrd Magath are provided in the Mayo Foundation for fellows who desire a general review of anatomy.

PHYSIOLOGY AND PHYSIOLOGIC CHEMISTRY

A. COURSES OFFERED AT THE MEDICAL SCHOOL

Professors Elias P. Lyon, Ph.D., M.D., Jesse F. McClendon, Ph.D., Fred H. Scott, Ph.D., M.B., D.Sc.; Associate Professors Richard O. Beard, M.D., Chauncey J. V. Pettibone, Ph.D.; Assistant Professor Esther Greisheimer, Ph.D., M.D.; Instructor William W. Swanson, B.A., M.S.

The Department of Physiology is well equipped for the various types of physiologic investigation. The library facilities are good.

For a minor or major in physiology, good courses in general zoology, general chemistry, organic chemistry, and college physics, are prerequisites. Physical chemistry is desirable.

For a minor or major in physiologic chemistry, general chemistry and organic chemistry are prerequisite, and physical chemistry, quantitative chemistry, and biology are desirable.

In addition, each student majoring in physiology or physiologic chemistry must have had the general courses, Physiology 100, 101, 103, 104, or the equivalent.

Students majoring in clinical subjects, and who desire a minor in physiology or physiologic chemistry, must have had the courses in these branches usually required of medical students.

A reading knowledge of German or French is required of candidates for the Master's degree in this department, and reading knowledge of both French and German, of candidates for the Doctor's degree.

A. COURSES OFFERED AT THE MEDICAL SCHOOL

100w,su-101s,su. Physiologic Chemistry, The components of the animal body; foods, digestion, the excreta, and metabolism. Prerequisite: organic chemistry. 198 hours; 12 credits. Dr. McClendon, Dr. Pettibone.

103f,su. Physiology of Muscle, Nerve, Blood, Circulation, and Digestion. Fourth year medical students and others. Prerequisites: organic chemistry and animal biology. 121 hours; 8 credits. Dr. Lyon, Dr. Scott, Dr. Greisheimer, and assistants.

104w,su. Physiology of the Nervous System and Special Senses; Respiration, Metabolism, Nutrition, and Excretion. Fourth year medical students and others. Prerequisites: organic chemistry and animal biology. 121 hours; 8 credits. Dr. Lyon, Dr. Scott, Dr. Greisheimer, and assistants.

108f. Seminar in Physiologic Optics. For graduate and medical students. 22 hours; 2 credits. Dr. Lyon.

110f. Physiologic Optics. A laboratory course. For graduate and medical students. 33 hours; 1 credit. Dr. Lyon.

113f,w,s,su. Problems in Physiology. Arranged by instructors with qualified students. Each student will be assigned a topic for special laboratory study, leading in some cases to original investigation. Conferences and readings. Prerequisites: Course 103-104 or equivalent. 66 hours; 3 credits or arrange. Dr. Lyon, Dr. Scott, Dr. Greisheimer.

115s. Applied Physiology. The application of physiology as a basis for interpretation of symptoms and signs of abnormal function. Three lectures weekly. 3 credits. Dr. Greisheimer.

131w. Advanced Physiology of Muscle, Blood, Circulation, and Digestion. Alterations due to physiologic conditions. Prerequisite: Physiology 103. 66 hours; 3 credits. Dr. Scott.

153f,w,s,su. Advanced Physiologic Chemistry. Course arranged by instructors with qualified students for special work. May be taken one or more quarters. Prerequisite: Course 100-101. Hours and credits arranged. Dr. McClendon, Dr. Pettibone.

155f. Physical Chemistry of Vital Phenomena. The application of electric conductivity; osmotic pressure; freezing points; hydrogen ion concentration; negative osmose; colloid chemistry and surface tension to physiological problems. Prerequisite: Course 100-101. 22 hours; 2 credits as lectures only. However, the student may take laboratory in addition under Course 153. Dr. McClendon.

162w. Chemical Analysis of Blood. The most recent methods in chemical analysis of blood. Limited to twelve students. Prerequisite: Physiology 101. 66 hours; 3 credits. Dr. Swenson.

163s. Metabolism. Lectures and laboratory work on special phases of metabolism. Lectures may be taken alone; number of students unlimited; laboratory course limited to ten students. Prerequisite: Physiology 101. 66 hours; 3 credits. Dr. Pettibone.

201f,w,s. Seminar in Physiology and Pharmacology. For instructors and advanced students. 11 hours; 1 credit. Dr. Hirschfelder, Dr. Lyon, and staff.

203f,w,s,su. Research in Physiology. Hours and credits arranged. Dr. Lyon, Dr. Scott, Dr. Greisheimer.

205f,w,s,su. Research in Physiologic Chemistry. Hours and credits arranged. Dr. McClendon, Dr. Pettibone.

B. COURSES OFFERED IN THE MAYO FOUNDATION

Professor Edward C. Kendall, Ph.D.

Most of the opportunities for graduate work in physiologic chemistry in the Mayo Foundation are in connection with the departments of Medicine, Pediatrics, and Clinical Pathology, for which see announcements under these several departments. In addition to these, advanced work is offered in the Department of Biochemistry to a limited number of well-prepared fellows.

M251f,w,s,su. Physiologic Chemistry. Research work in problems related to metabolism; includes training in the use of methods of organic and inorganic analysis. Dr. Kendall, Mr. Osterberg.

M263f,w,s,su. Medical Chemistry. Chemical and metabolic studies (in nephritis, acidosis, diseases of the liver and of the blood) together with research work along biochemical and metabolic lines. Dr. Rowntree, Dr. Keith. (See Department of Medicine.)

M254f,w,s,su. Medical Chemistry. Chemical and metabolic studies in diabetes, together with research work along biochemical lines. Dr. Wilder. (See Department of Medicine.)

M255f,w,s,su. In connection with various medical departments, special courses in biochemistry may be taken—(a) In the metabolic laboratory at the Kahler Hospital. (b) In the clinical chemical laboratories at the clinic. (c) In the medical laboratory at St. Mary's Hospital.

PHARMACOLOGY AND THERAPEUTICS

A. COURSES OFFERED AT THE MEDICAL SCHOOL

Professor Arthur D. Hirschfelder, B.S., M.D.; Associate Professor Edgar D. Brown, Phm.D., M.D.

The laboratories of the Department of Pharmacology are excellently equipped for the study of both the chemical properties of drugs and their actions upon the functions of the living organs and tissues. They are well equipped with chemical apparatus for the synthesis of new medicinal compounds, for studies upon the detection, isolation, and estimation of poisons

in toxicology and for the isolation of medicinal plant constituents. By the co-operation of the clinical departments, special studies may be made of the action of drugs, old and new, upon patients in the University and allied hospitals.

Opportunities are afforded for the special study of the actions of drugs which are used in each of the clinical specialties and the literature bearing upon them. As the needs of each graduate student are individual in this regard, these studies are taken up by conference, seminar, and experiments specially devised to meet each case.

101w. Introduction to Pharmacology. The principles underlying the structure, physicochemical properties, physiologic, therapeutic, and toxic action of substances, natural or synthetic, used as medicines. At least one quarter of physiology is prerequisite. 22 hours; 2 credits. Dr. Hirschfelder, Dr. Brown.

102s. General Pharmacology. A study of the most important drugs used in medicine with consideration of their chemical properties, actions on the normal and abnormal body, modes of administration, preparations, dosages, etc. 132 hours; 6 credits. Dr. Hirschfelder, Dr. Brown.

105su,w. General Pharmacology, in continuation. Lectures on narcotic, saporific, analgesic, antipyretic drugs, remedies used for the treatment of arthritides, etc. Writing of prescriptions for the drugs used. 33 hours; 3 credits. Dr. Hirschfelder, Dr. Brown.

105f. General Pharmacology, in continuation. Lectures on the salts of the metals, antiseptics, antisyphilitic drugs, chemotherapy, etc. 33 hours; 3 credits. Dr. Hirschfelder, Dr. Brown.

109f,w,s,su. Pharmacological Problems. Special investigations and experimental study of one or more of the following topics: anesthetics; circulatory stimulants and depressants; drugs acting upon the kidneys; urinary antiseptics; poisons and antidotes; effects of common harmless drugs; internal secretions; action of drugs upon parasites, tumors, etc. Hours and credits by arrangement. Dr. Hirschfelder, Dr. Brown.

110f,w,s. Poisons. Their detection, actions, and antidotes. 66 hours; 2 credits. Dr. Brown.

201f,w,s. Seminar in Physiology and Pharmacology. Reviews of recent literature. 11 hours; 1 credit. Staff.

203su,f,w,s. Research in Pharmacology. Open to graduate and advanced students. Hours and credits arranged. Dr. Hirschfelder, Dr. Brown.

204f,w,s. Advanced Pharmacology. With collateral readings. Limited to six advanced students. 11 hours; 1 credit. Time to be arranged. Dr. Hirschfelder, Dr. Brown.

205f,w,s. Chemical Pharmacology. Collateral reading and discussion of the relation of chemical structure to pharmacological action. Limited to four graduate students. 11 hours; 1 credit. Hour and registration to be arranged. Dr. Hirschfelder, Dr. Brown.

B. COURSES OFFERED IN THE MAYO FOUNDATION

All opportunities for advanced work in pharmacology and therapeutics offered in the Mayo Foundation are in connection with the departments of Medicine, Pediatrics, and Surgery. See announcements of these departments.

PATHOLOGY

A. COURSES OFFERED AT THE MEDICAL SCHOOL

Professor Elexious T. Bell, B.S., M.D.; Assistant Professors Benjamin J. Clawson, M.D., M.A., Ph.D., James Shearer McCartney, M.D.; Instructor John Franklin Noble, M.D.

Graduate students who desire to take their major or minor work in pathology must present credit in the following subjects: physics, 8 credits; general and organic chemistry, 12 credits; zoology, 6 credits; and a reading knowledge of German and French.

In addition, students who elect their major work in pathology must present credits for the equivalent of the first two years' work of the Medical School of this University.

104f,w,s,su. Autopsies. The average number of post-mortems available is about 65 per month or about 800 per year. Graduate students take part in post-mortems, prepare post-mortem records, and make microscopic examination of various organs and tissues. The student may attend as many post-mortems as his other work allows.

106f,w,s,su. Pathologic Technique. In this course the students may learn to prepare frozen sections from fresh tissues or tissues fixed in formalin. Instruction is also given in methods of preparing paraffin sections. There is also opportunity to learn some special staining methods. Hours to be arranged.

107f,w,s,su. Applied Pathology. In this course the students may study the routine surgical specimens, of which about nine hundred a year are available. The material of the previous years is also available in the form of operation records and microscopic sections. Students who have access to surgical material from private hospitals in Minneapolis and St. Paul may prepare the clinical records of the case, and study the specimens grossly and microscopically under supervision. Hours to be arranged.

108f,w,s,su. Diagnosis of Tumors. In this course one two-hour period per week is devoted to the study of clinical cases which are discussed by the pathologist and the surgeon. Subsequent operative findings and the results of treatment are also reported. From four to eight clinical cases are demonstrated each period. One three-hour period per week is devoted to systematic laboratory work in the study of gross and microscopic preparations of tumors. Five hours per week. Dr. Bell, Dr. Cameron, Dr. McCartney.

109f,w,s,su. Clinical Pathologic Conference. The students are provided one week in advance with the clinical history of a case. The case is fully discussed clinically. The students are expected, in so far as possible,

to predict the post-mortem findings from the clinical data. A full post-mortem report is then given, including the gross and microscopic demonstrations of the lesions that were found. Two hours per week. Staff of the Department of Pathology with Dr. Fahr or Dr. Cameron.

111s. Neuropathology. This course comprises a thoro study of the various lesions of the nervous system. One or two hours a week are devoted to lectures and recitations. The rest of the time is spent in the laboratory and lesions are studied both grossly and microscopically in connection with the clinical phenomena presented by the patients. Special emphasis is given to abnormal physiology. Six hours per week. Dr. J. C. McKinley.

112w. Pathology of Diseases of the Eye, Ear, Nose, and Throat. This course consists of lectures, demonstrations, and laboratory work on diseases of these special organs. A fair number of museum preparations is available. Three hours per week. Dr. W. E. Camp.

113f,w,s,su. Voluntary Assistantship in Pathology. Graduate students or undergraduates during the student interneship period may receive credit for full time work in pathology. Such students devote their time to the study of post-mortem and operative material. They are required to attend as many post-mortems as possible. They may also act as voluntary teaching assistants if they wish.

115s. Histopathology of the Skin. This course consists of lectures and microscopic studies of the various skin diseases. Very few gross specimens are available but representative clinical cases are frequently brought over from the University dispensary. Dr. H. E. Michelson.

201f,w,s,su. Research. Graduate students, of the necessary preliminary training, may elect research, either as majors or minors in pathology. Hours and credits to be arranged.

B. COURSES OFFERED IN THE MAYO FOUNDATION

Professors Louis B. Wilson, M.D., Harold E. Robertson, B.A., M.D., D.Sc., William C. MacCarty, M.S., M.D., Frank C. Mann, M.A., M.D., Arthur H. Sanford, M.A., M.D.; Associate Professors Albert C. Broders, M.D., M.S. in Pathology, Thomas Byrd Magath, M.S., M.D., Ph.D.

Opportunities for advanced work in pathology are offered in five different sections in the Mayo Foundation, as follows:

1. Clinical Pathology. Dr. Sanford, Dr. Magath.

Work in this section includes diagnostic work in the laboratories of gastrology, urinalysis, serology, bacteriology, parasitology, and clinical chemistry. The total number of examinations in these laboratories in one year is considerably more than 200,000. Of this number about 35,000 are Wasserman tests. Graduate students in these clinical laboratories may learn the technique of accepted diagnostic procedures. Special attention is called to the opportunity for experience and research in serology under the direction of Dr. Sanford, and for training and research in parasitology under the direction of Dr. Magath. This work may be taken either as a major, or fulfilling the conditions of a minor.

For opportunities in bacteriology offered in the clinical laboratories see announcements of this department.

2. Pathologic Anatomy. Dr. Robertson.

Post-mortem examinations are made in sufficient numbers to provide active work for approximately ten fellows at a time.

The service is designed to permit the laying of a thoro foundation in the general principles of pathologic anatomy. Each fellow serves as junior assistant three months and senior assistant three months, during which time he takes part in the routine of post-mortem examinations and studies the microscopic sections of these post-mortems, and engages in weekly conferences and seminars concerned with general and special subjects in pathologic anatomy. Each fellow is expected to take up some special line of work upon which he reports to the group. Microscopic and gross demonstrations are held at frequent intervals and the work throughout is intimately supervised. Collateral reading and study are encouraged and oftentimes the foundation may be laid for thesis subjects or special lines of research. In connection with this work there is a well-organized museum for both display and study purposes. Fellows are aided and encouraged in the use of this museum to further their knowledge.

3. Surgical Pathology. Dr. MacCarty, Dr. Broders.

The laboratories of surgical pathology in St. Mary's, Colonial, Kahler, and Worrell hospitals receive immediately all tissue removed at operation. It is studied both grossly and microscopically. The minimum service in this work is six months, during which time opportunity is given to study a large amount of operative material. Besides the routine diagnostic work fellows are expected to begin to carry along in these laboratories some piece of pathologic research.

4. General Pathology. Dr. Wilson.

The work in this section consists entirely of individual research work. The minimum service in this section is six months.

5. Experimental Pathology. Dr. Mann.

Work in this section consists of research in problems of pathology involving the use of experimental animals.

M151f,w,s,su. Parasitology. Routine clinical and special research in parasitology, examination of stools, study of internal parasites. Dr. Magath.

M152f,w,s,su. Clinical Pathology. Making and examination of cultures, preparation and administration of autogenous vaccines, Wasserman tests, special clinical and laboratory methods including hematology and serology and opportunity for research. Dr. Sanford.

M153f,w,s,su. Laboratory Demonstration of clinical laboratory methods. Dr. Sanford, Dr. Magath.

M154f,w,s,su. Clinical Chemistry. Studies in the newer methods of blood chemistry. Dr. Sanford, Dr. Magath.

M155f-w,w-s,s-su,su-f. Necropsy Service. Junior assistant three months; senior assistant three months; demonstrations in clinico-pathologic conferences; microscopic examination of fixed tissues removed at necropsy and operations. Weekly seminar. Dr. Robertson.

M156f,w,s,su. Laboratory Demonstration of tissue removed at necropsy and operation. Dr. Robertson.

M157f-w,w-s,s-su,su-f. Surgical and Fresh Tissue Pathology. The diagnosis of surgical specimens (gross and microscopic) with immediate correlation with all clinical data. (Daily demonstrations and discussions.) Dr. MacCarty, Dr. Broders.

M158f,w.s,su. Studies of Tumor Cells with Vital Stains. Dr. MacCarty, Dr. Broders.

M251f,w.s,su. Research Studies in Special Pathology; special pathology of various organs; gross and microscopic study of lesions; research work on assigned problems in the several fields. Dr. Wilson.

M252f,w.s.su. Cancer Research. Cytologic, histogenetic, and statistical. Dr. MacCarty, Dr. Broders.

M253f,w.s.su. Research Studies upon clinico-pathologic standardization. Dr. MacCarty, Dr. Broders.

M254f,w.s.su. Research Work on assigned problems in experimental pathology. Dr. Mann.

M255f,w,s.su. Research Work in clinical pathology. Dr. Sanford, Dr. Magath.

BACTERIOLOGY AND IMMUNOLOGY

A. COURSES OFFERED AT THE MEDICAL SCHOOL

Professor Winford P. Larson, M.D.; Associate Professor Arthur R. Henrici, M.D.; Assistant Professor Robert G. Green, B.S., M.D.

101f,su. Special Bacteriology for Medical Students. The study of pathogenic bacteria, especially in relation to definite diseases; bacteriological methods in clinical diagnosis; principles of infection and immunity. with practical application of serum reactions. Fourth year medical students and others. Prerequisite: general bacteriology. 66 hours; 4 credits. Dr. Larson and assistants.

105f. Food Bacteriology. The decay, fermentation, and putrefaction of foodstuffs; molds; canning; bacterial food-poisoning; bacteriology of the cleansing processes. Prerequisite: general bacteriology. 44 hours; 3 credits.

114s. The Higher Bacteria. Study of morphology, cultivation, and classification of actinomycetes, yeasts, and molds. Study of the mycoses. Prerequisites: general and special bacteriology. 44 hours; 3 credits. Dr. Henrici.

116w. Course in Immunity. Laws of hemolysis. Quantitative relationship between antigen and antibody. Wasserman reaction. Opsonins. Vaccines. Precipitin reaction. Blood grouping. Abderhalden reaction. Anaphylaxis. Fifth and sixth year medical students. Limited to ten students. 44 hours; 3 credits. Dr. Larson.

117s. Pathogenic Protozoa. Study of parasitic Protozoa in men, including spirochaets; their morphology and life history; intermediate hosts as agents in the spread of disease; cultural methods. Prerequisites: general and special bacteriology; Animal Biology 45 and 107. 44 hours; 3 credits. Dr. Larson.

118f. Morphology and Taxonomy of Bacteria. Cytology of bacteria; their origin and systematic position; consideration of morphological, biochemical, and immunological characters as data for classification; variations and mutations in bacteria; the biometrical method as applied to bacteriology. Prerequisites: general and special bacteriology. 44 hours; 3 credits. Dr. Henrici.

119f. Bacteriological Chemistry. Microphysics of bacteria. Inorganic and organic constituents. Permeability of cells. Metabolism of bacteria. Enzymes of micro-organisms. Bacterial activity in the gastro-intestinal tract. Pigments. Prerequisites: general and special bacteriology; physiologic chemistry or phytochemistry. 66 hours; 4 credits. Dr. Green and assistant.

120w. Continuation of 119f. Bacteriolysants. Protein poisons. Bacterial toxins. Phagocytosis, application of quantitative laws to disinfection, hemolysis and immune reactions. Cataphoresis. Stability of bacterial suspensions. Protein chemistry of immune reactions. Dr. Green.

125w. Industrial Bacteriology. Bacteriology of foods, fermentations, enzyme production, commercial sterilization. Bacteria in chemical industries, manufacture of acetone, butyl, alcohol, acetic, lactic, and sulphuric acids, leather and sugar industries.

150f-151w (or 150w-151s). Advanced Bacteriology. An advanced course giving additional work in bacteriology and the opportunity of working out special problems. Limited to ten students. 44 hours; 3 credits. Dr. Larson, Dr. Henrici.

201. Research in Bacteriology. Graduate students of the necessary preliminary training may elect research, either as majors or minors, in bacteriology. Hours and credits arranged. Dr. Larson, Dr. Henrici.

203. Seminar in Bacteriology. One credit.

205s. Bacteriological Survey. A survey of original literature in bacteriology and related sciences. 3 credits. Dr. Larson, Dr. Henrici, Dr. Green.

B. COURSES OFFERED IN THE MAYO FOUNDATION (ROCHESTER)

Professors Edward C. Rosenow, M.D., Arthur H. Sanford, M.A., M.D.; Associate Professor Thomas Byrd Magath, M.S., M.D., Ph.D.

Opportunities for the graduate study of bacteriology and immunology are in connection with routine clinical examinations and in special research. They are open to (a) graduate students holding only their baccalaureate or Master's degrees who have already had at least 176 clock hours of bacteriology but who have not had adequate preparation in pathology. Such students will not be permitted to attempt work involving a knowledge of pathology; (b) graduates in medicine or holders of Master's degrees who have had work both in bacteriology and pathology equivalent to that given in the medical course in the University. Such students will be given opportunity to do work in bacteriology involving pathologic relationships.

M151f,w,s,su. Clinical Bacteriology and Parasitology. Making and examination of cultures. Preparation and administration of autogenous

vaccines. Wasserman tests; special laboratory methods in clinical bacteriology or parasitology. Dr. Sanford, Dr. Magath.

M152f,w,s,su. Bacteriology of Necropsy Material. Collection of bacteriological material at necropsy under the supervision of a pathologist and its study in the laboratory under the supervision of a bacteriologist. Dr. Sanford, Dr. Magath, Dr. Robertson.[1]

M153f,w,s,su. Bacteriology of Surgical Material. Collection of bacteriological material from operative specimens under the supervision of a pathologist and its study in the laboratory under the supervision of a bacteriologist. Dr. Sanford, Dr. Magath, Dr. MacCarty,[1] Dr. Broders.[1]

M154f,w,s,su. Special Bacteriology of Medical Cases. A collection of bacteriological material in medical cases under the supervision of a physician and its study in the laboratory under the supervision of a bacteriologist. Dr. Sanford, Dr. Magath, Dr. Rowntree,[2] Dr. Keith.[2]

M251f,w,s,su. Experimental Bacteriology. Research in the bacteriology of normal and diseased tissues, the blood, secretions and exudates. Experimental inoculation of animals and immunological studies. So far as possible work limited to study of pathogenesis and to development of specific methods of prevention and treatment of various diseases presumably of infective origin. Dr. Rosenow.

MEDICINE

(Including General Medicine, Dermatology, and Nervous and Mental Diseases)

The graduate work in the Department of Medicine is designed to offer opportunities for gifted men and women thoroly to prepare themselves for consultation practice, research and university teaching in the fields of internal medicine, dermatology or nervous and mental diseases. Prospective fellows who have had no special work, in addition to that of the ordinary undergraduate courses, in physiology, physiologic chemistry, bacteriology, therapeutics, experimental medicine, or pathology will usually find it advisable to devote a year or more to one or more of these subjects before entering the course. Applicants for fellowships with this special preparation in addition to the required year's internship will be given preference over those without it.

In addition it is expected that each fellow will continue work in one or more of these departments throughout his course, such work to count towards fulfillment of his requirements for a minor subject. Work in these departments may frequently be of research character, supplementing or being supplemented by clinical experience. For fellows specializing in nervous and mental diseases, work in anatomy and psychology is especially available as minor subjects. Work can also be arranged in the Department of Ophthalmology and Oto-Laryngology for fellows working in nervous

[1] See Department of Pathology.
[2] See Department of Medicine.

and mental diseases, thus giving special opportunity to study lesions of the eye occurring in systemic disorders.

That a better understanding may be obtained of the work available in the Department of Medicine it is described in its several sections of General Medicine, Dermatology, and Nervous and Mental Diseases.

General Medicine

A. COURSES OFFERED AT THE MEDICAL SCHOOL

Professor S. Marx White, B.S., M.D., F.A.C.S. (Chief); Associate Professors George E. Fahr, B.S., M.D., Ernest T. F. Richards, M.D., C.M., John P. Schneider, M.D., Henry L. Ulrich, B.S., M.D.; Assistant Professors Moses Barron, B.S., M.D., Jay A. Myers, B.S., Ph.D., M.D.

The graduate work in internal medicine offered at the Medical School in Minneapolis affords an unusual opportunity to the student seeking preparation for the practice of the specialty, for research in the problems of medicine, and for teaching. The staff is especially selected for experience and capacity in teaching and investigation, and opportunity is given for contact with a large body of trained clinicians. The Minnesota General Hospital (University Hospitals), the Out-Patient Department, and the Minneapolis General Hospital afford a wide range of clinical material; and the laboratories of the fundamental branches of medicine provide an unusual opportunity for study and research in these fields so necessary in the training of the specialist in medicine.

Anatomy, including topographical anatomy, physiology, physiologic chemistry, pathology, bacteriology, immunology, and pharmacology have their laboratories and teaching centers on the campus, and the pursuit of one or more minor subjects to the extent required by the Graduate School may be carried on, particularly during the first year or two, alongside of, and in intimate relation to, the more definitely clinical studies. The large autopsy service of the Department of Pathology gives experience in this field and provides control of clinical diagnosis. Research work in one or more of the fundamental departments is carried on under the head of the department involved with the co-operation of the adviser in the Department of Medicine.

The more intensive clinical studies of the fellow are carried on in one or both of the hospitals mentioned, and in any case, the Out-Patient Department is utilized to the degree necessary for training of the fellow in the more active type of work to be seen later in practice and in teaching. Thus intensive scientific study is combined with active clinical experience. Independence of thought and of judgment concerning clinical problems is cultivated.

General rounds are conducted once a week in the hospital by the head of the department, and the reading of the fellow is supervised so that the broad field of medicine is covered and at the same time the special fields to which he may be attracted are thoroly cultivated. Clinics by faculty members, and many special lectures by invited guests, are available. The

requirement that a certain small amount of time be given by the fellow to teaching gives training in this art, essential to the accomplished clinician.

When the proper foundation is laid the fellow will find time, in addition to his clinical work, for research leading to his thesis, which may be purely clinical, or in a field combining clinical and laboratory study.

When he is sufficiently competent the fellow is eligible to appointment as resident in the hospital for one year with additional stipend, as is the case with fellows under the Mayo Foundation. In this position he acts as an officer of the clinic with definite duties and responsibilities in the care of patients in the University Hospital.

The fellow desiring special training in tuberculosis will find unusual opportunities in the Medical School and in the institutions close by, specializing in the care and treatment of this disease.

The courses listed below are described in the broadest outlines and for purposes of recording the character of the work done. No hard and fast program is contemplated, the individual capabilities, needs, and purposes of the fellow being given particular attention.

201f,w,s,su. Clinical Medicine. Study of general diagnosis and methods of investigation and recording clinical data. The laboratory of experimental medicine is open for study of special problems arising in the investigation of cases. Emphasis placed on methods of treatment. Dr. White, Dr. Fahr, Dr. Richards, Dr. Schneider.

202f,w,s,su. Diseases of Cardiovascular Apparatus. Special study of diseases of the heart and blood vessels, including technique and application of the polygraphs, electrocardiograph, and interpretation of outlines of the heart and great vessels obtained by means of the radiograms and orthodiagram. Dr. White, Dr. Fahr.

203f,w,s,su. Research in Medicine. University Hospital and Out-Patient Department. Dr. White, Dr. Fahr, Dr. Richards, Dr. Schneider.

204f,w,s,su. Problems in Medicine. Specific problems in diagnosis and treatment, including problems in immunology viewed from the clinical standpoint. General Hospital. Dr. Ulrich.

205f,w,s,su. Tuberculosis. Special opportunities in the study of problems relating to tuberculosis are afforded. Co-operation between the Medical School and various sanatoria specializing in tuberculosis is close, and problems may be studied, both the clinical and laboratory sides. An Out-Patient Department with rich material is available. Dr. Myers.

206f,w,s,su. Research in Mouth Infections. A study of dental and paradental infections as related to systemic disease. Experimental study to determine the lesion produced in animals by bacteria from these sources. Dr. Hartzell.

209f,w,s,su. Neurologic Research. Dr. Hamilton.

B. COURSES OFFERED IN THE MAYO FOUNDATION (ROCHESTER)

Professors Leonard G. Rowntree, M.D., D.Sc. (Chief), Henry S. Plummer, M.D., Arthur H. Sanford, M.A., M.D., Russell M. Wilder; Associate Professors Walter M. Boothby, M.A., M.D., George B. Euster-

man, M.D., Herbert Z. Giffin, B.S., M.D., Norman M. Keith, B.A., M.D., Willis S. Lemon, M.B., Archibald H. Logan, M.D.; Assistant Professors David M. Berkman, M.D., M.S. in Med., George E. Brown, M.D., Fred W. Gaarde, B.S., M.D., Dorr F. Hallenbeck, M.D., William A. Plummer, M.D., Lee W. Pollock, B.S., M.D., Leda J. Stacy, M.D., Fredrick A. Willius, M.D., M.S. in Med.; Instructors Arlie R. Barnes, M.A., M.D., Maurice B. Bonta, B.A., B.S., M.D., Louis A. Buie, B.A., M.D., Harry M. Conner, M.D., Carl H. Greene, Ph.D., M.D., Samuel F. Haines, B.S., M.D., Howard R. Hartman, B.S., M.D., William H. Long, M.D., Charles S. McVicar, M.D., Monte C. Piper, M.D., Irene Sandiford, Ph.D., Porter P. Vinson, B.S., B.A., M.D.

The clinical work in internal medicine in Rochester consists of diagnostic work on the floor of the clinic or in one of the hospital medical services, and includes history-taking, physical examinations, the recommendation of patients for special examinations with correlation of the results thereof, and the formation of independent judgments concerning diagnoses and indications and recommendations for medical and surgical treatment, all under the immediate direction of the head of the section and his associate or first assistant.

Each service consists of six days each week for one calendar year, except as noted, in a clinical section. There are ten general diagnostic sections in which the fellow may work in the clinic and six medical hospital services. The satisfactory completion of at least two services of one year each in these sections is required for recommendation for an advanced degree. When he is sufficiently competent in clinical work the fellow may be appointed to a first assistantship for a period of one year. This provides him with opportunities for informal teaching of junior men and with an additional stipend of $1,000 a year, from the Mayo Clinic.

The Medical Department has recently been extended and has been furnished amply with medical beds—in the neighborhood of four to five hundred—in St. Mary's, Kahler, and Colonial hospitals. Laboratories have been established in St. Mary's and Kahler hospitals and equipped with ample facilities for the best type of routine medical practice and for medical research and investigation. Special services have been created for the intensive study of metabolic, cardiorenal vascular diseases, and diseases of the glands of internal secretion.

Most medical graduates are usually lacking in autopsy experience. Efficiency in this most essential field can be made up by a service of six months or more in the Section of Pathologic Anatomy. Such a service gives the fellow good experience in autopsy technic and diagnosis.

In graduate work in medicine the didactic lecture plays but a minor rôle. In the diagnostic clinic and hospitals much of the teaching is done through seminars, through ward rounds, and by contact between the professor and the fellow in the handling of the patients, or in the carrying out of laboratory procedures. In both clinical and hospital sections the fellow enters the section as an assistant and assists in the actual work of

these sections under the supervision of the head of the section and his associates.

Seminars are conducted in each section. In the clinical seminars cases of unusual interest are discussed and presented. In the hospital services additional seminars are conducted on special phases of medicine, on laboratory methods, on current medical literature, and pathologic conferences are conducted in cases coming to operation and necropsy. In these seminars the fellows themselves play an active rôle in presenting to the group cases or subjects which have been assigned to them by their chiefs.

In the laboratories fellows are given every opportunity to work out for themselves the problems of their choice or to participate in investigations being carried out by members of the staff.

Staff meetings are held weekly on Wednesday evenings and problems and cases of interest are presented and discussed. Foundation lectures are given five evenings a week by members of the staff or by invited lecturers.

As soon as he becomes oriented, each fellow is expected to find time, in addition to his clinical work, to begin and carry forward persistently some piece of research. While this may be purely clinical, in most instances it will be found to have relationships requiring detailed study in physiology, physiologic chemistry, pathology, or bacteriology.

Research work in special laboratory departments is done under the head of the department with the advice and counsel of the head of the clinical department in which the fellow is registered.

The usual fellow will find that approximately two thirds of his time should be devoted to diagnosis and treatment of disease, but provision is also made for the occasional fellow with unusual research ability who desires to devote his entire time, or the major part of it, to scientific investigation.

Tho the minimum time required for recommendation for the degree of master of science for work done in these fields is three years, it will usually be found that considerably more time is desirable and supplementary stipends are provided for men desiring to devote four or five years to the work.

M151f,w,s,su. Laboratory of Hematology and Urinalysis. Dr. Sanford.

M152f,w,s,su. Gastrological Laboratory. Dr. Sanford.

M153f-w,w-s,s-su,su-f. General Medical and Surgical Diagnosis with special reference to diseases of the gastro-intestinal and accessory digestive tracts. Dr. Eusterman, Dr. Berkman, Dr. Hartman, Dr. McVicar.

M154f,w,s,su. Clinical Demonstration of diseases of the gastro-intestinal and accessory digestive tracts. 24 hours. Dr. Eusterman, Dr. Hartman, Dr. McVicar.

M155f-w,w-s,s-su,su-f. General Medical and Surgical Diagnosis with special references to diseases of the intestines. Dr. Logan, Dr. Pollock, Dr. Buie.

M156f,w,s,su. Clinical Demonstration of diseases of the intestines. 24 hours. Dr. Logan, Dr. Pollock, Dr. Buie.

M157f,w,s,su. Proctology. Dr. Logan, Dr. Pollock, Dr. Buie.

M158f-w,w-s,s-su,su-f. General Medical and Surgical Diagnosis with special reference to diseases of the chest and esophagus. Dr. Lemon, Dr. Gaarde, Dr. Vinson.

M159f,w,s,su. Clinical demonstration of diseases of the chest and esophagus. 48 hours. Dr. Lemon, Dr. Gaarde, Dr. Vinson.

M160f-w,w-s,s-su,su-f. General Medical and Surgical diagnosis with special reference to diseases of the blood and blood-forming organs. Dr. Giffin, Dr. Bonta, Dr. Conner.

M161f,w,s,su. Clinical Demonstration of diseases of the blood and blood-forming organs. 24 hours. Dr. Giffin, Dr. Bonta, Dr. Conner.

M162f-w,w-s,s-su,su-f. General Medical and Surgical Diagnosis with special reference to diseases of the cardiovascular system and ductless glands. Dr. H. S. Plummer, Dr. Boothby, Dr. W. A. Plummer, Dr. Willius, Dr. Barnes, Dr. Haines.

M163f,w,s,su. Clinical Demonstration of diseases of the thyroid. 24 hours. Dr. H. S. Plummer, Dr. Boothby, Dr. W. A. Plummer, Dr. Willius, Dr. Barnes, Dr. Haines.

M164f,w,s,su. Clinical Demonstration of diseases of the cardiovascular system. 24 hours. Dr. H. S. Plummer, Dr. Willius.

M165f-w,w-s,s-su,su-f. Diagnosis and Research (clinical and laboratory) in cardiorenal and vascular and metabolic diseases. Dr. Rowntree, Dr. Wilder, Dr. Keith, Dr. Brown.

M166f,w,s,su. Clinical demonstration of cardiorenal, vascular, and metabolic diseases. 24 hours. Dr. Rowntree, Dr. Keith, Dr. Brown.

M167f,w,s,su. Clinical Demonstration of pancreatitis and diabetes. 24 hours. Dr. Wilder.

M168f-w,w-s,s-su,su-f. General Medical and Surgical Diagnosis with special reference to gynecology. Dr. Stacy.

M169f,w,s,su. Radium Therapy. Dr. Stacy, Dr. Bowing.

M170f,w,s,su. Roentgen Therapy. Dr. Des jardins.

M171f-w,w-s,s-su,su-f. General Medical and Surgical Diagnosis with special reference to acute emergency conditions. Dr. Hallenbeck, Dr. Long, Dr. Piper.

M251f,w,s,su. Advanced Work in Electrocardiographic Laboratory. Dr. H. S. Plummer, Dr. Willius.

M252f,w,s,su. Metabolic Laboratory. Respiratory exchange and allied physiologic problems. Dr. Boothby, Miss Sandiford.

M253f,w,s,su. Seminar. Open to fellows who have been or who now are enrolled in Course M153. 12 hours. Dr. Eusterman, Dr. Hartman, Dr. McVicar.

M254f,w,s,su. Seminar. Open to fellows who have been or who now are enrolled in Course M156. 24 hours. Dr. Logan, Dr. Pollock, Dr. Buie.

M255f,w,s,su. Seminar. Open to fellows who have been or who now are enrolled in Course M158. 60 hours. Dr. Lemon, Dr. Gaarde, Dr. Vinson.

M256f,w,s,su. Seminar. Open to fellows who have been or who now are enrolled in Course M160. 12 hours. Dr. Giffin, Dr. Bonta, Dr. Conner.

M257f,w,s,su. Seminar. Open to fellows who have been or who now are enrolled in Courses M162, M251, or M252. 12 hours. Dr. H. S. Plummer, Dr. Boothby, Dr. W. A. Plummer, Dr. Willius, Dr. Barnes, Dr. Haines.

M258f,w,s,su. Seminar. Open to fellows who have been or who now are enrolled in Course M165. 12 hours. Dr. Rowntree, Dr. Wilder, Dr. Keith, Dr. Brown.

M259f,w,s,su. Seminar. Open to fellows who have been or who now are enrolled in Course M171. 12 hours. Dr. Hallenbeck, Dr. Long, Dr. Piper.

M260f,w,s,su. Seminar. Open to fellows who have been or who now are enrolled in Course M168. 12 hours. Dr. Stacy.

M263f,w,s,su. Medical Chemistry. Chemical and metabolic studies (in nephritis, acidosis, diseases of the liver and of the blood) together with research work along biochemical and metabolic lines. Dr. Rowntree, Dr. Keith.

M264f,w,s,su. Medical Chemistry. Chemical and metabolic studies in diabetes, together with research work along biochemical lines. Dr. Wilder.

M265f,w,s,su. Research in Medicine. Dr. Rowntree, Dr. Wilder.

Dermatology

A. COURSES OFFERED AT THE MEDICAL SCHOOL

No advance courses in dermatology are offered in the Medical School. Graduate students desiring this work will be given opportunity in the Mayo Foundation.

B. COURSES OFFERED IN THE MAYO FOUNDATION (ROCHESTER)

Assistant Professors W. H. Goeckerman, M.D., Paul A. O'Leary, M.D.

The Department of Dermatology of the Mayo Foundation offers excellent opportunities for the study of dermatology and syphilology. The service cares for about 5000 out-patients annually, of whom approximately 2000 have syphilis. The patients come to the section both direct and by refer from other departments. In the majority of cases they have been studied from every medical angle, so that the opportunity to master the relations and background of the specialty as well as its immediate diagnostic problems is unusually good. All the syphilis seen in the Mayo Clinic ultimately reaches this section, and provides a rich material for the study of every aspect of the disease. The in-patient service of the section includes a special hospital of 70 beds, with a treatment equipment through which pass from 20,000 to 25,000 patients per year. Approximately 10,000 arsphenamine injections and 3000 intraspinal injections are given

per year, and all such patients are retained under hospital care for at least 24 hours, which permits a full study and interpretation of their reactions and response to treatment. The section has a social worker who assists in the adjustment of the personal and social problems of patients, and directs the operation of the follow-up system. The department has special laboratories adapted to the prosecution of research problems and the general laboratories of the clinic and foundation are likewise available for this purpose.

The Department of Dermatology and Syphilology offers two types of graduate medical work.

1. *Short term service.*[1]—Offered only to fellows in the Mayo Foundation, with preference to those majoring in internal medicine. This course consists of three to six months of training in clinical diagnosis especially as applied to syphilology but with due emphasis on dermatology. The fellows in this group see all entering patients of the department. They are systematically drilled in methods of examination, including the objective approach, the use of the dark field, and the making of smears, stains, and special preparations of the types essential in office diagnosis. The results of special examinations in other departments of the clinic are co-ordinated and the proper use of the X-ray, the eye examination, the spinal fluid examination, the provocative procedure, and so forth in the modern diagnosis of syphilis are impressed upon the student. The fellows follow the treatment of their patients on the hospital service of the section, learning under direction, the theory of the expert management of various phases of syphilis and of cutaneous disease. Special emphasis is placed throughout the dermatologic work upon the relation of dermatology to internal medicine both from the standpoint of diagnosis and treatment. By means of conferences, quizzes, and hospital rounds, the fellow is kept alert to all aspects of the subject.

No training in treatment technic is offered in connection with this service.

2. *Long term service.*—Fellows who take this course elect dermatology and syphilology as a major. Three years are devoted to the mastery of the specialty and to gaining the necessary groundwork in related branches, including serology, radiotherapy, neurologic diagnosis, and such elective courses as may seem called for in the individual case. The purpose of major work in dermatology and syphilology is the training of experts, able to attack intelligently any problem which cutaneous and syphilologic diagnosis and treatment may present, and to assume, if necessary, organizing and teaching responsibility. The fellow in dermatology and syphilology is trained in diagnosis by at least two years of constant contact with every aspect of cutaneous disease and syphilis in both out-patient (office) service and hospital. He is trained in teaching methods by an experience of 10.000 arsphenamine treatments of various types, 3000 to 5000 diagnostic spinal punctures, and 2000 to 3000 intraspinal treatments of various types, with the necessary amount of technical preparation in

[1] Limited to three fellows.

the simpler procedures such as intramuscular injection, etc. This is equivalent to approximately a year of treatment service. A full equipment for hydrotherapeutic work, ultra-violet light, high frequency and electrocoagulation, radium and X-ray therapy insures familiarity with the most advanced methods of dermatologic treatment.

Immediate contact with the patient while reaching a diagnosis and throughout the course of his treatment is insured by a period of hospital residence varying from six months to one year as house officer of the Dermatological Hospital, a service of 70 beds, with equipment for every refinement of dermato-syphilologic practice in a private clientele.

Training in the fundamentals of the pathology of syphilis and cutaneous disease is likewise an essential part of the equipment of the expert, and is accomplished by a laboratory and demonstration course.

Training in methods of investigation and research, and in the technic of preparing and publishing new material is given to the full-time fellow as a necessary part of his equipment. This training begins with the statistical study of clinical problems and in the preparation of a case report. It will be extended for fellows who are suitably equipped to include an investigation, with a laboratory phase in chemistry, serology, or immunology, which the fellow exploits as his special field over his own name and uses as a basis for his thesis. A Journal Club furnishes the necessary training in the searching and interpretation of the literature.

After the second year of service fellows in dermatology and syphilology who exhibit special proficiency and fitness may be appointed assistants in the section. This provides an increase of $1000 per year in stipend over and above the fellowship remuneration. It makes possible the training of the fellowship man in the problems and responsibilities of consultant diagnosis, and permits his participation in teaching work. During an assistantship, the incumbent is expected to prepare and deliver a course of lectures under the supervision of the head of the department upon the history and recent developments in some important aspect of the specialty.

Discipline in executive responsibility and instruction in the problems of departmental administration are available for those who exhibit special aptitude and who are likely to be called upon to undertake organizing duties.

While full time fellowship standing in the Department of Dermatology and Syphilology is limited to those who carry the work as a major for three years, the department is prepared to consider as applicants for one or two years of service, those who, because of previous graduate medical work in the specialty, may be regarded as already partially equipped to meet the ultimate standards of the department. No application for less than one year of service will be considered, and no "brushing up" courses for practitioners are offered.

M172f,w,s,su. General Diagnosis with special reference to dermatology and syphilology. All day. Dr. Goeckerman, Dr. O'Leary.

M173f,w,s,su. Clinical Demonstration of Dermatologic and Syphilologic Material. 24 hours. Dr. Goeckerman, Dr. O'Leary.

M261f,w,s,su. Seminar. Open to fellows who have been or who now are enrolled in Course M172. 24 hours. Dr. Groeckerman, Dr. O'Leary.

Nervous and Mental Diseases

For students specializing in nervous and mental diseases, minors in anatomy, physiology, and psychology are especially valuable, and for those desiring it, work could be arranged in the Department of Ophthalmology and Oto-Laryngology, giving a special opportunity to study lesions of the eye occurring in systemic disorders.

A. COURSES OFFERED AT THE MEDICAL SCHOOL

Professor Arthur S. Hamilton, B.S., M.D.; Associate Professor Ernest M. Hammes, M.D.; Assistant Professor J. Charnley McKinley, M.A., M.D., Ph.D. in Neurology.

For fellows in general medicine opportunity is given for the study of clinical neurology in the hospital and in the Out-Patient Department. For fellows specializing in nervous and mental diseases there are unexcelled facilities for the study of the anatomy, physiology, and pathology of the nervous system, and fellows are given an opportunity to teach in these fields. In addition to the work in the University Hospital and Out-Patient Department, the student has access to the Minneapolis General Hospital, the St. Paul City and County Hospital, and to the laboratories of the Department of Psychology of the University, as well as to the Child Guidance Clinic established in Minneapolis under the auspices of the National Committee for Mental Hygiene.

The close relation between the division of nervous and mental diseases and the department of eye, ear, nose, and throat gives an opportunity for study under trained specialists of the special senses in their relation to diseases of the nervous system.

The clinics in general medicine and special lectures at the University by invited guests are freely open to the student.

207f,w,s. Pathology of the Nervous System. The preparation of gross and microscopic material from diseased nerve tissues; the relations existing between pathologic lesions, signs, and symptoms; the chief neuron systems and principles underlying their degeneration. Dr. Hamilton.

208f,w,s,su. Clinical Neurology. Advanced diagnosis of nervous diseases; practical experience in diagnostic procedures employed in the study of diseases of the nervous system. Dr. Hamilton.

209f,w,s,su. Neurologic Research. Dr. Hamilton.

B. COURSES OFFERED IN THE MAYO FOUNDATION (ROCHESTER)

Professor Walter D. Shelden, B.S., M.D.; Associate Professor Henry W. Woltmann, B.S., M.D., Ph.D. in Neurology; Instructors John B. Doyle, M.D., M.S. in Neurology, Harry Lee Parker, M.B., M.S. in Neurology.

A practical clinical course for fellows in general medicine and neurology is conducted for periods of six months or longer. This includes a daily conference on cases of special diagnostic importance, a weekly conference for the review of current neurologic literature, and a monthly clinical pathological conference for the study of autopsy material. For fellows majoring in neurology special work in neuropathology is offered. Considerable opportunity for psychiatry is offered and weekly visits are made to the Rochester State Hospital for the Insane.

This department is closely associated with the departments of the eye, ear, nose, and throat, and with various laboratories for the study of neurology as a specialty and its relationship to general medicine.

M174f-w,w-s,s-su,su-f. General Diagnosis in Neurology and Psychiatry. Dr. Shelden, Dr. Woltmann, Dr. Moersch, Dr. Doyle, Dr. Parker.

M175f,w,s su. Clinical Demonstration of Neurological Diseases. 24 hours. Dr. Shelden, Dr. Woltmann, Dr. Moersch, Dr. Doyle, Dr. Parker.

M261f,w,s,su. Seminar. Open to fellows who have been or who now are enrolled in Course M174. 12 hours. Dr. Shelden, Dr. Woltmann, Dr. Moersch, Dr. Doyle, Dr. Parker.

M262f,w,s,su. Neuropathology. Open to fellows who are majoring in neurology and who have had adequate preparation in general pathology. Dr. Woltmann.

PEDIATRICS

The graduate work of the Department of Pediatrics is arranged with the intention (a) of preparing students to become competent pediatrists; (b) to put them in position to attack original pediatric problems; and (c) to make them competent teachers in the subject.

A. COURSES OFFERED AT THE MEDICAL SCHOOL

Professor Frederic W. Schlutz, M.D., Chief; Associate Professors Walter R. Ramsey, M.D., Frederick C. Rodda, M.D.; Assistant Professors Edgar J. Huenekins, B.A., M.D., Max Seham, M.D., Rood Taylor, M.D., Ph.D. in Pediatrics; Instructor Naboth O. Pearce, M.D., M.S.

The work of the department is conducted in the wards and Out-Patient Department of the University Hospital, the Minneapolis General Hospital, and Lymanhurst in Minneapolis, the Ancker and Miller hospitals and the Out-Patient Department of the Wilder Charities in St. Paul. The Child Welfare organizations, the Child Guidance Clinic and special arrangements with the Board of Education afford excellent opportunities of all phases of preventive pediatrics.

The general library of the University, an unusually complete departmental library, and complete files of all journals dealing with pediatrics furnish adequate reference facilities.

Research laboratories attached to the Department of Pediatrics and the large general laboratory attached to the departments of Physiology,

Anatomy, Bacteriology, and Pharmacology are at the disposal of the graduate students, and afford every possible opportunity for research.

As a prerequisite a general understanding of physiologic (physical) and analytic chemistry and a working knowledge of French and German are essential.

Prospective students will find preparatory study in physiology and quantitative analysis of value.

Students will be encouraged to carry a minor in some of the fundamental branches.

The following electives in other departments are desirable. (For further information see description of courses under departmental headings.)

Quantitative Analysis
Organic Chemistry
Physical Chemistry
Mental Retardation
Physiologic Chemistry
Physiology of Muscle, Nerve, Blood, Circulation, and Digestion
Physiology of the Nervous System and Special Senses: Respiration, Metabolism, Nutrition, and Excretion
Physical Chemistry of Cells
Electrophysiology
Metabolism
Quantitative Methods
Human Neurology
Fetal Anatomy
General Roentgenologic Technique
Interpretations of Roentgenologic Findings
Hematology
Course in Immunity
The Physiological and Chemical Basis of Pharmacology (Pharmacology 113)
Diseases of Cardiovascular Apparatus (Medicine 123-124)
Medical Chemistry
Orthopedic Service
Orthopedic Diagnosis
Advanced Ophthalmoscopy

103f,w,s,su. Clinic in Pediatrics. Conducted at the University Hospital and the General Hospital; a part of course in required clinics.

104f,w,s,su. Contagious Diseases. The advanced study of contagious diseases, including the practice of intubation and tracheotomy, with training upon the cadaver.

111f,w,s,su. Diseases of the New-Born.

115f,w,s,su. Theory and Practice of Infant-Feeding, including diseases of the gastro-intestinal tract.

117f,w,s,su. Pediatric Clinic. Out-Patient Clinic; University Hospital.

125f,w,s,su. Special Graduate Contagious Course. Advanced study of contagious diseases, including practice of intubation with training upon the cadaver and the living dog. Limited to graduates.

127f,w,s,su. Thesis Course.

129f,w,s,su. Pediatrics Seminar.

130f,w,s,su. Course consisting of three to twelve months' residence in pediatrics and contagious diseases at General Hospital.

142f,w,s,su. Preparation of Infant Foods. Practical work.

144f,w,s,su. Contagious Diseases. Advanced study of contagious diseases.

200f,w,s,su. Advanced Study of Diseases of Infants and Children.

202f,w,s,su. Research in Diseases of New-Born. Students undertaking this work should have had the equivalent of Fetal Anatomy and Pediatrics III.

204f,w,s,su. Research in Physiology of New-Born. Prerequisite: Pediatrics III. Prerequisite preparation in physiology will depend upon the type of work undertaken.

206f,w,s,su. Research in Diseases of Infants and Growing Children. Prerequisite work will depend upon the type of work undertaken.

208f,w,s,su. Research in Physiology of Infants and Growing Children. Prerequisite preparation will depend upon the type of work undertaken.

210f,w,s,su. Research in Anatomy of Infants and Growing Children. Prerequisite preparation will depend upon the type of work undertaken.

B. COURSES OFFERED IN THE MAYO FOUNDATION

Professor Henry F. Helmholz, B.S., M.D.; Associate Professor Samuel Amberg, M.D.

The opportunities offered in pediatrics in the Mayo Foundation are designed for the purpose of training a few selected men for the special practice of pediatrics. The courses are also valuable to fellows majoring in special clinical fields.

The work of the department comprises:

a. The care of the new-born.

Immediately after the birth of the infant the Pediatrics Department assumes charge.

b. The Pediatrics Department is practically in charge of the work in preventive pediatrics in the City of Rochester and in Olmsted County, co-operating with the City Health Department and the Olmsted County Public Health Association. This work comprises infant welfare work as well as the care of the child of pre-school and school age.

c. A special advantage lies in the large number of cases presenting unusual manifestations of common diseases, as well as those conditions which are not so frequently seen in the ordinary hospital and out-patient departments.

d. The work in the city affords a chance for routine practice in pediatrics, including the usual infectious diseases.

e. The department has a service of its own at St. Mary's Hospital. In addition it has the supervision of all children below the age of fourteen

years in the other hospitals. The Pediatrics Department co-operates with the surgical section in the pre-operative and post-operative management of the patients.

f. Research is regarded as an important feature of the graduate work, and there are ample clinical and laboratory facilities for investigative study.

M151f-w,w-s,s-su,su-f. Diagnosis of Medical and Surgical Diseases of Infancy and Childhood. Dr. Helmholz, Dr. Amberg.

M152f,w,s,su. Clinical Demonstration of diseases of infancy and childhood. 24 hours. Dr. Helmholz, Dr. Amberg.

M153f-w,w-s,s-su,su-f. Preventive Pediatrics. 24 hours. Limited to two fellows. Dr. Helmholz, Dr. Amberg.

M251f,w,s,su. Seminar. Open to fellows who have been or who now are enrolled in Course M151. Dr. Helmholz, Dr. Amberg.

M252f-w,w-s,s-su,su-f. Research in Diseases of Infancy and Childhood. Dr. Helmholz, Dr. Amberg.

SURGERY

(Including divisions of General Surgery, Experimental Surgery, Orthopedic Surgery, Urology, and Dental Surgery)

A. COURSES OFFERED AT THE MEDICAL SCHOOL

Professor Arthur C. Strachauer, M.D., F.A.C.S. (Chief); Associate Professors J. Frank Corbett, M.D., F.A.C.S., Emil S. Geist, M.D., F.A.C.S., Arthur A. Law, M.D., F.A.C.S., William Lerche, M.D., F.A.C.S., Arthur T. Mann, B.S., M.D., F.A.C.S., Franklin R. Wright, D.D.S., M.D., F.A.C.S.; Assistant Professors Angus L. Cameron, M.S., M.D., Ph.D. in Surgery, Carl C. Chatterton, M.D., F.A.C.S., Gilbert J. Thomas, M.D.

Graduate work in surgery at the Medical School is designed to offer superior training to a limited number of fellows in three or more years of residence. The practical and scientific aspects of a well-rounded surgical course are equally emphasized.

The prospective fellow must be able to qualify as a candidate for the Ph.D. degree so far as his preliminary education is concerned. (See requirements for higher degrees.)

The fundamental laboratories of the Medical School offer numerous graduate courses closely related to surgery. (See statements of Anatomy, Pathology, Physiology, and Physiologic Chemistry, Bacteriology.) Opportunity for special investigative and research work is found in these departments. The minor subjects must be taken in one of the above departments; anatomy or pathology is usually selected by the fellow. The proximity of the medical buildings and arrangement of courses afford opportunity for co-ordination of clinical and laboratory work which is highly desirable.

The courses offered by the Department of Surgery consist of animal, experimental, and cadaver surgery, together with work in the hospital and out-patient departments in surgical diagnosis, operative surgery, and some of the surgical specialties, particularly urology and roentgenology.

Unexcelled opportunities for technical and experimental work under aseptic conditions comparable to a first-class operating room are offered in the laboratories of animal and experimental surgery. In these laboratories the fellow conducts his investigative work for his thesis.

The fellow assists in the instruction of undergraduate senior students in cadaver surgery and applied anatomy. These courses are repeated three times each year. This repetition is to the great advantage of the fellow. Clinical instruction is given throughout the entire fellowship period.

The University Hospital fellowship provides a house surgeonship in the University Hospital, with or without residence. The fellow aids the surgical staff in diagnosis and in the pre-operative and post-operative care of patients. He helps to direct and supervise the work of the internes, and after his first year assists in the bedside teaching of the surgical clerks. He acts as first assistant in operations performed by the general surgical staff. As soon as he proves himself capable, the more simple major operations are delegated to him to perform, with the surgeon acting as first assistant. Later, he is permitted to operate under the supervision of the surgeon, and finally, when he has demonstrated his ability, he operates independently. Increasingly difficult cases are assigned as his ability warrants. Supervision is always given until the staff surgeon is satisfied of the fellow's ability to perform independently any stated operation.

A Medical School surgical fellowship is also offered with assignment and residence at the Minneapolis General Hospital, which has a total of 679 beds.

By courtesy of and arrangement with the Mayo Foundation the second year of both of these fellowships may be spent in residence at Rochester, where exceptional opportunities for general and special diagnostic and operating room services are available.

The General Memorial Cancer Hospital of eighty beds, in process of construction, with complete operating, X-ray, and radium equipment will greatly enhance the opportunities for general surgical training at the Medical School.

A six months' special training in urology is offered to all graduate students. The student acts, for a limited period, as first assistant on this service, where he is taught the various diagnostic methods including cystoscopy and the allied procedures. Assisting and independent operating in this field are also provided.

Regular graduate students who are not fellows are offered combined courses leading to qualification for advanced degrees. The University Hospital fellowships are limited to candidates for the Ph.D. degree.

101f.w,s. Advanced Minor Surgery. The student is required to assist in the out-patient surgical clinic, and in this connection makes a special study of the diagnosis and treatment of selected cases. Dr. Strachauer.

102f,w,s. Operative Surgery on the Cadaver. Technique of abdominal incision and closure; of bowel suturing, appendix removal, kidney exploration, nephrotomy, tracheotomy, amputations, ligations, etc. Graduate students act as laboratory assistants, and may work out upon the cadaver various independent problems in emergency surgery. Dr. Cameron.

103f,w,s. Operative Surgical Technique. A study of surgical technique by cardinal operations upon living animals. Dr. Cameron.

105f,w,s. Proctoscopy and Sigmoidoscopy. The treatment and diagnosis of the pathological conditions found in the lower bowel, including minor surgical operations. Dr. Strachauer.

201w,s. Surgery of the Kidney. Review of the embryology, anatomy, and pathology. Diagnosis, cystoscopic study, including kidney function estimation and pyelography; operative technique. Study of special problems involved. Dr. Strachauer, Dr. Thomas.

204w,s. Surgery of the Brain and Spinal Cord. Operative technique; study of special problems involved. Prerequisites: Anatomy 103, Medicine 125. Dr. Strachauer.

205f-206w-207s. Surgical Diagnosis. In this course the graduate student assists in the practical instruction of the clinical clerks and internes in the University Hospital, and makes a special study of problems in surgical diagnosis. Dr. Strachauer, Dr. Law, Dr. Ritchie.

208f-209w-210s. Surgical Service. The graduate student acts as house surgeon, and in connection with the service is required to make a special study of the patients, preparing them for clinics and observing them after operations. Dr. Strachauer, Dr. Law, Dr. Ritchie.

211f-212w-213s. Operative Surgery. In this course the surgical fellow acts as first assistant at all operations by the surgical staff in the University Hospital. When properly qualified, the fellow will be permitted to operate, beginning with simpler surgical procedures. Dr. Strachauer, Dr. Law. Dr. Ritchie.

216f,w,s. Surgical Research. Properly qualified students may undertake original investigation of problems in either experimental or clinical surgery. The work may be used for thesis purposes. Dr. Strachauer, Dr. Cameron.

217f,w,s. Surgical Seminar. Conference for reports on surgical literature, with presentation and discussion of specially interesting cases and research work by members of the surgical staff. Dr. Strachauer, Dr. Cameron.

B. COURSES OFFERED IN THE MAYO FOUNDATION

Professors Donald C. Balfour, M.D. (Chief); E. Starr Judd, M.D., Frank C. Mann, M.A., M.D., Charles H. Mayo, M.A., LL.D., M.D., D.Sc., F.A.C.S.; Associate Professor Walter E. Sistrunk, Phm.C., M.D.; Assistant Professors Alfred W. Adson, M.D., M.S. in Surgery, Verne C. Hunt, B.S., M.D., M.S. in Surgery, James C. Masson, M.D., John de J. Pemberton, B.A., M.D., M.S. in Surgery; Instructors Stuart W.

Harrington, M.D., M.S. in Surgery, Fred L. Smith, M.D., Waltman Walters, M.D., M.S. in Surgery.

Dr. William J. Mayo, being a regent of the University, is not a member of the instructional staff. His services in instruction and conference, however, are available.

The opportunities for preparation in surgery in the Mayo Foundation are principally in the field of surgical pathology, in general and surgical diagnosis and in operative and experimental surgery. For work in pathology see the Department of Pathology. For work in surgical diagnosis see the Department of Medicine.

Fellows majoring in surgery usually select pathology as their minor. This the faculty recommends tho a minor may be taken in any other supporting preclinical field.

Men majoring in surgery usually begin their work with three or six months in post-operative care of ambulatory patients; with six months in pathologic anatomy; with six months in surgical pathology; or with a year's work in general diagnosis. This general diagnostic work is divided into two services of six months each. Anyone desiring more diagnostic work may take an additional half year. Fellows select the diagnostic sections in which they desire to work and their requests are followed so far as arrangements of the schedule will permit. The work in the minor field, pathology, anatomy, or physiology, and at least one year of diagnostic work should be completed before the fellow begins his operative service, at the Colonial, Kahler, or St. Mary's Hospital.

Operating room service for fellows in general surgery is given at St. Mary's, Kahler, and Colonial hospitals. The Kahler Hospital of 150 beds is at present utilized for the observation and surgical treatment of goiter, under the direction of Dr. Plummer, Dr. Pemberton, and Dr. Sistrunk. A limited amount of general surgery is also done in this hospital. Fellows on this service are charged with the pre-operative and post-operative care of the patients and act as second assistants in the operating room.

The Colonial Hospital of 325 beds is utilized for general surgery, including practically all the emergency surgery, and a large part of the surgery of certain specialties: neurology (Dr. Adson), the thorax (Dr. Harrington), orthopedics (Dr. Henderson and Dr. Meyerding), and urology (Dr. Hunt). During the fellow's service at the Colonial he acts as second assistant in the operating rooms and may have an opportunity of acting as first assistant.

St. Mary's Hospital contains 600 beds, 400 of which are available for general surgery. During the fellow's service in this hospital he works in various rooms as second assistant, and may have opportunity of acting as first assistant.

In their operative service fellows act as second assistants for a period of six months to one year. The service also includes post-operative care of all patients in the operating room in which the fellow is on service.

During this service the fellow works in various rooms as second assistant and has occasional opportunity to act as first assistant. All second assistants are resident in the hospitals in which they are on operative service.

Fellows who are considered best qualified are appointed first assistants for a period of one or two years. This service may begin during the third year of residence. There are ten such first assistantships available. There are also three positions as house surgeon open to competent fellows. House surgeons act as alternate first assistants.

Besides the work already mentioned opportunities are offered for work in urology, roentgenologic diagnosis, orthopedics, neurology, maxillofacial surgery, animal experimentation, X-ray and radium therapy, and regional anesthesia.

It will thus be seen that fellows in surgery may find it desirable to remain for longer than the minimum of three years. Recently the average residence is about four years, tho this is not required.

M152f,w,s,su. Post-operative Care of Patients; treatment of complications, surgical and medical. Dr. Sistrunk, Dr. Smith.

M153f-w,w-s,s-su,su-f. Operative Surgery. Second assistantship in operating rooms; occasional substitute service as first assistant. Dr. Mayo, Dr. Judd, Dr. Balfour, Dr. Sistrunk, Dr. Hunt, Dr. Masson, Dr. Pemberton, Dr. Adson, Dr. Harrington.

M154f,w,s,su. Surgery of the Abdominal Organs and the Ductless Glands. Operative technic; study of special problems involved. Dr. Mayo.

M155f,w,s,su. Surgery of the Abdominal and Genito-Urinary Organs. Operative technic; study of special problems involved. Dr. Judd.

M156f,w,s,su. Surgery of the Gastro-Intestinal Tract and Pelvic Organs. Operative technic; study of special surgical problems. Dr. Balfour.

M157f,w,s,su. Surgery of the Thoracic Organs. Operative technic; study of special problems involved. Dr. Harrington.

M158f,w,s,su. Surgery of the Central Nervous System. Operative technic and study of special problems involved. Dr. Adson.

M159f,w,s,su. Intravenous Medication. The work in intravenous therapy offers a large field for the study of problems related to blood physiology, the blood dyscrasias and the causes and prevention of reactions following such therapy. Dr. Pemberton.

M160f,w,s,su. Regional Anesthesia. The technic of field block and nerve block procedures will first be practiced upon the cadaver while the student observes the performance of the work on patients. During the latter half of the term opportunity will be provided for the student himself to perform these anesthetic procedures as part of the preoperative preparation on patients at St. Mary's, Colonial, and Kahler hospitals. Dr. Balfour.

M161f,w,s,su. Surgical Technic. The purpose of this course is to develop surgical technic. The fellows are paired and one operates while the other assists in performing the classical operations adaptable to experimental surgery. Two afternoons per week each quarter. Open only to fellows in surgery. Dr. Mann.

M249f,w,s,su. Research work on assigned problems in experimental physiology. Dr. Mann.

M250f,w,s,su. Applied Physiology. Demonstrations of physiological procedures and processes which are of value in relation to clinical medicine. Dr. Mann.

M251f,w,s,su. Applied Pathology. Demonstrations of pathological procedures and processes which are of value in relation to clinical medicine. Dr. Mann.

M252f,w,s,su. Surgical Research. Investigation of special problems in surgery. Open only to fellows of the department. Dr. Mann.

M253f,w,s,su. Research work on assigned problems in experimental pathology. Dr. Mann.

M254f,w,s,su. Surgical Seminar. Conference for the discussion of original work, problems, and surgical literature. Staff.

Orthopedic Surgery

A. COURSES OFFERED AT THE MEDICAL SCHOOL

Associate Professor Emil S. Geist, M.D., F.A.C.S.; Assistant Professor Carl C. Chatterton, M.D., F.A.C.S.

214f,w,s. Orthopedic Service. Three months' service as house surgeon in the State Hospital for Crippled and Deformed Children at Phalen Park. Special facilities for the study of orthopedic diagnosis and treatment. Dr. Chatterton.

215f,w,s. Orthopedic Diagnosis and Treatment. History-taking, physical examination, treatment, application and use of plaster of Paris casts and braces. The graduate student acts as assistant in the clinic. Dr. Geist.

B. COURSES OFFERED IN THE MAYO FOUNDATION

Professor Melvin S. Henderson, M.D., F.A.C.S.; Associate Professor Henry W. Meyerding, M.D., M.S. in Orthopedic Surgery, F.A.C.S.

Orthopedic surgery in the Mayo Foundation embraces not only the deformities of childhood but practically all deformities of the extremities and the spine in the adult. Fractures, recent and old; osteomyelitis, acute and chronic; bone tumors, cervical ribs, and so forth, that usually are relegated to general surgery are taken care of in the orthopedic service. In addition all the usual congenital deformities, such as club feet, dislocated hips, torticollis, and so forth are seen on this service. The surgeon who is to successfully cope with such a broad field of surgery must have a sound general surgical training. On account of the breadth of this service and the close association with general surgery as it is ordinarily understood, five places are held for fellows in general surgery. These include the position of house officer at St. Mary's Hospital where a service of thirty-five beds is maintained and a like position at the Colonial Hospital where a service of fifty beds is maintained. Here the hospital care of orthopedic patients is carried on. All emergency cases such as recent and compound fractures, acute osteomyelitis, etc. are also taken care of. The

remaining three services for general surgery are confined to orthopedic diagnosis, treatment of non-operative patients, manufacture and fitting of braces and out-patient and post-operative service. Careful history-taking and complete general examinations are done on all patients.

Two three-year services are available for fellows showing special adaptability for orthopedic surgery. Such fellows will have one year in diagnosis, at least one year in orthopedic surgery, one year in general surgery, and a minor either in pathology, anatomy, or neurology. Ample opportunity will be given the men majoring in orthopedic surgery for first assistantship in the operating room and in the office.

In connection with the examining rooms at the clinic is a brace shop and special shoe shop where braces and shoes are made. Thus ample opportunity is given for the study of the manufacture and use of orthopedic appliances. A department of physiotherapy is equipped and maintained also in connection with the section, so that gymnastics and exercises can be given and the post-operative care can be followed to completion. If a fellow has a problem that demands experimental work in its study, special time off can be arranged so that it can be carried out properly under the direction of the head of the experimental laboratory.

M162f,w,s,su. Orthopedic Diagnosis. History-taking and physical examination of orthopedic cases. Study of braces, material and construction, measurements and fitting; application and use of plaster of Paris; interpretation of radiograms of orthopedic cases; care of non-surgical and post-operative cases. Dr. Henderson, Dr. Meyerding.

M163f,w,s,su. Orthopedic Surgery. One year in service is offered to fellows majoring in orthopedic surgery. Dr. Henderson, Dr. Meyerding.

M164f,w,s,su. Demonstration of Orthopedic Cases. 24 hours. Dr. Henderson, Dr. Meyerding.

M255f,w,s,su. Seminar in Orthopedic Surgery. Open to fellows of the department. 12 hours. Dr. Henderson.

Urology

A. COURSES OFFERED AT THE MEDICAL SCHOOL

Associate Professor Franklin R. Wright, D.D.S., M.D., F.A.C.S.; Assistant Professor Gilbert J. Thomas, M.D.

218f,w,s. Urologic Diagnosis. History-taking, physical examination, and case study in diseases of the genito-urinary tract. Dr. Wright, Dr. Thomas.

219f,w,s. Cystoscopy and Urethroscopy. Cystoscopic examination; urethral catheterization; kidney function study; pyelography; intravesical operations; fulguration. Dr. Wright, Dr. Thomas.

B. COURSES OFFERED IN THE MAYO FOUNDATION

Professor William F. Braasch, B.S., M.D.; Associate Professor John L. Crenshaw, M.D.; Assistant Professor H. Carey Bumpus, Jr., Ph.B., M.D., M.S. in Urology; Instructor William H. Von Lackum, B.S., M.D.

Opportunity for graduate instruction in urology is offered as a major and as a minor course. Two appointments are made annually in each course. Those fellows having had advanced work in the fundamental sciences or who are otherwise unusually well qualified will be given preference.

The major course in urology extends over a period of three years, which includes one and one-half years devoted to the diagnosis and treatment of diseases involving the urinary tract in the Section of Urology, one year in operative surgery, and the remaining six months in pathology. The course is designed to provide a thoro experience in the diagnosis and treatment of diseases involving the urinary tract. Opportunity is given to spend additional time in the study of the anatomy and physiology of the urinary tract, and in experimental work.

Urologic diagnosis and treatment, including cystoscopy, urethroscopy, urography, fulguration, diathermy, removal of foreign bodies, lithotrity, ureteral manipulation, pelvic lavage, radium treatment, and so forth, are conducted daily in the cystoscopic rooms on the second floor of the Kahler. A suite of ten rooms in the south wing of the Kahler is devoted to this purpose. These rooms have been equipped with the latest devices for urologic diagnosis and treatment. They also include a special urologic laboratory and library. The technical work is carried on during the mornings under the supervision of Dr. W. F. Braasch, Dr. J. L. Crenshaw, and Dr. H. C. Bumpus. The fellow is given an opportunity personally to examine patients and familiarize himself with the diagnosis of a wide range of diseases affecting the urinary tract. More than six thousand cystoscopic examinations have been made in these rooms annually in recent years. Of this number a comparatively small percentage were negative cases, and the pathology involved was largely of a surgical nature. The afternoon is devoted to history-taking and physical examinations of patients suffering from diseases of the urinary tract and allied conditions, in the examining rooms of the Mayo Clinic. The close relation of this work to general diagnosis broadens the field and affords the fellow a breadth of clinical vision which he might not otherwise have. This service extends over a period of twelve months, which is divided into junior and senior services.

The diagnostic experience is also enlarged by a course of six months as resident in the urologic wards of the Colonial Hospital. In these wards he has an opportunity to study the pre- and post-operative treatment of urologic conditions, as well as the clinical study and urologic diagnosis of patients kept under observation in the Colonial Hospital.

The surgical training consists of second assistant work in general and urologic surgery. Here opportunity is given to observe a large number of patients operated for diseases involving the urinary tract and associated organs. Additional opportunity is offered to assist in operations for general surgical conditions, and particularly general abdominal surgery.

Instruction in pathology similarly includes a great variety of pathological conditions involving the urinary tract, as well as those embraced

in general pathology. The courses in pathology offered are General Pathology with Dr. Wilson, Surgical Pathology with Dr. MacCarty and Dr. Broders and staff, and Pathologic Anatomy under Dr. Robertson.

Opportunities for research work on problems in bacteriology of the genito-urinary tract are provided under the supervision of Dr. Rosenow, Dr. Sanford, and Dr. Magath.

Fellows in urology are encouraged to keep in touch with current literature and the facilities of a large and complete library are offered to them, not alone in the library of the section, but in the general library of the Mayo Clinic.

In the investigation of clinical problems, opportunity is offered for reviewing records in the record room of the Mayo Clinic, where records of some half million patients are kept. Special cross files on cases involving the diseases of the urinary tract are kept in special rooms, permitting of thoro study of the clinical records of these conditions.

The fellow in urology is expected to be interested in experimental work and is given every opportunity to do this work in the experimental laboratories under the direction of Dr. F. C. Mann. In the new laboratory recently completed for this purpose every opportunity will be given for experimental work in physiology and other work, in our attempt to solve the problems involved in urologic diagnosis.

At the Colonial Hospital Dr. Von Lackum has charge of a urologic service, which involves the diagnosis and treatment of inflammatory infections of the urethra. Every opportunity is given for the careful study and treatment of urethritis and complications, and each fellow is expected to spend at least three months on this service.

Special attention is given to urography, including pyelography, ureterography, cystography, and urethrography. A considerable experience in interpretation is necessary in order to make this diagnostic feature of value. During the past year over a thousand urograms were made in the cystoscopic rooms. A special technician is attached to the urologic section, who devotes his time largely to urography and special roentgenograms of the urinary tract. The services of Dr. R. D. Carman, Dr. A. B. Moore, and Dr. C. G. Sutherland of the Department of Radiology are available for consultation.

Every afternoon there is an hourly conference of the urologic staff, during which time the problems arising during the morning are discussed and the cases reviewed.

A seminar covering the current urologic medical literature is held at stated intervals, in which all members of the section take part.

Minor course.—The course is open to a limited number of fellows (two annually) who are majoring in general surgery. It consists of a diagnostic service in the Section of Urology, extending over a period of six months.

M165f,w,s,su. Urologic Diagnosis. Cystoscopic examination and history-taking in diseases of the genito-urinary tract. Six months. Dr. Braasch, Dr. Crenshaw, Dr. Bumpus.

M166f,w,s,su. Cystoscopy, Urethroscopy. Cystoscopic examination; urography; endoscopic operations; fulguration. Dr. Braasch, Dr. Crenshaw, Dr. Bumpus. (One and one-half years or more of service is offered as a part of a three-year fellowship for those desiring to specialize in urology.)

M167f,w,s,su. Special Urologic Treatment. A course of three months is offered in the study and treatment of infections of the urethra and adnexa. This course may be taken by those who are enrolled for either the major or the minor course in urology. Dr. Von Lackum.

Dental Surgery

A. COURSES OFFERED AT THE MEDICAL SCHOOL

Research Professor Thomas B. Hartzell, D.D.M., M.D.

206f,w,s,su. Research in Mouth Infections. A study of dental and paradental infections as related to systemic disease. Experimental study to determine the lesion produced in animals by bacteria from these sources. Dr. Hartzell.

B. COURSES OFFERED IN THE MAYO FOUNDATION

Associate Professor Boyd S. Gardner, D.D.S.

The work in dental surgery in the Mayo Foundation is designed primarily for fellows or special students who are graduates in dentistry and who are majoring in dental surgery. The work is also open to graduate medical students.

OBSTETRICS AND GYNECOLOGY

A. COURSES OFFERED AT THE MEDICAL SCHOOL

Professor Jennings C. Litzenberg, B.S., M.D., F.A.C.S. (Chief); Associate Professors Fred L. Adair, B.S., M.A., M.D., F.A.C.S., John L. Rothrock, M.A., M.D., F.A.C.S.; Assistant Professor Lee W. Barry, Ph.D., M.D., F.A.C.S.

Of the courses in other departments open to graduate medical students, the following are especially recommended for those desiring to specialize in obstetrics and gynecology.

Advanced Anatomy: gross and histological, of the female generative organs (Anatomy 153f-154w-155s-156su)

Fetal Anatomy: dissection of fetus and new-born (Anatomy 133f and 134f,s,su)

Implantation and Placentation (Anatomy 137f,w,s)

Advanced Physiologic Chemistry (Physiology 153f,w,s,su)

Gynecological Pathology (Pathology 118s)

Experimental Pharmacology (Pharmacology 104, 109a,b)

Other courses in fundamental or clinical subjects may be elected.

The following graduate courses are offered in the Department of Obstetrics and Gynecology (at Minneapolis):

117f-118w-119s-120su. Advanced Pathology of the Female Generative Organs. Required of first or second year fellows in obstetrics and gynecology. Prerequisite: Pathology 108, or equivalent. Dr. Adair.

121f-122w-123s-124su. Clinical Obstetrics and Gynecology. A course in diagnosis and treatment, with special study of selected cases. Clinic in the Out-Patient Department of the University Hospital, MWF, throughout the year. Required of first year fellows and may be elected by second year fellows. Dr Litzenberg and staff.

125f-126w-127s-128su. Clinical Obstetrics and Gynecology. Similar to Course 111-114, but on TThS. Required of second year fellows, and may be elected by first year fellows. Dr. Litzenberg and staff.

201f-202w-203s-204su. Advanced Obstetrics and Gynecology. Includes service in the University Hospital or Minneapolis General Hospital, affording ample opportunity for experience in diagnosis, care, and treatment (operative and non-operative) of patients. Special facilities are offered for study of problems and cases of unusual interest. Required of first year fellows. Dr. Litzenberg, Dr. Adair, Dr. Barry.

205f-206w-207s-208su. Similar to Course 201-204, but more advanced, both in clinical and research aspects of the subjects, so as to be adapted to the increased training and experience. Required of second year fellows. A special fellowship may be taken in the Swedish Hospital during the second year under Dr. Adair. Dr. Litzenberg, Dr. Adair, Dr. Barry.

209f-210w-211s-212su. Similar to Courses 201-204 and 205-208 but more advanced. Required of third year fellows. Dr. Litzenberg, Dr. Adair, Dr. Barry.

213f-214w-215s. Seminar. A conference, including the fellows and graduate students. Presentation and discussion of original work and reports upon the current literature in obstetrics and gynecology. Reading knowledge of French and German is necessary. Dr. Litzenberg.

216f-217w-218s-219su. Research. Clinical and laboratory research upon problems in obstetrics and gynecology. Required of third year fellows, who must complete a satisfactory thesis during the year. Elective for second year fellows or other properly qualified graduate students. Dr. Litzenberg, Dr. Adair, Dr. Rothrock, Dr. Barry.

B. COURSES OFFERED IN THE MAYO FOUNDATION (ROCHESTER)

Associate Professor Robert D. Mussey, M.D.; Assistant Professor Leda J. Stacy, M.D.

Limited opportunities for work in obstetrics are available with Dr. Mussey.

M251f,w,s,su. Clinical Obstetrics and Gynecology. Diagnosis and treatment with special study of selected obstetric cases.

Opportunities for diagnostic work in gynecology are available with Dr. Stacy and Dr. Melson. (See M168 and M260 in the Department of Medicine.)

Operative work in gynecology in the Mayo Foundation is not segregated in any surgical section. It is therefore impossible to offer opportunity for special study in this field.

OPHTHALMOLOGY AND OTO-LARYNGOLOGY

The graduate courses in these subjects are designed to prepare selected men for advanced work in the various lines, to prepare them for practice in these specialties, and to develop research and productive work in these subjects.

Of elective courses in other departments, the following are highly desirable.

Physics of Light and Acoustics
Advanced Optics
Advanced Anatomy of the Head and Neck
Topographic Anatomy of the Head and Neck
Advanced Histology and Embryology of the Eye, Ear, Nose, and Throat
Advanced Physiology of the Vision and Hearing
Physiologic Optics Seminar
Special Pathology of the Eye, Ear, Nose, and Throat
Immunity
Advanced Neuropathology

The Department of Ophthalmology and Oto-Laryngology in the Medical School, also offers a one-year course, to properly qualified graduate students, beginning with the fall quarter. This course is designed to give graduate students a training in the fundamentals (special anatomy, histology, embryology, pathology, physiology of special senses, physiologic optics) and clinical teaching in the Out-Patient Department in diagnosis and treatment. On the completion of this one-year course, students are urged to continue their work as residents in special hospitals, or further graduate clinical work in recognized institutions. Tuition fee for this course is sixty dollars per quarter.

A. COURSES OFFERED AT THE MEDICAL SCHOOL

OPHTHALMOLOGY AND OTO-LARYNGOLOGY

Professor William R. Murray, Ph.B., M.D., F.A.C.S.; Associate Professor Frank E. Burch, M.D., F.A.C.S.; Assistant Professor Horace Newhart, B.A., M.D., F.A.C.S.

100f. Refraction. Lectures and demonstrations on the theory of refraction. 22 hours.

101f,w,s,su. Advanced Refraction. Practical work in the refraction clinics. Prerequisite: Course 100.

102f,w,s,su. Clinical Ophthalmology. Diagnosis and treatment of diseases of the eye. Daily attendance in the Out-Patient Department. 132 hours per quarter.

103w. Ocular Muscles. 18 hours.

104w. Perimetry. 18 hours.

105w,s. Ophthalmoscopy. 22 hours.

106w,s. Operative Surgery of the Eye. Operations on the cadaver and animal eyes. 18 hours.

107s. Neuro-Ophthalmology. Lectures and demonstrations. 18 hours.

108f,w s,su. Ophthalmic Surgery. Operative clinic in the University Hospital. 22 hours per quarter.

200w,s. Seminar in Ophthalmology. Conducted by members of the staff and open to fellows, scholars, and qualified graduate students. 22 hours.

201f,w,s,su. Advanced Ophthalmology. Daily service in the University Hospital. Required of second and third year fellows, who will serve as assistants in operative and other clinical work.

202f,w,s,su. Research. Required of second and third year fellows who must complete a satisfactory thesis, based upon original work.

120f,w,s,su. Clinical Otology. Diagnosis and treatment of diseases of the ear. Daily attendance in the Out-Patient Department. 132 hours per quarter.

121f,w,s,su. Clinical Rhinology and Laryngology. Diagnosis and treatment of diseases of the nose and throat. Daily attendance in the Out-Patient Department. 132 hours per quarter.

122w. Operative Surgery of the Temporal Bone. Operations and demonstrations on the cadaver. 18 hours.

123w. Operative Surgery of the Nose and Throat. Operations and demonstrations on the cadaver. 18 hours.

124w,s. Functional Ear Tests. 12 hours.

125w,s. Diseases of the Labyrinth. 12 hours.

126w,s. Endoscopy. Lectures and demonstrations. 18 hours.

203w,s. Seminar in Oto-Laryngology. Conducted by members of the staff and open to fellows, scholars, and qualified graduate students. 22 hours.

204f,w,s,su. Advanced Oto-Laryngology. Daily service in the University hospitals. Required of second and third year fellows, who will serve as assistants in operative and other clinical work.

B. COURSES OFFERED IN THE MAYO FOUNDATION (ROCHESTER)

OPHTHALMOLOGY

Professor William L. Benedict, M.D.; Assistant Professor Avery D. Prangen, B.S., M.D.; Instructor Walter I. Lillie, M.D., M.S. in Ophthalmology, Henry P. Wagener, M.D., M.S. in Ophthalmology.

Fellows majoring in ophthalmology in the Mayo Foundation spend from six to nine months on the physics of light, physiologic optics, and anatomy, pathology, and bacteriology of the eye in the Medical School in Minneapolis. The remainder of their service is composed of the following:

M151f,w,s,su. Clinical Ophthalmology. External diseases of the eye, ophthalmoscopy, ophthalmic surgery. Dr. Benedict.

M152f,w,s,su. Refraction and Ophthalmic Myology. Theory of refraction, retinoscopy, diagnosis of refractive errors of the eye, prescribing of lenses, practical work on patients under supervision of instructor. Eye movements, disturbances of motility of the eyes. Dr. Prangen.

M153f,w,s,su. Medical Ophthalmology. Ophthalmology in relation to general diseases. Dr. Benedict.

M154f,w,s,su. Neuro-Ophthalmology. Ophthalmology in relation to diseases of the nervous system. Physiology of the eye, psychology of vision, functional eye disturbances. Dr. Lillie.

M155f,w,s,su. Pathology of the Eye. Dr. Benedict.

NOTE.—Laboratory facilities for research in pathology and bacteriology of the eye, animal experimentation; demonstrations; weekly seminars held jointly by sections on Ophthalmology, Oto-Laryngology and Rhinology, and Laryngology, oral and plastic surgery.

OTO-LARYNGOLOGY AND RHINOLOGY

Professors Harold I. Lillie, B.A., M.D., Gordon B. New, D.D.S., M.D.; Assistant Professor Bert E. Hempstead, B.A., M.D.

M157f,w,s,su. Diagnostic and Out-Patient Service. Diagnosis of neoplasms of the nose, throat, mouth, and neck. Plastic surgery of face and neck (pre- and post-operative treatment). Advanced laryngology as related to neurology and general medicine. Six months. Dr. New.

M158f,w,s,su. Hospital Service. Internship in Worrell Hospital. Operative and radium treatment of tumors of the nose, throat, and mouth. Plastic surgery of the face and neck (operative). Six months. Dr. New.

M159f,w,s,su. Clinical Oto-Laryngology and Rhinology. Theory and practice with differential diagnosis of diseases of the ear, nose, accessory sinuses, pharynx, and larynx and their relations to general diagnosis. Half time for nine months. Dr. Lillie, Dr. Hempstead.

M160f,w,s,su. Pre-operative and Post-operative Care of Patients. Treatment of complications. Half time for nine months. Dr. Lillie, Dr. Hempstead.

M161f,w,s,su. Operative Oto-Laryngology and Rhinology. Internship, second assistantship in operating service in Worrell Hospital. Half time for nine months. Dr. Lillie, Dr. Hempstead.

M162f,w,s,su. Operative Oto-Laryngology and Rhinology. First assistantship in operative service in Worrell Hospital. Half time for nine months. Dr. Lillie, Dr. Hempstead.

M251f,w,s,su. Pathology. Opportunity will be given fellows during the service to study the gross and microscopic pathology of tumors of the nose, throat, and mouth in connection with the clinical material. Dr. Broders, Dr. New.

RADIOLOGY

A. COURSES OFFERED AT THE MEDICAL SCHOOL

Professor Henry A. Erikson, B.E.E., Ph.D.; Assistant Professor Robert G. Allison, M.D.

Graduates of Class A schools who have completed at least one year's satisfactory interneship in a recognized hospital are eligible for an appointment as a fellow in radiology. The student must carry one major and two minor branches. The major shall be in radiology and one of the minor branches must be in physics. The course extends over a period of three years. The course in radiology covers the use of the X-ray as a means or aid to diagnosis in all branches of medicine. In addition the use of both superficial and deep radiation in therapy is taught.

The X-ray departments of the following hospitals are all fully equipped with modern diagnostic and therapeutic equipment and are available to fellows in radiology.

1. *University Hospital.*—Offers unusual clinical material of a chronic nature. There is an immense amount of material available in gastro-intestinal, chest, bone, and urological diagnosis. Unusual opportunity is given the student for pre-operative study of the case and post-operative study of the material removed at operation. The Dermetological Department furnishes a large number of both acute and chronic skin diseases for treatment.

2. *Minneapolis General Hospital.*—This institution offers an immense amount of material in acute and chronic diseases. There is an exceptional amount of work in acute respiratory and cardiac diseases. There is a very large fracture service in this institution.

3. *Glen Lake Sanatorium.*—This institution, with its 500 beds devoted to the treatment and diagnosis of all types of tuberculosis, offers the student excellent opportunity to follow both the clinical and radiological course of the diseases while undergoing treatment. Routine X-ray examinations, both pulmonary and gastro-intestinal, are done on admission and at intervals during the patient's stay in the institution.

4. *Lymanhurst School.*—Routine physical and X-ray examinations of all school children suspected of having pulmonary tuberculosis are conducted at this institution. The student is given an unusual opportunity to correlate the physical and X-ray findings in childhood tuberculosis.

5. *The Cancer Hospital.*—This hospital, which will be available shortly, will be situated on the University campus and will have an initial capacity of fifty beds. It will be devoted entirely to deep roentgen ray and radium therapy. It will be fully equipped with the newest types of deep therapy machines. A radium emanation plant will be housed in this building. This institution will be run and staffed by the staff of the University Hospital. The student will here obtain unlimited experience in roentgen and radium therapy. He will also be taught the collection of radium emanation.

B. COURSES OFFERED IN THE MAYO FOUNDATION

Professor Russell D. Carman, M.D.; Associate Professor Alexander B. Moore, M.D.; Instructors Harry H. Bowing, B.S., M.D., Albert Miller, M.D., Charles G. Sutherland, M.B.

The opportunities offered in radiology in the Mayo Foundation are designed to permit selected men to fit themselves for advanced work in this specialty. Unless the prospective fellow's preparation in normal anatomy, physiology, and pathology has been unusually good, at least a year should be spent in intensive study before entering on the special three years' course. The course in radiology covers every branch of work with the X-ray and radium as applied in medicine. All laboratories are modernly and thoroly equipped. In addition to the routine work, seminars are held weekly in each division for the discussion of unusual problems and interesting cases. The library of the clinic and that of the department are well supplied with texts and journals dealing with radiology, and free use of these is expected. Individual research is encouraged in any radiologic problem which especially interests the student.

M151f,w,s,su. General Roentgenologic Technic. Practical instruction in the employment of all varieties of roentgenologic apparatus including transformers, vacuum tubes, tables, plates, films, intensifying screens, Bucky-Potter diaphragms, and developers, as used in roentgenography, stereoroentgenography, and roentgenoscopy. Dr. Carman, Dr. Moore, Dr. Sutherland.

M152f,w,s,su. Special Applications of Roentgenology. By assisting in the routine work of the laboratory the student is given abundant opportunity to become familiar with the roentgenography of the osseous system, chest, heart, lungs, and urinary system, and with the special technics required for accessory sinuses, mastoids, ventriculography, and pyelography. Unusual facilities and material are furnished for the roentgenoscopy and roentgenography of the gastro-intestinal tract. Dr. Carman, Dr. Moore, Mr. Miller, Dr. Sutherland.

M153f,w,s,su. Roentgen Therapy. The installation for roentgen therapy comprises four medium voltage machines and one high voltage machine, the latter operating two rooms simultaneously. Fellowship men have the privilege of examining patients having the various benign and malignant diseases to which roentgen treatment is applicable, and observing its effects, both early and late. Technic suitable for the various conditions are taught by practical demonstration. Instruction is given as to the mode of production, sequelae, prevention and treatment of roentgen dermatitis; the causes, symptoms, and methods of minimizing radiation sickness; and the avoidance of danger from high tension currents. Dr. Des jardins.

M154f,w,s,su. Radium Therapy. Technics are demonstrated in the preparation and handling of radium tubes, needles, and plaques for therapeutic use, with methods of protection from professional injuries produced by radium. A large number of patients and an adequate

supply of radium permit a practical exhibition of its application in general surgery, gynecology, ophthalmology, internal medicine, and diseases of the ductless glands, showing the biologic effects, reactions, and dosage. Dr. Bowing.

M251f,w,s,su. Physics of Radiology. A physical research laboratory is affiliated with the department of radiology, and the problems of this department constitute the major portion of the work done. Instruction is offered in electricity and magnetism, their phenomena, nature, and properties; sources of electric energy; types of currents, continuous and alternating; units of electric measurement, voltage, amperage, and wattage; the interrupterless transformer; vacuum tubes, types, penetration measurements. Training is offered in the use of instruments for measuring rays and for standardizing radiation apparatus. The physical laboratory is so situated that measurements can conveniently be made on the roentgen treatment machine. In the laboratory there is also a complete apparatus for radium emanations, with the necessary auxiliary measuring devices.

M257f,w,s,su. Interpretation of Roentgenologic Findings. This very important field of roentgenology receives particular attention, and thoro training is given in the reading of plates and screen images, the recognition of normal and abnormal conditions, the roentgen signs of disease, both direct and indirect, roentgenologic differential diagnosis, the correlation of plate and screen findings, and the correlation of clinical and roentgenologic findings. In addition to the large current material, an extensive file of lantern slide reductions, exemplifying a wide variety of disease conditions, is accessible for study and comparison. Dr. Carman, Dr. Moore, Dr. Miller, Dr. Sutherland.

PREVENTIVE MEDICINE AND PUBLIC HEALTH

A. COURSES OFFERED AT THE MEDICAL SCHOOL

Associate Professor Albert J. Chesley, M.D.; Assistant Professors Harold S. Diehl, M.A., M.D., Orianna McDaniel, M.D., Jay A. Myers, Ph.D., M.D., E. M. Wade, M.A., H. A. Whittaker, B.A.

Inquiries concerning other work in public health should be addressed to the director, Dr. H. S. Diehl, Millard Hall, Minneapolis.

102. Sanitation. Sanitary supervision of water and milk supplies, sewerage systems and sewage, refuse, and garbage disposal systems. Practical work including field investigations, laboratory examinations, interpretation of results, recommendations to correct unsatisfactory conditions, report-writing and office procedure. Open only to graduate students who have had Bacteriology 101; Chemistry 20-21, 35-36; Physics 22, 32, 42. Credits arranged. Mr. Whittaker.

103. Public Health Bacteriology. Modern methods of a public health laboratory in making diagnoses; in the preparation of vaccines, and in research. Prerequisites: Bacteriology 101, 106. Credits arranged. Miss Wade.

104. Epidemiology. Lectures on principles and methods of epidemiological investigation. Analysis of data; methods of research conclusions; individual field work; collateral reading. Open only to graduate medical students. Credits arranged. Dr. Chesley, Dr. McDaniel.

105. Vital Statistics. Application of statistical methods to morbidity and mortality figures; births and deaths; the drawing of conclusions; preparation of tables and graphs; measurement of effectiveness of health activities; calculation of expectancy; actual experience with the State Board of Health. Prerequisites: 51 and Econ. 14. Credits arranged. Dr. Chesley.

106. Public Health Administration. Organization of state, municipal, and voluntary health activities; preparation of budgets; procedures in enforcing quarantine; in correcting unsanitary conditions; in controlling tuberculosis and venereal diseases; value of sanitary surveys, food inspections, etc. Prerequisite: 54 or 56. Credits arranged. Dr. Diehl, Dr. Chesley.

108. Field Work in Public Health. This will consist of actual health work, under supervision, in one or more of the approved public health organizations. The time, assignment, and credits will be arranged. Prerequisite: 104 or 106.

201. Research. Opportunities will be offered by the University and by the various co-ordinated organizations for qualified students to pursue research work. Dr. Diehl, Dr. Myers, Dr. Chesley.

ADDITIONAL COURSES

Other courses offered in this and the Graduate School bulletin which bear on work in public health:

Department	Course Title	Course Number
Animal Biology	Protozoology	107
Economics	Theory of Statistics	113
Chemistry	Sanitary Water Analysis	126
Political Science	Government of Minnesota	111
Psychology	Social Psychology	127
Sociology	Methods of Social Investigation	122
Education	Elementary Educational Psychology	139
Education	Mental Tests and Mental Diagnosis	135-136
Physiology	Physiology	101-102-103-104
Pathology	Pathology	101-102
Bacteriology and Immunology	Special Bacteriology	101
Bacteriology and Immunology	Household Bacteriology	105
Bacteriology and Immunology	Higher Bacteria	114

Bacteriology and Immunology	Immunity	116
Engineering	Water Supply Engineering	162
Engineering	Sanitary Engineering	163
Engineering	Water and Sewage Purification	261

B. COURSES OFFERED IN THE MAYO FOUNDATION

The only work in Preventive Medicine and Public Health offered in the Mayo Foundation is in connection with the Department of Pediatrics. See statement of that department.

The Bulletin *of the* University *of* Minnesota

The School of Business
Part I
Announcement of Courses for the Years 1924-1926

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THE SCHOOL OF BUSINESS

FACULTY

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Frederic B. Garver, Ph.D., Professor of Economics
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William L. Hart, Ph.D., Associate Professor of Mathematics
Ernest A. Heilman, Ph.D., Assistant Professor of Accounting
Bruce D. Mudgett, Ph.D., Professor of Economics
Walter R. Myers, Ph.D., Assistant Professor of Economics
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J. Franklin Ebersole, Ph.B., M.A., Professorial Lecturer in Economics
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Marion Andrews, M.A., Instructor in Economics
Henry D. Brohm, Ph.B., B.S., Instructor in Accounting
Claud F. Clayton, M.A., Instructor in Agricultural Economics
R. F. B. Cote, M.A., Instructor in Economics
Ralph H. Farmer, B.A., Instructor in Economics
Edwin W. Gaumnitz, M.A., Instructor in Agricultural Economics
Richard A. Graves, M.A., Instructor in Economics
Budd A. Holt, M.A., Instructor in Agricultural Economics
Calvin B. Hoover, B.A., Instructor in Economics
Richard L. Kozelka, B.A., Instructor in Economics
Otto F. Kuhlmann, M.A., Instructor in Accounting
Reuel I. Lund, M.A., C.P.A., Instructor in Accounting
Duane McCracken, M.A., Instructor in Economics
Harry J. Ostlund, B.A., Instructor in Accounting
George M. Peterson, M.A., Instructor in Economics

* Absent on leave, 1924-25.

Fred E. Ringham, B.A., Instructor in Accounting
William H. Stead, M.A., Instructor in Economics
W. Bayard Taylor, M.A., Instructor in Economics
Arthur R. Upgren, B.A., Instructor in Economics
Warren C. Waite, M.A., Instructor in Economics
Nina Louise Youngs, B.A., Instructor in Accounting

SPECIAL LECTURERS

David Bryn-Jones, Professor of Economics, Carleton College
H. A. Bullis, General Auditor, Washburn-Crosby Company
P. H. Carr, President, Retail Credit Men's Association, Minneapolis
C. R. Chaney, President, American Institute of Banking
D. G. Congdon, Advertising Manager, Confer Brothers, Realtors
G. M. Gillette, President, Minneapolis Steel and Machinery Company
W. H. Ingersoll, President, Ingersoll Redipoint Company
George M. Link, Executive Secretary, Board of Estimate and Taxation, Minneapolis
S. C. McCleod, Secretary of the National Association of Cost Accountants
John J. McHugh, Secretary, Minneapolis Chamber of Commerce
Wallace D. O'Brien, General Agent, Freight Department, Northern Pacific Railroad, St. Paul
R. H. Pearce, Manager, Export Department of Washburn-Crosby, Minneapolis
Roy Pearse, District Manager, General Motors Acceptance Corporation
Miss Frances Penrose, Educational Director, Powers Mercantile Company
Chester A. Phillips, Dean of the College of Commerce, University of Iowa
Miss A. Rooney, Advertising Department, Crawford, Rooney and Soderlund Advertising Agency
S. A. Stellwagen, Manager, Minneapolis Branch, Ford Motor Company
Leslie Vickers, National Industrial Conference Board, New York City
Mrs. Frank Wallace, Women's Department, Farmers and Mechanics Bank
Mrs. Frank M. Warren, Regent, University of Minnesota

GENERAL INFORMATION

PURPOSE

The School of Business recognizes the professional status of the business executive. It aims to give prospective executives thoro training for the work they are to undertake. Professional education rather than detailed drill in narrow technical processes is the object toward which instruction is directed. Scientific method in analyzing business data, trained intelligence in dealing with the human relationships of which business is made up, and a well-developed sense of moral responsibility will be the foundations of business effectiveness in the future. The School of Business combines with a well-rounded university education the kind of training that will prepare students to analyze business situations accurately and to bring together results of analysis into practical working plans.

LOCATION AND EQUIPMENT

The University of Minnesota is well situated with respect to education for business. With the business districts of the Twin Cities on either side, the opportunities for observing business processes and for effective field work and research are unsurpassed. The cordial support of business organizations and individual concerns in the Twin Cities is a large factor in making the resources of the metropolitan district available for developing and presenting subject-matter in every field of study covered. Equally valuable is the support of business men throughout the state. The close contact which members of the faculty have with the business of the Northwest greatly enhances the opportunities that students in the School of Business enjoy. Co-operation with the College of Agriculture, Forestry, and Home Economics brings the School of Business into contact with the agricultural background of many business problems. This co-operation is especially exemplified in the joint provision in the two schools for work in agricultural economics. Co-operation with Engineering, Law, and various departments of the College of Science, Literature, and the Arts is also an important factor in bringing many viewpoints to bear upon the business problems with which the student has to deal.

The library and laboratory facilities of the University are of a sort to contribute effectively to the success of the work which the School of Business is undertaking.

THE SCHOOL OF BUSINESS TRAINING CLASSES IN TWIN CITY BUSINESS ESTABLISHMENTS

During the past year, arrangements have been made with a number of Twin City business firms whereby seniors in the School of Business are afforded the opportunity of supplementing their studies with carefully supervised business practice. Through a logically worked out system of rotation, familiarity is gained with the operation of each important department. The student's University program is so arranged that he is able to give an average of two days per week to this phase of his training.

ADMISSION TO THE SCHOOL OF BUSINESS

For admission to the School of Business a student must have satisfied the requirements of one of the two-year pre-business courses, either in the College of Science, Literature, and the Arts, the College of Agriculture, Forestry, and Home Economics, or the College of Engineering. (See page 9.) However, students entering from other colleges and universities of recognized standing may be admitted if deficient in not more than two of the following: accounting, psychology, statistics, provided (1) that this deficiency is removed during the first year in the School of Business, and (2) that a minimum of 90 credits and 90 honor points is granted by the University examiner for the work done elsewhere.

SPECIAL STUDENTS

A limited number of high school graduates who have reached the age of twenty-four and can furnish evidence to the effect that they have had at least three years of successful business experience in an executive capacity may be admitted as special students. They will be required to maintain a C average and must not elect more than 12 hours of work per quarter. If later they decide to become candidates for a degree they must complete the requirements of the pre-business course.

STUDENTS IN OTHER SCHOOLS OR COLLEGES OF THE UNIVERSITY

Regularly enrolled students in other schools or colleges of the University may be admitted to such courses in the School of Business as are authorized by the faculties of the School of Business and the school or college concerned. Such students are urged to select their business subjects in accordance with a definite plan, and as far as possible to complete a systematic course of business study. *Only those courses in the School of Business are open to students of other schools or colleges of the University which are announced in the bulletin of that school or college.*

ADVANCED STANDING

Appropriate credit in the School of Business may be given for work of a similar character done in other approved colleges and universities, but no student may become a candidate for a degree in the School of Business who has not completed the senior year under the faculty of that school.

CREDITS

Requirements for graduation are expressed in credit hours, indicating amount of work done, and in honor points, indicating grade of work. Honor points are computed as follows: Each credit hour with the grade of A carries 3 honor points; each credit hour with the grade of B, 2 honor points; each credit hour with the grade of C, 1 honor point.

No regular student will be permitted to elect more than 17 nor less than 13 hours of work in any one quarter unless he receives special permission by petition to the Students' Work Committee.

Candidates for the degree of bachelor of science in business must have earned a minimum of 180 credits and at least one honor point for each

credit, (192 credits in the case of agricultural business and 187 credits in the case of industrial administration students) or a smaller number of credits determined as follows: For every 5 honor points in excess of 1 honor point per credit, the number 180 is diminished by 1, but no student will be recommended for graduation who has not acquired thoro proficiency in his field of specialization.

MILITARY SCIENCE AND TACTICS

Students who have completed the Basic Course, R.O.T.C., may be selected for advanced work by the professor of military science and tactics. Those who pursue the Advanced Course are required to sign an agreement with the Government to continue the two years' course to completion. This includes attendance at a training camp, held normally during the summer following the first year's advanced work. The camp is conducted free of cost to the student, and in addition, while actually in camp, the student receives the pay prescribed for the seventh grade in the army. Students pursuing the Advanced Course are also furnished a special uniform and receive a fixed allowance per day. The total Government compensation for the two years' advanced work amounts to something over $200. Students who satisfactorily complete the Advanced Course will be commissioned in the Officers' Reserve Corps of the United States Army. The faculty of the School of Business allow 12 credits for the two-year Advanced R.O.T.C. Course, which may be applied toward the degree of bachelor of science in business.

REGISTRATION

The dates of registration for both old and new students for 1924-25 are September 25 and 26. Pre-business sophomores and students coming with advanced standing from other institutions should obtain from the University registrar copies of their records and submit them to the dean of the School of Business. In the case of pre-business students this must be done before the close of the preceding spring quarter.

DEGREES

Bachelor of Science in Business

Candidates who have met the conditions for entrance to the School of Business, having satisfactorily completed the work covered in one of the pre-business courses at the University of Minnesota, should normally be able to qualify for the degree of bachelor of science in business at the end of the two full academic years of study in the School of Business.

If within a reasonable time after admission to the school, a student's work does not give promise of effectiveness in the business field, he will be discouraged from continuing the course, even tho he may have received passing grades in the subjects taken. It is expected that students will meet the requirements imposed with the same professional spirit and measure of precision demanded in well-regulated business houses, and students who fail to come up to the standard will not be recommended for the degree.

The degree is not awarded merely as the result of pursuing a specified number of courses.

Master of Science in Business

Students who have completed the course of study required for the degree of bachelor of science in business or its equivalent may enroll in the Graduate School and become candidates for the degree of master of science in business. Emphasis will be laid on individual work under the direction of particular members of the faculty rather than upon class instruction, and the student must present evidence of at least six months of successful experience in a responsible business position.

The general requirements for the Master's degree may be found in detail in the annual announcement of the Graduate School.

FEES

Tuition fees (per quarter)	
Residents of Minnesota	$30.00
Non-residents	40.00
Deposit* (first quarter only)	5.00
Military deposit (required of all students taking military drill)	10.00
Health fee (per quarter)	2.00
Minnesota Union or Shevlin Hall (per quarter)	1.00
Special fees:	
Examination for removal of condition	1.00
Examinations for credit (after the first quarter in residence)	5.00
Special examination	5.00
Chemistry deposit	5.00

Penalty Fees

Registration penalties.—A penalty fee for late registration, late change of registration, or late payment of fees shall be two dollars ($2) and one dollar ($1) additional for each day of delay after classes begin, provided that no student shall pay more than twelve dollars ($12) of penalty in any given quarter.

For information concerning living expenses, students are referred to the bulletin of general information.

The School of Business does not encourage students to enter entirely without funds. The intensive work required in the school will make it highly desirable for a person to devote all his time and energy to his studies.

EMPLOYMENT OF STUDENTS

Altho the School of Business does not promise to secure positions for its graduates, every effort is made to find positions for those students who have made a good record. Many business men have expressed a desire to co-operate with the school in placing the students both for summer work and in permanent positions.

* The following charges are made against the general deposit for each student in addition to such charges as may be incurred for lockers, library penalties, laboratory breakage, etc.:

Minnesota Daily	$0.50 a quarter
Post-office box	0.20 a quarter
University Address Book	0.35

STUDENT ORGANIZATIONS

The Commerce Club

The Commerce Club was organized by the students of the School of Business in the fall of 1919. The object of the club is to bring the men of the school together in an informal way for the purpose of promoting a serious interest in business problems. Some prominent business man addresses the students at each meeting. Membership is confined to the students and faculty of the School of Business and to pre-business students in the College of Science, Literature, and the Arts.

Beta Gamma Sigma

A chapter of Beta Gamma Sigma, the national honorary business fraternity, has been installed at the University. Members are selected upon the basis of scholarship and personality.

The University Business Women's Club

This is an organization of business and pre-business women. Its purposes are: (1) to form direct contacts with business problems through addresses by successful business men and women and visits to business establishments; (2) to bring together in a social way University women interested in business.

Gamma Epsilon Pi

A chapter of Gamma Epsilon Pi, a national honorary and professional business sorority, has recently been established. High scholarship, personality, and interest in school activities are requirements for membership.

THE COURSES OF STUDY

FRESHMAN AND SOPHOMORE YEARS

The work of the freshman and sophomore years known as the pre-business course is, in most cases, taken in the College of Science, Literature, and the Arts. For students interested in agricultural business, the pre-business course is taken in the College of Agriculture, Forestry, and Home Economics. A pre-business course in the College of Engineering and Architecture is available for students expecting to engage in manufacturing.

I. The two-year pre-business course in the College of Science, Literature, and the Arts, required for admission to the School of Business, is made up as follows:

1. Ten credits in Introduction to Economics (Economics 1-2)
2. Fifteen credits in English-Rhetoric (Rhetoric A-B-C)
3. Ten credits in *one* of the following social sciences: history, political science, sociology
†4. Ten credits in mathematics or in *one* of the laboratory sciences, (animal biology, botany, chemistry, physics)
5. Five credits in Mechanism of Exchange (Economics 5)
6. Six credits in psychology (Psychology 1-6)
7. Ten credits in the Principles of Economics (Economics 6-7)
8. Eight credits in the Principles of Accounting (eleven credits for students specializing in accounting) (Economics 25-26-27)
9. Five credits in Statistics (Economics 14)
10. Sufficient electives to make a minimum of 90 credits with one honor point for each credit, or a smaller number of credits determined as follows: for every 5 honor points in excess of one honor point for credit, the number 90 is diminished by one.

II. Students who wish to prepare for some branch of business which relates to agriculture, such as the marketing of farm products, farm finance, farm implements, farm real estate, country merchandising, and the like, will find it to their interest to include courses in agriculture as part of their pre-business training. This may be arranged in two ways, as follows:

A. Register in the College of Agriculture, Forestry, and Home Economics and take the following courses:

1. Ten or twelve credits in General Inorganic Chemistry (Chemistry 1-2-3)
2. Five credits in Types and Breeds of Livestock (Animal Husbandry 11-12)
3. One credit in Tree Crops (Forestry 26)
4. Nine credits in Rhetoric (Rhetoric 1-2-3)
5. Nine credits in General Botany (Botany 4-5-6)
6. Five credits in Economic Geography of Agriculture (Agricultural Economics 20)
7. Five credits in Economic History of Agriculture (Agricultural Economics 21)
8. Five credits in Elements of Dairying (Dairy Husbandry 1)
9. Five credits in Principles of Economics (Agricultural Economics 5)
10. Three credits in Agricultural Economics (Agricultural Economics 6)
11. Nine credits in General Zoology (Animal Biology 14-15-16)
12. Three credits in Farm Crops (Agronomy 1)
13. Eight credits in Principles of Accounting (Economics 25-26)
14. Five credits in Farm Engineering (Agricultural Engineering 8)
15. Three credits in Fruit-Growing (Horticulture 6) or Vegetable-Growing (Horticulture 32)

† Students who expect to specialize in accounting or banking should take Mathematics 8 and 20.

16. Five credits in Statistics (Agricultural Economics 13)
17. Six credits in psychology (Psychology 1-6)
18. Sufficient work from the following list to make a minimum of 102 credits:
    a. Six credits in Soils (Soils 4-5)
    b. Five credits in Argumentation (Rhetoric 11) or Public Speaking (Rhetoric 22)
    c. Five credits in Agricultural Physics (Agricultural Engineering 23)
    d. Five credits in Commerce Algebra (Mathematics 8) or Applied Mathematics.
    e. Five credits in bacteriology (Bacteriology 51)
    f. Ten credits in Agricultural Biochemistry (Agricultural Biochemistry 7-8)
    g. Two credits in Mechanical Drawing (Agricultural Engineering 3)

A standing of one honor point for each credit is required for admission to the School of Business.

Students considering this group of courses should consult the bulletin of courses in agriculture for further particulars as to courses, registration, etc.

B. Register in the College of Science, Literature, and the Arts and make substitutions for certain of the regular requirements of the pre-business course of the College of Science, Literature, and the Arts as follows:

Economics 20-21 for Economics 1-2
Economics 5 and 6 for Economics 3-4
Economics 13 for Economics 14
Political Science 1 for item number 3, Pre-Business course
Twenty credits in chemistry or animal biology and botany for item number 4
At least 5 credits in technical agricultural subjects should be selected in addition to the regular 90 hours.

III. Students who expect to engage in administrative work in manufacturing industries, should take their pre-business work in the College of Engineering and Architecture. The following prescribed program* for the freshman and sophomore years must be completed prior to registration in the course in Industrial Administration in the School of Business. A minimum of 97 credits is required for admission to the School of Business from this course.

FRESHMAN YEAR

Fall	Hours	Winter	Hours	Spring	Hours
M. & M. 11 College Algebra	5	M. & M. 12 Trigonometry	5	Spring M. & M. 13 Analytic Geometry	5
Chem. 4 General Inorganic Chemistry	4	Chem. 5 General Inorganic Chemistry	4	Qualitative Analysis	5
or		or		Rhet. 6 Rhetoric	3
Chem. 14 General Inorganic Chemistry	5	Chem. 15 General Inorganic Chemistry	5	Draw. 3 Descriptive Geometry	3
Rhet. 4 Rhetoric and Composition	3	Rhet. 5 Rhetoric and Composition	3	M.E. 11, 12, or 13 Shop Practice	2
Draw. 1 Engineering Drawing	3	Draw. 2 Engineering Drawing	3	P.H. 2 Hygiene and First Aid	0
M.E. 11, 12, or 13 Shop Practice	2	M.E. 11, 12, or 13 Shop Practice	2	Mil. 3 Military Science and Tactics	0
G.E. 11 Orientation	0	G.E. 12 Orientation	0		18
Mil. 1 Military Science and Tactics	0	Mil. 2 Military Science and Tactics	0		
	17 or 18		17 or 18		

* See bulletin of College of Engineering and Architecture for description of courses.

SOPHOMORE YEAR

Fall	Hours	Winter	Hours	Spring	Hours
M. & M. 91 Calculus..	4	M. & M. 92 Mechanics.	4	M. & M. 93 Materials.	4
Phys. 3 Mechanics and Sound	3	Phys. 23 Heat.....	3	Phys. 43 Magnetism and Electricity	3
Phys. 4 Mechanics Laboratory	1	Phys. 24 Heat Laboratory	1	Phys. 44 Electrical Laboratory	1
Econ. 8 General Economics	3	Econ. 9 General Economics	3	Econ. 10 General Economics	3
M.E. 14 Machine Shop Practice	4	Econ. 25 Principles of Accounting	4	Econ. 26 Principles of Accounting	4
Psy. 1 General Psychology	3	Psy. 6 General Psychology	3	M.E. 21 Mechanical Technology	1
	18		18	M.E. 41 Automotives..	2
					18

JUNIOR AND SENIOR YEARS

The work of the junior and senior years is taken in the School of Business, where stress is laid upon the adaptation of the student's curriculum to his future plans. In order to make this aim effective, every student is assigned to an adviser who makes a study of his needs and helps him to frame a program which will most nearly meet them.

The programs of study summarized below will therefore be varied as each particular case dictates. In some cases the student will be advised to elect subjects in other schools and colleges of the University in order to obtain a well-rounded preparation for his prospective career.

I. THE GENERAL COURSE IN BUSINESS

This course is recommended to those persons who desire a well-balanced training in the important fields of business education or for those who are not yet able to decide upon a specialized field. The program is made up of courses in finance, business law, marketing, transportation, labor, and advanced general economics, with sufficient leeway for electives in other fields.

II. ACCOUNTING

The program in accounting is designed to meet the needs of those persons who are preparing for public accounting, the teaching of accounting, or for positions as accountants in financial or business establishments In this program, courses in cost and industrial accounting, practice and procedure, income tax accounting, and auditing are required in addition to courses which afford a survey of all of the important fields of business.

III. AGRICULTURAL BUSINESS

This line of specialization is intended for students who wish to prepare for some branch of business which relates to agriculture, such as the marketing of farm products, farm finance, farm implements, farm real estate,

country merchandising, and the like. Supplementary courses in technical agriculture should be made a part of the freshman and sophomore programs of students who expect to choose this program. It differs from the general course chiefly with respect to the amount of work required in agricultural economics.

IV. BANKING

The program in banking is designed for persons who expect to become connected with banks and bond houses. It aims to supplement the broad general training in economics, given to all School of Business students, with courses which will be of value to persons who have to deal intimately with financial questions. Courses in foreign exchange, investments, corporate finance, and current financial problems are special requirements in this program.

V. FOREIGN TRADE

The course in foreign trade is designed for persons who plan to associate themselves with exporting houses or with export departments of large manufacturing and mercantile establishments. The special requirements of this course are an intimate knowledge of commercial policies, international commercial law, geography, and principles of international banking and exchange.

VI. PERSONNEL MANAGEMENT

This program offers basic training to (1) prospective heads of personnel departments in business establishments or of subdivisions thereof, and (2) to persons who expect to participate as trained experts in the adjustment of matters pertaining to the employment of labor. Thoro training in psychology and personnel administration are the outstanding features of the course.

VII. MERCHANDISING

The subjects offered here are sufficiently fundamental and the freedom of election sufficiently great to include preparation for both wholesaling and retailing businesses. Special attention is given to the problems of advertising, store management, and sales policy, but insistence is placed upon a thoro understanding of the economic, accounting, and statistical problems of the merchandising field.

VIII. SECRETARIAL COURSE

The courses offered in this program are arranged for the training of secretaries and assistants. If possible, the student should select supplementary courses which will best fit him for the special type of secretarial work he desires to enter. Emphasis is placed upon securing a complete understanding of the duties of a secretary, the organization and management of an office, and a thoro mastery of spoken and written English.

IX. INDUSTRIAL ADMINISTRATION

As the name indicates, this course involves a knowledge of industrial processes and it should therefore be preceded by the two-year pre-business course offered in the College of Engineering and Architecture. The work offered to all business students is supplemented by such electives in business administration and engineering as will give a well-rounded foundation for a person who expects to engage in manufacturing.

RELATED COURSES IN OTHER COLLEGES

The following courses are given under the direction of the Department of Political Science, College of Science, Literature, and the Arts:

1. *Diplomatic and consular service.*—Students looking forward to this field of work should take a major sequence in political science and such additional work in economics, history, geography, languages, and law as may be prescribed by the major adviser or the committee in charge of the course. A fifth year of work to be taken in the Graduate School is also strongly recommended. Consult Mr. Allin or Mr. Quigley.
2. *Municipal Administration and Engineering.*—By arrangement with the College of Engineering and Architecture, a combined course in Municipal Administration and Engineering has been provided, leading to the bachelor of science degree at the end of the fourth year, and the master of science degree at the end of the fifth year.

In the Junior College the student should take the mathematics and drawing work required of engineering students, American and Municipal Government, Principles of Economics and Physics. In the Senior College he should take from 24 to 30 credits in political science selected from the following courses: 111, 113, 115, 130, 131, 132, 141, 145, 151-152, 155, 157, and 159; from 15 to 18 credits in economics selected from the following courses: 14, 25-26, 154, 161, 191-192, 193; from 18 to 24 credits in civil engineering selected from the following courses: 11-12-13, 51-52-53, 162, 163, 272; and such work in bacteriology, public health, sociology, and other fields as may be prescribed by the adviser. Graduate work will be handled by special arrangement. Consult Mr. Anderson or Mr. Lambie.

DESCRIPTION OF COURSES

ACCOUNTING

25-26†-27. Principles of Accounting. Agricultural students see Agricultural Economics 28. Engineering students see Economics 29, College of Engineering bulletin.

131f-132w-133s.† Cost Accounting. Business students who desire a single quarter's survey of this subject should elect it under the course number 130f. Engineering students see Economics 93, College of Engineering bulletin.

134f. Income Tax Accounting.

135w-136s.† Auditing.

137f-138w-139s.† Accounting Practice and Procedure.

180f-181w-182s.† Senior Seminar. Section A. Accounting.

ADMINISTRATION

85f,s. Principles of Marketing. A general course dealing with the mechanism and operation of markets: classification, organization, market agencies as factors in production. The price-making process: control of supply, assumption of risk, incidence of marketing costs. Wastes of competition.

86s. Office Organization and Management.

88s. Advertising.

89f,s. Principles of Industrial Organization. Administration of business enterprises; co-ordination of men and departments; delegation of authority; planning, production control; scientific management. Engineering students see Economics 91w, College of Engineering bulletin.

94f-95w-96s. Secretarial Administration. (For juniors.)

97f-98w-99s. Advanced Secretarial Administration. (For seniors.)

108w.* Marketing Organization: Agricultural Products. The principles of organization of the market and of marketing enterprises applied especially to farm products. (Not open to those taking the agricultural business course of study.)

180f-181w-182s.† Senior Seminar. Section C. Marketing.

AGRICULTURAL ECONOMICS

See bulletin of College of Agriculture, Forestry, and Home Economics.

110f-111w. Economics of Agricultural Production I and II.

130w. Prices of Farm Products.

131s. Market Prices.

135s. Methods of Forecasting Farm Prices of Farm Products.

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

* Offered on Minneapolis campus.

144f. Principles of Co-operation.
145w-146s.* Marketing Management.
170s.* Land Economics.
171s. Land Tenure. (Not offered in 1924-25.)
219f-220w-221s. Seminar in Agricultural Economics.

COMMERCE

176f,s. Commercial Policies. Theory of international commerce; free trade, reciprocity, subsidies, preferential treatment, the open door, international finance, commercial treaties, foreign politics, and other governmental and organized efforts to affect trade. American problems emphasized.
177w. Foreign Trade.

ECONOMIC THEORY

1f-2w. Introduction to Economics. Principles of economics relating especially to productive organization, considered from standpoint of society as a whole and of individual enterprises. Application of principles and necessary description of industry and commerce. Emphasis upon localization of enterprises.
6f-7w. Principles of Economics. Engineering students see Economics 8-9-10, College of Engineering bulletin.
90s. Economics of Consumption. (See Economics 90, College of Agriculture bulletin.)
101f-102w.† Advanced General Economics.
103f-104w.† Value and Distribution.
105s. History of Economic Ideas.
203f-204w-205s.† Graduate Seminar in Economic Theory.

FINANCE

5s. The Mechanism of Exchange. Relation to economic system. Monetary principles, special reference to United States. American banking and bank organization, principles of commercial, non-commercial banking.
50s. Farm Finance. (See College of Agriculture bulletin.)
143f-144w,w-s.† The Financial System.

Note.—After 1925-26 this course will be discontinued. Economics 5, the Mechanism of Exchange, and 141, Financial Policies, will take its place.

145s. Foreign Exchange.
146f. Investments.
147s. Bank Administration.
149w,s. Business Cycles. American business conditions since 1890 with regard to the great cycles of alternate prosperity and depression, and

* Offered on Minneapolis campus.

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

financial panics. Critical examination of all the available business barometers designed to forecast similar conditions.

150s. Advanced Farm Finance.

155s. Corporation Finance. Engineering students see Economics 92, College of Engineering bulletin.

156f. Advanced Corporation Finance.

180f-181w-182s.† Senior Seminar. Section B. Business Finance.

191f-192w.† Public Finance.

193s. State and Local Taxation.

243f-244w-245s.† Graduate Seminar in Private Finance.

GEOGRAPHY

See bulletin of College of Science, Literature, and the Arts.

1-2.† Introduction to Human Geography.

33. Climatology.

41. Geography of Commercial Production.

62. Trade Routes and Trade Centers.

71. Geography of North America.

81. Geography of Minnesota.

HISTORY (Economic)

See bulletin of College of Science, Literature, and the Arts.

80f-81w. Introduction to Economic History.

118-119-120. Economic History of Europe and the United States, 1750 to the Present.

121-122-123. Economic History of Europe, 1300-1750. (Not offered in 1924-25.)

170s. Economic History of the United States since the Civil War.

210-211-212. Seminar in Economic History. (Not offered in 1924-25.)

INSURANCE

59f. Life Insurance.

60s. Property Insurance.

62w. Social Insurance.

LABOR AND PERSONNEL MANAGEMENT

161f,w. Labor Problems and Trade Unionism.

162w. Labor Movement in America and England.

167w. Personnel Administration. Managerial policy for various types of organization, of labor. Special attention to job analysis, employment incentives, and regularization of employment.

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

168s. Advanced Personnel Administration. Special attention to employee-training, joint relations, health and safety, and methods of personnel research, e.g., by analysis of labor turnover.
169s. The Labor and Socialist Movement in Europe.
180f-181w-182s.† Senior Seminar. Section D. Labor.

MATHEMATICS

See bulletin of College of Science, Literature, and the Arts.

8. Commerce Algebra.
20. Mathematics of Investment.

POLITICAL SCIENCE (including Business Law)

See bulletin of College of Science, Literature, and the Arts

51f-52w-53s.† Business Law.
65w. Colonization.
157f. Police Power.
158s. Government and Business.
159w. Law of Public Utilities.

PSYCHOLOGY

See bulletin of College of Science, Literature, and the Arts.

1f-6w. General Psychology for Business Students. Offered only to business and pre-business students.
56w. Psychology of Advertising.
60f. Employment Psychology.
64s. Vocational Psychology.
125f-126w. Psychology of Individual Differences.

PUBLIC UTILITIES

72f. Economics of Transportation.
73w. Railway Traffic and Rates.
74s. Transportation Problems. An intensive study of certain important problems such as valuation, public ownership, operation, and regulation.
153w. The Trust Problem.
154s. Public Utilities.
159w. Law of Public Utilities. (See Political Science 159.)
180f-181w-182s.† Senior Seminar. Section E. Public Utilities and Transportation.

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

STATISTICS

14s. Elements of Statistics. Agricultural students see Economics 13, College of Agriculture bulletin.

112f. Business Statistics. Application of statistical methods in analyzing the internal and external aspects of business operations; internal aspects involving analysis of production, markets, etc., within business units; external aspects, dealing with general business conditions.

113w-114s. Theory of Statistics. The calculation and use of various constants of importance in the analysis of statistical data; averages, measures of dispersion and of correlation, partial correlation; and the theory of errors. Index numbers and analysis of time series.

180f-181w-182s.† Senior Seminar. Section F. Statistical Investigation.

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

The Bulletin *of the* University *of* Minnesota

The School of Business
Part II
Announcement of Program for the Year 1924-1925

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1924

JULY

Su	Mo	Tu	W	Th	Fr	Sa
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6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	..	..
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AUGUST

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SEPTEMBER

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OCTOBER

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NOVEMBER

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DECEMBER

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1925

JANUARY

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FEBRUARY

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MARCH

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APRIL

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MAY

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JUNE

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JULY

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AUGUST

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SEPTEMBER

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OCTOBER

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NOVEMBER

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DECEMBER

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UNIVERSITY CALENDAR

1924-25

1924			
September	18	Thursday	Payment of fees closes, except for new students
September	18-20		Entrance examinations
September	22	Monday	First semester extension classes[3] begin
September	22-26		Examinations for removal of conditions
			Physical examinations for all new students
			Registration period,[2] colleges of Science Literature, and the Arts, Agriculture, Forestry, and Home Economics, and Education
September	25-26		Registration days[2] for all colleges not included above
September	26	Friday	Payment of fees for new students closes
September	29	Monday	Fall quarter begins, 8:30[1] a.m.
October	23	Thursday	Senate meeting, 4:30 p.m.
November	1	Saturday	Home Coming Day; classes dismissed the third and fourth hours
November	4	Tuesday	Election Day; a holiday
November	11	Tuesday	Armistice Day; a holiday
November	27	Thursday	Thanksgiving Day; a holiday
December	4	Thursday	State Day Convocation
December	17-20		Final examination period
December	18	Thursday	Commencement Convocation
December	18	Thursday	Senate meeting, 4:30 p.m.
December	20	Saturday	Fall quarter ends, Christmas vacation begins, 5:20 p.m.
1925			
January	5	Monday	Christmas vacation ends, winter quarter begins, 8:30[1] a.m.
January	30	Friday	First semester extension classes close
February	2	Monday	Second semester extension classes[3] begin
February	12	Thursday	Lincoln's Birthday; a holiday

[1] First hour classes begin at 8:00 in the Medical School and at 8:15 at University Farm.

[2] Registration subsequent to the date specified will necessitate the approval of the college concerned. See also penalty fees for late registration, Part I, p. 7.

[3] This date does not refer to correspondence study courses which may be started at any time during the year.

February	19	Thursday	Charter Day Convocation
February	19	Thursday	Senate meeting, 4:30 p.m.
March	16-19		Final examination period
March	21	Saturday	Winter quarter ends, spring vacation begins, 5:20 p.m.
March	30	Monday	Spring vacation ends, spring quarter begins, 8:30[1] a.m.
April	10	Friday	Good Friday; a holiday
May	14	Thursday	Cap and Gown Day Convocation
May	21	Thursday	Senate meeting, 4:30 p.m.
May	29	Friday	Second semester extension classes close
May	30	Saturday	Memorial Day; a holiday
June	10-13		Final examination period
June	13	Saturday	Spring quarter closes, 5:20 p.m.
June	14	Sunday	Baccalaureate service
June	15	Monday	Fifty-third annual commencement
June	19-20		Summer Session first term begins, registration and payment of fees
June	22	Monday	Classes begin, 8:00 a.m.
July	4	Saturday	Independence Day; a holiday
August	1	Saturday	First term Summer Session closes
			Registration and payment of fees for second term closes
August	3	Monday	Second term classes begin
September	5	Saturday	Second term Summer Session closes

No student will be allowed to register in the University after one week from the beginning of the quarter excepting in unusual cases wherein special and peculiar circumstances shall justify the appropriate committee of the college concerned permitting registration at a later date.

THE SCHOOL OF BUSINESS

THE COURSES OF STUDY

Students who have completed with a C average one of the two-year pre-business programs or its equivalent are eligible for admission to the junior class of the School of Business. However, students entering from other institutions of recognized standing may be admitted if deficient in not more than two of the following: accounting, psychology, statistics, provided (1) that at least 90 credits and 90 honor points have been granted by the University examiner for the work done elsewhere, (2) that the deficiency be removed during the first year in the School of Business.

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

The programs of study here given will therefore be varied as each particular case dictates. In some cases the student will be advised to elect one or more subjects in other schools and colleges of the University in order to obtain a well-rounded preparation for his prospective career.

I. THE GENERAL COURSE IN BUSINESS

Adviser, Mr. Mudgett

This course is recommended to those persons who desire a well-balanced training in the important fields of business education or for those who are not yet able to decide upon a specialized field of study.

JUNIOR YEAR

Fall	Hours	Winter	Hours	Spring	Hours
The Financial System	4	The Financial System	4	Corporation Finance	3
Business Law	3	Business Law	3	Business Law	3
Principles of Marketing	3	Industrial Organization	3	Electives	8 to 11
Electives	4 to 7	Electives	4 to 7		

SENIOR YEAR

Fall	Hours	Winter	Hours	Spring	Hours
Cost Accounting	3	Labor Problems	3	Business Cycles	3
Advanced General Economics	3	Advanced General Economics	3	Geography of Commercial Production	5
Econ. of Transportation	3	Personnel Administration	3	Electives	6 to 9
Electives	5 to 8	Electives	5 to 8		

RECOMMENDED ELECTIVES

	Hours
Economic History	3 to 6
Investments	3
Advanced Personnel Administration	3
Accounting Practice and Procedure	9
Government and Business	3
Property Insurance	3
Public Finance	6
Advanced English Composition	9
Agricultural Economics	3
The Trust Problem	3
Commercial Policies	3
Railway Traffic and Rates	3
Economics of Agricultural Production	3
Office Management	3
Life Insurance	3
Marketing of Farm Products	3
Police Power	3
Foreign Exchange	3

II. ACCOUNTING

Adviser, Mr. Heilman

The program in accounting is designed to meet the needs of those persons who are preparing for public accounting, the teaching of accounting, or for positions as accountants in financial or business establishments.

JUNIOR YEAR

Fall	Hours	Winter	Hours	Spring	Hours
Cost Accounting	3	Cost Accounting	3	Cost Accounting	3
Accounting Practice and Procedure	3	Accounting Practice and Procedure	3	Accounting Practice and Procedure	3
Business Law	3	Business Law	3	Business Law	3
Financial System	4	Financial System	4	Corporation Finance	3
Electives	1 to 4	Electives	1 to 4	Electives	2 to 5

SENIOR YEAR

Fall	Hours	Winter	Hours	Spring	Hours
Advanced General Economics	3	Advanced General Economics	3	Business Cycles	3
Income Tax Accounting	3	Auditing	3	Auditing	3
Seminar	3	Seminar	3	Seminar	3
Electives	5 to 8	Electives	5 to 8	Electives	5 to 8

RECOMMENDED ELECTIVES

	Hours
Economic History	3 to 6
Industrial Organization	3
Commerce Algebra	5
Mathematics of Investment	5
Government and Business	3
Public Finance	6
State and Local Taxation	3
Principles of Marketing	3
Office Management	3
Investments	3
Property Insurance	3
Business Statistics	3
Advanced English Composition	9

III. AGRICULTURAL BUSINESS

Adviser, Mr. Black

This line of specialization is intended for students, who wish to prepare for some branch of business which relates to agriculture, such as the marketing of farm products, farm finance, farm implements, farm real estate, country merchandising, and the like. The student should also take supplementary courses in technical agriculture. It is rcommended that as many as possible of these be taken during the pre-business years. One hundred ninety-two credits are required for graduation from this course.

JUNIOR YEAR

Fall	Hours	Winter	Hours	Spring	Hours
Economics of Agricultural Production I..	3	Economics of Agricultural Production II..	3	Marketing Organization: Perishables	3
Principles of Marketing Organization	3	Marketing Organization: Semi-Perishables ...	3	The Financial System..	4
Prices of Farm Products	3	Market Price	3	Business Law	3
Agricultural Statistics..	5	The Financial System..	4		
Business Law	3	Business Law	3		

SENIOR YEAR

Fall	Hours	Winter	Hours	Spring	Hours
Principles of Co-operation	3	Advanced General Economics	3	Methods of Forecasting Prices	3
Advanced General Economics	3	Railway Traffic and Rates	3	Advanced Farm Finance	3
Economics of Transportation	3	Business Cycles	3	Land Economics	3

RECOMMENDED ELECTIVES

	Hours
Economic History	3 to 6
Business Statistics	3
Theory of Statistics	3
Corporation Finance	3
Commercial Policies	6
Public Finance	6
Marketing Management	6
Farm Management II: Organization	3
Farm Management II: Operation	3

IV. BANKING

Adviser, Mr. Stehman

This program is designed for persons who expect to become connected with banks and bond houses.

JUNIOR YEAR

Fall	Hours	Winter	Hours	Spring	Hours
The Financial System	4	The Financial System	4	Corporation Finance	3
Business Law	3	Business Law	3	Business Law	3
Electives	7 to 10	Electives	7 to 10	Electives	8 to 11

SENIOR YEAR

Fall	Hours	Winter	Hours	Spring	Hours
Advanced General Economics	3	Advanced General Economics	3	Bank Administration	3
Advanced Corporation Finance	3	Senior Seminar	3	Foreign Exchange	3
Investments	3	Business Cycles	3	Senior Seminar	3
Senior Seminar	3	Electives	5 to 8	Electives	5 to 8
Electives	2 to 5				

RECOMMENDED ELECTIVES

	Hours
Economic History	3 to 6
Industrial Organization	3
Advanced Farm Finance	3
Cost Accounting	3
Public Finance	6
State and Local Taxation	3
Economics of Transportation	3
Advanced English Composition	9
Foreign Trade	3
Commercial Policies	3
Principles of Marketing	3
Geography	5-9
Land Economics	5
Agricultural Economics	3
Life Insurance	3
Business Statistics	3
The Trust Problem	3

V. FOREIGN TRADE

Adviser, Mr. Blakey

This course is designed for persons who plan to associate themselves with exporting houses or with export departments of large manufacturing and mercantile establishments.

JUNIOR YEAR

Fall	Hours	Winter	Hours	Spring	Hours
The Financial System	4	The Financial System	4	Foreign Exchange	3
Principles of Marketing	3	Railway Traffic and Rates	3	Advertising	3
Economics of Transportation	3	Psychology of Advertising	3	Transportation Problems	3
Electives	4 to 7	Electives	3 to 7	Geography of Commercial Production	5
				Electives	0 to 3

SENIOR YEAR

Fall	Hours	Winter	Hours	Spring	Hours
Advanced General Economics	3	Advanced General Economics	3	Business Cycles	3
Business Law	3	Business Law	3	Business Law	3
Commercial Policies	3	Foreign Trade	3	Electives	8 to 11
International Law	3	International Law	3		
Electives	2 to 5	Electives	2 to 5		

RECOMMENDED ELECTIVES

	Hours
Economic History	3 to 6
Industrial Organization	3
Foreign Languages	..
Public Finance	6
Comparative European Government	5
Personnel Administration	3
Advanced Personnel Administration	3
Economics of Agricultural Production	3
Property Insurance	3
Business Statistics	3
Advanced English Composition	9

VI. PERSONNEL MANAGEMENT

Adviser, Mr. Paterson

This program offers basic training to (1) prospective heads of personnel departments in business establishments, or of subdivisions thereof, and (2) to persons who expect to participate as trained experts in the adjustment of matters pertaining to the employment of labor.

JUNIOR YEAR

Fall	Hours	Winter	Hours	Spring	Hours
Labor Problems and Trade Unionism	3	Industrial Organization	3	Labor and Socialist Movement in Europe	3
Business Law	3	Labor Movement in America	3	Advanced Personnel Administration	3
The Financial System	4	Personnel Administration	3	Business Law	3
Principles of Marketing	3	Business Law	3	Corporation Finance	3
Electives	1 to 4	The Financial System	4	Electives	2 to 5

SENIOR YEAR

Fall	Hours	Winter	Hours	Spring	Hours
Business Statistics	3	Social Insurance	3	Business Cycles	3
Advanced General Economics	3	Advanced General Economics	3	Vocational Psychology	2
Employment Psychology	3	Principles of Public Administration	3	Senior Seminar	3
Senior Seminar	3	Senior Seminar	3	Electives	6 to 9
Introductory to Administration	3	Electives	2 to 5		

RECOMMENDED ELECTIVES

	Hours
Economic History	3 to 6
Introduction to Anthropology	5
Psychology of Individual Differences	6
Theory of Statistics	3
Cost Accounting	3
Office Management	3
Introduction to Sociology	5
Advanced English Composition	9

VII. MERCHANDISING

Adviser, Mr. Vaile

The subjects specified in this program are sufficiently fundamental and the freedom of election sufficiently great to include preparation for manufacturing, wholesaling, and retailing businesses.

JUNIOR YEAR

Fall

	Hours
Financial System	4
Principles of Marketing	3
Business Law	3
Business Statistics	3
Electives	1 to 4

Winter

	Hours
Financial System	4
Psychology of Advertising	3
Businses Law	3
Theory of Statistics	3
Electives	1 to 4

Spring

	Hours
Corporation Finance	3
Advertising	3
Business Law	3
Electives	5 to 8

SENIOR YEAR

Fall

	Hours
Advanced General Economics	3
Seminar	3
Economics of Transportation	3
Commercial Policies	3
Electives	1 to 5

Winter

	Hours
Advanced General Economics	3
Seminar	3
Railway Traffic and Rates	3
Marketing Organizations: Agricultural Products	3
Electives	1 to 5

Spring

	Hours
Business Cycles	3
Seminar	3
Transportation Problems	3
Electives	5 to 8

RECOMMENDED ELECTIVES

	Hours
Economic History	3 to 6
Employment Psychology	3
Labor Problems	3
Principles of Co-operation	3
Logic	5
Cost Accounting	3
Industrial Organization	3
Foreign Trade	3
Personnel Administration	3
Vocational Psychology	3
Geography of Commercial Production	5
Prices of Farm Products	3

VIII. SECRETARIAL COURSE

Adviser, Miss Leonard

The courses offered in this program are arranged for the training of secretaries and assistants. The student should select, with the help of his adviser, the courses which will best prepare him for the special type of secretarial work he expects to enter. Among the positions for which he may prepare are: office manager and assistant; private secretary to persons engaged in educational, social, philanthropic, scientific, medical, legal, religious, literary, professional, or mercantile work; secretary in schools and institutions; business correspondent; registrar; teacher of commercial branches; Civil Service.

JUNIOR YEAR

Fall	Hours	Winter	Hours	Spring	Hours
Secretarial Administration	5	Secretarial Administration	5	Secretarial Administration	5
The Financial System	4	The Financial System	4	Industrial Organization	3
Business Law	3	Business Law	3	Business Law	3
Rhetoric 18 (Formal Exposition)		Rhetoric 19 (Informal Exposition)		Corporation Finance	3
or		or		Electives	0 to 3
Rhetoric 47 (Description)	3	Rhetoric 48 (Narration)	3		
Electives	2 to 5	Electives	2 to 5		

SENIOR YEAR

Fall	Hours	Winter	Hours	Spring	Hours
Advanced Secretarial Administration	5	Advanced Secretarial Administration	5	Advanced Secretarial Administration	5
Advanced General Economics	3	Advanced General Economics	3	Office Organization and Management	3
Electives	6 to 9	Electives	6 to 9	Business Cycles	3
				Electives	3 to 6

RECOMMENDED ELECTIVES

	Hours
Life Insurance	3
Social Insurance	3
Principles of Marketing	3
Economics of Transportation	3
Advertising	3
Business Statistics	3
Investments	3
Economic History	3 to 6
Cost Accounting	3
Accounting Practice and Procedure	9
Labor Problems and Trade Unionism	3
Personnel Management	3
Commercial Policies	3
Geography of Commercial Production	5
American Government	5
Government and Business	3
Public Speaking	3 to 10

IX. INDUSTRIAL ADMINISTRATION

Adviser, Mr. O'Hara

This course follows the two-year pre-business course given in the College of Engineering. The program is designed primarily for students who wish to engage in purchasing, sales, employment, or cost accounting work in manufacturing estabishments.

JUNIOR YEAR

Fall	Hours	Winter	Hours	Spring	Hours
Principles of Marketing	3	Railway Traffic and Rates	3	Corporation Finance	3
Business Law	3	Business Law	3	Business Law	3
The Financial System	4	The Financial System	4	Business Cycles	3
Electives	5 to 7	Electives	5 to 7	Elements of Statistics	5
				Electives	2 to 5

SENIOR YEAR

Fall	Hours	Winter	Hours	Spring	Hours
Advanced General Economics	3	Advanced General Economics	3	Advanced Personnel Administration	3
Cost Accounting	3	Cost Accounting	3	Cost Accounting	3
Labor Problems	3	Personnel Administration	3	Electives	10
Electives	5 to 7	Electives	5 to 7		

RECOMMENDED ELECTIVES

Students are expected to divide the time available for electives between groups A and B.

A. General and Business

	Hours
Economic History	3 to 6
Psychology (1 and 6)	6
Business Statistics	3
Theory of Statistics	3
Industrial Organization	3
Accounting Practice and Procedure	9
Geography of Commercial Production	5

B. Engineering

Gas Manufacturing and Distribution	3
Municipal Engineering	3
Contracts and Specifications	3
Estimating	3
Technical Writing	3
Industrial Management	9
Safety Engineering	3

PROGRAM*

1924-25

No.	Title		Hour	Day	Bldg.	Instructor
1f-2w†	Introduction to Economics ..... (10 cred.; pre-bus. fr., and majors in economics, soph., jr., sr.; prereq., none)					
	Lect.		III	TTh	OLAud	Mr. Black and others
	Sec.	1	I	TThS	213B	
		2	I	TThS	25F	
		3	II	TThS	202B(f)213B(w)	
		4	II	TThS	25F	
		5	I	MWF	25F	
		6	II	MWF	213B(f)202B(w)	
		7	III	MWF	102B	
	(Sections	8	IV	MWF	15F	
	limited	9	IV	MWF	6F	
	to 25	10	V	MWF	109B	
	students	11	VI	MWF	109B	
	each)	12	VI	MWF	213B(f) 102B(w	
		13	VII	MWF	213B(f) 3F(w)	
		14	VII	MWF	209B	
		15	VIII	MWF	202B	
		16	VIII	MWF	213B	
(1s)-2f†§	Introduction to Economic History.....					
	Lect.		III	TThS	202B	Mr. Taylor and others
	Sec.	1	I	MW	213B	
		2	II	MW	209B	
		3	V	MW	202B	
5s	The Mechanism of Exchange..... (5 cred.; pre-bus. fr., and majors in economics; prereq., 1-2)					
	Lect.		III	TTh	LitTh	Mr. Dowrie and others
	Sec.	1	I	TThS	202B	
		2	I	TThS	102B	
		3	II	TThS	102B	
		4	II	TThS	213B	
		5	III	MWF	25F	
		6	IV	MWF	6F	
		7	IV	MWF	15F	
		8	V	MWF	202B	
		9	VI	MWF	213B	
		10	VI	MWF	202B	
		11	VII	MWF	102B	
		12	VIII	MWF	202B	

* Each course has in parentheses an abbreviated statement of credits and prerequisites. Thus (5 cred.; jr., sr., grad.; prereq., 3-4) means that the course carries 5 credits, is offered to juniors, seniors, and graduates, and demands Course 3-4 in the same department as a prerequisite.

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

( ) Numbers in parentheses do not refer to the year 1924-25.

§ Second quarter of Introduction to Economic History as given in 1923-24.

No.	Title		Hour	Day	Bldg.	Instructor
6f-7w†	Principles of Economics..... (10 cred.; pre-bus., soph.; prereq., none)					
	Lect.		I	Th	LitTh	Mr. Hansen and others
	Sec.	1	I	TWFS	124F	
	(Limited	2	II	TThFS	OLc	
	to 25	3	III	TThFS	25F	
	each)	4	IV	MWFS	109B	
		5	VI	MWThF	OLc	
		6	VII	MWThF	202B	
		7	III	TThFS	109B	
		8	V	MWFS	209B	
		9	VI	MWThF	212F	
(3s)-7f†*	Principles of Economics ..... (5 cred.; soph., jr., sr.; prereq., 3)					
	Lect.		III	F	LitTh	Mr. Hansen and others
	Sec.	1	I	TThFS	6F	
		2	II	TThFS	209B	
		3	IV	MTWS	209B	
		4	VI	MWThF	25F	
		5	VIII	MWThF	102B	
6w-7s†	Principles of Economics..... (10 cred.; soph., jr., sr.; prereq., none)					
	Lect.		II	T	LitTh	Mr. Hansen and others
	Sec.	1	I	TThFS	209B(w)6F(s)	
		2	I	TThFS	109B(w)OLb(s)	
	(Limited	3	II	MWFS	6F	
	to 25	4	II	MWFS	321F	
	each)	5	III	MWFS	102F	
		6	IV	MWFS	25F	
		7	V	MWFS	102B	
		8	VI	MWThF	25F	
		9	VI	MWThF	322F	
		10	VII	MWThF	25F	
		11	VII	MWThF	15F	
6s-(7f)†	Principles of Economics..... (5 cred.; soph., jr., sr.; prereq., none)					
	Lect.		III	W	MuAud	Mr. Hansen and others
	Sec.	1	I	TThFS	25F	
		2	II	TThFS	109B	
	(Limited	3	III	TThFS	202B	
	to 25	4	IV	MWFS	109B	
	each)	5	VI	MWThF	OLc	
		6	VII	MWThF	209B	
8f-9w-10s	General Economics		See College of Engineering bulletin			
14s	Elements of Statistics..... (5 cred.; soph., jr., sr.; prereq., 6-7)					
	Lect.		III	MW	OLAud	Mr. Mudgett and others
	Sec.	1	I-II	MW	301B	
		2	I-II	ThS	301B	
	(Limited	3	III-IV	TS	301B	
	to 25	4	VI-VII	WF	301B	
	each)	5	VI-VII	TTh	301B	
		6	VIII-IX	WF	301B	
		7	VIII-IX	TTh	301B	

† The entire course must be completed before credit is received for any quarter.
( ) Numbers in parentheses do not refer to the year 1924-25.
* Second quarter of Course 3-4 as offered in 1923-24.

No.	Title		Hour	Day	Bldg.	Instructor
		8	VI-VII	M	301B	
			I-II	F	301B	
		9	VIII-IX	M	301B	
			III-IV	F	301B	
25f-26w†	Principles of Accounting..... (8 cred.; soph., jr., sr.; prereq., 6-7, or concurrently)					
	Lect. Sec.	1	I	MWF	301B	Mr. Heilman and others
		2	I	TThS	301B(f)	
		3	II	MWF	301B	
		4	II	TThS	301B	
		5	III	MWF	301B(f)	
	(Limited	6	III	TThS	301B	
	to 30	7	IV	MWF	301B	
Both lecture	each)	8	V	MWF	301B	
and labora-		9	VI	MWF	301B	
tory must be		10	II	MWF	303B(f)	
taken in order	Lab. Sec.	1	VI-VII	M	303B	
to receive		2	I-II	T	303B	
credit for		3	VI-VII	W	303B(f)	
this course.		4	VI-VII	Th	303B	
		5	VI-VII	F	303B	
		6	VII VIII	M	301B	
		7	VII-VIII	T	301B(f)	
		8	VII-VIII	W	301B	
	(Limited	9	VII-VIII	Th	301B	
	to 18	10	VII-VIII	F	301B(f)	
	each)	11	VIII-IX	T	303B	
		12	VIII-IX	W	303B(f)	
		13	III-IV	T	303B	
		14	II-III	Th	303B	
		15	III-IV	S	303B	
		16	III-IV	F	303B	
25w-26s†	Principles of Accounting.....					
	Lect. Sec	1	II	MWF	303B	Mr. Heilman and others
		2	I	TThS	301B(w) 303B(s)	
		3	III	MWF	301B(w) 303B(s)	
		4	IV	MWF	209B(w) 303B(s)	
		5	VI	MWF	213B(w)	
	Lab. Sec.	1	VI-VII	T	303B	
		2	III-IV	W	303B(w) 301B(s)	
		3	VIII-IX	M	303B	
		4	VIII-IX	W	303B	
		5	II-III	S	104B	
		6	VII-VIII	F	301B(w) 303B(s)	
		7	VI-VII	W	303B	
		8	VII-VIII	T	301B(w)	
27s	Principles of Accounting..... (Required of all students who intend to specialize in accounting) (3 cred.; soph., jr., sr.; prereq., 25-26)					
	Sec.	1	I	TThS	209B	Mr. Heilman and others
		2	VI	MWF	209B	
28f,w,s	Principles of Accounting.....		See College of Agriculture bulletin			

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

No.	Title	Hour	Day	Bldg.	Instructor
29f	Principles of Accounting	See College of Engineering bulletin			
50s	Farm Finance	See College of Agriculture bulletin			
51f-52w-53s†	Business Law	See Political Science 51-52-53			
59f	Life Insurance (3 cred.; jr., sr.; prereq., 6-7)	III	TThS	102B	Mr. Graves
60s	Property Insurance (3 cred., jr., sr.; prereq., 6-7)	III	TThS	102B	Mr. Graves
62w	Social Insurance (3 cred.; jr., sr.; prereq., 6-7)	III	TThS	102B	Mr. Graves
65w	Colonization	See Political Science 65			
72f	Economics of Transportation (3 cred.; jr., sr.; prereq., 6-7)				
	Sec. 1	VI	MWF	202B	Mr. Cummings
	2 (Section limited to 30 students)	VII	MWF	109B	
72s	Economics of Transportation (3 cred.; jr., sr.; prereq., 6-7) (Section limited to 30 students)	VII	MWF	109B	Mr. Cummings
73w	Railway Traffic and Rates (3 cred.; jr., sr.; prereq., 6-7)	VI	MWF	102B	Mr. Cummings
74s	Transportation Problems (3 cred.; jr., sr.; prereq., 72)	VI	MWF	102B	Mr. Cummings
80f-81w	Introduction to Economic History	See History 80-81			
84w	Prices of Farm Products	See College of Agriculture bulletin			
85f	Principles of Marketing (3 cred.; jr., sr.; prereq., 6-7)				
	Lect.	I	F	209B	Mr. Vaile
	Sec. 1	I	TTh	202B	
	2	I	MW	209B	
	3	III	ThS	213B	
	4	IV	WF	213B	
85s	Principles of Marketing (3 cred.; jr., sr.; prereq., 6-7)				
	Lect.	I	F	109B	Mr. Vaile
	Sec. 1	I	TTh	109B	
	2	I	MW	109B	
	3	III	ThS	213B	
	4	IV	WF	213B	
86s	Office Organization and Management (3 cred.; jr., sr.; prereq., 6-7)	V	MWF	104B	Miss Leonard
88s	Advertising (3 cred.; jr., sr.; prereq., 85, Psy. 156)	III	MWF	109B	Mr. Vaile
89f	Industrial Organization (3 cred.; jr., sr.; prereq., 6-7)	I	TThS	109B	Mr. O'Hara
89s	Industrial Organization (3 cred.; jr., sr.; prereq., 6-7)	I	MWF	209B	Mr. O'Hara
90s	Economics of Consumption	See College of Agriculture bulletin			
91w	Principles of Organization and Management	See College of Engineering bulletin			
92s	Business Finance for Engineers	See College of Engineering bulletin			
93s	Cost Accounting for Engineers	See College of Engineering bulletin			
94f-95w-96s	Secretarial Administration (15 cred.; jr., sr.; prereq., 6-7)	VI-VII	MTW ThF	106B	Miss Leonard

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

No.	Title	Hour	Day	Bldg.	Instructor
97f-98w-99s	Advanced Secretarial Administration... (15 cred.; sr.; prereq., 94-95-96)	Ar	Ar	Ar	Miss Leonard
101f-102w†	Advanced General Economics ..... (6 cred.; sr.; prereq., 6-7)				
	Sec. 1	I	MWF	102B	Mr. Garver
	2	I	TThS	102B	
	3	II	MWF	102B	
103f-104w†	Value and Distribution	See Science, Literature, and Arts bulletin			
105s	History of Economic Ideas ..... (3 cred.; jr., sr., grad.; prereq., 103-104)	VIII	MWF	102B	Mr. Garver
106w	Land Economics	See College of Agriculture bulletin			
106s*	Land Economics	VII-VIII½	TTh	202B	Mr. Black
107s	Land Tenure	See College of Agriculture bulletin			
108w*	Marketing Organization: Agricultural Products ..... (3 cred.; jr., sr., grad.; prereq., 85; not open to agric. bus. students)	VIII	MWF	102B	Mr. Price
112f	Business Statistics ..... (3 cred.; jr., sr., grad.; prereq., 14)	I	MWF	109B	Mr. Mudgett
113w-114s	Theory of Statistics ..... (6 cred.; jr., sr., grad.; prereq., 14)	I	MWF	213B	Mr. Mudgett
116f,w	Economics of Agricultural Production..	See College of Agriculture bulletin			
118f-119w-120s†	Economic History of Europe, 1750 to the Present	See History 113-114-115 (Not offered in 1924-25)			
121f-122w-123s†	Economic History of Europe, 1300-1750				
130f	Cost Accounting (General survey)..... (3 cred.; sr., grad.; prereq., 25-26)	III	TThS	15F	Mr. Ostlund
131f-132w-133s†	Cost Accounting ..... (9 cred.; jr., sr., grad.; prereq., 25-26)	II	TThS	109B, 303B(s)	Mr. Ostlund
134f	Income Tax Accounting ..... (3 cred.; jr., sr., grad.; prereq., 137-138-139)	II	MWF	202B	Mr. Reighard
135w-136s†	Auditing ..... (6 cred.; jr., sr., grad.; prereq., 134)	II	MWF	209B	Mr. Reighard
137f-138w-139s†	Accounting Practice and Procedure.... (9 cred.; jr., sr., grad.; prereq., 25-26)	IV	MWF	102B	Mr. Heilman
143f-144w†	The Financial System ..... (8 cred.; jr., sr., grad.; prereq., 6-7)				
	Lect.	IV	T	LitTh	Mr. Dowrie and others
	Sec. 1	VIII	MTW	209B	
	2	II	MWF	9F	
	3	III	MWF	202B	
	4	II	TThS	OLb	
	5	III	TThS	209B	
	6	VI	MWF	209B	
	7	III	MWF	209½F	
	8	II	MWF	25F	

* Section on main campus.

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

No.	Title	Hour	Day	Bldg.	Instructor
143w-144s†	The Financial System				Mr. Dowrie, Mr. Farmer
	(8 cred.; jr., sr., grad.; prereq., 6-7)				
	Lect.	IV	S	202B	
	Sec. 1	III	MWF	227F	
	2	IV	MWF	110F	
	3	VII	MWF	213B	
145s	Foreign Exchange	IV	MWF	102F	Mr. Myers
	(3 cred.; jr., sr., grad.; prereq., 143-144)				
146f	Investments	IX	MTW	209B	Mr. Ebersole
	(3 cred.; jr., sr., grad.; prereq., 155, 143-144)				
147s	Bank Administration	IX	MTW	209B	Mr. Ebersole
	(3 cred.; jr., sr., grad.; prereq., 143-144)				
149w	Business Cycles				
	(3 cred.; sr., grad.; prereq., 143-144)				
	Lect.	IX	MT	209B	Mr. Ebersole
	Sec. 1	IX	W	209B	
	2	IX	F	209B	
	3	IX	W	202B	
149s	Business Cycles				
	(3 cred.; sr., grad.; prereq., 143-144)				
	Lect.	VIII	MT	209B	Mr. Ebersole
	Sec. 1	VIII	W	209B	
	2	VIII	F	209B	
	3	IV	F	209B	
150s	Advanced Farm Finance	VI-VII	F	104B	Mr. Dowrie
	(3 cred.; sr., grad.; prereq., 143-144)				
153w	The Trust Problem	II	MWF	213B	Mr. Stehman
	(3 cred.; jr., sr., grad.; prereq., 91,155)				
154s	Public Utilities	I	MWF	102B	Mr. Reighard
	(3 cred.; jr., sr., grad.; prereq., 155 or Pol. Sci. 159)				
155s	Corporation Finance				
	(3 cred.; jr., sr.; prereq., 143-144)				
	Lect.	III	Th	OLAud	Mr. Stehman and others
	Sec. 1	II	MW	109B	
	2	III	MW	102B	
	3	III	MW	202B	
	4	IV	MW	209B	
	5	VI	TTh	102B	
	6	VII	TTh	102B	
156f	Advanced Corporation Finance.....				
	(3 cred.; jr., sr.; prereq., 155)				
	Sec. 1	I	TThS	209B	Mr. Stehman
	2	II	TThS	213B	
157f	Police Power	See Political Science 157			
158s	Government and Business.....	See Political Science 158			
159w	The Law of Public Utilities.....	See Political Science 159w			
161f	Labor Problems and Trade Unionism...				
	(3 cred.; jr., sr., grad.; prereq., 6-7)				
	Lect.	IV	MW	202B	Mr.Hansen
	Sec. 1	IV	F	202B	
	2	IV	F	209B	
	3	I	F	213B	

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

No.	Title	Hour	Day	Bldg.	Instructor
161w	Labor Problems and Trade Unionism.. (3 cred.; jr., sr., grad.; prereq., 6-7)	III	TThS	202B	Mr. Hansen
162w	Labor Movement in America and England ..... (3 cred.; jr., sr., grad.; prereq., 161)	IV	MWF	202B	Mr. Hansen
167w	Personnel Administration ..... (3 cred.; jr., sr., grad.; prereq., 161)				
	Lect.	II	T	202B	Mr. Stead
	Sec. 1	II	ThS	202B	
	2	III	ThS	213B	
168s	Advanced Personnel Administration.... (3 cred.; jr., sr., grad.; prereq., 167)	II	TThS	209B	Mr. Stead
169s	Labor and Socialist Movement in Europe (3 cred.; jr., sr., grad.; prereq., 161)	IV	MWF	202B	Mr. Hansen
170s	Economic History of the United States since the Civil War	See History 169			
176f	Commercial Policies ..... (3 cred.; jr., sr., grad.; prereq., 6-7)	I	MWF	202B	Mr. Blakey
176s	Commercial Policies ..... (3 cred.; jr., sr., grad.; prereq., 6-7)	I	MWF	202B	Mr. Blakey
177w	Foreign Trade ..... (3 cred.; jr., sr., grad.; prereq., 176)	I	MWF	202B	Mr. Blakey
180f-181w-182s†	Senior Seminar ..... (9 cred.; School of Business seniors)				
	A. Accounting	V½-VI	TTh	301B(f,w)104B(s)	
	B. Business Finance	VII-VIII	T	213B	
	C. Marketing	VI-VII	TTh	209B(f,w)104B(s)	
	D. Labor	Ar	Ar	Ar	
	E. Public Utilities and Transportation..	Ar	Ar	Ar	
	F. Statistics	Ar	Ar	Ar	
191f-192w†	Public Finance ..... (6 cred.; jr., sr., grad.; prereq., 6-7)				
	Lect.	III	M	LitTh	Mr. Blakey
	Sec. 1	II	WF	109B	
	2	III	WF	209B	
	3	IV	WF	108F	
193s	State and Local Taxation ..... (3 cred.; jr., sr., grad.; prereq., 191-192)	III	MWF	209B	Mr. Blakey
203f-204w-205s†	Seminar in Economic Theory..... (9 cred.; grad.; prereq., 103-104)	VIII½-IX	TTh	104B	Mr. Garver
219f-220w-221s†	Seminar in Agricultural Economics....	See College of Agriculture bulletin			
243f-244w-245s	Seminar in Private Finance..... (6 cred.; grad.; prereq., 103-104 or equiv.)	Ar	Ar	Ar	Mr. Dowrie

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

The Bulletin *of the* University *of* Minnesota

General Extension Division
Announcement of Extension Classes
1924-1925

Vol. XXVII No. 28 June 21 1924

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Minneapolis, Minnesota

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Extension Calendar

In case a class observes other holidays than those here shown, the sessions missed are to be made up by extra meetings within the semester limits.

1924			
September	15-20		Registration
September	22	Monday	First semester begins
November	27	Thursday	Thanksgiving Day; a holiday
December	20	Saturday	Christmas recess begins
1925			
January	5	Monday	Class work resumed
January	26-30		Examinations, first semester classes
February	2	Monday	Second semester begins
May	25-29		Examinations, second semester classes

Contents

Opportunities through Extension Work

In his famous lecture, "Acres of Diamonds," Dr. Russell H. Conwell tells the story of Ali Hafed, an ancient Persian of great wealth, who sold his farm and other possessions at a sacrifice that he might go forth in search of a diamond mine, expecting thus to win even greater wealth and power than he had previously enjoyed. His search was in vain—and his experience all the more bitter because of the fact that, in the dooryard of his former possessions, diamonds of untold value were found by his successor.

Today we measure our "Acres of Diamonds" in terms of opportunity, which grows out of training and experience. And everyone owes it to himself or herself to secure this training, which is within the reach of all who are willing to avail themselves of it.

It is the function of the General Extension Division of the University of Minnesota to bring the benefits of university training to *all* citizens of Minnesota, including those who, for one reason or another, cannot take advantage of the instruction offered on the University campus. By this means, the University seeks to measure up to its full responsibility to the people of the state, who have built the University and who now support it.

There are many people to whom extension work opens an opportunity which otherwise they would lack. There are public school and high school teachers who wish to keep abreast of new developments in the work they are doing. There are industrial workers who must make a living, but who are anxious to devote spare time to training for advancement. There are business men and women who realize the advantages of a thoro training in the principles and practice of modern business, but who cannot give up their positions in order to pursue a full time vocational course. It is to serve these groups, as well as those who wish for further study with a view merely to self-development and culture, that the University has created the Extension Division.

The General Extension Division is prepared to organize and conduct late afternoon and evening classes in any community in the state where there is sufficient demand. For several years classes have been conducted in Minneapolis, St. Paul, Duluth, Brainerd, and at other points. The director of General Extension will welcome the opportunity to co-operate with other communities in a similar way.

Such extension classes include:

1. Courses leading to credit in the College of Science, Literature, and the Arts, in the College of Education, and in the School of Business. In extension classes of this nature many persons are completing a considerable part of the work required for a degree in the colleges mentioned.

2. Courses in business administration, accountancy, and finance. The student who so desires may arrange his work in such a way that he will be awarded an Extension Division certificate in accounting, banking and finance, or general business. Such certificates carry considerable weight in the business world, proving as they do the satisfactory completion of three years of university work in business subjects.

3. Practical courses in engineering and in industrial subjects. Certificates in engineering are awarded to students who complete satisfactorily three or four years of engineering study.

Full information regarding these courses may be found in this bulletin.

Other extension activities include Correspondence Courses in each of the three groups of subjects above, totaling about two hundred courses; and a Municipal Reference Bureau and Community Service Department (see last page of this bulletin).

General Extension Faculty

Lotus Delta Coffman, Ph.D., LL.D., President
Richard Rees Price, M.A., Ed.D., Director of University Extension
Charles W. Ball, Instructor in Accounting
Winfield W. Bardwell, LL.M., Judge of the Hennepin County District Court, Instructor in Business Law
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Gisle C. Bothne, M.A., Professor of Scandinavian Languages and Literatures
William E. Brooke, B.C.E., M.A., Professor of Mathematics and Mechanics
Joseph C. Brown, M.A., Lecturer on the Teaching of Arithmetic
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J. William Buchta, M.A., Instructor in Physics
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[1] Absent on leave, winter and spring quarters.

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Joseph E. Gillet, Ph.D., Assistant Professor of Romance Languages
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Robert Guinn, B.A., Instructor in Romance Languages
Marguerite Guinotte, Brevet Supérieur, Certificat d'Aptitude Pédagogique, M.A., Instructor in Romance Languages
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John A. Jacobson, Instructor in Accounting
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Elmer W. Johnson, E.E., M.E., Instructor in Mathematics and Mechanics
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Paul C. King, B.A., Instructor in Romance Languages
August C. Krey, Ph.D., Associate Professor of History

Samuel Kroesch, Ph.D., Associate Professor of German
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William Niemackl, Instructor in Accounting
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Everett W. Olmsted, Ph.D., Litt.D., Professor of Romance Languages
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John I. Parcel, B.A., B.S. (C.E.), Professor of Structural Engineering
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Orrin W. Potter, E.M., Instructor in Drawing and Descriptive Geometry
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A. J. B. Schmidt, B.S. in E., Instructor in Accounting
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Lee J. Seymour, B.A., Assistant Professor of Public Speaking, General Extension Division
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[1] Absent on leave, 1924-25.

Lester B. Shippee, Ph.D., Associate Professor of History
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Alpheus W. Smith, B.A., Instructor in English
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Jeremiah S. Young, Ph.D., Professor of Political Science
Otto S. Zelner, B.S. (C.E.), Associate Professor of Surveying

[1] Absent on leave, 1924-25.

General Information

The General Extension Division is organized to meet the needs of persons who are unable to matriculate and enroll as full-time students in the University. Its purpose is to serve office, store, and factory employees, teachers and home makers, and persons seeking wider culture or sounder technical training. To this end, in addition to other activities, it organizes and directs late afternoon and evening classes in any part of the state where there is sufficient demand. Through such extension classes and through its correspondence courses the opportunity is presented to pursue subjects included in a liberal or vocational education, and to have these subjects credited toward an academic degree. It is understood that students desiring credit must meet the academic entrance requirements. For those whose preparation is incomplete, the opportunity is offered to make up the deficiencies and to continue with the regular course.

The extension year is divided into two semesters of sixteen weeks each, with an extra week devoted to examinations. Classes usually meet once a week in a two-hour session. Such classes ordinarily carry three credits or "credit equivalents" (see below). Those meeting more frequently and requiring more time in preparation carry more credit.

Admission.—It is not intended that any regulation should debar from the privilege of these courses any person who can profitably pursue them. Those persons who desire credit toward an academic degree must, however, comply with the regulations governing such degree. Those not desiring credit will be admitted, provided they are sufficiently mature (more than eighteen years of age), and can satisfy the department in which they wish to study that they are able to carry the work profitably to themselves and without hindrance to the class. Students may attend any class once before registering. All classes, except those in swimming, are open to both men and women.

Students who are graduates of accredited high schools or other approved preparatory schools are urged to file with the University registrar their credentials, so that the credits earned in the Extension Division may apply toward a University degree. Attention is called to the fact that those who are not graduates of accredited preparatory schools may satisfy the University entrance requirements in several other ways. They may take the University High School Board examinations; they may pass the regularly scheduled University entrance examinations; or they may take the entrance courses offered in the Correspondence Study Department of the Extension Division. (See the University bulletin of general information for further particulars.)

Registration.—Students should register at the extension offices before the second meeting of the class in which they expect to enroll. Downtown offices are located in Minneapolis, St. Paul, and Duluth (see page 15 for location of these offices) in addition to the general office on the

campus. A class card will be given to the student at the time of registration, which must be presented to the instructor. In towns where no extension offices exist students will register with the instructor.

No student will be regarded as registered in any class until he has paid the required fee and presented his class card to the instructor.

Students are urged to enroll in advance for all extension classes. Registrations, as a rule, will not be taken at classes but must be made either at the city offices or at the campus office of the division.

Advice on registration.—Students who have had sufficient preparation need not start at the beginning of a subject but may take up the work at the point where they can pursue it with advantage.

It has been found that many persons register who cannot take the work with any great profit to themselves because of inadequate preparation. For this reason it is desirable that students should consult with the head of the department concerned before taking up any course, so that they may have proper guidance and direction.

"Credit equivalents" for extension courses.—Every student who successfully completes a course offered by the General Extension Division (including passing the final examination in that course) receives a "credit equivalent" equal in amount to the credit stated in the announcement of the course.

"Credit equivalents" for subjects prescribed in group courses leading to extension certificates (see pages 32 and 41) may be counted directly as credits toward such certificates.

The credits in the Extension Division are now computed in terms of "quarter" hours, in accordance with the present University usage, and not in "semester" hours, as was formerly the case. One semester credit equals one and one-half quarter credits. Courses meeting once a week for one semester normally carry three credits.

Conversion of credit equivalents into University credits.—Subject to the regulation that candidates for degrees must be regularly matriculated, and must complete in resident study aminimum of 45 quarter credits, "credit equivalents" may also be applied as credits toward a degree in any college of the University, so far as the subject conforms to the curriculum requirements of that college. The College of Engineering does not accept extension credits toward an engineering degree.

Students desiring credit toward a degree must, of course, satisfy the entrance requirements of the college in which the degree is sought. Virtually all the courses listed under the heading Collegiate Courses carry University credit unless otherwise specified, and the same is true of nearly all of the business courses. A few courses listed under Engineering carry credits, tho others do not. Such credits will be recorded in the registrar's office when the student has matriculated and established a record in the University.

Students must indicate at the time of registration whether or not they desire University credit in the courses pursued.

In many cases, by departmental regulations, the completion of more work in a subject than is included in one extension semester course is required before credit for any part of it can be counted on a degree. For information as to such courses see bulletins of the several schools and colleges.

The following regulations govern credit in the College of Science, Literature, and the Arts:

1. All courses for which credit is given in the College of Science, Literature, and the Arts must be authorized with the credits by the Advisory Committee. But credit shall be given only to those extension courses which are conducted in essentially the same manner as the corresponding courses in the University, and which are carried on under similar conditions as to attendance, term's work, quizzes, and examinations.

2. Each credit course shall be directly in charge of a member of the faculty.

3. Any regularly enrolled University student successfully completing an approved course shall receive the appropriate credit.

4. Any person shall receive a certificate upon satisfactorily completing an approved course. The certificates entitle the holder to the corresponding University credits whenever he has earned forty-five credits in residence. The registrar or the Students' Work Committee shall in all cases pass upon the qualifications of the student.

5. The maximum credit towards a degree for work done in extension courses shall not exceed one-half the unit hours required for graduation.

6. Credit for an amount not exceeding one quarter of the unit hours required for graduation may be given at the University of Minnesota to students of such other extension schools or departments as may be approved by the Advisory Committee, provided that such credit shall be subject to the same provisions as govern credits in the General Extension Division of the University of Minnesota.

The following limitations as to students in residence at the University should also be noted:

1. No University student may enroll for extension courses for the purpose of removing a condition or failure.

2. No University student may enroll for an extension course if this would increase his credit hours beyond what the rules allow.

3. Any University student who wishes to enroll for an extension course must first obtain the approval of the dean of his college.

Examinations.—Examinations in all of the subjects given are conducted during the last week of each semester. All students who are eligible for credit and desire it must pass these examinations.

Condition examinations will be conducted at the convenience of the instructors. Students having conditions must pass a condition examination within two semesters following the resumption of the student's extension work, otherwise the condition becomes a failure. A fee of $1 is charged for each such examination.

A grade of "incomplete" not removed by the end of the second semester following the resumption of the student's extension work, becomes a condition or a failure as the instructor may direct.

Fees.—The fee for an extension class, meeting one evening a week for two hours, and continuing through one semester of seventeen weeks, with three hours credit, is $10. Wherever the fee is more or less than this standard the amount is stated in the program of classes.

In case a student takes three or more courses simultaneously, a reduction of ten per cent is made in the total fee of $30 or more.

The fee does not include the cost of texts or materials. Where mimeographed material is supplied in place of a basic text, a uniform charge of $1 is made, payable at time of registration. For Veterans' Bureau trainees the material fees are paid by the bureau.

All fees are payable at the time of registration, and registration should not be deferred longer than the second meeting of any class. Checks should be made payable to the University of Minnesota.

Refunds.—Students who cancel their registration before the middle of any semester may obtain a pro rata refund of the tuition fee, provided notice is given the office of the Extension Division at the time of cancellation. No refund is made after the eighth week of the semester. In no case will a refund be made to a student of a class organized on a minimum registration basis. Two dollars ($2) of each fee is non-refundable, being withheld to cover expenses of registration.

Class attendance.—Every student is expected to attend the meetings of his class regularly. For credit towards a degree or a certificate the following rule must be adhered to:

"No student whose absence exceeds three of the regular scheduled sessions of the course of a semester shall be admitted to the final examination of the course without special permission of the director of University Extension."

Reports of students' work.—Reports of students' work and grades are sent to the office of the registrar of the University at the close of each semester. A report of the grade and credit earned is sent from that office to the student. This information will not be given out at the office of the Extension Division.

Length of courses.—Most of the classes meet one afternoon or evening a week for two hours, for a period of sixteen weeks, with an additional week for final examination.

Program of classes.—The time of meeting of the classes is stated in a printed program or schedule of classes issued by the Extension Division at the beginning of each semester. Ordinarily the classes will meet at 6:30 and 7:30 p.m., but a suitable time will be scheduled for any group. Classes arranged primarily for teachers often meet at 4:00 or 4:15 p.m. The program for the first semester will be sent out about September 10.

It should be understood that not all the courses listed in this bulletin are given in any one year. Final announcement of the courses offered in any semester will be found in a program issued for that semester.

The Minneapolis classes meet at the University, the Minneapolis City Hall, and the several schoolhouses. The St. Paul classes meet at the St. Paul City Hall, the Public Library, and also in schoolhouses. The Duluth classes meet in the St. Louis County Courthouse and the Central High School. In other places the classes will meet in such suitable quarters as may be obtained.

The exact place and time of meeting of each class will be announced in the program of classes.

Extension classes do not ordinarily observe the regular University holidays, except as shown in the calendar prefixed to this bulletin. In case sessions are missed for any reason they are to be made up by extra meetings within the semester limits.

Size of classes.—Classes will not ordinarily be organized for a smaller enrolment than fifteen. Under exceptional circumstances some continuation classes will be conducted for a minimum of twelve students. However, it should be understood that in some classes a larger registration will be required. Variations of the above rule will be made only at the discretion of the director.

Any course announced may be withdrawn if the registration for that particular course is considered insufficient. In case of withdrawal of any course the full fees paid will be refunded.

General Extension offices.—The General Extension Division maintains the following offices, where full information and bulletins may be obtained. Registration in all courses will be made at these offices:

Minneapolis: Room 736, Security Building (telephone, Main 0624).
Room 5, Main Engineering Building, University campus (telephone, Dinsmore 2760).

St. Paul: Room 920, Pioneer Building (telephone, Cedar 7312).

Duluth: Room 704, Alworth Building (telephone, Melrose 7900).

Department of Collegiate Instruction

Purpose.—The courses here offered are selected in the main from the College of Science, Literature, and the Arts, with two purposes in view. First, they are designed to afford an opportunity, to persons who are candidates for degrees but who are unable to pursue their entire college course in residence, to complete a part of their work while otherwise engaged. Second, the advantage of university training in cultural subjects is offered those who can devote one or more evenings a week to such work, regardless of any desire for university credit.

Courses offered.—Naturally only a portion of the numerous "academic" or "collegiate" courses offered by the University to its resident students can be given through extension classes. Graduate courses are excluded by a regulation of the Graduate School to the effect that no credits earned in extension courses may be counuted towards an advanced degree. Research courses, advanced laboratory courses, and courses requiring a large amount of library reading are by their very nature unfitted for extension teaching; and some subjects tho of a more elementary nature are ruled out because of the difficulty of getting the minimum class of fifteen. Additional courses to those listed in this bulletin will be given upon the request of any responsible individual or group willing to organize a sufficiently large class to insure the success of the undertaking.

The number prefixed to the course is usually the same as that given to the corresponding course in the regular college bulletin. The letters *ex* affixed to a number indicate either that the course is not given in the regular campus work or that it is materially modified for the purposes of extension teaching.

Credits and fees.—For detailed statement concerning credits and fees, see under General Information.

Schedule of classes.—A printed schedule indicating the time and place of meeting for each class is issued about ten days before the beginning of each semester, and will be sent upon request. Courses marked with a star (*) in the following lists were given last year.

ART

For courses in free-hand drawing, history of architecture, elements of architecture, etc., see under Department of Engineering Instruction. Under the heading Home Economics a course in interior decoration is listed.

*Art Ed. 1. Fundamental Principles of Design. First semester: Elementary problems with emphasis on value relations; the decorative use of nature material.—Second semester: Design in relation to the house; a study of period furniture with trips to the Art Institute; also a continuation of design problems related to public school work. Six credits; one meeting a week, first and second semesters. Mrs. Hanley.

Art Ed. 7. Sketching. Drawing from the posed figure in charcoal, crayon, and pencil; action and memory drawing, blackboard practice. The course will help public school teachers in illustration work. Two credits; one meeting a week, first semester. Class limited to twenty-five. Mrs. Hanley.

ASTRONOMY

*11. Descriptive Astronomy I. Lectures and recitations on the general principles and fundamental facts of astronomy, illustrated by lantern slides, simple problems, naked-eye and telescopic observations. Three credits; one meeting a week, first semester. Mr. Beal.

CHEMISTRY

*14ex. General Inorganic Chemistry—the Non-Metals. A study of the common non-metallic elements and their principal compounds, with discussions of the laws and theories of chemistry. Five credits; one lecture, one recitation, and three hours' laboratory work a week, first semester. Mr. Geiger.

*16ex. General Inorganic Chemistry and Qualitative Analysis—the Metals and Qualitative Analysis. A study of the common metallic elements and their principal compounds, with a further discussion of the laws and theories of chemistry, and systematic qualitative analysis. Open to students who have completed Course 14 or its equivalent. Five credits; one lecture, one recitation, and three hours' laboratory work a week, second semester. Mr. Geiger.

*20ex. Quantitative Analysis—Gravimetric. Introductory course covering the general principles and methods of quantitative analysis. Typical problems are assigned and attention given to proper laboratory practice. Prerequisite: Qualitative Analysis. Five credits; two meetings a week, 2½ hours each, first semester. Mr. Geiger.

*21ex. Quantitative Analysis—Volumetric. Continuation of Course 20ex. Five credits; second semester. Mr. Geiger.

*27ex. Quantitative Analysis—Pre-medical. An introductory course covering the general principles and methods of quantitative analysis, both gravimetric and volumetric. Typical problems are assigned and attention given to proper laboratory practice. Prerequisite: Qualitative Analysis. Given in connection with 21ex. Four credits; second semester. Mr. Geiger.

ECONOMICS

Classes in any of the subjects here listed will be formed on application of the minimum number of students.

*5. Survey of Financial Institutions. For description, see Department of Business Instruction.

*6. Principles of Economics. For description, see Department of Business Instruction. Three credits; one meeting a week, first semester.

*7. Economic Problems. For description, see Department of Business Instruction. Three credits; one meeting a week, second semester.

72. Economics of Transportation.

85. Principles of Marketing. A general course dealing with the mechanism and operation of markets, the price-making process, wastes of competition, etc.

*146. Investments and the Stock Exchange. For description, see Department of Business Instruction.

*149. Business Cycles and Forecasting. For description, see Department of Business Instruction.

*155. Business Finance. For description, see Department of Business Instruction.

161. Labor Problems and Trade Unionism.

191. Public Finance and Taxation.

EDUCATION

In addition to the courses listed below, attention is directed to the courses described under the heading Psychology, and also to the special course in higher algebra (listed under Mathematics) in which considerable attention is given to the related problems of arithmetic and their presentation in the schools.

*3. Educational Sociology. A course designed to explain, from the sociological standpoint, what the aims of education are, and what subjects are of most value; also designed to show how education can predetermine the institutions of the future. Three credits; one meeting a week, first semester. Mr. Finney.

42ex. Fundamental Educational Theories Relating to Instruction in the Elementary School. A study of current educational concepts as related to problems of the elementary school. Three credits; one meeting a week, first semester. Miss Lommen.

43ex. The Teaching of English in the Elementary School. A consideration of the materials and the means for improving instruction in spelling, language, and reading processes; emphasis on silent reading technique in Grades 1 to 6. Three credits; one meeting a week, second semester. Miss Lommen.

44ex. Children's Literature. A study of the nature and purposes of literature in the elementary school; bases of selecting materials for intensive and extensive reading; critical examination and evaluation of new literary materials for children's use. Three credits; one meeting a week, second semester. Miss Lommen.

*55. Elementary Educational Psychology. A survey of fundamental facts of human behavior involved in educational activities. Introduction to test and measurement in education, and general statistical methods; analysis of the learning process; suggestions for improvement of study; criticism of marks as measures of school work. Open to qualified students. Three credits in College of Education only; one meeting a week, first semester. Mr. Filter.

ENGLISH

COURSES IN LITERATURE

*1. Survey of English Literature I. A general study of the most significant English classics from Shakespeare to Swift. Lectures, recitations, and assigned readings. Three credits; one meeting a week, first semester. Miss Lees.

*2. Survey of English Literature II. A continuation of Course I; from Swift to Stevenson. Three credits; one meeting a week, second semester. Miss Lees.

8. Shakespeare. Shakespeare's development as a dramatist up to King Lear, with some attention to the general history of English drama from 1580 to 1603. The course will include the reading of all Shakespeare's earlier plays and the masterpieces of his chief contemporaries, as well as studies in the technique of Elizabethan play-writing and producing. Three credits; one meeting a week, first semester. Mr. Spencer.

*45. American Literature. Lectures on American literature, with extensive readings from the principal poets and prose writers of the United States. Little attention is paid to the novelists in this course. Three credits; one meeting a week, first semester; repeated in the second semester. Mr. Nichols.

60. The English Novel. A course dealing with the novel from the time of Scott to the present. Introductory lectures on the earlier novel; a study of Scott, Dickens, Thackeray, George Eliot, Meredith, Hardy, and others, with some work on twentieth-century fiction if time permits. Required reading of at least ten novels. Three credits; one meeting a week, first semester. Mr. Hillhouse.

70. Elizabethan Drama. Shakespeare's later development as a dramatist, with some attention to the general history of English drama from 1603 to 1642. The course will include the reading of all Shakespeare's later plays and of the masterpieces of his chief successors. The decadence of Elizabethan dramatic art will be studied, and consideration given to the evolution of the modern, or picture, stage. Three credits; one meeting a week, second semester. Mr. Spencer.

109. The Romantic Poets. A study of the Romantic School of poets from Wordsworth to Keats, and the influence of the French Revolution upon them. Three credits; one meeting a week.

136. The Contemporary Drama. A study of the drama from Ibsen to the present. Reading of about twenty-five plays by the chief dramatists, both English and continental. Three credits; one meeting a week, second semester. Mr. Hillhouse.

151. Recent Poetry. Poetry in England and America since the death of Queen Victoria; the main tradition and tendencies now prevailing. Three credits; one meeting a week, second semester.

155. The American Novel. The beginnings of the American novel and short story and their development to about 1865. Among the writers

included are Charles Brockden Brown, Irving, Cooper, Poe, Hawthorne, Thomas Bailey Aldrich. Three credits; one meeting a week, second semester. Mr. Moore.

COURSES IN RHETORIC

For a course in Business English, see that heading under Department of Business Instruction.

*4. Rhetoric I. Practical training in writing, largely exposition; analysis of prose selections and of compositions written by the class. The student will be required to do a certain amount of reading from the classics. Three credits; one meeting a week, first semester; repeated in second semester. Miss Lees.

*5. Rhetoric II. A continuation of the preceding course. Three credits; one meeting a week, second semester. Miss Lees.

*6ex. Rhetoric III. Description and Narration. Principles and practice of description and narration, with analysis of selected specimens; writing of themes and essays. Open to those who have completed the equivalent of Courses 4 and 5. Three credits; one meeting a week, first semester. Miss Lees.

*18. Exposition and Elementary Literary Criticism. A study of the essay, and the writing of essays. Open to those who have completed the equivalent of Courses 4, 5, and 6ex. Three credits; one meeting a week, second semester. Miss Lees.

*69-70. Short Story-Writing. An advanced course in writing for those who have had experience in writing for publication or have had preliminary training in the technique of writing. Open for credit only to those who have had at least two years of college courses in writing or the equivalent. Six credits; one meeting a week, first and second semesters. Mr. Sutcliffe.

51ex. English for Engineers. A course in practical English, designed to meet the professional needs of engineering students. The material of this course will include business letters—about twelve types, reports, estimates, instructions, etc. Some attention will be given to oral English. Three credits; one meeting a week, first semester.

COURSES IN PUBLIC SPEAKING

Students in public speaking will be interested in the course in parliamentary law described on page 26.

*41-42. General Course in Public Speaking. Extemporaneous speaking based on outlines; analysis and organization of speech materials; study of model speeches. Attention is also given to correctness and effectiveness in delivery. This course is designed to meet the practical needs of business and professional students. Six credits; one meeting a week, first and second semesters. Mr. Rarig, Mr. Garns, Mr. Edwards.

*81-82-83. Interpretative Reading. Interpretation and oral expression of the various forms of literature—the essay, the short story, lyric and narrative poetry, and the drama. Open to those who have credit for Courses 1-2, College Composition and Rhetoric, and Public Speaking

41-42. Six credits; one meeting a week, first and second semesters. Mr. Rarig, Mr. Garns.

*85-86. Advanced Public Speaking. The distinctive characteristics of oratorical style; analysis of the styles of representative orators. Written and extemporaneous speeches. Individual criticism and direction. Six credits; one meeting a week, first and second semesters. Mr. Rarig.

*9ex. Story-Telling to Children. (1) Story-telling, its place and value; (2) choice of the story qualities desirable and undesirable; (3) preparation of the story, application of the short-story ideals of "singleness of impression" and "dramatic struggle"; reconstruction of the story from the child's viewpoint; (4) the problem of delivery—the group consciousness, holding attention, self-effacement, vocal and verbal adaptation. No University credit; one meeting a week, first semester. Mr. Garns.

*91. Play Production. A teachers' course in classroom dramatic interpretation. (Not offered in 1924-25.)

GEOGRAPHY

41. Geography of Commercial Production. A study of the geographic basis for the production of the principal commodities which enter into world trade, together with a consideration of the areas of consumption. Special attention is given to the factors localizing great manufacturing districts. Three credits; one meeting a week, first semester. Mr. Davis.

*71. Geography of North America. A systematic study of the United States, Alaska, Mexico, and the West Indies, with special reference to industrial and commercial opportunities and the distribution and activities of the population. Three credits; one meeting a week, second semester. Mr. Davis.

*118ex. Geography of Europe. Includes (1) Europe as a whole, its main physical features, climate, soils, vegetation, natural divisions, and peoples; and (2) a separate consideration of each of the present day countries from the standpoint of natural features, resources, industries, resulting centers of population, government, etc. Incidental attention is paid to the effects of the World War and the period of reconstruction. Lectures, readings, and the preparation of two papers. Three credits; one meeting a week, first semester. Mr. Everly.

*119ex. Geography of South America. (1) The continental factors: physiography, climate, vegetation, and peoples. (2) An intensive study of each country, including physical features, mineral resources, agriculture and stock-raising, transportation, centers of population, and world's commerce. Lectures, readings, and the preparation of one paper. Three credits; one meeting a week, second semester. Mr. Everly.

GERMAN

*1. Beginning German I and II. Pronunciation, grammar, conversation, and composition; select readings in easy prose and verse. Open to students who have had no German, but both semesters must be completed before

credit is given. Six credits; one meeting a week; first and second semesters. Mr. Kroesch.

*2. Beginning German III and IV. Continuation of the above. Six credits; one meeting a week, first and second semesters. Mr. Kroesch.

10. Rapid Reading I and II. Short stories and dramas by Storm, Heyse, Baumbach, Lessing, Goethe, Schiller, Hebbel, and Sudermann. Class work and discussions are conducted in German. Open to students who have had at least one year of German. Six credits; one meeting a week, first and second semesters. Mr. Downs.

13. Elementary Conversation I and II. Conversation on topics of everyday life, aiming at fluency in the use of idiom; not a course in composition; organized on the laboratory basis. Intended for those who have had at least one year of German. Six credits; one meeting a week, first and second semesters. Mr. Davies.

*17. German for Graduate Students. Open to students who have had one year of German recently. This course is intended for candidates for advanced degrees who wish to acquire a reading knowledge of German. Three credits; one meeting a week, first semester. Mr. Downs.

GREEK IN ENGLISH

*1. Greek Mythology. A course of lectures, textbook work, and illustrative reading; dealing with the myths which appear in the literature and art of ancient Greece. The course will be illustrated with the stereopticon. The origin and evolution of the myth, its relation to Greek literature, philosophy, and religion, and its influence upon later literature will be touched upon. No knowledge of Greek is required for this course. Three credits; one meeting a week, second semester. Mr. Savage.

*2. Greek Literature and Life. A course dealing with the literature, life, and art of the ancient Greeks. Lectures and illustrative readings by the instructor, assigned readings in translations, and textbook work by the class; conferences and informal discussions. The character and influence of Greek culture, especially along the lines of literature and art will be discussed, and the course will be illustrated with the stereopticon. No knowledge of Greek is required. Three credits; one meeting a week, first semester. Mr. Savage.

*3. Greek Drama in English. A critical reading and interpretation of representative Greek plays in English translation, together with lectures on the origin, development, character, and influence of the Greek drama, and special stereopticon illustrations of Greek plays and Greek theaters. Lectures supplemented by textbook work, readings, and informal discussions. No knowledge of Greek is required. Three credits; one meeting a week, first semester. Mr. Savage.

HISTORY

*1-2. Modern World I, II, III. A survey of the leading political, social, and economic factors and events in European history from the beginnings of the French Revolution to the World War. Textbooks, lectures, and assigned reading. Open to all. Nine credits; one meeting a week for three semesters. Mr. Harding.

*8. The Renaissance. Outline of European history from 1300 to 1648, with emphasis on the development of the intellectual, artistic, and social phases of civilization. Open to all. Three credits; one meeting a week, second semester. Mr. Krey.

11. The Middle Ages. An outline of medieval history from the fall of the Roman Empire to about 1300, with emphasis upon such topics as feudalism, the medieval church, the crusades, conflicts of papacy and empire, and medieval culture. Three credits; one meeting a week, first semester. Mr. Krey.

17ex. Greek Civilization. Greece to the death of Alexander the Great, with special emphasis on the social and economic development. (Not offered in 1924-25.)

18ex. Roman Civilization. The development of Rome to the death of Constantine, in 337 A.D. (Not offered in 1924-25.)

*21-22. The United States, 1776-1877. A general survey of the development of the United States to the close of the Reconstruction Period. Six credits; one meeting a week, first and second semesters. Mr. Harding.

55. American Political Leaders since Reconstruction. (Not offered in 1924-25.)

60. History of American Immigration. (Not offered in 1924-25.)

HOME ECONOMICS

3. Textiles. Includes a discussion of those points in fabric study that are of value to both the purchaser and seller of fabrics—fabric structure, fibers employed in their manufacture, methods of substitution and adulteration, tests for quality, art and economic considerations in their purchase for clothing and household purposes. Three credits; one meeting a week, first semester. Miss Weller.

*13. Dressmaking. A course in the technique of clothing construction that will give practice in the use of commercial patterns, modeling on the dress form, and application of construction processes. Problems: preparation of a dress form, and the making of a wool dress and tailored silk waist. Three credits; one meeting a week, first semester. Miss Patchin.

17. Advanced Clothing Construction. A laboratory course involving an application of the principles of costume-modeling in the construction of one high grade garment, suit, coat, or dress. Three credits; one meeting a week, second semester.

*131ex. Interior Decoration. The course will be prefaced by such a discussion of house plans as will give a proper and necessary background for the major part of the work. The principles involved in house-furnishing will then be taken up in lecture, illustrated by lantern slides and actual materials wherever possible. Such subjects as wall treatment, rugs, selection and arrangement of furniture, hangings, pictures, and accessories will be discussed at first separately, and later as they relate to each other and the room as a whole. Three credits; one meeting a week, second semester. Miss Morse.

21ex. Nutrition. A brief course in the fundamental principles of human nutrition as applied to the feeding of adults, under conditions of health and under such pathological conditions as are chiefly dependent upon dietetic treatment. Three credits; one meeting a week, first semester.

JOURNALISM

*1. News-Writing I. Practice in writing types of stories covered by reporters for metropolitan newspapers. Study of style, structure, news value, and news-gathering methods, with practice in getting news. Analyses of American newspapers. Three credits; one meeting a week, first semester. Mr. Barlow, Mr. Steward.

*2. News-Writing II. A continuation of the above, with study of feature stories. Three credits; one meeting a week, second semester. Mr. Barlow, Mr. Steward.

MATHEMATICS

One class in higher algebra (Course 1) will be organized for grade school teachers. In this class the relations of arithmetic and algebra will be stressed in such a way as naturally to aid the arithmetic teacher. In general the last half-hour of each session will be devoted to a discussion of specific teaching difficulties brought forward by members of the class, and to which a right understanding of the principles of algebra, and the relation to arithmetical processes, will usually suggest the solution.

*A. Plane Geometry. A course covering elementary geometry as usually given in accredited high schools. Rectilinear figures and the circle, with miscellaneous original exercises and some elementary construction problems; proportion, similar triangles, proportional properties of line segments, proportional properties of chords and secants; trigonometric ratios, areas of polygons, regular polygons and circles. Prerequisite: elementary algebra. One-half entrance credit; one meeting a week, first and second semesters. Mr. Edwards.

*B. Solid Geometry. A course of high school grade designed to give a knowledge of the standard theorems and exercises, to develop the student's imagination and initiative, and to give a well-rounded view of the subject by practice in special proofs and original exercises. Prerequisite: Course A. One-half entrance credit; one meeting a week, first and second semesters. Mr. Edwards.

*1. Higher Algebra. A review and a collegiate treatment of the topic for those who have had one year of elementary algebra. The course includes linear equations in one, two, and three unknowns, with solution by determinants; ratio and proportion, variation, quadratic equations in one and two unknowns, graphs, progressions, binomial theorem. Prerequisites: Courses A and B, or equivalent. Not open for credit to those who present higher algebra for entrance to college. Six credits; one meeting a week, first and second semesters. Mr. Edwards.

*6. Trigonometry. A course in plane and spherical trigonometry, designed to meet the needs of beginners and to include the subject usually considered in the ordinary college course. The solution of triangles is treated quite fully, but not to the exclusion of analytical trigonometry. Prerequisites: Course 1 and logarithms. (Students who have not had logarithms in algebra may secure special mimeographed lessons on this subject.) Six credits; one meeting a week, first and second semesters. Mr. Teeter.

*7. College Algebra. The study of variation, quadratic equations, special higher equations, simultaneous equations of the second degree, maxima and minima of functions, logarithms, theory of equations, solution of numerical higher equations, partial fractions, series of complex numbers, and mathematical induction. Six credits; one meeting a week, first and second semesters. Mr. Edwards.

*30. Plane Analytic Geometry. Includes systems of co-ordinates, loci, the type forms of the equation of the straight line with application, the circle, central and general conic sections, tangents, diameters, asymptotes, some higher plane curves, parametric loci, polar curves. The fundamental problem of the equation and its locus forms the basis of the course. Prerequisites: Courses 6 and 7. Six credits; one meeting a week, first and second semesters. Mr. Teeter.

50. Differential Calculus. A first course in differential calculus, including differentiation of algebraic and transcendental functions, with attention to the notion of the limit of a function, continuity of a function, and the derivative. Extensive practice in the technique of differentiation by means of exercises and applications to maxima and minima, tangents, normals, curvature, singular points, velocity, and acceleration. Elementary discussion of Rolle's theorem and the law of the mean, indeterminate forms, and partial differentiation. Textbook with supplementary written lectures and exercises. Prerequisites: Courses 6, 7, and 30. Six credits; one meeting a week, first and second semesters. Mr. Edwards.

*51. Integral Calculus. First course in integral calculus. The integration of various types of functions, the definite integral with application to areas, surfaces, and volumes of geometric figures, rectification of curves and simple problems of mechanics; practice in the technique of integration and the use of tables of integrals; evaluation of simple, double, and triple integrals. Prerequisite: Course 50. Six credits; one meeting a week, first and second semesters. Mr. Edwards.

106. Differential Equations. Intended for students who expect to continue the study of engineering, the physical sciences, or pure mathematics. The primary object of the course is to familiarize the student with advanced differential and integral calculus and the application of common types of differential equations to geometry, electricity, mechanics, and physics. Prerequisite: Course 51. Three credits; one meeting a week, first semester. Mr. Edwards, Mr. Teeter.

MUSIC

49ex. Historical Appreciation of Music. A general non-technical account of the principal musical forms, together with their historical origins and associations, and a study of the nature and scope of musical expression, designed to give an understanding of music as literature. Biographical and critical reading required. The course will be extensively illustrated. Three credits; one meeting a week, first semester. Mr. Ferguson.

PARLIAMENTARY LAW

*7ex. Parliamentary Law. Presented not as a mere list of rules, but as a system, based upon principles, a knowledge of which will supply the answer to any of the seven thousand possible questions of procedure which may arise in the conduct of a deliberative assembly. The class is limited to forty members. No text is required; mimeographed material will be furnished to students without charge. No college credit; one meeting a week, first semester. Mr. Hawley.

PHILOSOPHY

*1. Introduction to Philosophy. A popular discussion of some of the great problems of philosophy. Three credits; one meeting a week, first semester. Mr. Conger.

10. Science and Religion. A popular discussion of religious problems as affected by contemporary science. Special attention to new contributions as they appear. Three credits; one meeting a week, second semester. Mr. Conger.

124. Political and Social Ethics. A study of ethical basis of society and the state and a consideration of some of the unsettled problems of politics and economics from the ethical point of view. Three credits; one meeting a week, first semester. Mr. Wilde.

*129. Modern Political Thought. A study of the development of modern theories of the nature, basis, and authority of the state. Beginning with a preliminary sketch of the ideas of Plato and Aristotle, the course will include the most important political theories from the Renaissance to the present. Three credits; one meeting a week, first semester. (Not offered in 1924-25.)

POLITICAL SCIENCE

The attention of students is called also to the course on Modern Political Thought listed under the heading Philosophy.

1. American Federal Government. An elementary course in American government and politics designed for those studying the problems of citizenship, and for teachers. (Not offered in 1924-25.)

7. State Government. Complementary to Course 1 above. (Not offered in 1924-25.)

158. Government and Business. (Not offered in 1924-25.)

167. Current Political Problems. Physical problems such as territory and the people; citizenship and Americanization; the electorate—its burdens and such reforms as proportional representation and the short ballot; the place of political parties; distribution of political power; the making and amending of constitutions; the reorganization and improvement of the three departments of government; recent experiments with popular control—the initiative, referendum, recall, and direct primaries; internationalism and foreign affairs; struggle of classes or government by blocs; some municipal problems; the place of education in a democracy. Three credits; one meeting a week, first semester. Mr. Young.

PSYCHOLOGY

*1. General Psychology I: Beginners' Course. Description and illustration of general aims and methods of psychology, introduction to analytic study of human conduct, with emphasis upon the native equipment of man. Special topics: reflex and instinctive adjustment to life; the rôle of the nervous system in conduct; emotion and feeling; sense-organ equipment; characteristics and conditions of attention; heredity and intelligence. Three credits; one meeting a week, first semester Mr. Filter.

*2. General Psychology II. A survey of important factors in mental development; study of habit formation and principles of economy in learning. Special topics: perception; memory and its improvement; imagination; problems of social adaptation, such as insanity, the delinquent, the criminal; factors in personality; mental hygiene. Prerequisite: Psychology 1. Three credits; one meeting a week, second semester. Mr. Filter.

*3. Applied Psychology. The practical application of psychology, especially in the field of business. Special topics: improving efficiency in office and shop; methods of selecting employees; survey of attempts at character analysis; measurement of mental traits; problems of advertising and selling. Open to all applicants. Prerequisite for college credit: Psychology 1. Three credits; one meeting a week, first semester. Mr. Filter.

Educ. 55. Elementary Educational Psychology. A survey of fundamental facts of human behavior involved in educational activities. For full description see under Education. Open to qualified students. Credited in

College of Education, but not in College of Science, Literature, and the Arts. Three credits; one meeting a week, first semester. Mr. Filter.

ROMANCE LANGUAGES

FRENCH

*1-2. Beginning French. Grammar, pronunciation, reading, and practice in speaking; practice in conversation will be given early in the course. Open to all. Both semesters must be completed before credit is given for the first semester. Six credits; one meeting a week, first and second semesters. Mr. Sirich, Mr. Watts.

*3. Intermediate French. Reading, grammar, and composition. French grammar review, readings from modern authors. 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. Six credits; one meeting a week, first and second semesters. Miss Guinotte, Mr. King.

*5. French Readings for Graduate Students. Outline of grammar and reading of texts to prepare students for the French examination required of those who are candidates for advanced degrees. No previous knowledge of French required. Six credits; one meeting a week, first and second semesters. Mr. Frelin.

6. Lectures on French Literature. Prerequisite: French 1-2. Six credits; one meeting a week, first and second semesters. Mr. van Roosbroeck.

20. Elementary French Conversation and Composition. The course will include a careful drill in pronunciation and practical phonetics. Prerequisite: French 1-2. Six credits; one meeting a week, first and second semesters. Mr. Coburn.

SPANISH

*1-2. Beginning Spanish. Grammar, pronunciation, reading, and practice in speaking. Open to all. Both semesters must be completed before credit is given for the first semester. Six credits; one meeting a week, first and second semesters. Mr. Olmsted, Mr. Guinn.

*3. Intermediate Spanish. Readings from modern authors; grammar review; composition work, devoted chiefly to correspondence and commercial practice. Spanish will be as largely as possible the language of the classroom. Open to those who have had Spanish 1-2 and are approved by the teacher. Six credits; one meeting a week, first and second semesters. Mr. Gillet.

5ex. Commercial Spanish. Designed for students interested in commercial correspondence and business relations with Spain or Spanish America. Prerequisite: Spanish 1-2. Three credits; one meeting a week, first semester. Mr. Coburn.

20. Elementary Spanish Conversation and Composition. The course will include a careful drill in pronunciation and practical phonetics. Prerequisite: Spanish 1-2. Six credits; one meeting a week, first and second semesters. Mr. Coburn.

*50. Advanced Spanish Conversation and Composition. Prerequisite: Spanish 1-2, or a satisfactory knowledge of Spanish grammatical principles and some practice in speaking. Those who desire advanced credit in Spanish courses of the College of Science, Literature, and the Arts will be required to do outside work in some special subject, prepare special reports, and pass special examinations. Six credits; one meeting a week, first and second semesters. Mr. Coburn.

SCANDINAVIAN

5. Norwegian Survey. Prose and poetry. Six credits; one meeting a week, first and second semesters. Mr. Bothne.

101ex. Modern Norwegian Literature: In the Original. Works of Wergeland, Welhaven, Moe, Bjornson, Ibsen, Lie, Kielland will be studied; also the Landsmaal movement. Three credits; one meeting a week, second semester. Mr. Bothne.

103ex. Modern Norway from 1814: In English. Lectures and translated works of modern authors; the aim of the course is to make students familiar with modern Norway. Three credits; one meeting a week, first semester. Mr. Bothne.

45. Scandinavian Mythology. A course of lectures and readings dealing with the legends and myths of Viking Scandinavia. The origin of mythological ideas, the story of creation, character and activities of the different divinities, moral concepts, contributions of Scandinavian mythology to literature and art, are the main points of emphasis. Knowledge of Scandinavian not required. Three credits; one meeting a week, first semester; repeated in the second semester. Mr. Stomberg.

118ex. Swedish Literature: Writers of the New Romantic Period (1809-1830). Selected works in prose and poetry of Tegner, Geijer, Wallin, Atterbom, Stagnelius, and others will be studied in the original. Open to students who have a practical reading knowledge of Swedish. Three credits; one meeting a week, first semester. Mr. Stomberg.

119ex. Swedish Literature: The Period of Liberal Thought (1830-1865). Works in the original of Almquist, Malmstrom, Runeberg, and Gunnar Wennerberg will be studied. Open to students who have a practical reading knowledge of Swedish. Three credits; one meeting a week, second semester. Mr. Stomberg.

SOCIOLOGY

*1. Introduction to Sociology. The evolution of human society from its earliest beginnings to the present, including the fundamental factors involved and the social institutions arising, followed by an analysis of some social problems of the day and a discussion of psychic and biologic factors. Lectures, readings, discussion. Prerequisite to all other courses in Sociology when taken for University credit. Three credits; one meeting a week, first semester; repeated in the second semester. Mr. Bernard.

*3. Educational Sociology. A course designed to explain, from the sociological standpoint, what the aims of education are, and what subjects are of most value; also designed to show how education can predetermine the institutions of the future. Three credits; one meeting a week, first semester. Mr. Finney.

*6. Modern Social Reform Movements. A survey of attempts to overcome certain social maladjustments: child labor, the city, bad housing, poverty; degeneracy; movements for public health, industrial democracy, social insurance, protection of infancy and youth, public recreation, etc. Three credits; one meeting a week, first semester. Mr. Elmer.

14. Rural Sociology. The background and evolution of country life; rural conveniences, communication, co-operation; rural social institutions, especially the family, school, church, and social center; rural leadership, surveys, organization, social agencies. Three credits; one meeting a week, second semester. Mr. Lundquist.

*53. Elements of Criminology. The development of the general concept of crime and criminals; the types of criminals; causes of crime; social control of crime; treatment of the criminal; agencies for the prevention of crime. Three credits; one meeting a week, first semester. Mr. Elmer.

*100. Social Psychology. (Not offered in 1924-25.)

101. Social Organization. A study of the social mind and its communication, the problems of democracy, of class and caste, of social conflict and revolution, and of social organization on the rational and scientific basis for social efficiency and progress. Lectures, reading, discussion. Course 1 is a prerequisite if University credit is desired. Three credits; one meeting a week, first semester. Mr. Bernard.

102. Social Control. A study of the social, psychological, and physical factors which control and direct people in their social relationships. Subjects considered are the origin, evolution, and direction of social control; the means and technique of social control; the growth toward rational and scientific social control under the influence of a developing social science; the limits and purposes of social control. Designed for the same class of students as Course 100. Three credits; one meeting a week, second semester. Mr. Bernard.

114. Rural Social Institutions. A detailed study of the problems of organization and efficiency of selected rural institutions, especially religious, educational, civic, and recreational. Lectures, discussions, and reports. Three credits; one meeting a week, second semester. Mr. Lundquist.

*119. The Family. The evolution of the family; its various forms and their relation to other social institutions; the rôle of the family in social evolution; contemporary problems of the family. Three credits; one meeting a week, second semester. Mr. Elmer.

120. Social Progress. (Not offered in 1924-25 unless requested.)

140. History of Social Thought. (Not offered in 1924-25 unless requested.)

141. Contemporary Social Thought. (Not offered in 1924-25 unless requested.)

SWIMMING

Instruction in swimming is given (to women) in the Women's Gymnasium of the University campus, through both semesters, one hour an evening, under competent instructors. The fee is $5 a semester and a towel fee of ten cents is charged for each meeting. The courses carry no University credit. If a demand arises for classes for men, they will be organized in the University Armory. Persons taking the courses are required to conform to the regular University rules in regard to the gymnasium and the pool. Woolen suits are not permitted because the fibers clog the plumbing.

*1. Swimming. Beginners—women only. One meeting a week; first and second semesters. Mr. Foster, Miss Coxe.

*2. Swimming. Advanced—women only. One meeting a week; first and second semesters. Mr. Foster, Miss Coxe.

Department of Business Instruction

Purpose.—The Department of Business Instruction recognizes the professional status of the business executive. It aims to give prospective executives thoro training for the work they are to undertake. Professional education rather than detailed drill in narrow technical processes is the object toward which instruction is directed. Scientific method in analyzing business data, trained intelligence in dealing with the human relationships with which business is made up, and well-developed sense of moral responsibility will be the foundations of business effectiveness in the future. Experience has proved that those persons whom the department is reaching can, by being actively employed during the day, comprehend and appreciate this course of instruction in a particularly advantageous manner. The courses are conducted in close co-operation with the School of Business of the University.

Instruction.—The subjects of instruction are divided into three groups of courses of study; namely, those aiding in a preparation for accountancy, those aiding in preparation for banking, and those having for their object a general business training. In each of these courses certain fundamental subjects such as business law, economics, and business English are required.

Upon the completion of one of these courses, a University certificate in accountancy, banking, or general business, as the case may be, will be granted.

Admission to courses.—Any person may be admitted to extension courses who is sufficiently mature and can satisfy the instructors in whose classes he wishes to register that he is able to carry the work profitably to himself and without hindrance to the classes. (See under heading General Information.)

The admission requirements for the School of Business are as follows:

1. Four high school units of English; or three units of English and four units of a foreign language; or three units of English and two units each of two foreign languages.

2. One unit of algebra and one unit of plane geometry, and enough additional work to make in all fifteen units, of which not more than four may be in Group F.

The term unit means not less than five recitations of forty minutes each week for a school year of at least thirty-six weeks. In manual subjects and kindred courses, it means the equivalent of ten recitation periods a week for thirty-six weeks.

A detailed statement of the entrance subjects, grouped into six groups, may be found in the University bulletin of general information. The completion of preparatory courses as above outlined will also be accepted by the State Board of Accountancy as the preliminary high school training required of applicants for the degree of C.P.A.

Credits and fees.—The credits are stated throughout in terms of "quarter" hours, and not in "semester" hours as was formerly the practice. One and one-half quarter credits equal one semester credit. The fee for a class which meets once a week in a two-hour session and carries three credits is ten dollars. (For more detailed statement, see under General Information.)

Certificates in accounting, finance, and general business.—Credits earned in this department can be applied towards a University certificate in accountancy, finance, or general business, as the case may be, and in addition, where the student has satisfied the University entrance requirements, may be applied towards a degree from the School of Business under certain restrictions. (For further information on this subject see the bulletin of the School of Business.)

The requirements for each of these certificates are set forth below. It is possible for a student to obtain two of the certificates listed above, but the second certificate will not be granted until the student has earned an additional 9 credits over the 45 credits required for the first certificate.

Group course in accountancy.—This course is designed to meet the needs of two classes of students, namely those who wish to prepare to take the state C.P.A. examinations with a view to becoming public accountants, and those who aim to fit themselves for responsible positions with private business firms.

For the student who wishes to pursue either object we recommend that he plan to take the regular course herein outlined and thus secure a broad foundation for his work.

Upon the satisfactory completion of this course, the University certificate in accountancy will be granted.

Students of experience and some maturity may join a class as auditors, in case they do not care to secure credit for the course toward a certificate in accountancy. These students will not be called upon to take part in the discussions nor to turn in work, which is required of students registering for credit. In this way the University hopes to make available the benefits of the courses to those who feel they lack the opportunity or time to do the work regularly required in the course.

The course requires a total of 45 quarter credits, as follows:

Principles of Accounting A (3 credits), Principles of Accounting B (3), Accounting Laboratory A (1½), Accounting Laboratory B (1½), Accounting Practice and Procedure A (3), Accounting Practice and Procedure B (3), Auditing A (3) and Auditing B (3), or Cost Accounting A (3) and Cost Accounting B (3), Business Law A (3), Business Law B (3), Business Law C, D, or E (3), Economics (3), Business English (3), Elective subjects (9).

Group course in banking and finance.—This course is intended to meet the needs of (1) those who are preparing for, or who are now engaged in such occupations as banking, corporation management, stock and bond brokerage, credit work, or financial journalism; and (2) business men who wish to utilize in their particular business modern scientific knowledge of practical financial nature.

Beginning with the year 1923-24, the University certificate in finance is granted to those who complete a total of 45 credits distributed as follows:

Principles of Economics (3), Banking and Finance A (3), Banking and Finance B (3), Banking and Finance C (3), Banking and Finance D (3), Business English (3), Principles of Accounting A (3), Principles of Accounting B (3), Accounting Laboratory A (1½), Accounting Laboratory B (1½), Business Law A (3), Business Law B (3), Business Law C or D (3), Elective subjects (9).

Group course in general business.—For the benefit of students who do not care to specialize in either accounting or in finance, yet wish to secure recognition as having completed a definite group of subjects, the following course is arranged.

The University certificate in general business will be granted to those who successfully complete a total of 45 credits distributed as below.

The electives should be selected with a view to specializing in some particular field, as in advertising and selling, in railroad traffic, and the like.

Business English (3), Business Law A (3), Business Law B (3), Business Law C (3), Business Law D (3), Principles of Accounting A (3), Principles of Accounting B (3), Accounting Laboratory A (1½), Accounting Laboratory B (1½), Economics A (3), Economics B (3), Electives (15).

Description of subjects offered.—A complete list of the subjects offered is given below:

ACCOUNTING

The first year's work consists of, first, a series of lectures and discussions in the principles of accounting; and second, the putting of these principles to practical application in the working out of specific problems. Students not desiring to specialize in accounting may omit this latter course, i.e., Accounting Laboratory A and B; but all who take the laboratory courses are required to take the corresponding courses in accounting principles.

*10. Introduction to Accounting. A course designed for those who are not prepared by experience or training to enroll immediately in Principles of Accounting, but who desire to overcome their deficiencies and pursue the regular accounting courses. The course will take up the purposes of accounting, the use of books of original entry, posting to the ledger, the trial balance, closing the ledger, preparation of simple trading statements. No credit; one evening a week, first semester Mr. Ringham, Mr. Miller.

*25. Principles of Accounting A. Designed to cover fundamentals. Classification of the balance sheet and operating accounts; the books and records of original entry; special discussions on the trading margins, operating expenses, etc.; various bookkeeping and accounting operations, such as accruals, deferred charges; special systems of handling accounting data, such as departmentalization of accounts, imprest cash systems, the treatment of controlling accounts and auxiliary ledgers; preparation of simple working sheets and statements. Three credits; one meeting a week, first semester. Mr. Heilman, Mr. Blandin, Mr. Houston, Mr. Le Borious, Mr. Ringham, Mr. Smith.

*26. Principles of Accounting B. Continuation of Principles of Accounting A with more special reference to manufacturing and corporation accounts; treatment of goodwill and depreciation, accountant's working sheet; adjusting of surplus, sinking funds, and reserve accounts; drafting condensed balance sheets and income statements. Three credits; one meeting a week, second semester. Mr. Heilman, Mr. Blandin, Mr. Houston, Mr. Le Borious, Mr. Ringham, Mr. Smith.

*25L. Accounting Laboratory A. The working out of practical problems covering the subject-matter discussed in Principles of Accounting A, under the guidance of an instructor. One and one-half credits; one meeting a week, first semester. Mr. Ball, Mr. Blandin, Mr. Culmer, Mr. Jacobson, Mr. Le Borious, Mr. Niemackl, Mr. Smith.

*26L. Accounting Laboratory B. Work of similar kind covering the subject-matter discussed in Principles of Accounting B. One and one-half credits; one meeting a week, second semester. Mr. Ball, Mr. Blandin, Mr. Culmer, Mr. Jacobson, Mr. Le Borious, Mr. Niemackl, Mr. Smith.

*131. Cost Accounting A. A specialized course in manufacturing accounts. Chief objectives of the course are, first, the development of principles useful in determining the profitableness of each branch of manufacturing; and second, the establishment of a basis to judge relative efficiencies of operation. Subject-matter includes consideration of materials, labor, and burden; continuous process and production order costs; burden distribution methods, standard costs, etc. Three credits; one meeting a week, first semester. Mr. Tuttle.

*132. Cost Accounting B. A continuation of Course 131. Three credits; one meeting a week, second semester. Mr. Tuttle.

*134. Income Tax Problems. Course offered to those who have completed Principles of Accounting A and B for the purpose of familiarizing the accounting student with the accounting ramifications of the federal income tax law, and its application to various businesses and also to varying business conditions. The purpose of the course also will be to point out possible errors likely to be made in the preparation of the regular tax reports. Lectures, discussions, and working out of problems. Three credits; one meeting a week, first semester.

*135. Auditing A. This course is essentially practical and is intended only for those whose previous training in the principles of accounting has been sufficient to enable them to be benefited by this advanced work. The chief aim will be to give students the training necessary to enable them to conduct audits and investigations either as private auditors or public accountants; to set up accounts for various purposes as a result of such audits or investigations and to prepare suitable reports thereon. Three credits; one meeting a week, first semester. Mr. Rotzel.

*136. Auditing B. A continuation of Course 135. Three credits; one meeting a week, second semester. Mr. Rotzel.

*137. Accounting Practice and Procedure A. An advanced course for the accounting student following the study of accounting principles. The object of the subject is twofold: first, to familiarize the student with

the peculiar accounting problems of business; and, second, to afford the student the means to secure that necessary insight and skill which practicing accountants must possess in order to meet the demands made upon them. The work consists of the following: (a) a study of a distinctive group of accounting problems and the scientific solution of those problems; (b) a study of the accounting problems peculiar to representative business. Three credits; one meeting a week, first semester. Mr. Rotzel, Mr. Blandin, Mr. Houston, Mr. Wagner.

*138. Accounting Practice and Procedure B. A continuation of Course 137. Three credits; one meeting a week, second semester. Mr. Rotzel, Mr. Blandin, Mr. Houston, Mr. Wagner.

140. Accounting Practice and Procedure C. Constructive accounting. A course outlining subject-matter relative to the design and installation of a modern accounting system. The make-up of various forms for use in the system, purchase orders, receiving slips, invoices, requisitions, shop tickets, and other forms. The design and ruling of books of original entry; ledgers of various kinds. Three credits; one meeting a week, second semester. Mr. Rotzel, Mr. Schmidt.

*141. Accounting Practice and Procedure D. Interpretative accounting. The meaning of accounting reports and statements including balance sheets, income accounts, cost statements, etc. The value of comparison in interpretation. Consideration of the base of comparison. Proper place of statistics in the accounting fabric. Development of accounting ratios and their meaning. Practical problems in the above cost method used. Three credits; one meeting a week, second semester. Mr. Schmidt.

*142. Accounting Practice and Procedure E. Interpretative accounting. Continuation of Accounting Practice and Procedure D with the addition of further problems and the study of more intricate cases. The student is here given specific problems to solve and present to the class with the aid of the instructor. Three credits; one meeting a week, first semester. Mr. Schmidt.

*89. Business Management A. Place of management in the field of business; business organizations, internal and financial; functions of business; principles of plant location; analysis of the functions of business; types of operating organizations; use of graphs in management qualifications of executives; compensation of labor; wastes in industry considered. Three credits; one meeting a week, first semester. Mr. Schmidt.

*90. Business Management B. Operating laws. Sales administration; promotion management and operating management contrasted. Sales and production policies. Practical problems in management and policies. Consideration of the human element. Aid given by accounting in making managerial decisions. Three credits; one meeting a week, second semester. Mr. Schmidt.

BANKING AND FINANCE

*143. Finance A—Elementary Money and Banking. Designed as a general survey of the principles determining value and price and the interrelationship of our various financial institutions. The origin, evolution, and functions of money; the nature and functions of credit and credit instruments; domestic and foreign exchange; functions of various credit agencies; government regulation of banking. Three credits; one meeting a week, first semester, Minneapolis; second semester, Minneapolis, if sufficient enrolment. Mr. Stehman, Mr. Powell.

*155. Finance B—Financing a Business. The corporate form of financial organization and problems, such as the organization of a corporation; charters and articles of association; directors and officers, manner of their selection, their functions and responsibilities; forms of corporation stocks and bonds and their respective legal and financial characteristics; the marketing of securities; capital and revenue; intangible values; books and accounts; dissolutions, consolidations, and reorganization; trust and holding companies; the taxing of corporations; corporation statistics; the preparation and analysis of corporation reports; the corporation before the law. Prerequisite: Finance A. Three credits; one meeting a week, second semester, Minneapolis and St. Paul. Mr. Stehman.

*146. Finance C—Investments and the Stock Exchange. Bonds, mortgages, stocks, and other forms of property in which funds may be invested, with emphasis on the needs of the conservative investor. The criteria of a good investment are carefully considered and tested by applying them to specific issues of governments, corporations, and individuals, including railroad, industrial, timber, and mining securities, and real estate loans. Stock exchange organization and operations. Prerequisites: Finance A and B, except that during 1924-25 this course may be taken with Finance A and on condition that Finance B is taken in the second semester, before credit is given for the course. Three credits; one meeting a week, first semester. Mr. Ebersole.

*149. Finance D—Business Cycles and Forecasting. This course aims to give the student: first, a clear understanding of the sequence of events during a business cycle, and how business changes from depression to prosperity, and from prosperity to depression; and second, ability to find, read, and interpret such barometers of conditions as are readily available for determining the exact position of current events in the cycle. Prerequisites: Finance A and B, except that in 1924-25 this course may be taken at the same time that the student is taking Finance B. Three credits; one meeting a week, second semester. Mr. Ebersole.

147. Finance E—Banking Practice. Banking from the administrative point of view; organization of a bank; stockholders and directors; bank departments and their administration; deposits and tellers; bank reserves; circulating notes; checks, the clearing house and transit department; collections; domestic and foreign exchange; problems involved

in granting loans; credit department; how banks make a profit; accounting methods; the Federal Reserve System. Prerequisite: Finance A, except that during 1924-25 this course may be taken at the same time as the student is taking Finance A. Three credits; one meeting a week, first semester or second semester, Minneapolis or St. Paul, if sufficient enrolment. Mr. Powell.

145. Finance F—Foreign Trade and Foreign Exchange. The middle west produces almost half of the goods exported from the United States. This course is designed to give a working knowledge of the foreign markets for our goods, how to get in touch with them, and the mechanism of foreign exchange which is used in paying and collecting for goods sold. A thoro discussion of foreign exchange, fundamentals as well as practice, and current foreign developments as they affect the foreign exchange market. Prerequisites: Finance A and E. Three credits; one meeting a week, second semester, St. Paul and Minneapolis, if sufficient enrolment. Mr. Millen, Mr. Powell.

41. Finance G—History of Banking and Finance in the United States. Prerequisite: Finance A. (Not offered in 1924-25.) Mr. Ebersole.

191. Finance H—Public Finance. Prerequisites: Finance A and elementary economics; second semester. (Not offered in 1924-25.)

BUSINESS ENGLISH

81. Business English. A practical course designed for business men and women who recognize the value of a command of English for business and everyday writing and conversation. The types of letters to be studied include adjustment, acknowledgment, recommendation, application, collection follow-up, sales, and interdepartmental. Ability to write simple, grammatically correct English is a prerequisite. No credit toward a degree, three credits for a certificate in business; one meeting a week, first semester; repeated second semester. Mr. Conley, Mr. Shadbolt, Mr. Smith.

BUSINESS LAW

The courses in Business Law are designed not merely to give a knowledge of the fundamental principles of law which should be known to every well-informed person, but particularly to aid the business or professional man in his practical legal problems. The credits may be applied in the College of Science, Literature, and the Arts, and as general academic credits in other colleges, but cannot be accepted as professional credits towards the degree of bachelor of laws.

*51. Business Law A—Contracts and Agency. A brief introduction to the study of law with a general consideration of legal rights and remedies, followed by a more detailed survey of two subjects which are the legal basis for most business transactions. (1) Contracts—their formation,

interpretation, operation, transfer and discharge, with some consideration of the Statute of Frauds. (2) Agency—the creation, nature, and termination of the relation; rights and liabilities of the parties. Three credits; one meeting a week, first semester; repeated in the second semester. Judge Bardwell, Mr. Smiley, Mr. Chapin, Mr. Hoshour.

*52. Business Law B—Personal Property, Negotiable Instruments. A brief consideration of the nature of personal property, its transfer by sale or bailment, followed by a more detailed study of the Uniform Negotiable Instrument Act and the Uniform Bills of Lading Act. Prerequisite: Business Law A. Three credits; one meeting a week, second semester. Judge Bardwell, Mr. Smiley, Mr. Chapin, Mr. Hoshour.

*53. Business Law C—Business Organizations, Insurance, Insolvency, and Bankruptcy. (1) The organization, management, and responsibility of associations, partnerships, corporations, and business trusts. (2) Elements of the law of insurance. (3) Insolvency and the National Bankruptcy Act. Prerequisite: Business Law A. Three credits; one meeting a week, first semester. Mr. Smiley, Mr. Glick, Mr. Palmer, Mr. Rumble.

*54ex. Business Law D—Real Estate, Mortgages. The nature and classification of estates in land; deeds and conveyances; landlord and tenant; recording and abstracting; Torrens titles; liens and mortgages. Prerequisite: Business Law A. Three credits; one meeting a week, second semester. Mr. Smiley, Mr. Glick, Mr. Palmer, Mr. Rumble.

*7ex. Parliamentary Law. For description see Parliamentary Law under Department of Collegiate Instruction. No college credit; one meeting a week, first semester. Mr. Hawley.

ECONOMICS AND COMMERCE

*6. Elements of Economics. A fundamental course in economic principles as a basis for the study of current economic problems. Three credits; one meeting a week, first semester. Mr. Cummings, Mr. Myers.

*7. Economic Problems. Current problems of importance will be studied, for example: business cycles and industrial depression, taxation, labor organizations, combinations and monopoly, immigration, international trade, and others. This course may be taken before Elements of Economics, but credit for it will not be granted until the elementary course has been successfully completed. Three credits; one meeting a week, second semester. Mr. Cummings, Mr. Myers.

61. Salesmanship. A course for insurance men, specialty men, traveling salesmen. Lectures and demonstrations on the principles underlying successful salesmanship, as follows: the proper approach, securing attention; arousing interest; creating desire; closing the sale; the use of suggestion in selling; the use of argument. The chief feature of the work will be the demonstration sales. So far as possible each student will be given an opportunity to take part in a sufficient number of demonstrations that he may apply the principles laid out in the

course. No credit for degree, three credits for certificate in business; one meeting a week, first and second semesters. Mr. Conley.

63. National Advertising. A study of advertising from a new angle. The student puts himself in the place of one having a product for sale, and, from the first lesson to the last, each lecture is so planned as to give the methods pursued in conducting the many different steps in an advertising campaign. The student first analyzes the product from the standpoint of marketability. He considers the planning of a trademark, the organization of the sales force, the selling points, the prices, and the profits. He then thoroly analyzes the market, chooses the advertising medium most adaptable to his particular campaign, and decides on the appropriation. No credit for degree, three credits for certificate in business; one meeting a week, second semester. Mr. Conley.

*73. Railway Traffic and Rates. A practical study of the Act to Regulate Commerce and the other laws and regulations covering the transportation of property, locally and in foreign commerce, both by rail and by water. The student is acquainted with the correct compilation and interpretation of freight tariffs and economical and efficient methods in shipping. The lectures are comprehensive and embrace rate-making bases, the classifying and tracing of freight, the preparation of claims, etc. Rulings of the Interstate Commerce Commission and of the various state commissions are referred to and rates are quoted from current tariffs and classifications. Six credits; one meeting a week, first and second semesters. Mr. Crellin.

*88. Elementary Advertising. A course intended for those who desire sufficient knowledge of the elements of advertising to prepare reasonably satisfactory copy for newspapers, magazines, streetcar cards, circulars, and booklets. The fundamental elements of display, layout, headings, and copy are carefully outlined and the student is given practice in the preparation of advertisements. The course is intended to acquaint the student with what may be called "the tools of advertising" before he undertakes the advanced course in the planning and preparation of advertising campaigns. No credit toward a degree, three credits for certificate in business; one meeting a week, first semester. Mr. Conley.

Department of Engineering Instruction

Purpose.—The General Extension Division now offers groups of courses in (1) architecture, (2) civil engineering, (3) electrical engineering, and (4) mechanical engineering. These groups are arranged to be completed in either three or four years and are planned primarily for persons who are already employed.

Engineering requires very thoro study. Mathematics is the foundation of the whole profession, and no step should be neglected. These courses have been laid out with care and are especially adapted to the needs of men working in shops and industrial establishments. They are planned so that such men may have added to their practical training a technical and theoretical knowledge which will enable them to advance more rapidly in their chosen line of work. These courses also offer an opportunity to college graduates who may wish to specialize in some subject not covered in their regular college work.

Credits and fees.—Courses in engineering do not carry credit in the College of Engineering but do carry credit towards the Extension Division certificate. For detailed statement concerning credits and fees, see under General Information.

Group course certificates.—Upon completion of 45 credits in any one of the groups of courses indicated above, a certificate in the group subject will be granted by the University of Minnesota. On completion of the entire four years' course a more advanced certificate will be issued. Students who have a preparation equivalent to two years of high school work, including physics and algebra, together with at least one year's shop experience, can obtain the certificate in less time. Requests for advanced standing must be accompanied by a transcript of the work done, otherwise the fitness of a student to omit any part of the work must be determined by a comprehensive examination in the subject for which he desires credit. At least 30 per cent of the credits toward certificates must be earned in the extension classes of the University of Minnesota.

The following groups of courses can be completed in four years by devoting three evenings a week to class work. Students may, however, adapt the number of evenings a week to their own specific circumstances, bearing in mind that the minimum number of credits required for a certificate is 45.

Group course in architecture.—The course in architecture in the Extension Division affords a training in the general practice of architecture for those who are employed during the major part of their time and for teachers in the public schools. While adequate attention is given to structural studies, the course lays particular stress on the study of architectural design. It leads to a certificate in architecture on the completion of 45 credits, and to an advanced certificate on completion of the full four years' course as outlined below.

FIRST YEAR

First semester.—Elements of Architecture I (3 credits); Free-Hand Drawing I (1½); Practical Mathematics I or II (3).

Second semester.—Elements of Architecture II (3); Free-Hand Drawing II (1½); Practical Mathematics III (3).

SECOND YEAR

First semester.—Architectural Design I (3); Free-Hand Drawing III (1½); Mathematics IV (3).

Second semester.—Architectural Design II (3); Free-Hand Drawing IV (1½); Mathematics V (3).

THIRD YEAR

First semester.—Architectural Design III (3); History of Architecture I (3); Applied Mechanics (3) or Strength of Materials (3).

Second semester.—Architectural Design IV (3); History of Architecture II (3); Structural Design (3) or Reinforced Concrete (3).

FOURTH YEAR

First semester.—Architectural Design V (3); Theory of Engineering (3); Architectural Construction I (3).

Second semester.—Architectural Design VI (3); Heating and Ventilating (3); Architectural Construction II (3).

Group courses in civil engineering.—The following course in civil engineering has been prepared for men who desire to specialize in this branch of the profession. It deals with the fundamentals of civil and structural engineering and is designed to fit men for either field or office work.

There are certain options allowed the student depending largely upon the work he intends to follow. This information must be furnished the Extension Division at the time the student registers and his options will then be given him.

FIRST YEAR

First semester.—Shop Mathematics I or II (3); Mechanical Drawing (3); Practical Physics (3).

Second semester.—Mathematics III (3); Structural Drafting (3); Practical Physics (3).

SECOND YEAR

First semester.—Mathematics IV (3); Applied Mechanics (3); Plane Surveying (3) or Map-Drawing (3).

Second semester.—Mathematics V (3); Strength of Materials (3); Curves and Earthwork (3).

THIRD YEAR

First semester.—Mathematics VI (3); Reinforced Concrete (3); Theory of Engineering (3) or Hydraulics (3).

Second semester.—Mathematics VII (3); Reinforced Concrete Design (3); Theory of Engineering (3) or Structural Design I (3).

FOURTH YEAR

First semester.—Highways and Pavements I (3) or Railway Engineering I (3) or Cost Estimating (3); Advanced Structural Design (3).

Second semester.—Highways and Pavements II (3) or Railway Engineering II (3) or Municipal Engineering (3); Engineering Finance (3).

Group courses in electrical engineering.—The purpose of this course is to give the student a foundation in the fundamental principles of electricity together with a sufficient knowledge of professional practice to enable him to apply them in his daily work. The course is designed with special consideration for those already employed in the electrical industries.

FIRST YEAR

First semester.—Shop Mathematics I or II (3); Mechanical Drawing (3); Practical Physics I (3).

Second semester.—Mathematics III (3); Mechanical Drawing (3); Practical Physics II (3).

SECOND YEAR

First semester.—Mathematics IV (3); Direct Current Machinery I (3); Direct Current Laboratory I (3).

Second semester.—Mathematics V (3); Direct Current Machinery II (3); Direct Current Laboratory II (3).

THIRD YEAR

First semester.—Alternating Currents I (3); Mathematics VI (3); Alternating Current Laboratory I (3).

Second semester.—Alternating Currents II (3); Mathematics VII (3); Alternating Current Laboratory II (3).

FOURTH YEAR

First semester.—Applied Mechanics (3); Central Stations (3); Telephony (3) or Advanced Radio I (3); Electrical Machine Design I (3).

Second semester.—Strength of Materials (3); Electric Power Transmission (3); Telephony (3) or Advanced Radio II (3); Electrical Machine Design II (3).

Group course in mechanical engineering.—The course in mechanical engineering is designed especially for men employed as operating engineers. It has been prepared and is taught by men who have had practical experience in their fields. There is a continual demand for operating men to fill executive positions and to meet this demand the following course has been prepared.

FIRST YEAR

First semester.—Shop Mathematics I or II (3); Mechanical Drawing (3); Physics I (3) or Engineering English I (3).

Second semester.—Mathematics III (3); Mechanical Drawing (3); Physics II (3); or Engineering English II (3).

SECOND YEAR

First semester.—Mathematics IV (3); Advanced Mechanical Drawing I (3); Applied Mechanics (3).

Second semester.—Mathematics V (3); Advanced Mechanical Drawing II (3); Strength of Materials (3).

THIRD YEAR

First semester.—Mathematics VI (3); Machine Design I (3) or Elementary Electricity (3); Steam Engines and Boilers (3) or Automotives (3) or Shop Methods (3).

Second semester.—Mathematics VII (3); Machine Design II (3) or Elementary Electricity (3); Heat Engines (3) or Advanced Automotives (3) or Foundry Practice (3).

FOURTH YEAR

First semester.—Advanced Mechanics (3); Boiler Room Practice (3) or Heating and Ventilating (3) or Gas Engines and Producers (3) or Shop Management Problems (3).

Second semester.—Advanced Mechanics (3); Advanced Engine Room Practice (3) or Steam Fitting (3) or Plumbing (3) or Gas Engine Testing (3).

Description of courses.—A detailed description of the courses in engineering offered through the Extension Division is given below.

ARCHITECTURE

14-15-16. Architectural History I. Sixteen lectures illustrated with lantern slides, covering the ancient and Renaissance periods. Suitable for students in architecture, teachers of art and history in high schools. Three credits; one meeting a week, first semester. Mr. Forsythe.

17-18-19. Architectural History II. Sixteen lectures illustrated with lantern slides, covering the medieval and modern periods. Suitable for students in architecture, teachers of art and history in high schools. Three credits; one meeting a week, second semester. Mr. Forsythe.

*24-25-26. Free-Hand Drawing I-II. Drawing and painting from life and from casts, with lectures on the structure of the human figure and its application to decoration; assigned readings. Students completing both semesters will be taught how to make etchings. Three credits; one meeting a week, first and second semesters. Mr. Burton.

27-28-29. Free-Hand Drawing III-IV. Continuation of I and II. Prerequisite: Free-Hand Drawing I and II. Three credits; one meeting a week, first and second semesters. Mr. Burton.

31-32-33ex. Elements of Architecture I-II. Shades, shadows, and wash rendering. Architectural elements, doors, windows, moldings, and the architectural orders; general drawing, exercises, and lectures in the application of these elements to simple problems in design; a survey of architectural history illustrated by lantern slides. Open to students who have had mechanical drawing, to those who have had one year in an architect's office, or equivalent experience. Six credits; two meetings a week, first and second semesters. Mr. Forsythe.

*‡34-35-36. Architectural Design I-II. Regular Class B "Analytique" or order problems of the Society of Beaux Arts Architects, or equivalent designs in architectural problems from the regular course of the University of Minnesota. Open to those who have completed Course 31-32-33ex, or who have had two years in an architect's office, or equivalent preparation in an architectural school. Six credits; two meetings a week, first and second semesters. Mr. Forsythe.

*‡37-38-39. Architectural Design III-IV. Class B, plan problems, and Class A, problems of the Society of Beaux Arts Architects, or equivalent design problems from the regular course in Architecture at the University of Minnesota. Open only to those who have completed the required "Analytique" or order problems, one or more years of design in any architectural school. Six credits; two meetings a week, first and second semesters. Mr. Forsythe.

‡ Regular instruction will be given on Monday and Thursday evenings, but students in these classes may work in the drafting rooms of the Architectural Department on other evenings, except Sunday.

51-52-53. Architectural Construction I-II. Nature and use of building materials—wood, brick, stone, concrete, steel, etc. Lectures. Six credits; one meeting a week, first and second semesters.

‡131-132-133. Architectural Design V-VI. Long, short, and sketch problems done under individual criticism dealing in general and more complex kinds of architectural composition with subjects involving special character and a decorative and imaginative interest. Prerequisite: Architectural Design III and IV. Six credits; two meetings a week, first and second semesters.

CIVIL ENGINEERING

*11. Plane Surveying. Elements of plane surveying, methods of chain, compass, transit, and stadia surveys; leveling; field notes; determination of area of irregular plots; computation and plotting of field notes; care, use, and adjustment of instruments; methods of subdivision of the United States public lands. Prerequisite: Trigonometry. Three credits; one meeting a week, first semester. Mr. Teeter.

12. Map-Drawing. Farm and city plats; real estate display maps; landscape architect's maps; topographic and hydrographic symbols. Prerequisite: Trigonometry and Plane Surveying. Three credits; one meeting a week, second semester. Mr. Zelner.

*21-22. Curves and Earthwork. Mathematics of simple, compound, and spiral curves; preliminary and location surveys; plotting of profiles; vertical curves; cross sectioning and computation of earthwork volumes; methods of computation of overhaul; mass diagram, right-of-way and station ground maps. Prerequisite: Trigonometry and Plane Surveying. Three credits; one meeting a week, second semester. Mr. Cutler.

*31-32-33. Structural Design I-II. Includes a treatment of structural mechanics and stress computation, and the elements of the principles and practice governing the design of tension and compression members, beams, girders, and columns. Prerequisite: an elementary working knowledge of mathematics through trigonometry, and some knowledge of elementary physics. Six credits; one meeting a week, first and second semesters. Mr. Lagaard.

*135. Reinforced Concrete Design. Studies and problems in the structural layout of various types of buildings. Various types of floor systems, columns, and footings calculated and studied to determine their desirability in specific cases. Three credits; one meeting a week, first semester. Prerequisite: Course 33. Mr. Maney.

146. Concrete Materials: Selection and Tests. The selection of materials for concrete, their properties, and the tests to be applied. A study of the proper combinations for lowest cost. Local materials will be used. Students make their own specimens and perform all the tests. Prerequisite: Shop Mathematics I and II. Three credits; one meeting a week, first semester. Mr. Lagaard.

147. Concrete and Steel Structures: Tests and Analysis. Study of the strength and carrying capacity of bridges and buildings; methods of testing in the field; special types of extensometers used and tests of laboratory models and buildings in actual service. Prerequisite: Course 146. Three credits; one meeting a week, first semester. Mr. Lagaard.

*245. Advanced Reinforced Concrete Design. The theory and design of structures, for graduate students. Reinforced concrete arches, framed structures, continuous beams, culverts, and circular pipes, statically indeterminate methods, moments and shears, application of the most recent developments in reinforced concrete design methods and materials. Prerequisite: Elementary Reinforced Concrete. Three credits; one meeting a week, either semester. Mr. Parcel.

*51-52. Highways and Pavements I-II. Elementary economics, location, construction, and maintenance of highways and pavements, a study of road-building materials and methods of testing with laboratory practice. Prerequisite: Advanced Algebra and Trigonometry. Six credits; one meeting a week, first and second semesters. Mr. Lang.

53. Municipal Engineering I-II. Development of municipal public works. City-planning, transportation, and housing. The principles of public health and sanitation. Public water supplies, sewerage and sewage disposal, refuse collection and disposal, and the sanitation of buildings. Prerequisite: Hydraulics. Six credits; one meeting a week, first and second semesters. Mr. Bass.

*129. Hydraulics. Mechanics of liquids, pressure in pipes, on gates and dams, flow through pipes and open channels, water hammer; the basic principles of centrifugal pumps and water wheels. Prerequisite: Strength of Materials and Trigonometry. Three credits; one meeting a week, first semester. Mr. Teeter.

162. Water Power and Elements of Hydrology. Types of low, medium, and high head developments. Details of developments; spillway dams; hollow reinforced concrete dams, arch dams, high masonry dams, movable dams. Turbine settings and characteristics. Prerequisite: Hydraulics. Six credits; one meeting a week, first and second semesters. Mr. Teeter.

ELECTRICAL ENGINEERING

*111-113-115. Direct Current Machinery I-II. In elementary electricity, the simple laws of magnetism, the theory of direct current machinery; direct current motors and generators, armature windings, commutation, and wiring diagrams; of value to those who work with direct current apparatus, a foundation for the study of alternating current machinery and power plants. Prerequisites: Practical Physics and Trigonometry. Six credits; one meeting a week, first and second semesters. Mr. Martin.

*112-114-116. Direct Current Laboratory I-II. A course of experimental work to aid in understanding direct current theory. The laws of magnetism and direct current circuits illustrated in experiments performed by the student himself. Machine characteristics for several

types of motors and generators. Prerequisite: registration in Direct Current Machinery, Practical Physics, and Trigonometry. Six credits; one meeting a week, first and second semesters. Mr. Swenson.

*121-123-125. Alternating Currents I-II. An elementary course in alternating current circuits and machines; series and parallel circuits, single and polyphase systems, power and power factor, transformers, induction motors, alternators, synchronous motors, rotaries, single phase motors, and transmission lines. Prerequisite: Direct Current Machinery and Direct Current Laboratory. Six credits; one meeting a week, first and second semesters. Mr. Ryan.

*122-124-126. Alternating Currents Laboratory I-II. Supplementary to Alternating Currents 121-123-125. An experimental study of alternating currents, regulation and efficiency tests of alternators, transformers, motors, and rotaries. Prerequisite: registration in Alternating Currents 121-123-125. Six credits; one meeting a week, first and second semesters. Mr. Kuhlmann.

*132-134-136. Electrical Machine Design I-II. The design of transformers, alternators, motors, and generators, the calculation of all dimensions and predetermination of operating characteristics. Prerequisite: Alternating Currents I-II, Mathematics VI, and Mechanical Drawing II. Six credits; one meeting a week, first and second semesters. Mr. Kuhlmann.

141. Central Stations. (Not offered in 1924-25.)

142. Electrical Transmission. Consideration involved in the designing and building of transmission lines, Kelvin's law and its limitations, the transmission line as a mechanical structure, lightning arresters, study of particular high tension lines. Three credits; one meeting a week, first semester. Prerequisite: Mechanical Drawing II, Courses 134 and 141. Mr. Ryan.

63. Telephone Apparatus. Nature of voice sounds, frequency, and wave length. Construction and operation of receivers, transmitters, inductance and repeating coils, and the electromagnet as used in telephony. Primary and storage batteries, ringing machines, and pole changers. Signaling equipment, including magnetos, ringers, and central energy lamp or visual signals. The treatment will be elementary, using only simple mathematics. Prerequisites: Direct Currents 115-116, Alternating Currents 125-126, Trigonometry, and Mechanical Drawing II. Three credits; one meeting a week, first semester. Mr. Swenson.

65. Telephone Circuits. Subscribers' sets for magneto and common battery exchanges; magneto and common battery circuits; circuit and blue print reading; cable codes, cable- and line-testing; inductance and capacity of lines, aerial and cable construction; traffic studies, and multiple switchboard arrangements. Prerequisite: Course 63, or its equivalent, Mechanical Drawing II. Three credits; one meeting a week, second semester. Mr. Swenson.

*66. Radio Communication I. Analysis of the theory and operation of radio transmitting and receiving circuits, with emphasis on the various

types of receiving sets now in use; economic status of radio communication. Prerequisite for credit: College Physics and Trigonometry or equivalent. Three credits; one meeting a week, first semester. Mr. Jansky, Mr. Todd.

*67. Radio Communication II. Continuation of prerequisite Course 66 or equivalent. Three credits; one meeting a week, second semester. Mr. Jansky, Mr. Todd.

161-162-163. Radio Communication III-IV. Phase relations in high frequency circuits; theory of damped wave circuits; inductance and capacity measurements; the electron tube; undamped wave transmitting and receiving circuits; heterodyne reception; sources of high frequency power. Design of electron tube oscillator and amplifier circuits. Radio telephone modulation, carrier frequencies. Prerequisite: registration in Calculus and Alternating Currents I-II. Six credits; one meeting a week, first and second semesters. Mr. Jansky.

ENGINEERING DRAWING

*1-2. Elementary Mechanical Drawing I-II. A beginning course in drafting; use of instruments and drawing materials, lettering, tracing, view-drawing, dimensioning and working drawings of machine parts. Six credits; one meeting a week, first and second semesters. Mr. French.

45ex. Teachers' Course in Mechanical Drawing I-II. A special course offered to those who teach drawing in grade and high schools and who wish better to acquaint themselves with standard drafting room practice. Six credits; one meeting a week, first and second semesters. Mr. French.

46ex. Mechanical Drawing for Women I-II. Similar to Course 1-2, with more emphasis on lettering and tracing at the option of the student. Six credits; one meeting a week, first and second semesters. Mr. French.

*47ex. Cost Estimating I-II. Plan-reading and cost-estimating of buildings, bridges, culverts, roads, pavements, etc.; analysis of the cost of concrete, steel, timber, and brick construction, piling, transportation, equipment rental, overhead and general costs; cost estimates of buildings, bridges, culverts, etc. Lectures, classroom problems, and discussions. A drawing outfit is not needed, but working knowledge of blue print reading is desirable. Six credits; one meeting a week, first and second semesters. Mr. French.

48ex. Plan Reading. An elementary course of lectures and plan reading exercises for those who wish to obtain a knowledge of plan reading without a regular course in mechanical drawing. No drawing outfit is required. Interpretation of drawings of castings and machine parts, structural steel and concrete building, bridge plans, maps and topographical drawings, architectural plans of houses and larger buildings. No credit; one meeting a week, both semesters. Mr. French.

54. Advertising Lettering. A study of lettering as applied to commercial advertising; analysis of advertisements; design of small space ads; trips

to commercial firms where etching, engraving, lithographing, etc., can be observed. Prerequisite: Any lettering experience. One credit; one meeting a week, first semester; repeated in the second semester. Mr. Levens.

15. Structural Drafting. A practical course in structural detailing of various types of girders, columns, and roof trusses. Complete drawings of frame, mill, bent, and other structures. The solution of problems of simple structures. Prerequisite: Mechanical Drawing I. Three credits; one meeting a week, first semester; repeated in the second semester. Mr. Herrick.

*31-32. Advanced Mechanical Drawing I-II. A practical course in drafting and drafting room methods taking up the detail of machine parts, such as fastenings, screws, bolts, rivets, and rivet joints; keys, cotters, and pins; pipe and pipe-fastenings; bearings and journals, pulleys and belting; spur gears, bevel gears, and spiral gears; cams, link motions, etc.; the application of empirical design and the principles of mechanics; assembly, diagrammatic and layout drawings. It is assumed that the student has a previous knowledge of drawing equivalent to Course 1-2. Six credits; one meeting a week, first and second semesters. Mr. Herrick.

*33. Mechanism and Kinematics. A study of motion without the consideration of the strength of parts; levers, gearing, linkwork, kinematic pairs; machine parts; construction of tooth profiles; paths and velocities of mechanism. Prerequisites: a previous knowledge of drawing equivalent to Course 1-2. Three credits; one meeting a week, first or second semester. Mr. Herrick.

*35-37. Machine Design I-II. An elementary course in the calculation and design of machines and machine parts, such as machine frames, shafting, flywheels, pulleys, riveted and screwed fastenings, bearings, spur gearing, bevel gearing, and helical gearing. Lectures and drawing room practice of practical problems. Prerequisites: previous knowledge of drawing equivalent to Course 1-2, and mathematics through Trigonometry; a working knowledge of Elementary Physics and Strength of Materials is desirable. Six credits; one meeting a week, first and second semesters. Mr. Herrick.

MATHEMATICS AND MECHANICS

For other courses in mathematics, see under that heading in the Department of Collegiate Instruction.

*7. Shop Mathematics I. A general review of all elementary mathematics through geometry. Designed to meet the needs of anyone who wishes to take up engineering work of a higher grade. The course covers fractions, decimals, percentage, weights of materials, areas and volumes, thread-cutting, gearing, belts and pulleys, the milling machine, and a general drill in equations and the use of formulae. Three credits; one meeting a week, first semester. Mr. Teeter, Mr. Edwards, Mr. Boehnlein.

*8. Shop Mathematics II. A continuation of Shop Mathematics I, taking up the subjects of algebra and geometry. Three credits; one meeting a week, second semester. Mr. Teeter, Mr. Edwards, Mr. Boehnlein.

*9. Mathematics III—Advanced Algebra. A continuation of Shop Mathematics II, including a study of variation; quadratic equations, simultaneous equations, progressions, series, logarithms, theory of exponents, and graphical algebra. Prerequisite: Shop Mathematics II. Three credits; one meeting a week, either semester. Mr. Teeter, Mr. Edwards, Mr. Boehnlein.

11. College Algebra for Engineers. A course of college grade in fundamental rules, fractions, linear simultaneous equations, graphs, theory of exponents, surds, complex quantities, quadratic equations, indeterminate equations, ratio, proportion, variation, theory of equations, Horner's and Newton's methods. Textbook: Hall and Knight. Six credits; one meeting a week, first and second semesters. Mr. Wilcox.

*12. Mathematics IV. Trigonometry. Designed for those who have had algebra and geometry and wish to pursue engineering studies. The solution of right and oblique triangles, practical plane surveying, and electrical and mechanical problems. Prerequisite: Mathematics III. Three credits; one meeting a week, first semester. Mr. Teeter, Mr. Edwards, Mr. Priester.

*13. Mathematics V—Analytic Geometry. Of great importance to the engineering student who wishes to take up the study of calculus. The straight line, circle, ellipse, parabola, hyperbola, tangents, normals, rotation of axes, and a few of the higher plane curves met with in practice. Prerequisite: Mathematics IV. Three credits; one meeting a week, second semester. Mr. Teeter, Mr. Edwards, Mr. Johnson.

*24. Mathematics VI—Calculus. Rules for differentiation. The various derivatives and their application to tangents, normals, evolutes, involutes, and maximum and minimum. Engineering examples will be given whenever possible. Prerequisite: Mathematics V. Three credits; one meeting a week, first semester. Mr. Edwards.

25. Mathematics VII. A continuation of Mathematics VI, taking up the standard forms of integration, special methods of integration. Important mechanical and electrical problems will be introduced and discussed in class. Prerequisite: Mathematics VI. Three credits; one meeting a week, second semester. Mr. Edwards.

*52ex. Theory of Engineering. A course in the use of handbooks, for students who have had two years' training in engineering work; the practical application of the fundamentals to engineering problems. Kent's "Mechanical Engineer's Pocket Book," "Machinery Hand Book," or Mark's "Mechanical Engineers' Hand Book" will be used as a text. The design of a simple machine will be taken up. Prerequisites: Structural Design, Direct Current Machinery, Mathematics II, III, IV, V, and Strength of Materials. Three credits; one meeting a week, either semester. Mr. Edwards.

151. Differential Equations. For description see under Department of Collegiate Instruction.

*50ex. Practical Physics I and II. Lectures and experimental demonstrations in general physics, designed to meet the needs of technical students and to be of value in understanding the machinery of everyday life. The subjects treated primarily are mechanics, heat and electricity; but geometrical optics, sound, and the general principles of radio-activity, X-rays, and vacuum tubes will also be taken up. This course should be taken in conjunction with Course 51ex. Six credits; one meeting a week, first and second semesters. Mr. Buchta.

51ex. Practical Physics: Laboratory I and II. Experiments by the student illustrating the principles taught in Physics 50ex. This course should be taken with the preceding one as it is of great value in understanding the fundamental ideas and their applications. Six credits; one meeting a week, first and second semesters. Mr. Buchta.

*30ex. Elementary Applied Mechanics. A short practical course in the action of forces in engineering structures, for students who have limited mathematical training. It includes numerical calculations, simple graphical calculations, forces, simple mechanics, work, power, and energy. Prerequisites: Mathematics II and Physics I. Three credits; one meeting a week, first semester. Mr. Teeter, Mr. Brooke.

*33ex. Strength of Materials. An elementary course designed to follow the course in applied mechanics. The subject includes the properties of materials, stress and strain, elastic and ultimate strength, deformations, principles of moments, moments of inertia, simple stresses, sheer, riveted joints, the general elementary theory of beams, columns, and shafts. Prerequisites: Applied Mechanics and Mathematics IV. Three credits; one meeting a week, first or second semester. Mr. Brooke.

126. Advanced Mechanics I. Statics, resolution of forces, moments, theory of couples, conditions of equilibrium, free body method, catenary, and allied subjects. Prerequisite: Calculus I and II. Three credits; one meeting a week; first semester. Mr. Wilcox.

127. Advanced Mechanics II. Dynamics of particles and of rigid bodies, center of gravity, moment of inertia, kinematics of circular, harmonic, and curvilinear motion in general, work, energy, and power. Prerequisite: Advanced Mechanics I. Three credits; one meeting a week, second semester. Mr. Wilcox.

141. Testing of Materials. The testing of various grades of carbon and alloy steels, woods, and other engineering materials, to determine their mechanical properties. Supplemented by lectures on special methods of testing. Prerequisites: Strength of Materials, Trigonometry. Three credits; one meeting a week, first semester. Mr. Priester.

*142. Elementary Reinforced Concrete. A rapid review of the fundamental principles of beams and columns; elementary principles of reinforced beams, slabs, and columns. Prerequisite: Strength of Materials. Three credits; one meeting a week, first semester. Mr. Holman.

MECHANICAL ENGINEERING

1ex. Metallography and Heat Treatment of Iron and Steel. This is a beginning course and includes lectures, demonstrations, and laboratory work. Pyrometry, thermal analysis, preparation of alloys, microscopic examination of metals and alloys and the preparation of photomicrographs are included in the work. The theory of heat treating is given and its relation to practice is illustrated and many practical problems are discussed. The work should be suitable for those engaged in the practical heat treatment of iron and steel and for those who are writing specifications, purchasing or selling iron and steel. Three credits; one meeting a week, second semester. Mr. Harder.

40ex. Steam Fitting. Covers steam-using machines and equipment with particular emphasis on heating appliances and refrigerating machines. Three credits; one meeting a week, first semester. Mr. Martenis.

41ex. Plumbing. A course designed to meet the needs of the practical shopman, covering the principles of plumbing and the best practice in use at the present time. Mimeographed notes or a standard text will be used. Three credits; one meeting a week, second semester. Mr. Martenis.

*42. Boiler Room Practice. Designed for the benefit of persons who have charge of boiler plants; of value to janitors in charge of schoolhouses and apartment houses, as well as factory boiler shops. It will also be of benefit to those who are expecting to obtain licenses as boiler inspectors. Three credits; one meeting a week, first semester. Mr. Martenis.

*43. Engine Room Practice. A continuation of the preceding course, taking up the subject of the steam engine and its accessories. This course is of value to those seeking a chief engineer's license. Three credits; one meeting a week, second semester. Mr. Martenis.

*153. Heating and Ventilating. A course covering present heating and ventilating practice for heating contractors and others desirous of obtaining a fundamental knowledge of the subject; the study of heat; methods employed for heating and ventilating buildings; piping systems and temperature regulation. Three credits; one meeting a week, first semester. Mr. Martenis.

*41. Elementary Automobiles. A course intended to acquaint men and women in a simple way with the mechanism of a motor car, intelligently to purchase and operate it, and more economically to analyze and remedy troubles. Illustrated lectures and laboratory demonstrations, with discussions of the engine, lubricating and cooling systems, gasoline and carburetors, ignition and starting systems, the storage battery, the chassis, transmission, axles, etc., tires, cost of operation, and other kindred subjects. Prerequisite: Practical Physics and Shop Mathematics II. Three credits; one meeting a week, first or second semester. Mr. Hazen.

150. Gas Engines. A practical course in the theory of construction and operation of the gas engine. It includes various types of engines, cycles, ignition, carburetion, cooling, oiling, methods of determining horse power, etc. Three credits; one meeting a week, first semester. Mr. Rowley.

183. Gas Engine Testing. A practical laboratory course in gas engine testing in which the student performs tests on the various types of gas engines such as stationary oil and kerosene-burning engines, and automobile, airplane, and tractor motors. Students will keep records of the various tests in their notebooks. Prerequisite: Gas Engines, Course 150. Three credits; one meeting a week, second semester. Mr. Rowley.

82. Steam Engine and Power Plant Testing. Intended for stationary engineers who wish to become more efficient in their line of work. The course will consist of lessons supplemented by experimental demonstrations. Actual problems arising in power plant testing will be worked out in class, with explanations and instructions for their solution. The laws of mechanics, heat, power, work, and energy will be applied to engine and power plant testing. Three credits; one meeting a week, first semester. Mr. Shoop.

144. Elementary Thermodynamics. An elementary course required of all engineering students, relating to properties of steam heat engines; the steam engine and boiler; the steam turbine, and the gas engine. The general problem of a modern power plant is considered for the benefit of those who do not devote further time to the subject. Three credits; one meeting a week, second semester. Mr. Edwards.

151. Thermodynamics. Advanced mechanical theory of heat as applied to steam, oil, and gas engines and gas producers, compressor, injectors, reheaters, and refrigeration apparatus. Prerequisite: Strength of Materials, Calculus. Three credits; one meeting a week. Mr. Shoop.

*124. Foundry Practice I-II. A semi-technical course dealing with everyday foundry problems from a technical standpoint; designed to link up the practical with the technical in the simplest manner possible. It will appeal especially to foremen, clerks, mechanics, and other persons interested in foundry practice who have had the equivalent of a common grade school education. The course covers drawing, materials, metallurgy, sands, refractories, fluxes, foundry economics, foundry machinery, and office practice. Six credits; one meeting a week, first and second semesters. Mr. Potter.

58ex. Shop Methods. The practical application of shop mathematics to metal-cutting machines. Screw-cutting, gear and milling cutter calculations. Lectures and demonstrations. Three credits; one meeting a week, first semester. Mr. Shipley.

COLLATERAL COURSES

3. Engineering Finance. Primary basis of price; fixed charges and operating costs; depreciation and appreciation; obsolescence, inadequacy, uselessness; fundamental financial calculations; basic costs and "vestances;" unit cost determination; size of systems for best financial efficiency. Prerequisites: registration in Calculus and physics. Three credits; one meeting a week, second semester. Mr. Teeter, Mr. Edwards.

51ex. English for Engineers I and II. A course in practical English, designed to meet the professional needs of engineering students. The material of this course will include business letters—about twelve types; reports; estimates; instructions, etc. Some attention will be given to oral English. Six credits; one meeting a week, first and second semesters.

7. Law for Engineers A. Personal and ethical relations; rights and remedies; agreements and contractual relations; proposals, advertising and letting of contracts; competency of parties; mutuality of obligations; legality; specifications and construction; evidence; authority of agents; employment; workmen's compensation acts. Three credits; one meeting a week, first semester. Mr. Smiley.

8. Law for Engineers B. Property, real and personal; sales; carriers and storage; land laws; surveys and boundaries; rights of way and water rights; negligence and damages; engineer's legal relations. Three credits; one meeting a week, second semester. Mr. Smiley.

Extension Certificates Granted, 1923-24

CERTIFICATES IN ACCOUNTANCY

Oscar H. Bardill
Henry M. Conroy
Margaret Devereux
Ben Goldfein
Ivan L. Hagerman
Daniel Kennedy
N. Gertrude Koll
James D. Lewis
Elmer Lindborg
Dora Mangney
Clarence Miller
Orval W. Morris
George G. Pierce
Harold Schmidt
Adam H. Schoenborn
Allen S. Solomon
Alfer B. Strom
Philip N. Syhl
A. F. Toensing

CERTIFICATES IN GENERAL BUSINESS

Raymond W. Egan
Margaret Devereux
Mary Gillespie
Orval W. Morris
Walter E. Olson
Philip N. Syhl

CERTIFICATES IN BANKING AND FINANCE

Theodore Gran
Howard I. Mudgett
Emil A. Proulx
Jeanette E. Sell
Frank J. Vosmek

CERTIFICATES IN ENGINEERING

Walter Frank
Albert Kacher
Frank Zipoy

Summary of Student Semester Registrations, 1923-24

Minneapolis collegiate	2138		
Minneapolis business	1442		
Minneapolis engineering	968		
		4548	
St. Paul collegiate	813		
St. Paul business	654		
St. Paul engineering	198		
		1665	
Duluth collegiate	480		
Duluth business	357		
Duluth engineering	78		
		915	
Cloquet collegiate	13		
Virginia collegiate	78		
Virginia business	18		
		109	
Total number of student semester registrations			7237
Total number of individuals taking work 1923-24			4272
Total collegiate registrations		3522	
Total business registrations		2471	
Total engineering registrations		1244	
			7237

Extension Service

The Extension Service of the University of Minnesota is organized to include the following:

A. THE GENERAL EXTENSION DIVISION

I. Extension classes in Minneapolis, St. Paul, Duluth, and other cities.
   1. Courses in Collegiate Instruction leading to credit in the College of Science, Literature, and the Arts, in the College of Education, and in the School of Business.
   2. Courses in Business Administration, Accounting, and Finance leading to certificate and also to University credit.
   3. Practical courses in Engineering and in Industrial Subjects leading to certificates.

II. Correspondence Courses in each of the three groups of subjects above, totaling about 200 courses. (Special bulletin sent on request.)

III. Municipal Reference Bureau, which compiles and furnishes to city officials information pertaining to municipal government and administration.

IV. Community Service Department, with its subdivisions for (1) Extension lectures, singly or in groups; (2) Lyceum lectures, concerts, and entertainments; (3) Visual Instruction, through loan collections of lantern slides and films; (4) Drama Service, to aid clubs and school societies in the selection and production of amateur theatricals; and (5) Community Organization, through community institutes formed with the co-operation of a special adviser from the Extension Division. (Special bulletin sent on request.)

V. Short Courses at the University of from one to twelve weeks, for graduate dentists, retail merchants, bankers, and in such subjects as embalming, playground supervision, citizenship (for women voters), etc.

B. AGRICULTURAL EXTENSION DIVISION

Agricultural Extension includes lectures, demonstrations, institutes, and short courses under the direction of the College of Agriculture, Forestry, and Home Economics.

The Bulletin *of the* University *of* Minnesota

Correspondence Courses

Announcement for the Year

1924-1925

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WILLIAM WATTS FOLWELL, LL.D., President Emeritus
RICHARD R. PRICE, Ed.D., Director of University Extension
WILLIAM C. SMILEY, LL.M., Head of Correspondence Study Department

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WILLIAM ANDERSON, Ph.D., Associate Professor of Political Science
LUTHER L. BERNARD, Ph.D., Professor of Sociology
ROY G. BLAKEY, Ph.D., Professor of Economics
GISLE C. BOTHNE, M.A., Professor of Scandinavian Languages and Literatures
RUTH E. BOYNTON, B.S., M.D., Director, Division of Child Hygiene, State Board of Health
OSCAR C. BURKHARD, Ph.D., Associate Professor of German
EDWARD G. CHEYNEY, B.A., Professor of Forestry
ROBERT V. CRAM, Ph.D., Assistant Professor of Latin
JAMES DAVIES, Ph.D., Assistant Professor of German
OLIVER C. EDWARDS, B.S., M.E., Assistant Professor of Mechanical Engineering, General Extension Division
RAYMOND O. FILTER, Ph.D., Assistant Professor of Psychology, General Extension Division
JULES T. FRELIN, B.A., Assistant Professor of Romance Languages
ROBERT W. FRENCH, B.S. (C.E.), Assistant Professor of Drawing and Descriptive Geometry
JOHN M. GAUS, M.A., Assistant Professor of Political Science
ALVIN H. HANSEN, Ph.D., Professor of Economics
SAMUEL B. HARDING Ph.D., Professor of History, General Extension Division
SAMUEL KROESCH, Ph.D., Associate Professor of German
JOHN V. MARTENIS, M.E., Associate Professor of Machine Design
WALTER R. MYERS, Ph.D., Assistant Professor of Economics
CHARLES W. NICHOLS, Ph.D., Assistant Professor of English
EUGENE F. PARKER, Ph.D., Assistant Professor of Romance Languages
JOSEPH B. PIKE, M.A., Professor of Latin
HAROLD S. QUIGLEY, Ph.D., Assistant Professor of Political Science
ALBERT W. RANKIN, B.A., Professor of Education, Retired
CHARLES A. SAVAGE, Ph.D., Professor of Greek
CARLYLE M. SCOTT, Professor of Music
WILLIAM C. SMILEY, LL.M., Assistant Professor of Business Law, General Extension Division
J. WARREN STEHMAN, Ph.D., Associate Professor of Economics

ANDREW A. STOMBERG, M.S., Professor of Scandinavian Languages and Literatures

EMERSON G. SUTCLIFFE, Ph.D., Assistant Professor of English

THOMAS A. H. TEETER, B.S. (C.E.), Associate Professor of Engineering, General Extension Division

J. FRANKLIN EBERSOLE, M.A., Ph.B., Professorial Lecturer in Economics

WILLIAM H. SPAULDING, B.A., Head Football Coach

JEAN H. ALEXANDER, M.A., Instructor in History and Philosophy of Education

REUEL R. BARLOW, B.A., Instructor in Journalism

WILLIAM O. BEAL, M.S., M.A., Instructor in Astronomy and Assistant Astronomer

CHARLES LEROY CONLEY, B.A., Instructor in Business, General Extension Division

LYNWOOD G. DOWNS, M.A., Instructor in German

RALPH H. FARMER, B.A., Instructor in Economics

RICHARD A. GRAVES, M.A., Instructor in Economics

LEAH MILLER HANLEY, B.S., Instructor in Art, General Extension Division

SOPHIA HUBMAN, M.A., Instructor in English, University High School

REWEY B. INGLIS, B.A., Instructor in English, University High School

HERBERT W. KRIEGER, M.A., Instructor in Anthropology

OTTO F. KUHLMAN, M.A., Instructor in Economics

JEAN LEES, B.A., Instructor in English, General Extension Division

ORRIN W. POTTER, E.M., Instructor in Descriptive Geometry

FRED E. RINGHAM, B.A., Instructor in Accounting

DORA V. SMITH, M.A., Instructor in English, University High School

HOMER J. SMITH, Ph.B., M.A., Instructor in Trade and Industrial Education

GEORGE W. SWENSON, M.S. (E.E.), Instructor in Telephone and Telegraph Engineering

LOUIS A. TOHILL, M.A., Instructor in History, University High School

GENERAL INFORMATION

CORRESPONDENCE STUDY

The developments of the last few years have clearly demonstrated the effectiveness of, and the necessity for, university teaching by correspondence. The foremost American universities have recognized this opportunity for specific service by extending their work beyond the lecture room and the campus.

In thus extending its functions, the University offers a plan of practical instruction whereby preparatory, vocational, and collegiate training is made available to those who of necessity must devote a part of their time to other duties, and hence can not attend classes. Teaching by correspondence thus has become a part of the state educational system and has broadened it so that it now makes education possible to every person who is willing to make the effort to get it.

By a careful economy of time it is possible to contribute largely to the requirements for a Bachelor's degree by combining work in residence at the University Summer Session with correspondence study under the General Extension Division.

ADVANTAGES

Correspondence study accommodates itself to a person's spare time, enabling him to make valuable use of short periods which would otherwise be wasted; it permits him to carry on work in a single field of study in which he has a special interest, to prepare for special occupations, to broaden his intellectual outlook to meet the demands of mature life, or to make up defects in his education—defects one often does not realize until it is too late to attend school.

The student recites on every part of every lesson and receives the individual attention of the teacher in the correction of the papers he submits. Since a student is not hurried in his work, but may within reasonable limits take as much time as he needs for the preparation of a lesson, he can master the material thoroly and make every recitation report represent his best efforts.

THE INSTRUCTION

Upon the receipt of the application and fee for any course the first lessons are sent, together with instructions for the preparation of lessons and directions for making reports.

The teaching is done by teachers from the various faculties in the University who are in continuous charge of similar courses in residence and who are familiar with the needs of non-resident students.

Each lesson contains questions to test the student's methods of work as well as his understanding of the ground covered. After preparing for recitation, the student writes his answers to the questions and returns them, together with a statement of any difficulties which may have arisen during his study.

Each recitation report is returned to the student with such corrections, explanations, and suggestions as may be needed. It is expected that these will be carefully gone over. Lists of books, assignments for reading, and all necessary assistance will be furnished throughout the course, so that the student at no time will be left without adequate aid and guidance. Questions on the subject in hand are at all times encouraged.

THE UNIT COURSE

The unit course is divided, where practicable, into twenty-seven lessons, representing a five-credit course for one quarter in residence. Such a course represents an amount of work equal to that done in residence at the University in a study of five full recitation hours per week for one quarter. It is assumed that this work may be done by the average student in twenty-seven weeks with a minimum leisure for study of one hour per day, six days in the week. Variations from the unit course are indicated by the number of credits, or by the number of lessons when university credit is not allowed. Two lessons in correspondence approximately cover the ground in quantity of a week's work in residence.

Preparatory courses are arranged so that each lesson covers approximately the equivalent of a week's work in high school.

SELECTION OF COURSES

In selecting courses for university credit, the student should conform to the prescribed course of study of each college. It is advisable for such students to secure a copy of the bulletin of the college which they expect to enter, in order to find out what subjects are prescribed. The bulletin of any of the colleges of the University may be secured by addressing the registrar, University of Minnesota, Minneapolis.

PREPARATORY COURSES

This department now offers a variety of courses for entrance credit. These are sometimes spoken of as "high school" or "subfreshman" courses. They enable students to make up deficiencies in their preparatory work by home study or to do all or a major portion of it through this means.

To qualify for admission to the University a candidate must present a minimum of fifteen credit units in specified subjects. The particular subjects required differ with the various colleges but all include four units of English, two or more of mathematics, and enough additional credits to make up the total of fifteen. Specific information in this regard may be obtained from the University bulletin of general information.

Ordinarily a candidate must pass entrance examinations in each of the required subjects, but there are some exceptions to this rule. Certificates from the College Entrance Examination Board, from the Minnesota State High School Board, or from the New York regents' examinations are accepted in lieu of examinations in the subjects they represent. Graduates of accredited preparatory or high schools who show a record of having passed in the required fifteen units may be admitted without examination,

but non-graduates can not make use of credits obtained in such schools. Finally, candidates who hold entrance credits from this department are not required to submit to further examination in the subjects so passed. For list of courses see pages 13-19.

Certain subjects, such as the elementary courses in languages, may be taken either for entrance or for collegiate credit, but not for both, that is, a subject which is presented for entrance credit can not be repeated by the same student for collegiate credit. A high school credit represents five classroom periods each week for a school year. A college credit represents one classroom period each week for a quarter. Making allowance for the greater length of the college period and the more intensive nature of the work required, the ratio is about ten to one. This means that when the same course is offered either for entrance or for college credit a nine- or ten-credit college course will carry but one entrance credit.

Whether a state teachers' college or a local high school will accept the entrance or "high school" credits obtained from this department and apply them toward a diploma, and the extent to which such credits will be accepted and applied, depends entirely upon the rules of the school concerned. Many of them are known to accept such credits and none has been reported as refusing to do so, but this is a matter over which the University has no jurisdiction. Therefore, students who expect to make use of credits in this way should first make sure of the attitude of the school in which it is sought to apply them. No registration for entrance credit will be accepted from a student who is at the same time enrolled in a secondary school, except upon written permission from that school. The University does not grant a high school diploma for work done by correspondence.

BOOKS AND OUTFIT

All necessary textbooks, drawing outfits, and apparatus are extra and *must be procured by the student.* Money should *not be sent* to the University for the purchase of texts and other material. When ordering textbooks, the student should give the exact title, the author, and the publisher. The student pays postage on lessons one way.

Some reference books may be borrowed from the University library. This privilege does not apply to the necessary textbooks. The period of loan is one month. The student is expected to pay express or postage both ways. Requests for such reference books should be addressed to the librarian, University of Minnesota, Minneapolis, and the student should state explicitly what books are desired, with the author's name, title of the book, and the volume number, naming the course in which they are to be used and giving full instructions for mailing. Blanks are supplied for this purpose.

No list of textbooks is published by the department.

PROCEDURE

The student who wishes to undertake correspondence study should first select such course or courses as he may desire to take and send for an application blank if he has not already obtained one. All applications must be made on the blank furnished by the department. He should fill out the blank with all the information called for and return it with the required fee to the Correspondence Study Department, General Extension Division, University of Minnesota, Minneapolis.

HOW TO SEND MONEY

Payment should be made by post-office or express money order, personal check, or draft. *Make all checks and orders payable to the University of Minnesota.* They should cover the exact amount of the fee, no more and no less.

OTHER EXTENSION ACTIVITIES

The Extension Service of the University of Minnesota is organized to include:

A. Evening classes, in Minneapolis, St. Paul, Duluth, and other cities.

1. Courses leading to credit in the College of Science, Literature, and the Arts, in the College of Education, in the School of Business, and in the School of Mines.
2. Courses in business administration, accounting, and finance.
3. Practical courses in engineering and in industrial subjects.

B. Correspondence courses.

C. Extension lectures, singly or in groups, and lyceum lectures, concerts, and entertainments.

D. The Municipal Reference Bureau, which compiles and furnishes to city officials information pertaining to municipal government and administration.

E. The Branch of Visual Instruction, through which loan collections of lantern slides and films are furnished to schools and clubs.

F. Drama Service, through which dramatic clubs and school societies are given advice about the production of amateur theatricals and copies of plays are lent for reading and selection.

G. Community Service, through which the elements making up a community and its trading fringe are given advice and assistance for bringing together all the social forces into an organization whose purpose shall be to make the people healthy and wealthy and wise.

H. Agricultural Extension, including lectures, demonstrations, institutes, and short courses under the direction of the College of Agriculture, Forestry, and Home Economics.

REGULATIONS

ADMISSION

All men and women who seem qualified to pursue successfully the courses offered will be admitted to registration without formal examination. The student is required to fill out an application blank giving all the information asked for in order that his fitness to pursue the course selected may be determined. It is desired that the student state fully the purpose he has in view in taking the work and give in detail the educational advantages, training, or experience he may have had. The department endeavors to meet the needs of the individual student by advice and suggestions, as well as by formal instructions, but whenever it finds that the courses selected are not for the best interests of the student, it reserves the right to reject the application or to advise change. It also reserves the right to advise discontinuance or change after a course has been started, if the student shows entire unfitness for the work. Whenever a registration is discontinued in this way or rejected the fee will be returned.

TIME

Students may begin a correspondence course at any time during the year and will be required to complete the course within twelve months from the time of enrolment, but the department *can not guarantee that all courses will be given during the summer months.* During an instructor's vacation, a substitute will be provided to carry on such course or courses, if possible, or the time for completing the course will be extended.

Four recitation reports in a subject is the maximum number which will be accepted by the University from a student in any single week. Subject to this regulation the student may work as rapidly as he desires providing his work is satisfactory.

As a rule the student should endeavor to send in a recitation report every week or at least one in two weeks. If it is not possible to do this the department should be notified. Temporary delays are, however, unavoidable in a busy person's work, and no student should become discouraged because of them.

NUMBER OF COURSES CARRIED

Not more than two courses may be carried through correspondence at one time.

FEES*

All fees are payable at the time the student files his application for registration. No reduction of fee is made for a combination of courses carried simultaneously. The fee for each course may be found in the lists of courses, pages 13-19.

REFUNDS

Two dollars ($2) of each fee is the non-refundable portion withheld to cover expenses of registration. No fee will be refunded after two months from the date of registration or after the student has completed

* State war service tuition is not applicable after June 30, 1924.

one half of the course for which he has registered. If an application for instruction is rejected the entire fee is returned.

REINSTATEMENT

Any student whose registration has expired, or who has failed to complete a course within the prescribed time of one year through causes not within the control of the University may be reinstated with the consent of the department on payment of one dollar for each course reinstated.

CREDIT

Students who undertake correspondence study work for university credit must state this fact in advance and comply with all requirements of the University, including the prerequisites for each course. University credits allowed in this connection will be recorded separately until the student matriculates at the University, when they will be recorded permanently as university credits. Registrations for credit will not be accepted unless evidence is given that university entrance requirements can be met. These requirements are usually comprised in a four-year high school course.

Those seeking a university degree must conform to all the requirements exacted by the college or school in which such degree is sought. The bulletin of any college or school may be obtained from the registrar.

A maximum of one half of the required credits for the bachelor of arts degree may be accumulated through correspondence. The work of the earlier part of the course is more likely to be available for correspondence study. The work of the senior year, or the major portion of it, must be done in residence.

Normal students who undertake courses for university credit with the purpose of having the credit transferred to the teachers' college in which they are working for a diploma should make certain by consultation with the proper authorities at the teachers' college that the arrangement to do this is satisfactory and that the course selected fits into their program.

Entrance credit is allowed for courses of high school grade. See Preparatory Courses, page 6.

No credits may be earned by correspondence study to apply on the Master's degree, or any other graduate degree.

Notice of completion with or without credit, as the case may be, is sent by the University registrar to each student who satisfactorily completes a course.

TRANSFER OF CREDITS

Credits obtained through work with this department will be certified to other schools or colleges upon request, but it must be understood that their acceptance by another institution depends wholly upon the regulations of that institution. Students who expect to apply our credits elsewhere should first make sure of the rules of the other school or college.

A "credit" does not mean the same thing in different institutions respectively and hence a transfer of credits usually involves the calculation

of credit equivalents. A University of Minnesota credit now means one fifty-minute classroom period per week for a "quarter," or twelve weeks. Formerly it meant the same quantity of classroom work per week for a "semester" of seventeen weeks. Three "quarter" credits" are equivalent to two "semester" credits.

Most colleges reckon credits by one of the foregoing methods, but there are others. For example a credit in a Minnesota state teachers' college means five fifty-minute classroom periods per week for a "term" of twelve weeks; in Minnesota high schools a credit represents five forty-minute classroom periods per week for a "year" of thirty-six weeks.

It must be understood that the classroom periods indicated above do not include the time required for preparation, which is ordinarily two hours of outside study for each classroom hour.

PROFESSIONAL STATE TEACHER'S CERTIFICATE

The State Department of Public Instruction does not accept grades acquired through correspondence study in lieu of examination for credit toward the state professional or any other state teacher's certificate. Correspondence courses listed in this bulletin, however, may be taken as a preparation for the state examination in the required branches.

RESIDENT STUDENTS

Registration for correspondence courses will not be accepted from resident students of the University of Minnesota or of any other institution of learning unless acceptance would be justified by exceptional circumstances.

Persons pursuing correspondence courses for credit must discontinue them when they enter school. Arrangements may be made to hold the courses over until the student is again free to pursue them.

No university student may enroll for a correspondence course for the purpose of removing a condition or a failure, except by consent of the Students' Work Committee.

EXAMINATIONS

All students on completing any course will be given an examination either at the University or, by arrangement, in their home towns under the supervision of an accredited representative of the University. This representative may often be the local superintendent of schools.

GRADE SYMBOLS

The following grade symbols are used to indicate the grade of any paper:

A (93-100)	D (75-81)
B (87-93)	E (Conditioned*)
C (81-87)	F (Failed)

* Grade E will become grade F unless condition is removed by re-examination within three months.

LIST OF COLLEGIATE COURSES†

Anthropology				
51 Introduction	27 lessons	5	credits	$17.00
Art Education				
3 Interior Decorating	16 lessons	3	credits	$10.00
Astronomy				
1 Descriptive Astronomy	24 lessons	4½	credits	$15.00
2 Uranography	12 lessons	2‡	credits	7.50
Athletics				
5 Football	24 lessons	no	credit	$15.00
Business				
1 Business Correspondence	24 lessons	4½‡	credits	$15.00
2 Business Law A	16 lessons	3	credits	10.00
3 Business Law B	16 lessons	3	credits	10.00
4 Business Law C	16 lessons	3	credits	10.00
5 Business Law D	16 lessons	3	credits	10.00
6 Principles of Accounting I	24 lessons	4½	credits	15.00
Principles of Accounting II	24 lessons	4½	credits	15.00
Economics				
1 Principles I	27 lessons	5	credits	$17.00
2 Principles II	27 lessons	5	credits	17.00
3 Banking Practice	24 lessons	4½	credits	15.00
6 Labor Problems	16 lessons	3	credits	10.00
7 Public Finance	24 lessons	4½	credits	15.00
8 Commercial Policies	16 lessons	3	credits	10.00
9 Economic History I	24 lessons	4½	credits	15.00
10 Economic History II	24 lessons	4½	credits	15.00
11 Money and Banking I	16 lessons	3	credits	10.00
12 Money and Banking II	16 lessons	3	credits	10.00
13 Corporation Finance	16 lessons	3	credits	10.00
Education				
2 Educational Psychology	16 lessons	3	credits	$10.00
3 Early History of Education	24 lessons	4½	credits	15.00
4 History of Modern Educ.	24 lessons	4½	credits	15.00
7 Industrial Education	22 lessons	4	credits	14.00
8 Theory of Teaching	24 lessons	4½	credits	15.00
9 School Organization and Law	27 lessons	5	credits	17.00
10 School Sanitation	27 lessons	5	credits	17.00
12 Social Aspects of Education	27 lessons	5	credits	17.00
13 Industrial History	11 lessons	2	credits	7.00
25 Teaching Related Subjects	16 lessons	3	credits	10.00

† Credits indicated are "quarter" credits as explained on the preceding page and are applicable toward a University degree, except those marked ‡ which are extension credits only.

ENGINEERING

6 Statics and Kinematics	27 lessons	5‡	credits	$17.00
7 Dynamics	27 lessons	5‡	credits	17.00
9 Strength of Materials	27 lessons	5‡	credits	17.00
10 Hydraulics	22 lessons	4‡	credits	14.00
19 Descriptive Geometry	27 lessons	5‡	credits	17.00

ENGLISH

Literature

1 English Survey I	16 lessons	3	credits	$10.00
2 English Survey II	16 lessons	3	credits	10.00
3 English Survey III	16 lessons	3	credits	10.00
4 American Literature	16 lessons	3	credits	10.00
6 The English Novel	24 lessons	4½	credits	15.00

Rhetoric

1 Rhetoric I	16 lessons	3	credits	$10.00
2 Rhetoric II	16 lessons	3	credits	10.00
3 Rhetoric III	16 lessons	3	credits	10.00
4 Exposition	16 lessons	3	credits	10.00
7 Description	16 lessons	3	credits	10.00
8 Narration	16 lessons	3	credits	10.00
9 Versification I	16 lessons	3	credits	10.00
10 Versification II	16 lessons	3	credits	10.00

GERMAN

*1 Beginning German I	20 lessons	4	credits	$13.50
*2 Beginning German II	20 lessons	4	credits	13.50
*3 Intermediate German I	20 lessons	4	credits	13.50
*4 Intermediate German II	20 lessons	4	credits	13.50
5 Rapid Reading I	24 lessons	4½	credits	15.00
7 Elementary Composition I	16 lessons	3	credits	10.00
8 Elementary Composition II	16 lessons	3	credits	10.00
9 Drama I	24 lessons	4½	credits	15.00
10 Drama II	24 lessons	4½	credits	15.00
11 Medical German I	16 lessons	3	credits	10.00
12 Medical German II	16 lessons	3	credits	10.00
15 Chemical German I	16 lessons	3	credits	10.00
Chemical German II	16 lessons	3	credits	10.00

GREEK

*1 Beginning Greek I	27 lessons	5	credits	$17.00
*2 Beginning Greek II	27 lessons	5	credits	17.00
*3 Beginning Greek III	27 lessons	5	credits	17.00
4 Anabasis	27 lessons	5	credits	17.00
5 Herodotus	27 lessons	5	credits	17.00
6 Homer	27 lessons	5	credits	17.00
51 Philosophy	16 lessons	3	credits	10.00
52 Oratory	16 lessons	3	credits	10.00
53 Drama	16 lessons	3	credits	10.00

* May be taken for one-half entrance credit.

History				
1	Ancient I (Greece)	24 lessons	4½ credits	$15.00
2	Ancient II (Rome)	24 lessons	4½ credits	15.00
7	Middle Ages	24 lessons	4½ credits	15.00
10	Modern World I	27 lessons	5 credits	17.00
11	Modern World II	27 lessons	5 credits	17.00
15	English I	24 lessons	4½ credits	15.00
16	English II	24 lessons	4½ credits	15.00
20	United States I	24 lessons	4½ credits	15.00
21	United States II	24 lessons	4½ credits	15.00
Journalism				
1	Reporting I	16 lessons	3 credits	$10.00
2	Reporting II	16 lessons	3 credits	10.00
3	Reporting III	16 lessons	3 credits	10.00
4	Editing I	16 lessons	3 credits	10.00
5	Editing II	16 lessons	3 credits	10.00
6	Editing III	16 lessons	3 credits	10.00
20	Editorial-Writing I	16 lessons	3 credits	10.00
21	Editorial-Writing II	16 lessons	3 credits	10.00
Latin				
*1	Beginning Latin I	27 lessons	5 credits	$17.00
*2	Beginning Latin II	27 lessons	5 credits	17.00
*3	Caesar I	20 lessons	4 credits	13.50
*4	Caesar II	20 lessons	4 credits	13.50
*5	Cicero I	27 lessons	5 credits	17.00
*6	Cicero II	27 lessons	5 credits	17.00
*7	Aeneid I	24 lessons	4½ credits	15.00
*8	Aeneid II	27 lessons	5 credits	17.00
9	Livy	24 lessons	4½ credits	15.00
10	Plautus and Terence	24 lessons	4½ credits	15.00
Mathematics				
*6	Higher Algebra I	27 lessons	5 credits	$17.00
*7	Higher Algebra II	27 lessons	5 credits	17.00
*8	Trigonometry	27 lessons	5 credits	17.00
9	Plane Analytical Geometry	27 lessons	5 credits	17.00
10	Differential Calculus	27 lessons	5 credits	17.00
11	Integral Calculus	27 lessons	5 credits	17.00
12	Differential Equations	27 lessons	5 credits	17.00
Music				
1	Harmony	24 lessons	4½ credits	$15.00
Physics				
1	Mechanics and Sound	16 lessons	3 credits	$10.00
2	Heat	16 lessons	3 credits	10.00
3	Optics	16 lessons	3 credits	10.00
4	Magnetism and Electricity	16 lessons	3 credits	10.00

* May be taken for one-half entrance credit.

POLITICAL SCIENCE

1 American Government	27 lessons	5	credits	$17.00
3 State and Local Government	27 lessons	5	credits	17.00
4 International Law	24 lessons	4½	credits	15.00
5 Political Parties	27 lessons	5	credits	17.00

PSYCHOLOGY

1 General Psychology I	16 lessons	3	credits	$10.00
2 General Psychology II	16 lessons	3	credits	10.00
3 Applied Psychology	16 lessons	3	credits	10.00

ROMANCE LANGUAGES

French

*1 Beginning French I	20 lessons	4	credits	$13.50
*2 Beginning French II	20 lessons	4	credits	13.50
*3 Intermediate French I	20 lessons	4	credits	13.50
*4 Intermediate French II	20 lessons	4	credits	13.50
5 Elementary Composition	16 lessons	3	credits	10.00
6 Advanced Composition	16 lessons	3	credits	10.00
7 Scientific French I	16 lessons	3	credits	10.00
8 Scientific French II	16 lessons	3	credits	10.00
9 Scientific French III	16 lessons	3	credits	10.00

Spanish

*1 Beginning Spanish I	20 lessons	4	credits	$13.50
*2 Beginning Spanish II	20 lessons	4	credits	13.50
*3 Intermediate Spanish I	20 lessons	4	credits	13.50
*4 Intermediate Spanish II	20 lessons	4	credits	13.50
5 Elementary Composition	16 lessons	3	credits	10.00
6 Advanced Composition	16 lessons	3	credits	10.00

SCANDINAVIAN

Norwegian

*1 Beginning Norwegian I	20 lessons	4	credits	$13.50
*2 Beginning Norwegian II	20 lessons	4	credits	13.50
*3 Intermediate Norwegian I	20 lessons	4	credits	13.50
*4 Intermediate Norwegian II	20 lessons	4	credits	13.50
5 Advanced Norwegian I	24 lessons	4½	credits	15.00
6 Advanced Norwegian II	24 lessons	4½	credits	15.00

Swedish

*1 Beginning Swedish I	20 lessons	4	credits	$13.50
*2 Beginning Swedish II	20 lessons	4	credits	13.50
*3 Intermediate Swedish I	20 lessons	4	credits	13.50
*4 Intermediate Swedish II	20 lessons	4	credits	13.50
5 Literature I	24 lessons	4½	credits	15.00
6 Literature II	24 lessons	4½	credits	15.00

* May be taken for one-half entrance credit.

Sociology

1 Introduction	27 lessons	5	credits	$17.00
2 Rural Sociology	27 lessons	5	credits	17.00
10 Rural Com. Organization	16 lessons	3	credits	10.00
11 Social Organization	16 lessons	3	credits	10.00
14 Social Progress	16 lessons	3	credits	10.00
52 Rural Field Work	(See description)			5.00

LIST OF VOCATIONAL COURSES†

Business

*7 Elementary Bookkeeping	12 lessons	$ 7.50

Engineering

1 Shop Mathematics I	24 lessons	$15.00
2 Shop Mathematics II	24 lessons	15.00
*3 Mechanical Drawing I	20 lessons	12.50
*4 Mechanical Drawing II	20 lessons	12.50
5 Elementary Mechanics	16 lessons	10.00
8 Strength of Materials	16 lessons	10.00
11 Electricity and Magnetism I	24 lessons	15.00
12 Electricity and Magnetism II	24 lessons	15.00
13 Alternating Currents	20 lessons	12.50
14 Heating and Ventilating	24 lessons	15.00
16 Boiler Room Practice	16 lessons	10.00
17 Engine Room Practice	24 lessons	15.00
18 Machine Design	24 lessons	15.00
20 Lumber and Its Uses	10 lessons	8.00
21 Foundry Practice I	12 lessons	7.50
22 Foundry Practice II	12 lessons	7.50
23 Foundry Practice III	12 lessons	7.50
24 Radio Communication	16 lessons	10.00

Hygiene

‡1 Maternity and Infancy	15 lessons	no fee

† Vocational courses carry no college credit and may be undertaken by those who lack the prerequisites for entrance to the University.

* May be taken for entrance credit, see list of preparatory courses.

‡ Offered only to residents of Minnesota.

LIST OF PREPARATORY COURSES

Group A: English

English Literature A	20 lessons	½ credit	$12.50
English Literature B	20 lessons	½ credit	12.50
English Literature C	20 lessons	½ credit	12.50
English Literature D	20 lessons	½ credit	12.50
English Composition A	20 lessons	½ credit	12.50
English Composition B	20 lessons	½ credit	12.50
English Composition C	20 lessons	½ credit	12.50
English Composition D	20 lessons	½ credit	12.50

Group B: Languages

See list of collegiate courses.

Group C: History and Social Science

American History A	20 lessons	½ credit	$12.50
American History B	20 lessons	½ credit	12.50
Social Science A	20 lessons	½ credit	12.50

Group D: Mathematics

Algebra A	20 lessons	½ credit	$12.50
Algebra B	20 lessons	½ credit	12.50
Plane Geometry A	20 lessons	½ credit	12.50
Plane Geometry B	20 lessons	½ credit	12.50
Solid Geometry	24 lessons	½ credit	15.00
Higher Algebra I	27 lessons	½ credit	17.00
Higher Algebra II	27 lessons	½ credit	17.00
Trigonometry	27 lessons	½ credit	17.00

Group E: Natural Science

Elementary Physics A	16 lessons	no credit	$10.00
Elementary Physics B	16 lessons	no credit	10.00

The courses under Group E carry no general entrance credits, but do satisfy the entrance requirement of the College of Dentistry, and will prepare a student to pass the state teachers' examination in physics for a first grade certificate.

Group F: Vocational and Miscellaneous

Mechanical Drawing I	20 lessons	½ credit	$12.50
Mechanical Drawing II	20 lessons	½ credit	12.50
Elementary Bookkeeping	12 lessons	¼ credit	7.50

This special course in bookkeeping is primarily intended to fit students to take up a college course in accountancy, but it may be applied as one quarter entrance credit.

DESCRIPTION OF COURSES

ANTHROPOLOGY

51. Introduction to Anthropology. Origin and development of mankind and the races; racial distribution and immigration; the bearing of anthropology on present-day thought and problems.

Twenty-seven lessons (five credits). Mr. Krieger.

ART EDUCATION

3. Interior Decorating. The course aims to meet the needs of home makers and teachers; to show how to make the home comfortable, and artistic. Instruction will consist of written lectures and textbook study. Blue prints and samples of fabrics will be sent with course. Students will draw series of simple plates to illustrate principles. Subjects discussed include: color, walls, floors and their coverings, period and modern furniture, fireplaces, pictures, and accessories. This course is equivalent to Art Education 3, College of Education.

Sixteen lessons (three credits). Mrs. Hanley.

ASTRONOMY

1. Descriptive Astronomy. A descriptive course designed to give accurate general information regarding the solar system and the stellar universe. It emphasizes the basic facts of the physical universe which all intelligent people should know, rather than the technical details of the work of a professional astronomer. Altho not necessary the student will find that a small telescope or even an opera glass, will add greatly to the interest in the subject.

Twenty-four lessons (four and one-half credits). Mr. Beal.

2. Uranography. A study of the constellations visible from the United States. The course includes an exposition of star magnitudes; use of star maps; identifications of the constellations, brighter stars, variables, doubles, clusters, and nebulae; interpretation of the Milky Way; reading of star folklore; watching the motions of the brighter planets relative to the sun and stars. The course can be begun at any time.

Twelve lessons (extension credit only). Mr. Beal.

ATHLETICS

5. Football. A practical exposition of the details of individual and team play, offensive and defensive, with instruction on training and organization. For players and secondary school coaches.

Twenty-four lessons (no credit). Mr. Spaulding.

BUSINESS COURSES

1. Business Correspondence. Mastery of materials, letters in general, letters adjusting complaints, reminder letters, recommendation letters, application letters, credit and collection letters, general sales letters, form letters, follow-up letters. The ability to use correct English is prerequisite.

   Twenty-four lessons (extension credit only). Mr. Conley.

2. Business Law A—Contracts and Agency. Contracts: Formation of contracts, offer and acceptance, consideration, capacity of parties, minors, married women, misrepresentation, fraud, legality of object, the operation of contracts, interpretation of contracts, methods of discharging contracts. Agency: Methods of forming the relation of agency, who may act as agent, who may act as principal, liabilities of principal to third parties, liabilities of agents, termination of agency.

   The general rules of contracts being fundamental to all work in business law, this course must precede Business Law B, C, and D.

   Sixteen lessons (three credits). Mr. Smiley.

3. Business Law B—Personal Property, Sales, Bailments, Negotiable Instruments. Negotiable instruments, nature and characteristics, definition; the uniform negotiable instruments law, essentials, non-essentials, negotiations, indorsements and delivery, holder in due course and his rights, notice of dishonor, protest, checks. Personal property—bailments: definitions, distinction between real and personal property, nature of bailment, rights of bailor, rights of bailee. Sales of personal property: definition of a sale; when the title passes to the buyer; rights of the seller (a) to set the contract aside on the ground of fraud, (b) the seller's lien for the purchase money, (c) right of stoppage in transit; rights of the purchaser to demand (1) goods of a certain quality, (2) warranty of the purchaser's title. Prerequisite: Course 2.

   Sixteen lessons (three credits). Mr. Smiley.

4. Business Law C—Partnerships, Corporations, and Bankruptcy. Partnerships: formation of partnerships; articles of co-partnership; methods of terminating partnerships; rights and obligations of partner (a) toward his co-partners, (b) as an agent of the firm, (c) toward the firm's creditors, (d) for an accounting; special partners; limited partnerships.

   Joint stock companies; how distinguished from ordinary partnerships; how like ordinary partnerships; statutory requirements.

   Corporations: formation of corporations of various classes; terminations of corporations; membership in corporations, methods of transferring interest, fraudulent issuance of stock by corporate officers; rights of stockholders (a) to dividends, (b) to inspect and control corporate affairs; liabilities of stockholders (a) on stock subscriptions, (b) to pay assessments, (c) for the corporate debts; the doctrine of

ultra vires; rights and obligations of corporate directors; corporate mergers and consolidations; domestic and foreign corporations; solvency and the national bankruptcy act. Prerequisite: Course 2.

Sixteen lessons (three credits). MR. SMILEY.

5. BUSINESS LAW D—REAL PROPERTY, MORTGAGES. Classification of property, distinction between real and personal property; estates in land, freehold, life estate, tenancy for a term, at will, at sufferance; estates held jointly or in common, equitable estates, relative rights of adjoining owners, trespass, easements, sales of real property, the contract to sell, conveyances, wills, mortgages, and liens; landlord and tenant, the lease, assignment and subletting, rent, and remedies for non-payment. Prerequisite: Course 2.

Sixteen lessons (three credits). MR. SMILEY.

6. PRINCIPLES OF ACCOUNTING. This is a course containing all the fundamental principles of accounting, together with sufficient practice work to show the application of these principles. The emphasis throughout is put upon principle rather than upon the details of method; but the practice material is made to conform to present-day methods as nearly as possible, and the course demonstrates what service accounting should render to business.

Part I treats of the fundamentals of debit and credit, the books of account, standard methods of recording transactions, accruals and adjustments, construction and interpretation of balance sheets and income statements, classification of accounts, the distinction between capital and revenue, and an introduction to partnerships.

Twenty-four lessons (four and one-half credits). MR. RINGHAM.

Part II is built up with corporation accounting as its leading feature, but gives further consideration to partnerships, and to certain essential accounting principles, such as valuation, depreciation, capital, and revenue. These general principles will be emphasized and made clear by application to various businesses by means of problems, in which manufacturing establishments will be included.

Twenty-four lessons (four and one-half credits). MR. RINGHAM.

7. ELEMENTARY BOOKKEEPING. The aim of this course is to present the groundwork of bookkeeping for the student who does not feel able to complete an extensive course in accounting. The following topics will be covered: the function of accounting, theory of debit and credit, journalizing and posting, account analysis, the use of special types of journals and ledgers, trial balance, adjusting and closing the accounts, presentation of the period's results, balance sheet, and profit and loss statements. Sufficient practice material will be given to enable the student to grasp the fundamentals.

Twelve lessons (one-quarter entrance credit). MR. KUHLMAN.

ECONOMICS

1. Principles of Economics, Part I. This course, with Part II, is designed to give a general understanding of our present industrial order. Special attention is given to descriptive accounts of economic institutions and to a consideration of basic principles underlying their operation.

   Part I of the course presents certain fundamental concepts followed by a study of division of labor, of large scale production, and of the corporation as a type of enterprise. The principles governing value follow. This part closes with a discussion of money, banking, prices, crises, and international trade.

   Twenty-seven lessons (five credits). Mr. Farmer.

2. Principles of Economics, Part II. A continuation of the study of value to discover what measures the reward received by the respective factors of production in wages, interest, rent, and profits. Then follows special problems of labor and labor unions, railways, public utilities, and finally the principles underlying taxation.

   Twenty-seven lessons (five credits). Mr. Farmer.

3. Banking Practice. The subject-matter of this course aims to present a thoro understanding of the operations of a modern commercial bank and includes many managerial problems. Some attention will be given to the legal problems arising in dealings between banks and their customers. Beginning with a description of commercial banking, of savings banks, and trust companies, the course will be developed under the following topics: how to organize a commercial bank; shareholders, directors and officers, their duties, powers, and liabilities; deposits, depositors, and the receiving teller; the paying teller and checks; the bank reserve; national bank notes; clearing houses; collections and domestic exchange; foreign exchange; loans and discounts, credit departments and how they judge credit; collateral loans; statements of conditions; the objects of bank accounting; supervision and examination; central banks of England, France, and Germany, and the federal reserve system of the United States. Prerequisite for credit: Course 1.

   Twenty-four lessons (four and one-half credits). Mr. Ebersole.

6. Labor Problems and Trade Unionism. Origin of the labor problem; conditions of labor in American industries; structure, aims, policies, and methods of trade and industrial unionism and employers' associations; collective bargaining and shop committees; mediation and arbitration; injunctions; labor legislation.

   Sixteen lessons (three credits). Mr. Hansen.

7. Public Finance. Government revenues, expenditures, and debts. This includes a study of the various forms of taxation, of budgetary legislation and control, of war and emergency financiering, of the shifting

and incidence of taxation, and of fiscal reforms. Prerequisite for credit: Courses 1 and 2.

Twenty-four lessons (four and one-half credits). MR. BLAKEY.

8. COMMERCIAL POLICIES. Theory of international commerce, free trade, reciprocity, protection, and other governmental and organized efforts to affect trade, with special emphasis upon American policies in view of post-war conditions. Prerequisites for credit: Courses 1 and 2. Several texts must be read in addition to those on which the course is based.

Sixteen lessons (three credits). MR. BLAKEY.

9. ECONOMIC HISTORY I. This is a general course in economic history and includes a survey of the development of agriculture, manufacture, transportation, and storage, and the exchange of goods; economic crises; land, capital, management, and labor; the interplay of economic and political forces.

Twenty-four lessons (four and one-half credits). MR. GRAVES.

10. ECONOMIC HISTORY II. This is a continuation of Course 9, which is a prerequisite to it. The two parts are required of all pre-business students and form an introduction to the principles of economics. The work especially meets the needs of those students who desire to qualify as full business students, but who failed to take this subject when they did their first two years of work. It is also of great value to those who wish to gain a clear understanding of present-day economic conditions.

Twenty-four lessons (four and one-half credits). MR. GRAVES.

11. PRINCIPLES OF MONEY AND BANKING I.* This course deals with the government regulations of money, with the mechanism of the money market, the sale of securities and with the functions of trust companies, savings institutions, and commercial banks. Prerequisite: Courses 1 and 2.

Sixteen lessons (three credits). MR. MYERS.

12. PRINCIPLES OF MONEY AND BANKING II.* This is a continuation of Course 11 and deals with the inter-relation of banks, government regulation of banking, the relation of business cycles to banking, the federal reserve system, farm finance, the American financial system as a whole, and the outstanding features of certain foreign financial systems. Prerequisites: Courses 1, 2, and 11.

Sixteen lessons (three credits). MR. MYERS.

13. CORPORATION FINANCE. A study of the organization and financial management of corporations, with reference to corporate securities for purposes of promotion and reorganization and of facilities for marketing them.

Sixteen lessons (three credits). MR. STEHMAN.

* Courses 11 and 12 carry general credit in economics, but are not applicable in a major sequence in economics or finance.

EDUCATION

NOTE.—See Courses 1 and 2 under Psychology.

2. EDUCATIONAL PSYCHOLOGY. A survey of fundamental facts of human behavior involved in educational activities This survey includes the following topics: psychological and educational measurements, habit formation, transfer of training, statistical methods. Courses 1 and 2 in psychology are prerequisite.

   Sixteen lessons (three credits). MR. FILTER.

3. HISTORY OF EDUCATION TO THE REFORMATION. An historical study of the foundations of modern education. The theories and practices of the Hebrews, Greeks, and Romans, and of the Middle Ages and the Renaissance, are considered in the light of their influence upon the present educational situation. The course includes the work offered in residence Course 101. Prerequisite: six credits in psychology. In special cases these prerequisites may be waived.

   Twenty-four lessons (four and one-half credits). MISS ALEXANDER.

4. HISTORY OF MODERN EDUCATION. Educational history since the time of the Renaissance. A study of the theory of the great modern educators; the origin, aims, and development of typical secondary and higher schools in various countries; the rise of the modern elementary school with emphasis upon early state systems and reform movements. Equivalent in part to residence Courses 102 and 103. Prerequisite: six credits in psychology.

   Twenty-four lessons (four and one-half credits). MISS ALEXANDER.

7. INDUSTRIAL EDUCATION. The principles fundamental to vocational training in the public school system as affecting the arrangement of school years, the course of study, and the methods of teaching. Prerequisite for credit: Courses 3 and 4.

   Twenty-two lessons (four credits). MR. RANKIN.

8. THEORY OF TEACHING. An introductory course in educational theory for elementary school teachers. The work includes a study of the principles upon which the present practice of teaching is based, and of the responsibility of the school in providing various forms of training. Other topics are considered briefly, such as types of classroom, exercises, the making of lesson plans, qualifications of teachers, school management. Prerequisite: six credits in psychology. In special cases a student may, by conference with the instructor, waive these prerequisites.

   Twenty-four lessons (four and one-half credits). MISS ALEXANDER.

9. SCHOOL ORGANIZATION AND LAW. An introductory course in the organization and management of schools in American communities, with special reference to the duties of school boards and school superintendents, principals, and teachers, to the methods and equipment proper

to schools of various grades, and to the main facts in the school law of Minnesota. Prerequisite for credit: Courses 3 and 4.

Twenty-seven lessons (five credits). MR. RANKIN.

10. SCHOOL SANITATION. This course is designed for those who are concerned with schools of any and all grades. It deals with conditions affecting the health of school children of all ages. School architecture, courses of study, and the discipline of the school will be considered as well as all other questions affecting the well-being of pupils. Prerequisite for credit: Courses 3 and 4.

Twenty-seven lessons (five credits). MR. RANKIN.

12. SOCIAL ASPECTS OF EDUCATION. This course is concerned with the school as an environment which is designed to fit its pupils for their social relations; also it discusses the school in respect to its interaction with other institutions of a similar character and aim. It is a common remark that the school is becoming more and more a social institution, and this course attempts to determine in what respect and in what manner this is true. Prerequisite for credit: Psychology 1 and 2.

Twenty-seven lessons (five credits). MR. RANKIN.

13. INDUSTRIAL HISTORY. Evolution of arts, industry, tools, processes, and production to 1800; evolution of economic and social conditions; culmination of the industrial revolution in America—resultant agricultural, industrial, economic, and social problems; twentieth century outlook and opportunities; implications for practical education.

Eleven lessons (two credits). MR. RANKIN.

25. THE TEACHING OF RELATED SUBJECTS. Theory, practices, and problems of related instruction; content in related mathematics, drawing, science, hygiene, and safety; group study and unit-course preparation; usable methods and the means of supervision; both incidental and scheduled teaching discussed; acquaintance with texts and supplementary materials; courses designed particularly for shop and related subjects teachers in day, evening, and part-time vocational classes and for those preparing for service in this special field; suggestive for teachers in the more standardized units of the public school system.

Sixteen lessons (three credits). MR. SMITH.

ENGINEERING

1. SHOP MATHEMATICS, PART I. This course is for the practical man who desires training in mathematics to solve mechanical and electrical problems and will be found valuable by the teacher who is preparing to teach applied mathematics under the Smith-Hughes Act. It takes up arithmetic from fractions through proportion and contains problems in areas, volumes, weights of materials, screw threads, and gears. It teaches logarithms, the use of the slide rule, and the fundamental elements of machines, such as levers, pulleys, and the inclined plane.

Twenty-four lessons (extension credit only). MR. EDWARDS.

2. SHOP MATHEMATICS, PART II. This work follows Part I and takes up algebra, geometry, and trigonometry from a practical shop standpoint. A thoro working knowledge of the formulae is given. Each lesson in both Parts I and II has numerous practical problems to be worked by the student.

Twenty-four lessons (extension credit only). MR. EDWARDS.

3.* MECHANICAL DRAWING, PART I. The course includes the use of instruments, lettering, views and sections, conventions, sketching, dimensioning, completed working drawings, and tracing. The course is designed to meet the needs of beginners.

Twenty lessons (extension credit only). MR. FRENCH.

4.* MECHANICAL DRAWING, PART II. A continuation of Part I.

Twenty lessons (extension credit only). MR. FRENCH.

5. ELEMENTARY MECHANICS. A short, practical course in elementary mechanics designed to meet the needs of students who have had limited training in mathematics. Numerical and simple graphical calculations, forces, simple machines, velocity, acceleration, impulse, momentum, work, power, and energy are treated. This course is designed for those who desire an elementary knowledge of the subject, but who are not familiar with calculus. Prerequisite: Courses 1 and 2 or equivalent.

Sixteen lessons (extension credit only). MR. TEETER.

6. TECHNICAL MECHANICS I—STATICS AND KINEMATICS. Characteristics of a force, parallelogram law, moments, couples, resultant of a force system, equilibrium of a force system, frictions, centroids, moment of inertia. Motion of a particle, motion of a rigid body. Prerequisite: Mathematics, Course 11.

Twenty-seven lessons (extension credit only). MR. TEETER.

7. TECHNICAL MECHANICS II—DYNAMICS. Force, mass, acceleration, translation and rotation, gyroscope, governors, work, energy, power, conservation of energy, impulse, momentum, loss of kinetic energy, conservation of momentum. Prerequisite: Course 6.

Twenty-seven lessons (extension credit only). MR. TEETER.

8. STRENGTH OF MATERIALS—ELEMENTARY. An elementary course on the strength of materials in common use. It treats of properties of materials, stress and strain, elastic limit, ultimate strength, deformation, deflection, principle of moments, moments of inertia, and the general elementary theory of beams, columns, and shafts. This course is especially designed for those students who desire an elementary knowledge of the subject, but who are not familiar with calculus. Prerequisite: Courses 1, 2, and 5.

Sixteen lessons (extension credit only). MR. TEETER.

* May be taken for one-half entrance credit. It is impossible to quote prices on drawing outfits. The cost will probably be from $8 to $12.

9. STRENGTH OF MATERIALS—TECHNICAL. Mechanical and elastic properties of materials of construction, beams, shafts, columns, combined stresses, hollow cylinder, rollers, plates, curbed bars, springs, dynamic stresses, true stresses. Prerequisite: Mathematics, Course 11.

Twenty-seven lessons (extension credit only). MR. TEETER.

10. HYDRAULICS. Laws of equilibrium of fluids, flow through orifices and over weirs, pressure and flow through tubes and pipes, flow in conduits and rivers, dynamic pressure of water, elementary principles of turbines and pumps. Prerequisite: Mathematics, Course 11.

Twenty-two lessons (extension credit only). MR. TEETER.

11. ELECTRICITY AND MAGNETISM, PART I. An elementary study of magnetism and electricity. Simple laws of magnetism, and the relation of magnetism to direct current electricity are developed. Series and parallel circuits, and combinations of both, simple wiring and armature winding are taken up. A knowledge of arithmetic such as is given by Shop Mathematics I is necessary.

Twenty-four lessons (extension credit only). MR. EDWARDS.

12. ELECTRICITY AND MAGNETISM, PART II. This course is a continuation of Part I. It will deal with motors, generators, and instruments.

Twenty-four lessons (extension credit only). MR. EDWARDS.

13. ALTERNATING CURRENTS. This course takes up simple laws of alternating currents and their application to machines; inductance, capacity, and impedance are fully treated.

Twenty lessons (extension credit only). MR. EDWARDS.

14. HEATING AND VENTILATING. The course is intended to meet the needs of those who wish to know about the principles and installation of heating and ventilating apparatus. The work will include an introduction and study of heat, heat losses, heat loss due to ventilation, ventilation practice, air conditioning, heating systems—steam and hot-water, direct and indirect, use of exhaust steam, warm-air systems, fan systems—plenum and exhaust systems, vacuum systems, piping systems, central station heating, and heating accessories.

Twenty-four lessons (extension credit only). MR. MARTENIS.

16. BOILER ROOM PRACTICE. The course is intended for the boiler operator. Outline of course: combustion, coal; firing methods; flue-gas analysis; boiler construction; feed water; boiler fittings; power of boilers; care of boilers; pipes and fittings; pipe covering; steam tables.

Sixteen lessons (extension credit only). MR. MARTENIS.

17. ENGINE ROOM PRACTICE. The course is planned to give an elementary and plain presentation of the subject to operating engineers who are not able to comprehend fully the average textbook on steam engines. Outline of course: principles of energy, motion, steam; classes of

steam engines; parts of the steam engine; valves and steam action; valve-setting; governing; reversing gears; indicators and cards; calculating horse-power; pumps, condensers, lubrication; engine troubles.

Twenty-four lessons (extension credit only). MR. MARTENIS.

NOTE.—For those who are in boiler room practice and who may wish to take an examination for a chief engineer's license, Courses 1, 16, and 17 are of the utmost importance.

18. ELEMENTS OF MACHINE DESIGN. A short, practical course in machine design. Some elementary machines will be discussed and the laws of mathematics, mechanics, and strength of materials will be applied in each case, leading to the complete design of the particular machine under consideration. Working details and general drawings will be made as the work advances. Prerequisites: Courses 1, 2, 3, 4, 5, and 8.

Twenty-four lessons (extension credit only). MR. EDWARDS.

19. DESCRIPTIVE GEOMETRY. An elementary course in methods of projection and developments as applied to engineering drawing, template-making, etc. Correlated with analytic geometry. Graphical and algebraic solutions.

Twenty-seven lessons (extension credit only). MR. TEETER.

20. LUMBER AND ITS USES. Structural and physical properties of wood, standard grades and sizes, structural timbers, seasoning and preservation, paints and stains, lumber prices, cost of wood construction, specific uses of woods, and selections of materials.

Ten lessons (extension credit only). Fee includes text material. MR. CHEYNEY.

21.*FOUNDRY PRACTICE I. This course is offered for all who are connected with, or are interested in, the practical operation of a foundry. It is written in clear and simple language and aims to link up everyday practice with the technical side of the foundry business. It takes up the elements of shop mathematics, elementary drawing, reading blue prints, figuring weights, and checking patterns and core boxes, the physical and chemical properties of foundry materials, sands, refractories, and fluxes, specifications for the use and purchase of materials, sampling materials, and the metallurgical troubles of the foundry.

Twelve lessons (extension credit only). MR. POTTER.

22.* FOUNDRY PRACTICE II. This is a continuation of Course 21 and deals with mixtures, melting practice, test bars, specifications, defective castings, melting losses, economical use of materials, and the problem of foundry refuse. It also discusses safety devices, accident prevention, and methods of handling labor. Prerequisite: Course 21.

Twelve lessons (extension credit only). MR. POTTER.

* Courses in Foundry Practice are not available prior to October, 1924.

23.* FOUNDRY PRACTICE III. This is a continuation of Courses 21 and 22. It takes up power and machinery, heating machinery, pneumatic tools, molding and cleaning machines, sand-handling equipment. Attention also is given to office methods, shop orders and instructions, cost records, estimates, and shipping and stock records. Prerequisites: Courses 21 and 22.

Twelve lessons (extension credit only). MR. POTTER.

24. ELEMENTS OF RADIO COMMUNICATION. A brief non-mathematical discussion of magnetism; direct and alternating currents; electromagnetic waves and their propagation; apparatus and methods used in radio communication. Attention is given to the construction and use of crystal and vacuum tube receiving sets and to radio telegraph and telephone sending sets. The rules and laws covering licenses, wave-lengths, and safety precautions are indicated. This course is especially valuable to students in elementary physics.

Sixteen lessons (extension credit only). MR. SWENSON.

ENGLISH AND RHETORIC

PREPARATORY COURSES

1. ENGLISH COMPOSITION A. This course, and the three following, are suited to the needs of those persons who do not have a good foundation in English, and hence need training in the correct use of the language. It covers that part of the work in composition usually given in the freshman year at high schools. It gives practice in writing compositions on simple subjects, with special attention to the development of sentence structure and a unified paragraph; special drill to overcome errors in grammar, spelling, punctuation, etc.; training in the use of the dictionary.

Twenty lessons (one-half entrance credit). MISS HUBMAN.

2. ENGLISH COMPOSITION B. This course is a continuation of the work of the first year, and covers the equivalent of the sophomore work in composition in high schools. Special emphasis is placed on punctuation and letter-writing. Prerequisite: Course 1 or equivalent.

Twenty lessons (one-half entrance credit). MISS HUBMAN.

3. ENGLISH COMPOSITION C. This course is a continuation of Courses 1 and 2, but it is more advanced and presupposes the ability to do more thoughtful work, as it covers the composition work of the junior year of the high school. Composition forms a large part of the course. In it emphasis is placed on gathering material and organizing it into longer themes than those of the first year. Drill in spelling, punctuation, etc., includes more difficult points than those covered in the first year. Prerequisite: Courses 1 and 2 or equivalent.

Twenty lessons (one-half entrance credit). MISS INGLIS.

* Courses in Foundry Practice are not available prior to October, 1924.

4. English Composition D. This course is a continuation of Course 3 and corresponds to high school senior English composition. Prerequisite: Courses 1, 2, and 3 or their equivalent.

Twenty lessons (one-half entrance credit). Miss Inglis.

5. English Literature A. The object of this course is to arouse in the student an interest in the reading of good literature and to assist him to a knowledge and appreciation of some of the masterpieces in the various forms of literature. It includes the study of a volume of short stories, a volume of poetry, Shakespeare's *Merchant of Venice,* and Scott's *Ivanhoe.* The reading of an additional volume of each type is required of the student and questions set to assist as well as to test his understanding of the works read. The course corresponds to the literature part of high school freshman English.

Twenty lessons (one-half entrance credit). Miss Smith.

6. English Literature B. The aim of this course is similar to that of English Literature A but the material studied is more difficult and the standard of work higher. It corresponds to the literature part of high school sophomore English. The works studied are Poe's *Tales,* Shakespeare's *Julius Caesar,* Dickens' *Tale of Two Cities,* Lowell's *Vision of Sir Launfal,* and Coleridge's *Rime of the Ancient Mariner.* Outside reading from literature of each type is also required. Prerequisite: Course 5 or equivalent.

Twenty lessons (one-half entrance credit). Miss Smith.

7. English Literature C. This is a course in American literature. The works of well-known American authors, including those of recent date, are studied according to type rather than in chronological order. Some knowledge of the authors' lives as well as of their works is required. The course corresponds to the literature half of high school junior English. Prerequisite: Courses 5 and 6 or equivalent.

Twenty lessons (one-half entrance credit). Miss Smith.

8. English Literature D. This course, which corresponds to high school senior English literature, consists of a chronological study of the outstanding writers of English literature, their chief works and the periods in which they lived. It aims to establish standards of appreciation for the student's later reading, and to stimulate him to further reading of good literature. Prerequisite: Courses 5, 6, and 7 or equivalent.

Twenty lessons (one-half entrance credit). Miss Smith.

COLLEGE COURSES

English

1. Survey of English Literature I. A general survey of English literature from the earliest times to 1630, with a great deal of emphasis upon the historical setting. Extensive readings from volumes of examples of the most famous poetry and prose. When feasible, the special study

of the work of one of the major authors is recommended to be done at the same time, as an intensive offset to so much rather sporadic reading. Prerequisites for credit: Rhetoric 1, 2, and 3 or equivalent.

Sixteen lessons (three credits). MISS LEES.

2. SURVEY OF ENGLISH LITERATURE II. A general survey of English literature from 1630 to 1780. Prerequisite for credit: Course 1 or equivalent.

Sixteen lessons (three credits). MISS LEES.

3. SURVEY OF ENGLISH LITERATURE III. A general survey of English literature from 1780 to 1900. Prerequisite for credit: Courses 1 and 2 or equivalent.

Sixteen lessons (three credits). MISS LEES.

4. AMERICAN LITERATURE—GENERAL SURVEY. A study of American literary development, with particular attention to the influence of English literature and the effect of our own national history upon the progress of thought and expression in the United States. The student must read extensively from American authors and answer questions which will call for constructive criticism and independent estimates. Textbook comments will not be accepted. Prerequisite for credit: Courses 1, 2, and 3 or equivalent.

Sixteen lessons (three credits). MR. SUTCLIFFE.

6. THE ENGLISH NOVEL. An elementary course in the principles of fiction with the careful study of seven novels, selected to represent various aspects of the history of English prose fiction; also the study of a contemporaneous novel with an attempt to ascertain its literary value and its relationship to the masterpieces of the past. The consecutive study of the novels will be accompanied by selected assignments from George Saintsbury, *The English Novel*. Prerequisite for credit: Courses 1, 2, and 3 or equivalent.

Twenty-four lessons (four and one-half credits). MR. SUTCLIFFE.

Rhetoric

1. RHETORIC I. Practical training in the art of writing, the principles of structure, and analysis of specimens of good prose. Constant practice in writing papers, mainly expository in character. This course, with the two following, is equivalent to Rhetoric 4-5-6 in the College of Science, Literature, and the Arts. Rhetoric 1, 2, and 3 and Survey of English Literature 1, 2, and 3 fulfill the freshman English requirement.

Sixteen lessons (three credits). MISS LEES.

2. RHETORIC II. Continuation of Course 1. Advanced work in composition, with practice in writing exposition, narration, and description.

Sixteen lessons (three credits). MISS LEES.

3. RHETORIC III. Continuation of Course 2. Advanced work in analysis, with practice in writing exposition and informal argument.
Sixteen lessons (three credits). MISS LEES.

4. EXPOSITION. Imitative and creative work in the various types of exposition, with especial recognition of the way in which exposition merges into narration and description. This course, with the two following, is equivalent to Rhetoric 11, 12, and 13 in the College of Science, Literature, and the Arts. Prerequisite for credit: Courses 1, 2, and 3.
Sixteen lessons (three credits). MISS LEES.

7. DESCRIPTION. Non-technical but thorogoing study and application of the principles of descriptive writing. Analysis of specimens and exercises in description. Prerequisite for credit: Courses 1, 2, and 3.
Sixteen lessons (three credits). MISS LEES.

8. NARRATION. Study of the principles of narrative-writing; point of view, plot, setting, characterization. Exercises, and practice in writing short narratives. Prerequisite for credit: Courses 1, 2, and 3.
Sixteen lessons (three credits). MISS LEES.

9. VERSIFICATION I. Study of the nature of poetry, and a detailed analysis of English meters and the various English verse forms. Theory accompanied by criticism of poetry and practice in writing verse. Prerequisite for credit: Courses 1, 2, 3, 4, 7, and 8.
Sixteen lessons (three credits). MR. NICHOLS.

10. VERSIFICATION II. A continuation of Course 9. Prerequisite for credit: Courses 1, 2, 3, 4, 7, 8, and 9.
Sixteen lessons (three credits). MR. NICHOLS.

GERMAN

1. BEGINNING GERMAN I. Grammar and easy composition. The course aims to give the student a knowledge of the elements of German grammar, the facility to read easy German, and to write simple German sentences.
Twenty lessons (four credits). MR. BURKHARD.

2. BEGINNING GERMAN II. A continuation of Course 1.
Twenty lessons (four credits). MR. BURKHARD.

3. INTERMEDIATE GERMAN I. Grammar and composition continued; selected readings in easy prose and verse. Prerequisite: Courses 1 and 2 or equivalent.
Twenty lessons (four credits). MR. BURKHARD.

4. INTERMEDIATE GERMAN II. A continuation of Course 3. Prerequisite: Courses 1, 2, and 3 or equivalent.
Twenty lessons (four credits). MR. BURKHARD.

5. Rapid Reading I. Selections from modern narrative and descriptive prose. Assigned outside readings and reports. Prerequisite: Courses 1, 2, 3, and 4 or equivalent.

Twenty-four lessons (four and one-half credits). Mr. Kroesch.

7. Elementary Composition I. Translation of short English selections. Paraphrasing of simple poems. Free narration. Exercises based on topical grammar review. Open to those who are taking or have taken Course 5 or equivalent.

Sixteen lessons (three credits). Mr. Downs.

8. Elementary Composition II. Translation and grammar review continued. Both 7 and 8 must be completed before credit is given for 7.

Sixteen lessons (three credits). Mr. Downs.

9. Drama I. Study of the present-day drama in Germany. Selected plays of Hebbel, Hauptmann, or Sudermann, with assigned readings and reports. Open to those who have completed Courses 1, 2, 3, 4, 5, and 6.

Twenty-four lessons (four and one-half credits). Mr. Davies.

10. Drama II. Study of the German drama of the eighteenth century and through the classic period. Selected plays of Lessing, Goethe, or Schiller, with assigned readings. Prerequisites as in Course 9.

Twenty-four lessons (four and one-half credits). Mr. Davies.

11. Medical German I. Readings from general works on biology, anatomy, physiology, and hygiene. This course is intended primarily for medical students. It aims to give the student a scientific vocabulary and to acquaint him with the style of scientific articles. Prerequisite: Course 5. No credit given until Course 12 is completed.

Sixteen lessons (three credits). Mr. Burkhard.

12. Medical German II. A continuation of Course 11. No credit is given for 11 until 12 is completed.

Sixteen lessons (three credits). Mr. Burkhard.

15. Chemical German. The reading of works on chemistry. Vocabulary exercises. Both parts must be completed before credit is given. Prerequisite: Courses 5 and 6 or equivalent.

Part I, sixteen lessons (three credits).

Part II, sixteen lessons (three credits). Mr. Downs.

GREEK

1. Beginning Greek I. The declensions and conjugations and the simpler rules of syntax, together with translation of sentences from Greek into idiomatic English and from English into Greek. Courses 1, 2, and 3 must be completed before credit is given for Course 1.

Twenty-seven lessons (five credits). Mr. Savage.

2. BEGINNING GREEK II. Course continued; general principles, inflections, word formations, syntax, elementary readings, composition. Prerequisite: Course 1.

Twenty-seven lessons (five credits). MR. SAVAGE.

3. BEGINNING GREEK III. Course continued. Prerequisite: Courses 1 and 2.

Twenty-seven lessons (five credits). MR. SAVAGE.

4. HISTORY—XENOPHON'S ANABASIS. Selections from Books 2, 3, 4; Hadley's *Greek Grammar;* etymology reviewed and syntax studied sufficiently to enable the student to proceed confidently in the translation of the text; the irregular verb. Prerequisite for credit: Courses 1, 2, and 3 or equivalent.

Twenty-seven lessons (five credits). MR. SAVAGE.

5. HISTORY—HERODOTUS. Selected readings from Herodotus's history; syntax, dialectical forms, the irregular verb; collateral work.

Twenty-seven lessons (five credits). MR. SAVAGE.

6. EPIC POETRY—ELEMENTARY COURSE IN HOMER. Selections from the *Iliad* or the *Odyssey;* mythology, scansion, dialectical forms. Open to those who have read in Greek prose three books of the *Anabasis,* or the equivalent.

Twenty-seven lessons (five credits). MR. SAVAGE.

51. PHILOSOPHY. Plato's *Apology* and selections from other works of Plato or from Xenophon's *Memorabilia;* study of Greek philosophy. Open to those who have had at least two years of Greek. Prerequisite for credit: Courses 4 to 6 or equivalent.

Sixteen lessons (three credits). MR. SAVAGE.

52. ORATORY. Selected readings from Lysias and Demosthenes; study of the principles of Greek rhetoric and Greek oratory.

Sixteen lessons (three credits). MR. SAVAGE.

53. DRAMATIC POETRY—ELEMENTARY COURSE IN THE DRAMA. Euripides' *Alcestis* or *Medea;* translation, study of mythology and of Greek life. Open to those who have read at least two books of Homer in addition to three books of the *Anabasis,* or the equivalent.

Sixteen lessons (three credits). MR. SAVAGE.

HISTORY

PREPARATORY COURSES

1. AMERICAN HISTORY. This is a course in United States history similar to that taken by third- and fourth-year students in the high school. Since it presupposes a course in the same subject in the grades, the approach is made in a somewhat different manner from that in an elementary course. More emphasis is placed on the relative importance

of periods and events, on the causes and relations of events, and upon securing a broader view of our country's history. The supplementary reading is assigned with the notion that it may suggest as well as inform. The following subjects are treated with especial fulness: discovery and exploration, typical colonies and colonial life, passage of control to England, the Revolution, its causes and results, the establishment of the new government, the rise of democracy and of nationalism, slavery and expansion, the Civil War, reconstruction the era of big business. The course gives one entrance unit in history.

Part A, twenty lessons (one-half entrance credit).

Part B, twenty lessons (one-half entrance credit). MR. TOHILL.

COLLEGE COURSES

1. ANCIENT HISTORY, PART I—GREEK. This course includes a brief preliminary survey of Egypt, Babylonia, and the Aegean region, showing their influence on later civilization, followed by a study of Greek history, with special stress on the development of Sparta and Athens the Persian Wars, the Age of Pericles, the inter-relation of politics with the artistic and literary development, and finally the conquests of Alexander and the diffusion of Greek civilization over the East.

Twenty-four lessons (four and one-half credits). MR. HARDING.

2. ANCIENT HISTORY, PART II—ROMAN. A course in Roman history, including the rise of Rome from a petty city to the position of mistress of the ancient world, the great struggle with Carthage, the causes that led to the fall of the Republic, the transition to the Empire, and its history to the death of Constantine.

Twenty-four lessons (four and one-half credits). MR. HARDING.

7. THE MIDDLE AGES (800-1500). A study of western European history from the time of Charlemagne to the end of the fifteenth century.

Twenty-four lessons (four and one-half credits). MR. HARDING.

10. THE MODERN WORLD, PART I (1500-1815). A study of the political and social history, primarily of Europe, from the Reformation period to the fall of Napoleon Bonaparte.

Twenty-seven lessons (five credits). MR. HARDING.

11. THE MODERN WORLD, PART II (1815 to the present). The political and social history of Europe and the spread of European influences and rule, from the fall of Napoleon to the close of the World War.

Twenty-seven lessons (five credits). MR. HARDING.

15. ENGLISH HISTORY, 1066 TO PRESENT, PART I—MEDIEVAL. A study of English history from the Norman Conquest to the accession of the Tudors. The work consists of a careful study of a narrative text and of a constitutional manual, supplemented by source study and collateral reading. Special emphasis is placed upon the beginnings of popular

government as shown in jury trial, the limited monarchy idea, and the growth of the House of Commons.

Twenty-four lessons (four and one-half credits). MR. HARDING.

16. ENGLISH HISTORY, 1066 TO PRESENT, PART II—MODERN. A continuation of Part I, devoted to a study of English history from 1485 to the close of the World War. The emphasis is upon the seventeenth-century struggle for political liberty, and upon the reform movements of the nineteenth and twentieth centuries.

Twenty-four lessons (four and one-half credits). MR. HARDING.

20. UNITED STATES HISTORY, PART I. This is the first half of a comprehensive course in American history. About one third of Part I is devoted to the colonial period, the remainder to the Revolution, the formation of the Constitution, and the early years of the nineteenth century (to 1836). The work consists of the study of a text, supplemented by a considerable amount of source study and collateral reading. The student is required to prepare written answers to questions based on the text and on the supplementary readings. Prerequisite for credit: six credits in history.

Twenty-four lessons (four and one-half credits). MR. HARDING.

21. UNITED STATES HISTORY, PART II. A continuation of Part I, devoted mainly to a study of the period from the beginning of the slavery struggle down to 1914, with a brief survey of the part of the United States in the World War.

Twenty-four lessons (four and one-half credits). MR. HARDING.

HYGIENE

1.* HYGIENE OF MATERNITY AND INFANCY. Prepared by the Division of Child Hygiene of the Minnesota State Board of Health in co-operation with the United States Children's Bureau in work authorized under the Sheppard-Towner Act of November 1921. The first eight lessons take up personal and prenatal hygiene; care of the expectant mother; common complications and how to avoid them; preparation for confinement and after care of mother and child. The remaining lessons deal with the care and feeding of the baby; the well baby; the sick baby; growth, development, training. This course is given in co-operation with federal and state agencies without charge to the student.

Fifteen lessons (no credit). DR. BOYNTON.

JOURNALISM

1. REPORTING I. Gathering and writing of news for newspapers; study of news values; exercises in journalistic style; analysis of newspapers. Part I takes up the study of news and news values, the requirements

* Offered to residents of Minnesota only.

of style in straight news-writing, and the structure of news stories, based upon the study of newspapers.

Sixteen lessons (three credits). MR. BARLOW.

2. REPORTING II. Continuation of Part I. Emphasis upon the actual getting and writing of news for newspapers. Assignments will be of a practical nature, the stories to be written for publication.

Sixteen lessons (three credits). MR. BARLOW.

3. REPORTING III. Continuation of Part II. The practical getting and writing of news will be continued with emphasis upon the human interest and feature story.

Sixteen lessons (three credits). MR. BARLOW.

4. EDITING I. The reading and preparation of copy for the printer; libel; study of type as applied to newspaper-making. Course in reporting or six months practical experience in reporting is a prerequisite.

Sixteen lessons (three credits). MR. BARLOW.

5. EDITING II. Writing of headlines; headline design and typography; handling of all kinds of copy; press associations and syndicates.

Sixteen lessons (three credits). MR. BARLOW.

6. EDITING III. Newspaper make-up, content, departments, typography; practice in handling copy and making up newspaper pages; rewrite and follow stories; the work of various editors; office system.

Sixteen lessons (three credits). MR. BARLOW.

20. EDITORIAL-WRITING I. Study of the style and structure of editorials; practice in writing various types of editorials.

Sixteen lessons (three credits). MR. BARLOW.

21. EDITORIAL-WRITING II. The writing of editorials is continued with the study of the editorial page, its functions, typography and special problems.

Sixteen lessons (three credits). MR. BARLOW.

LATIN

1. BEGINNING LATIN I. Inflections; translation of easy Latin prose; the study of elementary syntax; Latin composition. Textbook: Bennett, *First Year Latin.*

Twenty-seven lessons (five credits). MR. CRAM.

2. BEGINNING LATIN II. A continuation of Course 1. Translation of selections from Eutropius; forms; syntax; Latin composition. Textbook: Beeson and Scott, *New Second Latin Book.*

Twenty-seven lessons (five credits). MR. CRAM.

3. CAESAR I. Translation of the Helvetian Campaign (Book I, chs. 1-29) and of the Campaign against the Belgians (Book II entire); syntax; composition. Textbooks: Beeson and Scott, *New Second Latin Book,* Bennett's *Latin Grammar,* and Bennett's *New Latin Composition.*

Twenty lessons (four credits). MR. CRAM.

4. CAESAR II. Translations of the Second Expedition into Britain (Book V, chs. 1-23) and of the Manners and Customs of the Gauls and Germans (Book VI, chs. 9-29); syntax; composition. Textbooks: same as in Course 3. Prerequisite: Course 3 or equivalent.

Twenty lessons (four credits). MR. CRAM.

5. CICERO I. Translation of the First and Second Oration against Cataline and of selected Letters; syntax; composition; life of Cicero. Textbooks: Kelsey's *Cicero,* Bennett's *Grammar* and *New Latin Composition.* Open to those who have completed two years of preparatory Latin.

Twenty-seven lessons (five credits). MR. CRAM.

6. CICERO II. Translation of the Oration for the Manilian Law (the equivalent of two orations), the Archias, and the Marcellus; syntax; composition. Textbooks: same as in Course 5. Prerequisite: Course 5.

Twenty-seven lessons (five credits). MR. CRAM.

7. VIRGIL'S AENEID I. The course will cover the first two books of the *Aeneid* and include the study of the life and times of Virgil, the principles of Latin prosody, the literary style of the *Aeneid,* and, to a limited extent, Roman mythology. Open to those who have completed three years of preparatory Latin.

Twenty-four lessons (four and one-half credits). MR. PIKE.

8. VIRGIL'S AENEID II. Books 3, 4, 6 of the *Aeneid.* Textbooks: *Virgil's Aeneid* by Charles Knapp, Bennett's *Latin Grammar.* The student will, besides, be expected to read and report on Sellar's *Virgil.* Open to those who have completed Course 7.

Twenty-seven lessons (five credits). MR. PIKE.

9. LIVY, BOOK I. The work will comprise the study of the text, the life, times, and literary style of Livy, and, in some measure, early Roman institutions, and lastly, Latin composition. Textbooks, Westcott's *Livy,* Book I, Bennett's *Latin Grammar,* and White's *Latin-English Lexicon.* The student will also read and report on Ihne's *Early Rome.* Open to those who have completed four years of preparatory Latin.

Twenty-four lessons (four and one-half credits). MR. PIKE.

10. PLAUTUS AND TERENCE: SELECTIONS. The course will consist of a study of the texts, the literary styles of Plautus and Terence, and an outline of the history and technique of the Roman drama. Textbooks: *Plautus*

Menaechmi by Fowler, *Terence's Phormio* by Elmer, and White's *Latin-English Lexicon.* The student will also be required to read and report upon Sellar's *Plautus and Terence* in *The Roman Poets of the Republic.* Open to those who have completed Course 7.

Twenty-four lessons (four and one-half credits). MR. PIKE.

MATHEMATICS*

PREPARATORY COURSES

1. ELEMENTARY ALGEBRA A. A course for students who have never studied algebra. The course treats positive and negative numbers; addition, subtraction, multiplication, and division of monomials and polynomials; simple equations in one unknown quantity; elementary special products and factoring; highest common factor and lowest common multiple. Prerequisite: common school arithmetic.

   Twenty lessons (one-half entrance credit). MR. EDWARDS.

2. ELEMENTARY ALGEBRA B. This course, with Course 1, constitutes one entrance unit in mathematics. The course treats addition, subtraction, multiplication, and division of fractions including complex fractions; equations in one unknown quantity which involve fractions; graphical representation; simultaneous equations of the first degree; square roots and quadratic surds; quadratic equations in one unknown quantity. Prerequisite: Course 1.

   Twenty lessons (one-half entrance credit). MR. EDWARDS.

3. PLANE GEOMETRY A. The work of this course is elementary geometry, Books I and II. Rectilinear figures and the circle, with the miscellaneous original exercises and some elementary construction problems. Prerequisite: Courses 1 and 2.

   Twenty lessons (one-half entrance credit). MR. EDWARDS.

4. PLANE GEOMETRY B. This course treats proportion, similar triangles, proportional properties of line segments, proportional properties of chords and secants, trigonometric ratios, areas of polygons, regular polygons and circles. Prerequisite: Course 3.

   Twenty lessons (one-half entrance credit). MR. EDWARDS.

5. SOLID GEOMETRY. This course is designed not only to give a knowledge of the standard theorems and exercises of the text, but to develop the student's own imagination and initiative and to give a well-rounded view of the subject by practice in special proofs and original exercises. Prerequisites: Courses 3, 4, or equivalent.

   Twenty-four lessons (one-half entrance credit). MR. EDWARDS.

NOTE.—Courses 2 and 5 satisfy the requirements of the School of Mines course, Mine Plant 1.

* See also Engineering, Courses 1, 2, 19.

COLLEGE COURSES

6. HIGHER ALGEBRA, PART I. Brief review of Courses 1 and 2, linear equations in one, two, and three unknowns, with solution by determinants, ratio and proportion, variation, quadratic equations in one and two unknowns, graphs, completion of quadratic equations, progressions, equations in quadratic form, binomial theorem. Prerequisite: Courses 1 and 2, or equivalent.

Twenty-seven lessons (five credits). MR. TEETER.

NOTE.—Courses 5 and 6 meet the extra high school requirements in mathematics of the College of Engineering.

7. HIGHER ALGEBRA, PART II. A continuation of Part I, including a study of variations, quadratic equations, special higher equations, simultaneous equations of the second degree, maxima and minima of functions, logarithms, theory of equations, and solution of numerical higher equations.

Twenty-seven lessons (five credits). MR. TEETER.

NOTE.—Courses 6 and 7 satisfy the requirements of the School of Mines course, Mine Plant 2 and 3.

8. TRIGONOMETRY. A course in plane and spherical trigonometry, designed to meet the needs of beginners and to include the subject usually considered in the ordinary college course. The solution of triangles is treated quite fully but not to the exclusion of analytical trigonometry. Prerequisite: Course 6 and logarithms. (Students who did not have logarithms in higher algebra may secure special lessons in this subject.)

Twenty-seven lessons (five credits). MR. TEETER.

NOTE.—Course 8 satisfies the requirement of the School of Mines course, Mine Plant 4.

9. PLANE ANALYTIC GEOMETRY. This course treats systems of co-ordinates, loci, the type forms of the equation of the straight line with application; the circle, central and general conic sections, tangents, diameters, asymptotes, some higher plane curves, parametric loci, polar curves. The fundamental problem of the equation and its locus forms the basis of the course. Prerequisite: Courses 7 and 8.

Twenty-seven lessons (five credits). MR. TEETER.

NOTE.—Course 9 satisfies the requirement of the School of Mines course, Mine Plant 5.

DESCRIPTIVE GEOMETRY. See Engineering 19.

10. DIFFERENTIAL CALCULUS. A first course in differential calculus treating differentiation of algebraic and transcendental functions with attention to the notion of the limit of a function, continuity of a function, and the derivative. Extensive practice in the technique of differentiation by means of exercises and applications to maxima and minima,

tangents, normals, curvature, singular points, velocity, and acceleration. Elementary discussion of Rolle's theorem and the law of the mean, indeterminate forms, and partial differentiation. The course is based upon a textbook with supplementary written lectures and exercises upon many of the topics. Prerequisites: Courses 7, 8, and 9.

Twenty-seven lessons (five credits). MR. EDWARDS.

11. INTEGRAL CALCULUS. First course in integral calculus. The integration of various types of functions, the definite integral with applications to areas, surfaces, and volumes of geometric figures, rectification of curves and simple problems of mechanics. Much practice in the technique of integration and the use of tables of integrals, the evaluation of simple double and triple integrals. Prerequisite: Differential Calculus.

Twenty-seven lessons (five credits). MR. EDWARDS.

NOTE.—Courses 10 and 11 satisfy the requirements of the School of Mines courses, Mine Plant 6, 7, and 8.

12. DIFFERENTIAL EQUATIONS. A study of the elementary differential equations with emphasis on applications to geometry, elementary mechanics, physics, and engineering.

Twenty-seven lessons (five credits). MR. TEETER.

MUSIC

1. HARMONY. Scales, major and minor; intervals; formation of triads, their inversion; the dominant seventh chord, its inversions; modulation; suspension, organ-point, etc. Registration subject to approval of previous preparation in music, which must be fully stated upon application.

Twenty-four lessons (four and one-half credits). MR. SCOTT.

PHYSICS

PREPARATORY COURSES

1. ELEMENTARY PHYSICS A. Weights and measures, simple machines, mechanics of liquids, mechanics of gases, non-parallel forces, elasticity and strength of materials, accelerated motion, force and acceleration, energy and momentum, heat—expansion and transmission—water, ice, and steam, heat engines.

Sixteen lessons (no credits). MR. TEETER.

2. ELEMENTARY PHYSICS B. Magnetism, the beginnings of electricity, battery currents, measuring electricity, induced currents, electric power, alternating current machines; sound; lamps, and reflectors, lenses and optical instruments, spectra and color, electric waves, Roentgen rays.

Sixteen lessons (no credits). MR. TEETER.

NOTE.—These preparatory courses in physics are without laboratory work; hence carry no entrance credit. They do, however, meet the physics requirements of the College of Dentistry and will prepare students for examination for first grade county certificates.

COLLEGE COURSES

1. ELEMENTS OF MECHANICS AND SOUND. An elementary university course in the fundamental principles of mechanics and sound. Theoretical course without laboratory work. One year of high school physics is prerequisite.

   Sixteen lessons (three credits). MR. EDWARDS.

2. HEAT. An elementary university course in the general principles of heat, without laboratory work. Prerequisite: Course 1.

   Sixteen lessons (three credits). MR. EDWARDS.

3. OPTICS. An elementary university course in the fundamental principles of light. Prerequisite: Course 1.

   Sixteen lessons (three credits). MR. EDWARDS.

4. MAGNETISM AND ELECTRICITY. An elementary university course in the principles underlying electrical and magnetic phenomena. Prerequisite: Course 1.

   Sixteen lessons (three credits). MR. EDWARDS.

POLITICAL SCIENCE

1. AMERICAN GOVERNMENT. An elementary course in American government and politics intended as a preparation for teaching in secondary schools and for good citizenship. The course deals with the national government, treating its nature and origin. Special attention will be given to the organization of the executive, legislative, and judicial branches of the government, together with the various powers and duties of each department; to the conduct of foreign affairs; and to the present problems of national government.

   Twenty-seven lessons (five credits). MR. GAUS.

2.* MUNICIPAL GOVERNMENT. A study of the city problems in the United States. Organization, functions, and administration. Forms of charters. Commission and manager plans. Home rule. Inefficiency, corruption. Civil service and other reform measures. Finance, health, police, education, and other activities. Prerequisite for credit: Course 1.

   Twenty-four lessons (four and one-half credits). MR. ANDERSON.

3. STATE AND LOCAL GOVERNMENT. A complementary course to Course 1. The constitutional basis of state government; relation of the state to the national and local governments, and to the citizen; organization, functions, and actual workings of state governments, and of county, township, and city governments; public opinion and popular control in state governments; nominations and elections, initiative, referendum and recall; taxation and finance; social and regulatory legislation.

   Twenty-seven lessons (five credits). MR. GAUS.

* New registrations for the course in Municipal Government will not be accepted until further notice.

4. International Law. Recognition, extinction, and succession of states; inviolability of territory; freedom of the seas. Declaration of war; rules of war on land and on sea. Neutrality and neutral rights; blockade, contraband, unneutral service, visit and search. Mediation, arbitration, and judicial settlement of international disputes. A world court. Prerequisite for credit: Course 1.

Twenty-four lessons (four and one-half credits). Mr. Quigley.

5. Political Parties. A course dealing with the nature, functions, organization, and methods of political parties and public opinion as a factor in representative government. The lessons cover the methods of nominating public officers, the conduct of election campaigns, the election law of Minnesota, the operation of political parties in the actual control of government. Careful study is made of a number of specific problems of democracy including the direct primary, corrupt practices, boss rule, the spoils system and the civil service, the initiative, referendum and recall, and the short ballot.

Twenty-seven lessons (five credits). Mr. Gaus.

PSYCHOLOGY

1. General Psychology I. The purpose of this course is to acquaint the student with the general characteristics and laws of mental life and with the aims and methods of modern psychology.

Sixteen lessons (three credits). Mr. Filter.

2. General Psychology II. The study of mental development in its relation to heredity and training, with an investigation of the facts and theories of childhood and adolescence with special reference to their bearing on education. Prerequisite: Course 1.

Sixteen lessons (three credits). Mr. Filter.

3. Applied Psychology. A survey of practical applications of psychology. Special topics considered are: methods of selecting employees; history and evaluation of attempts at character analysis; measurement of mental traits; improving efficiency in office and shop; problems of advertising and selling. Prerequisite: Psychology 1 and 2.

Sixteen lessons (three credits). Mr. Filter.

Note.—See also Education, Course 2.

ROMANCE LANGUAGES

FRENCH

1. Beginning French I. French grammar and reader; modern texts.

Twenty lessons (four credits). Mr. Frelin.

2. Beginning French II. A continuation of Course 1, which is prerequisite to it.

Twenty lessons (four credits). Mr. Frelin.

3. INTERMEDIATE FRENCH I. Review of grammar; composition, reading of representative authors. Prerequisite: Courses 1 and 2 or equivalent.
Twenty lessons (four credits). MR. FRELIN.

4. INTERMEDIATE FRENCH II. A continuation of Course 3. Prerequisite: Course 3.
Twenty lessons (four credits). MR. FRELIN.

5. ELEMENTARY FRENCH COMPOSITION. This course is designed to train the student in the use of French. It presupposes a knowledge of intermediate French. It consists of translations of passages of connected prose dealing with everyday life in France, such as traveling, shopping, going to the theater, etc. Towards the end of the course, the student is expected to translate short clippings from newspapers. Prerequisite: Courses 1, 2, 3, and 4.
Sixteen lessons (three credits). MR. PARKER.

6. ADVANCED FRENCH COMPOSITION. A continuation of Course 5. It affords practical exercises in prose composition. Prerequisite: Course 5 or equivalent.
Sixteen lessons (three credits). MR. PARKER.

7. SCIENTIFIC FRENCH I. Readings from general works on scientific subjects. Particularly valuable to pre-medical students and others who expect to take up courses in science. Prerequisite: Courses 1, 2, 3, and 4.
Sixteen lessons (three credits). MR. FRELIN.

8. SCIENTIFIC FRENCH II. A continuation of Course 7.
Sixteen lessons (three credits). MR. FRELIN.

9. SCIENTIFIC FRENCH III. A continuation of Course 8.
Sixteen lessons (three credits). MR. FRELIN.

SPANISH

1. BEGINNING SPANISH I. Grammar and reading. In this course stress will be laid upon grammar, accurate translation, and composition. Exercises in phonetic equivalents will be given with the view of acquiring a careful pronunciation.
Twenty lessons (four credits). MR. PARKER.

2. BEGINNING SPANISH II. A continuation of Course 1.
Twenty lessons (four credits). MR. PARKER.

3. INTERMEDIATE SPANISH I. Review of grammar; composition, reading of modern Spanish texts. Prerequisite: Courses 1 and 2 or equivalent.
Twenty lessons (four credits). MR. PARKER.

4. INTERMEDIATE SPANISH II. A continuation of Course 3. Prerequisite: Courses 1, 2, and 3.
Twenty lessons (four credits). MR. PARKER.

5. ELEMENTARY SPANISH COMPOSITION. Connected prose composition dealing with everyday life in Spain. The aim is the ability to write Spanish. Prerequisite: Courses 1, 2, 3, and 4 or equivalent.
Sixteen lessons (three credits). MR. PARKER.

6. ADVANCED SPANISH COMPOSITION. A continuation of Course 5, which is prerequisite.
Sixteen lessons (three credits). MR. PARKER.

SCANDINAVIAN

NORWEGIAN

1. BEGINNING NORWEGIAN I. Elementary study of the language: grammar, composition, select readings in easy prose and poetry.
Twenty lessons (four credits). MR. BOTHNE.

2. BEGINNING NORWEGIAN II. A continuation of Course 1, which is prerequisite.
Twenty lessons (four credits). MR. BOTHNE.

3. INTERMEDIATE NORWEGIAN I. Grammar; composition; elementary history of literature; select works of modern authors. Prerequisite: Courses 1 and 2 or equivalent.
Twenty lessons (four credits). MR. BOTHNE.

4. INTERMEDIATE NORWEGIAN II. A continuation of Course 3.
Twenty lessons (four credits). MR. BOTHNE.

5. ADVANCED NORWEGIAN I. The reading of representative prose and poetry. Prerequisite: Courses 1, 2, 3, and 4 or equivalent.
Twenty-four lessons (four and one-half credits). MR. BOTHNE.

6. ADVANCED NORWEGIAN II. A continuation of Course 5. Reading in prose and verse.
Twenty-four lessons (four and one-half credits). MR. BOTHNE.

SWEDISH

1. BEGINNING SWEDISH I. Grammar and composition; select readings in easy prose and verse.
Twenty lessons (four credits). MR. STOMBERG.

2. BEGINNING SWEDISH II. A continuation of Course 1, which is prerequisite.
Twenty lessons (four credits). MR. STOMBERG.

3. INTERMEDIATE SWEDISH I. Grammar; composition; easy reading. Prerequisite: Courses 1 and 2.
Twenty lessons (four credits). MR. STOMBERG.

4. INTERMEDIATE SWEDISH II. A continuation of Course 3.
Twenty lessons (four credits). MR. STOMBERG.

5. SWEDISH LITERATURE I. History of Swedish literature from 1718 to the present time. History of the literature, and study of modern authors, including Selma Lagerlöf, Gerierstam, Strindberg. Prerequisite: Courses 1, 2, 3, 4, and advanced Swedish.
Twenty-four lessons (four and one-half credits). MR. STOMBERG.

6. SWEDISH LITERATURE II. A continuation of Course 5. Open to advanced students. Both courses must be completed before credit is given for the first course.
Twenty-four lessons (four and one-half credits). MR. STOMBERG.

SOCIAL SCIENCE

PREPARATORY COURSE

1. SOCIAL SCIENCE A. This is a course whose primary aim is to give citizens an insight into the world in which they are living—an insight which will enable them to understand the economic, social, and political happenings of everyday existence and through their understanding to live more useful lives. Since present institutions are the outgrowth of past experience, the first few weeks will be spent in an historical survey of man's progress up through the industrial revolution. The remaining three quarters of Part A is devoted to a study of the present economic organization of society. Production, consumption, exchange, and transportation are taken up in turn. Much attention is given to certain fundamental principles which should underlie all business dealings. Chief among these are (1) responsibility, which is best illustrated by banking; (2) fairness, which is at stake in the devices of competition used by corporations and trusts, in the wages paid to laborers, and in the prices charged to consumers; and (3) the principle of public service which is enforced by law through public control over combinations in restraint of trade and over the railroads. Such concrete questions as the wisdom of government ownership, the causes of the high cost of living, the justice of the strike and the closed shop are considered impartially from all angles.
Twenty lessons (one-half entrance credit). MR. BERNARD.

SOCIOLOGY

1. INTRODUCTION TO SOCIOLOGY. A study of the evolution and present organization of human society. The evolution of typical social institutions, such as the family, industry, and the state; the influence of the biological and environmental (both physical and social) factors upon

man in his social relationships; an introductory analysis of some of the leading social problems of the time; a study of the methods of social organization and control, especially from the standpoints of tradition, custom, and science. This course is intended to serve (1) as an introduction to other more specialized courses in sociology, (2) as a background for a better understanding of the society in which we live and of its problems.

Twenty-seven lessons (five credits). MR. BERNARD.

2. RURAL SOCIOLOGY. A study of the conditions and problems of country life. Analysis of environmental, human, and general social conditions; how soil, climate, etc., the quantity and quality of the rural population, the interaction of city and county determine the type of rural communities. Problems of sanitation, co-operation, education, religion, recreation, crime, and dependency growing out of these conditions. This course has been thoroly revised.

Twenty-seven lessons (five credits). MR. BERNARD.

10. RURAL COMMUNITY ORGANIZATION. This course is intended for those working in the rural community and small towns and considers more technical problems than those discussed in the course in Rural Sociology. The subjects covered include co-operation, organization for health and sanitation, the social work of the church and schools, organized recreation, clubs, social centers, the organization and co-operation of rural social agencies, small town and county organization, social surveys. Should be preceded by Course 2 (Rural Sociology), but may be taken independently by those who have a special interest in the subject.

Sixteen lessons (three credits). MR. BERNARD.

11. SOCIAL ORGANIZATION. A study of the foundations of democracy, including the organization and structure of groups, the development of social ideals, the factors producing disorganization and reorganization of institutions, and the methods of promoting an intelligent and lasting democracy. Prerequisite: Course 1 or equivalent.

Sixteen lessons (three credits). MR. BERNARD.

14. SOCIAL PROGRESS. A study of the conditions, causes, and criteria of social progress, with the probable limits thereto. Besides the lessons based on the assigned reading, the student will be expected to prepare a paper, either in fundamental criticism of some work on social progress, or in the nature of an original study based on the critical use of library materials. This course is open only to those who have taken Introduction to Sociology and Social Organization, either by correspondence or in residence.

Sixteen lessons (three credits). MR. BERNARD.

52. FIELD WORK IN RURAL SOCIOLOGY. Students who have completed the work in Rural Sociology (Sociology 2) or its equivalent may, with the consent of the instructor, enroll for more advanced work on some selected rural community problem. The work will consist of the application of the survey method to the study of the problem selected. Schedules will be provided through the Correspondence Department. The student will collect the data and will be responsible for some preliminary interpretation of this data. The accuracy of the completed schedules, which will be returned to the instructor, and the ability shown in interpreting the data collected will serve as a basis for judging the quality of the work done. One, two, or three hours' credits, according to amount of work done. MR. BERNARD.

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The Bulletin *of the* University *of* Minnesota

The Summer Session

Announcement of Courses

1924

First Term June 21 to July 31

Second Term July 31 to September 5

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CALENDAR

SUMMER SESSION 1924

June	21-23	Sat.-Mon.	Registration days, first term
June	24	Tuesday	First term classes begin
July	4	Friday	Independence Day; a holiday
July	31	Thursday	First term closes
July	31	Thursday	Registration for second term closes
August	1	Friday	Second term classes begin
September	5	Friday	Second term closes

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JAMES A. JOHNSON, M.D., F.A.C.S., Assistant Professor
GILBERT J. THOMAS, M.D., Assistant Professor
ARCHA E. WILCOX, M.D., F.A.C.S., Assistant Professor
HARRY B. ZIMMERMAN, M.D., F.A.C.S., Assistant Professor
JOHN S. ABBOTT, B.A., M.D., Instructor
GEORGE R. DUNN, Ph.D., M.D., Instructor
WALTER A. FANSLER, M.A., M.D., Instructor
PAUL W. GIESSLER, B.S., M.D., Instructor
WALTER J. KREMER, M.D., Instructor
FRANK S. MCKINNEY, B.A., M.D., Instructor
FREDERICK A. OLSON, M.S., M.D., Instructor
EMIL C. ROBITSHEK, M.D., Instructor
ROSCOE C. WEBB, B.A., M.D., F.A.C.S., Instructor
ANTON G. WETHALL, B.S., M.D., Instructor
ARTHUR A. ZIEROLD, D.D.S., B.S., M.D., Ph.D., Instructor
ARTHUR F. BRATRUD, B.S., M.D., Assistant
JAMES M. HAYES, M.S., M.D., F.A.C.S., Assistant
LOUIS D. HUGHES, M.D., Assistant
MINAS JOANNIDES, M.D., Assistant

COLLEGE OF DENTISTRY

PETER J. BREKHUS, D.D.S., Professor
CHARLES A. GRIFFITH, D.D.S., Professor
WILLIAM F. LASBY, B.A., D.D.S., Professor
JAMES M. WALLS, D.M.D., Professor

SCHOOL OF CHEMISTRY

CHARLES A. MANN, Ph.D., Professor
EVERHART P. HARDING, Ph.D., Associate Professor
M. CANNON SNEED, Ph.D., Associate Professor
ISAAC W. GEIGER, Ph.D., Assistant Professor
LAWRENCE M. HENDERSON, Ph.D., Assistant Professor
GEORGE H. MONTILLON, M.S., Assistant Professor

LLOYD H. REYERSON, Ph.D., Assistant Professor
LEE I. SMITH, Ph.D., Assistant Professor
WALTER M. LAUER, M.S., Instructor

COLLEGE OF EDUCATION

AGRICULTURAL EDUCATION

ASHLEY V. STORM, Ph.D., Professor
WILLIAM P. DYER, M.A., Assistant Professor
ALBERT M. FIELD, M.S., Assistant Professor
FRANK W. LATHROP, M.S.A., Assistant Professor
SHERMAN DICKINSON, M.A., Instructor

ART EDUCATION

HAZEL S. MARTIN, Instructor
GERTRUDE D. ROSS, Instructor
LUCILE SUTORIUS, B.S., Assistant

EDUCATIONAL ADMINISTRATION AND SUPERVISION

EARL HUDELSON, Ph.D., Professor
F. H. SWIFT, Ph.D., Professor
L. V. KOOS, Ph.D., Professor
LEO J. BRUECKNER, Ph.D., Associate Professor
FRANK W. LATHROP, M.S.A., Assistant Professor
WESLEY PEIK, M.A., Lecturer
GEORGE SELKE, B.S., Lecturer
J. ORRIN POWERS, M.A., Instructor
FRED VON BORGERSRODE, B.S., Assistant Director of Educational Research

EDUCATIONAL PSYCHOLOGY

WILFORD S. MILLER, Ph.D., Professor
JOHN G. ROCKWELL, B.A., Assistant Professor
MARVIN J. VAN WAGENEN, Ph.D., Assistant Professor
LAWSON G. LOWREY, M.D., Lecturer
E. K. WICKMAN, B.A., Lecturer
E. A. MEYERDING, M.D., Instructor
FRED VON BORGERSRODE, B.S., Assistant

HISTORY OF EDUCATION

ROSS L. FINNEY, Ph.D., Assistant Professor
JEAN H. ALEXANDER, M.A., Instructor

HOME ECONOMICS EDUCATION

WYLLE B. MCNEAL, M.A., Professor
CLARA M. BROWN, B.A., Assistant Professor

THEORY AND PRACTICE OF TEACHING

Earl Hudelson, Ph.D., Professor
Fletcher H. Swift, Ph.D., Professor
August C. Krey, Ph.D., Associate Professor
Albert M. Field, M.S., Assistant Professor
Isaac W. Geiger, Ph.D., Assistant Professor
Georgina Lommen, M.A., M.L., Assistant Professor
William D. Reeve, B.S., Assistant Professor
James M. Hughes, M.A., Lecturer
Charles R. Allen, M.A., Instructor
M. Reed Bass, Instructor
May Byrne, B.S., Instructor
Ralph T. Craigo, B.S., Instructor
Marie B. Denneen, M.A., Instructor
Rewey B. Inglis, M.A., Instructor
E. A. Meyerding, M.D., Instructor
John A. Smith, Ph.B., M.A., Instructor
Lynn E. Stockwell, M.A., Instructor

LIBRARY METHODS

Alma Penrose, B.A., B.L.S., Instructor

PUBLIC SCHOOL MUSIC

John W. Beattie, Instructor
Abe Pepinsky, Instructor

TRADE AND INDUSTRIAL EDUCATION

M. Reed Bass, Instructor
Ralph T. Craigo, B.S., Instructor
Homer J. Smith, Ph.B., M.A., Instructor
Lynn E. Stockwell, M.A., Instructor
Louis A. Tohill, M.A., Instructor

THE SCHOOL OF BUSINESS

Roy G. Blakey, Ph.D., Professor
Frederic B. Garver, Ph.D., Professor
Bruce D. Mudgett, Ph.D., Professor
Warren J. Stehman, Ph.D., Associate Professor
Joseph E. Cummings, M.A., Assistant Professor
Ernest A. Heilman, Ph.D., Assistant Professor
Walter R. Meyers, Ph.D., Assistant Professor
W. Bayard Taylor, B.A., Instructor
Nina L. Youngs, B.A., Instructor

THE SUMMER SESSION

I. GENERAL INFORMATION

The Summer Session of the University of Minnesota is a regularly established division of the University. Its courses are designed (1) for graduate and undergraduate students who wish to reduce their period of residence at the University by accumulating extra credits during the summer; (2) for teachers and others of professional interests who desire further training in their professions; (3) for adult persons who seek an opportunity to continue study for intellectual pleasure; (4) for graduates of accredited high schools who do not meet the special subject-matter requirements to enter some of the colleges and professional schools; (5) for high school graduates who wish to become acquainted with the methods of instruction and the policies and practices in collegiate work before registering in the regular session during the academic year.

LOCATION

The main campus of the University of Minnesota is located on the east bank of the Mississippi River in the city of Minneapolis. The summer courses, with the exception of those in agriculture and in home economics, are given on the Minneapolis campus. The University buildings, libraries, laboratories, observatory, and museums are at the service of the summer students. In addition to the equipment of the University, there are a number of public and semipublic libraries in St. Paul and Minneapolis available for the students' use.

The courses in agriculture and home economics are given on the University Farm campus, one of the beautiful spots of the Twin Cities. The College of Agriculture has its own library, laboratories, museums, gymnasium, tennis courts, and grounds for other sports. It also offers the advantages of the main campus, for it is connected with the latter by an intercampus trolley line which gives a regular thirty-minute service. The Como-Harriet interurban line between the two cities is only a short distance from the college campus, so that the libraries, art galleries, lecture courses, and recreational facilities in both cities are accessible.

DURATION OF THE SESSION

The Summer Session consists of two terms. The first term, of six weeks, begins Tuesday, June 24 (registration days Saturday, June 21, and Monday, June 23) and closes Thursday, July 31. The second term, of five weeks, begins Friday, August 1, and closes Friday, September 5. The last day for registration for the second term is Thursday, July 31. Friday, July 4, will be observed as a holiday.

GENERAL OFFICES

The office of the director of the Summer Session is the president's office, Library Building. The offices of the registrar and cashier are on the

first floor of the Library Building, and for the convenience of students registering in agriculture and home economics, branch offices are established on the second floor of the Administration Building, University Farm. Details of procedures to be followed in registering will be given out at these places.

DEGREES

Regular collegiate credit is given for Summer Session work to qualified students. For a detailed statement of the credit requirements for the various degrees, see the general information bulletin for 1923-24, pages 12-21; and the bulletins of the various schools and colleges of the University for the same year.

The University requires at least one year of residence for any degree; and if the term of residence is only one year, that must be the senior year. In any case two quarters of the senior year must be spent in residence. Work completed in the Summer Session is considered as residence credit.

CREDIT

Credit is administered on the following basis: One credit (quarter) requires 12 lecture or recitation periods (two per week for a summer term) requiring two hours of preparation each; or, 24 periods of laboratory work requiring one-half hour of preparation each; or 36 hours of laboratory work with no preparation. Courses carrying two or more units of credit require corresponding multiples of these amounts.

AMOUNT OF WORK

A maximum of nine quarter credit hours is considered a full program for either term. Registration for a greater number requires special permission from the Students Work Committee, of which Dean Nicholson is chairman.

Examinations are held at the last scheduled class hour for each course.

GRADING SYSTEM

There are four passing grades, A, B, C, and D, representing varying degrees of achievement, which are acceptable for the completion of a single course.

There are two grades indicating work of distinctly unsatisfactory quality. These grades are E (condition), which may be removed by examination or other means stipulated by the faculty of the college or school concerned, and F (failure), which may be converted into a higher grade only by a repetition of the work in the course or, in exceptional cases, by examination by permission of the faculty concerned.

The grade I (incomplete), indicates that a student, for reasons satisfactory to the instructor in charge, has been unable to complete the work of the course. This grade is given only when the work already done has been of quality acceptable for the completion of the course. Any student receiving this grade will be given an opportunity to complete the said course within the first thirty days of his next quarter in residence.

RECREATION

The recreational activities of the University of Minnesota Summer Session have been very definitely organized and placed in the personal charge of a director of recreation. A program of varied activities is laid out, and a definite provision for its financial support is assured, so that practically all of it is available to students, without extra charges or, at most, with only nominal incidental expense.

The Twin Cities, Minneapolis and St. Paul, offer many attractions for the summer visitor. Institutions of an educational or industrial nature afford opportunity for the inspection of materials and processes, while numerous lakes, parks, and other points of purely recreational interest supply the play element. Information about these points of interest is frequently given, and excursions are conducted to a considerable number of them.

The University plant itself supplies much in the way of equipment for recreation. Three gymnasiums, with swimming pools and directed physical training, are open for regular use. The men's gymnasium on the Minneapolis campus is open every afternoon, with a director and a corps of assistants ready to arrange for any kind of games or exercises and to supply some equipment. The women's gymnasium, in addition to the class work conducted there, also affords continuous service. The gymnasium on the University Farm campus is available for men on certain days and for women on others, with a physical instructor always in charge. Locker and towel service can be secured by every student.

Closely allied with physical exercise is a series of song and play hours conducted on the Campus Knoll. These hours are spent in real play, with singing games, and others that are more athletic than musical.

Thirty tennis courts are available for daily use, except on Sundays. These courts are kept in condition and well marked constantly, students supplying regular playing equipment.

An extended series of lectures is provided throughout the summer. During the first term there is a series of weekly convocations, for which the third hour of each Thursday is left free of classes. These convocations are addressed by men of national prominence in educational and other fields. This series is supplemented by many lectures on various topics by members of the University faculty and by invited visitors. Many of these are illustrated and the element of attractiveness is not neglected.

A series of weekly musical recitals is conducted throughout both terms. These are given by well-known and recognized artists of the Twin Cities and such visiting performers as may be available. The programs aim both to give immediate pleasure and to inculcate a finer appreciation of musical values. These musical offerings, like the lectures, are free to students, and for the most part are open to the public.

The auditorium of the new Music Building will be used in the summer and is completely equipped with grand pianos, a four-manual organ, a moving picture machine, and a stage fitted for dramatic production. A series of showings of motion pictures, employing films used by the General Extension

Division in its visual instruction work, will be given throughout the summer.

Gatherings of a purely social nature are frequent and varied. Several organized groups, notably the "Knights of the Hickory Stick" (obviously school men), hold banquet or dinner meetings. There are weekly parties at which dancing, refreshments, and various other means of developing acquaintanceships are in order. One of these will take the form of a steamboat trip down the Mississippi River, which is a treat in itself, while another will be a picnic, play hour, and general jollification on the University Farm campus.

EDUCATION WEEK

The week of July 14 will be known as "Education Week" at the University of Minnesota. There will be daily lectures and conferences on the administrative and supervisory problems of public education. The speakers will be members of the faculty, superintendents of Minnesota schools, and invited speakers. Among those coming from outside the state will be Dean M. G. Neale, of the University of Missouri, Dean Paul C. Packer, University of Iowa, Dean George F. Arps, of Ohio State University, and Mr. J. C. Wright, director of the Federal Board for Vocational Education. The University convocation for the week will be devoted to educational subjects, and on Thursday night will occur the annual dinner of the Knights of the Hickory Stick. Minnesota school men not in attendance on the summer school are especially invited to spend the week at the University, attend the lectures, and join in the conferences.

MINNESOTA UNION

The Minnesota Union is a men's clubhouse, furnishing social and recreational facilities and operating a soda fountain. There are also a ballroom, reception rooms, reading rooms, and lounging rooms. These rooms and their facilities are open to all men students of the session.

The Minnesota Union cafeteria will be open during the Summer Session.

Room 202, Administration Building, University Farm, is used as a reading room and social room for men students on the University Farm campus.

SHEVLIN HALL

Shevlin Hall affords to women students what the Minnesota Union does to men. It contains rest and study rooms, rooms for social gatherings, the offices of the dean of women and the Housing Bureau.

For women students on the University Farm campus similar facilities are available in the Home Economics Building.

UNIVERSITY POST-OFFICE

The University post-office, for distribution of mail addressed to the University, is located in the School of Business Building. The University Farm post-office is in the Administration Building. At the time of registration each student is assigned a post-office box in which he will

receive all mail, announcements, and University communications. The mail box should be visited at least once a day. When leaving at the close of a session, students should give the postmaster a forwarding address.

OFFICIAL DAILY BULLETIN

Throughout the year an *Official Daily Bulletin* is issued, containing announcements to students and faculty. During the summer it also contains other information, programs of the various recreational activities, and matters of general interest which would ordinarily be found only in a daily student newspaper. The bulletin is delivered to offices and laboratories, and to the post-office box of every student early each morning except Monday. Each student is held responsible for the official notices appearing in the bulletin.

STUDENTS' HEALTH SERVICE

The Students' Health Service is conducted during the Summer Session on the same basis as during the regular school year, the same staff of physicians, dentists, and nurses being on duty. The Health Service operates, exclusively for students, a general infirmary in addition to dispensary clinics in medicine, surgery, dermatology, ophthalmology, oto-laryngology, and dentistry. Here any student may receive a complete physical examination or medical consultation without charge beyond the health fee, which is paid as part of the tuition. For surgical operations, special drugs, dentistry, and hospital board, a charge on a strictly cost basis is made. This service is maintained by the University to help each student to possess a healthy, active body, thereby contributing to his success while in college and in later life; and to reduce to the minimum that prodigious academic and economic loss due to indisposition and illness of students.

THE INTERCAMPUS CAR

For students who are registered for class work on both the Minneapolis campus and the University Farm campus, free transportation of the intercampus car is provided by tickets issued from the registrar's office.

Students who attend classes on the Minneapolis campus and who live in the College of Agriculture dormitories will also be given free transportation on the intercampus car line.

SUMMER EMPLOYMENT

Students are not advised to engage in extra work during the summer; a full program of study during the warm weather should, with reasonable recreation, be a sufficiently heavy load. But for the benefit of those who feel compelled to aid themselves financially while in attendance, the service of the University Employment Bureau is always available. There is considerable demand for services during the summer at good rates of remuneration, and many students are aided in this way. Mr. C. J. Vogel, who is in charge of the bureau, will be glad to confer with students. His office is in Room 9, School of Business Building.

TEACHERS' EXAMINATION

Examinations for state teacher's certificates will be conducted by the State Department of Education at the University during the Summer Session. The date of the examinations will be announced in the *Official Daily Bulletin.*

THE UNIVERSITY LIBRARY

The University Library, which includes the general library and the college and departmental libraries, is open to all students of the Summer Session. It includes about 385,000 volumes and many periodicals and pamphlets on all subjects in the University curriculum.

A large part of the library is housed in the Library Building on the Minneapolis campus. The library of the Department of Agriculture, with an excellent collection on agriculture and home economics, is located in the Administration Building at the University Farm. Branch libraries are maintained in certain of the schools and colleges, and there are smaller collections in many of the departments.

The Library Handbook, copies of which may be had gratis upon application at the library, contains information regarding library hours, rules, and other matters essential to the proper use of the library.

LIVING EXPENSES

The living expenses for students at the University are never very high, and this is true especially for the Summer Session. Good accommodations for room and board may be had from $9.00 to $12.00 per week. Several good restaurants are to be found in the immediate vicinity of the University. Further information concerning room and board may be obtained by addressing Mrs. Mary Staples, Shevlin Hall. It is generally more satisfactory to engage accommodations after arrival than to make reservations in advance.

SANFORD HALL

Sanford Hall, a residence hall for women, is on the Minneapolis campus. It has 83 single rooms and 52 double rooms, accommodating 205 students. The building is lighted with electricity and all rooms have hot and cold water. Each double room has two closets.

The furniture consists of a cot, with mattress and bedding, one double blanket, a dresser, study table, chair, and rug for each student. Students must supply towels, dresser scarf, couch cover, and extra blanket.

A rate of $3 per week is charged for a single room and $2.50 per week for each person occupying a double room. Applications for rooms should be addressed to Miss Lila Hainer, Director of Sanford Hall, University of Minnesota. No application will be recorded until a deposit fee of $2 (to apply on residence fee) is received. This deposit will hold the room until the day after the opening of the Summer Session.

Rooms for the second term are available in Sanford Annex. Sanford Hall itself will not be open.

Co-operative cottages are maintained during one or both terms of the Summer Session according to demand. Living expenses in these cottages are reduced to the lowest level by the occupants themselves assisting in the work. Applications for room in these cottages should be addressed to Mrs. Mary Staples, Shevlin Hall.

MEN'S DORMITORY

The men's dormitory consists of four houses on University Avenue, between Eighteenth and Nineteenth Avenues. There are twenty-two sleeping rooms which, filled to capacity, will accommodate forty men. Single rooms rent for $2.50 and $3.50 a week and double rooms for $4 and $5 a week. The houses are modern, well furnished, and cared for. Each student is provided with a cot, study table, and dresser. Everything except towels is provided.

Application for residence should be addressed to Mrs. Mary Staples, Shevlin Hall. No room is reserved without a $2 deposit. The dining room will not be open during the summer.

DEPARTMENT OF AGRICULTURE DORMITORIES

Those taking regular work during the Summer Session either on the Minneapolis campus or on the Farm campus may obtain rooms in the Department of Agriculture dormitories. The dormitories contain a few single rooms; other rooms are intended to accommodate two persons. The rooms are furnished with necessary bedding and hand towels.

The expenses for room rent, use of bedding, and laundering of the same are $2.50 per week for one student in a room and $2 per week for more than one student in a room.

Pendergast Hall will be open to men for the Summer Session provided the demand warrants it. Rates are the same as for the women's dormitories.

Rooms will be assigned, during registration, in the Administration Building. Payment for the first term of the Summer Session must be made to the cashier, University Farm, at the time of assignment. Dormitories will be open Saturday, June 21. These dormitories will not be available for the second term of the Summer Session.

A cafeteria with reasonable charges is maintained on the Farm campus.

BUREAU OF APPOINTMENTS

The Bureau of Appointments of the College of Education is operative during the Summer Session. Students who have done sufficient work at the University of Minnesota to secure academic standing here are eligible to the services of the bureau. The office is located at Room 102, Education Building.

CORRESPONDENCE COURSES

The Correspondence Study Department of the General Extension Division affords an opportunity to students who come to the University only for the Summer Session to continue their studies during the remainder of the year, and thus to accumulate additional credit toward their degrees as well as to secure the training which regular study gives. On the other hand, students who are now pursuing correspondence courses have in the Summer Session a chance to complete some of their resident work at a time when many of them are free to do so. All those who come to the Summer Session are urged to call at the offices of the General Extension Division to become acquainted with its work. Full information concerning correspondence courses may be had at any time by addressing the Correspondence Study Department, General Extension Division, Room 7, Main Engineering Building, University of Minnesota.

INSTITUTE OF GOVERNMENT AND POLITICS

An Institute of Government and Politics will be conducted at the University during the week of June 23-28 inclusive by the General Extension Division in co-operation with the Department of Political Science. Three lines of work will be pursued: (1) The Government of Minnesota; (2) Political Parties and the Formation of Public Opinion; (3) American Government. Lectures and discussions will be scheduled afternoons and evenings. Fee for the course, $3.

INFORMATION

Correspondence with reference to the Summer Session and requests for circulars and additional information may be addressed to the director, Summer Session, or the registrar, University of Minnesota, Minneapolis, Minnesota.

II. ADMISSION AND REGISTRATION

ADMISSION

The courses of the Summer Session are open to all standard high school graduates and to mature men and women who, after consultation with their respective instructors, are considered qualified to pursue the chosen work to advantage, but college credit will be given only when college entrance requirements have been fulfilled. Those who desire college credit for their work, and those who desire advanced standing for college work done elsewhere, should submit their credentials, consisting of official transcripts of their high school, normal school, or college work.

Students should consult the statements under each college announcement in this bulletin for detailed information concerning admission to that college. This information may also be found in the general information bulletin which may be obtained at the office of the registrar.

REGISTRATION

Saturday, June 21, and Monday, June 23, are the regular registration days for the first term of the Summer Session. Class work will begin at eight o'clock, Tuesday morning, June 24. Students arriving late may register by special permission until five o'clock Monday afternoon, June 30, but after that date no registration will be received. Registration is not completed until all fees are paid. Saturday, August 2, is the last day for registration for the second term.

Candidates for admission to all colleges except Agriculture and Home Economics will secure their registration blanks at the office of the registrar, Minneapolis campus. Candidates for admission to the College of Agriculture and Home Economics will register at the University Farm, 205 Administration Building.

Changes in Registration

Any modification of the prescribed program must be made by petition. This petition, which may be secured at the registrar's office, must be approved by Dean E. E. Nicholson, 239 Chemistry Building.

FEES

The following fees are payable by each full-time student at the time of registration and must be paid before registration is complete:

Tuition fee (first or second term of Summer Session) $25.00*
General deposit 2.00

In addition each laboratory course will carry a fee as indicated in the statement of courses.

Charges for lockers, laboratory breakage, library fines, etc., will be deducted from the $2 deposit and the balance will be refunded by mail after the close of the session.

For fees for students desiring legal time credit in the Medical School, see page 75.

For fees for students registering for clinical courses in the College of Dentistry, see page 92.

For fees for students registering for music courses, see page 41.

For fees for students registering for the eight weeks' Course in Civil Engineering, see page 54.

For part-time students in courses for which the full-time fee is $25 registering for four credit hours or less the tuition fee will be reduced to $15 for either term.

Refund of Fees

Students cancelling during the first week of either term for unavoidable reasons will be granted a four-fifths refund. After twelve o'clock Saturday

* This fee of $25 includes the following in addition to tuition: health fee, Minnesota Union or Shevlin Hall fee, recreation fee, and post-office box rental. For regular students in Medicine and Dentistry, special fees covering these items are charged in addition to tuition.

noon, June 28, no refunds will be granted for the first term. After Saturday noon, August 9, no refunds will be granted for the second term. All refunds must be approved by the director of the Summer Session.

AUDITORS

Permission to attend classes as auditors will be granted only to students who are regularly registered in at least one other Summer Session class. Fees for auditors are the same as for students registered for credits.

III. GRADUATE WORK

It is possible through work in the Summer Session to fulfill the requirements for the Master's degree and absolve in part the requirements for the degree of doctor of philosophy. Any Summer Session student who is a graduate of a standard college should register through the Graduate School for his courses in the Summer Session.

This bulletin carries an increased number of courses of advanced character. In general, courses numbered above 100 carry graduate credit. There is sufficient work available each summer to fulfill the course requirement for the major and minor in practically any combination of departments.

Graduate students from acceptable colleges may expect to meet the residence and course requirements for the Master's degree and complete their thesis in four summer sessions of six weeks each or three summer quarters.

A full statement of the requirements for advanced degrees may be found in the Graduate School bulletin.

Students should bear in mind the necessity of registering each summer in the Graduate School if they desire their work to be counted for an advanced degree.

IV. STATEMENT OF COURSES

The following pages contain announcements of the courses offered in the several colleges and schools of the University. Departmental statements also indicate certain requirements as to entrance and credits. For more detailed statements of these matters, reference should be made to the bulletin of general information and the regular annual bulletin of the college concerned.

Any course announced for the Summer Session may be cancelled if the enrolment is not sufficient to warrant its continuance.

Following each course is a statement, in parentheses, of credits, prerequisites, classes of students eligible, class hour, days of the week, and location of the class. Thus (3 cr.; jr., sr., grad.; 3-4; II; MTWThF; 117F) means that the course carries three credits, is open to juniors, seniors, and graduate students, demands Course 3-4 in the same department as a prerequisite, meets at the second hour, on Monday, Tuesday, Wednesday,

Thursday, and Friday, in Room 117, Folwell Hall. Abbreviations for class hours and buildings are interpreted by the following tables:

CLASS HOUR SCHEDULE

	Minneapolis Campus	University Farm
I Hour	8:00– 8:50	7:45– 8:35
II Hour	9:00– 9:50	8:45– 9:35
III Hour	10:00 10:50	9:45–10:35
IV Hour	11:00–11:50	10:45–11:35
V Hour	12:00–12:50	11:45–12:35
VI Hour	1:00– 1:50	1:00– 1:50
VII Hour	2:00– 2:50	2:00– 2:50
VIII Hour	3:00– 3:50	3:00– 3:50
IX Hour	4:00– 4:50	4:00– 4:50
X Hour	5:00– 5:50	5:00– 5:50

Convocation, III hour, Thursdays

(See *Official Daily Bulletin* for announcements.)

KEY TO ABBREVIATIONS USED FOR BUILDINGS

Minneapolis Campus Buildings

A, Armory
AB, Animal Biology
B, School of Business
BM, U.S. Bureau of Mines Bldg
C, Chemistry Bldg
D, Dentistry Bldg
E, Main Engineering Bldg
Ed, Education Bldg
EE, Electrical Engineering Bldg
EMH, Elliot Memorial Hospital
Exp, Experimental Engineering Bldg
F, Folwell Hall
G, Greenhouse (13th and University avs)
IA, Institute of Anatomy
L, Law Bldg
Lib, Library Bldg
M, Mines Bldg
MA, Mechanic Arts Bldg
ME, Mechanical Engineering Bldg
MGH, Minneapolis General Hospital
MH, Millard Hall
Mu, Music Bldg
O, Observatory
OT, Ore Testing Works
P, Pillsbury Hall
Ph, Physics Bldg
Phm, Pharmacy Bldg
Pr, Printing Bldg
Psy, Psychology Bldg
SBH, State Board of Health Bldg
Sh, Shevlin Hall
UD, University Dispensary (Basement MH)
UH, University Hospital
WGm, Women's Gymnasium

University Farm Buildings

Ad, Administration Bldg
Ch, Chemistry Bldg
DH, Dairy Hall
En, Engineering Bldg
FH, Farm House
Gy, Gymnasium
HE, Home Economics Bldg
Ho, Home Bldg
Hr, Horticulture Bldg
Pe, Pendergast Hall
PP, Botany and Plant Pathology
So, Soils Bldg
St, Stock Pavilion
Ve, Veterinary Bldg
WH, Women's Hall

THE COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

ANIMAL BIOLOGY*

COURSES

Credit is given for acceptable work done at the Puget Sound Biological Station (under the supervision of Mr. Lund) or at any other accredited seaside station.

First Term

1su.[1] GENERAL ZOOLOGY. A survey of the animal kingdom, emphasizing the principles of morphology, physiology, embryology, heredity, classification, and evolution of animals. Textbook, lectures, quizzes, and laboratory. (5 cr.; all; no prereq.; lect., III, IV; MTWThF; 10 additional hrs. for lab., forenoon or afternoon, to be arranged with the class; lab., 100, lect., 313AB.) MR. RINGOEN.

2su.[1] GENERAL ZOOLOGY. A continuation of Course 1su. (5 cr.; all; prereq., 1; III, IV; MTWThF; 10 additional hrs. for lab., forenoon or afternoon, to be arranged with the class; lab., 100, lect., 313AB.) MR. MINNICH.

124su. ADVANCED ECOLOGY. An intensive study of an aquatic environment. (5 cr.; prereq., 117-118-119; ar.; 401AB.) MR. CHAPMAN.

144su.[1] ANIMAL PARASITES AND PARASITISM. The second term of the course is devoted primarily to the relation of insects to diseases of man and animals. (3 cr.; jr., sr., grad.; prereq., 1-2 and 5 additional cr.; VI, VII, VIII, IX; MWF; lab. and lect., 202AB.) MR. RILEY.

Second Term

2su.[1] GENERAL ZOOLOGY. Second half of Course 1su. (5 cr.; prereq., Course 1su or equiv.; I, II, III, IV; MTWThF; lab., 100, lect., 313AB.) MR. RINGOEN.

ANTHROPOLOGY

COURSES

First Term

1su. INTRODUCTION TO ANTHROPOLOGY. Origin and development of mankind and the races; racial distribution, and immigration; the bearing of anthropology on present day thought and problems. (3 cr.; no prereq.; II; MTWThFS.) MR. WALLIS.

55su. HUMAN MIGRATION AND POPULATION PROBLEMS. Lectures and assigned topics on migrations and the dynamics of population. (3 cr.; soph., jr., sr., grad.; prereq., 15 cr. in social sciences; III; MTWFS and 1 hr. ar.; 12F.) MR. KRIEGER.

* See also Department of Entomology and Economic Zoology, page 66.

[1] A laboratory fee of $1.50 is charged for this course.

62su. GENERAL ETHNOLOGY. The different so-called races of men; their historical classifications; determinants of ethnic types; important ethnic problems. (3 cr.; soph., jr., sr., grad.; no prereq.; V; MTWThFS; 15F.) MR. KRIEGER.

110su. PHYSICAL ANTHROPOLOGY AND AMALGAMATION. Theory of evolution as applied to natural and cultural man. Eugenics in theory, law, and practice. Studies in amalgamation of peoples. (3 cr.; no prereq.; I; MTWThFS; 12F.) MR. WALLIS.

114su. NEWER IMMIGRANTS. Characteristics, contributions, and distribution of the newer immigrant peoples in America; their modification and importance to us. (3 cr.; no prereq.; IV; MTWThFS.) MR. KOENIG.

Second Term

1su. INTRODUCTION TO ANTHROPOLOGY. Same as first term. (3 cr.; no prereq.; II; MTWThFS; 15F.) MR. KRIEGER.

62su. GENERAL ETHNOLOGY. Ethnology. Same as first term. (3 cr.; soph., jr., sr., grad.; no prereq.; I; MTWTh; 15F.) MR. KRIEGER.

ASTRONOMY

COURSES

First Term

11su. DESCRIPTIVE ASTRONOMY. A course of lectures and recitations on the general principles of astronomy, illustrated with lantern slides and by the use of the telescope. (5 cr.; fr., soph., jr., sr., grad.; no prereq.; III-IV; MTWFS; 124F.) MR. BEAL.

62su. ELEMENTS OF PRACTICAL ASTRONOMY. Theory and use of astronomical instruments in determining time, latitude, longitude, azimuth, and positions of heavenly bodies. (3 cr.; soph., jr., sr., grad.; prereq., 1 yr. math., 3 cr. in astronomy; ar.; 124F.) MR. BEAL.

Second Term

11su. DESCRIPTIVE ASTRONOMY. Same as first term.

25su. STELLAR ASTRONOMY. Review of present state of knowledge concerning the stars and nebulae. Theories of stellar evolution. (3 cr.; soph., jr., sr., grad.; prereq., 3 cr. in astronomy; II; MTWThFS; 124F.) MR. BEAL.

BOTANY

COURSES

First Term

4su.[1] GENERAL BOTANY. General morphology of the flowering plants. (3 cr.; no prereq.; I-II; MTWThF; 214P.) MR. JOHNSON, MISS MYGRANT.

6su. GENERAL BOTANY. General survey of the plant kingdom. (3 cr.; no prereq.; VI-VII; MTWThF; 214P.) MR. JOHNSON, MISS MYGRANT.

[1] A laboratory fee of $1.50 is charged for this course.

7su. TAXONOMY AND CLASSIFICATION OF THE FLOWERING PLANTS. (3 cr.; no prereq.; VI-VII; MTWThF; 214P.) To be given if sufficient number of students register. MR. JOHNSON.

ENGLISH

COURSES IN ENGLISH

First Term

1su. ENGLISH SURVEY. Intended for students who have had work in composition equivalent to that of A-B-C, but who have not had the survey of English classics included in that course. This course carries university credit for the first quarter of English 1, 2, 3. (3 cr.; soph, jr., sr.; prereq., 9 cr. in rhet.; IV; MTWThFS; 303F.) MISS ARMSTRONG, MR. KIERZEK.

2su. ENGLISH SURVEY. A continuation of 1su. This course carries university credit for the second quarter of English 1, 2, 3. (3 cr.; soph., jr., sr.; prereq., 9 cr. in rhet.; II; MTWThFS; 305F.) MR. CREAMER.

3su. ENGLISH SURVEY. A continuation of 2su. This course carries university credit for the third quarter of English 1, 2, 3. (3 cr.; soph., jr., sr.; prereq., 9 cr. in rhet.; I; MTWThFS; 311F.) MR. FRANTZ.

6su. CHAUCER. Reading of tales from the Canterbury collection with introduction dealing with the grammar and literary forms of fourteenth-century English. (3 cr.; soph., jr., sr.; prereq., A-B-C or equiv.;[2] I; MTWThFS; 204F.) MR. MALONE.

8su. SHAKESPEARE. Shakespeare's development as a poet and dramatist up to *King Lear*. (3 cr.; soph., jr., sr.; prereq., A-B-C or equiv.;[2] Sec. 1, II; MTWThFS; Sec. 2, VI; MTWThF, and 1 hr. to be arranged; 204F.); Sec. 1, MR. MALONE; Sec. 2, MISS JACKSON.

45su. AMERICAN LITERATURE. This course carries university credit for the second quarter of English 44-45. (3 cr.; soph., jr., sr.; prereq., A-B-C or equiv.;[2] IV; MTWThFS; 204F.) MISS JACKSON.

50su. OLD ENGLISH. Old English prose and poetry. The relation to modern English is particularly emphasized. (3 cr.; jr., sr.; prereq., A-B-C or equiv.;[2] II; MTWThFS; 205F.) MR. RUUD.

53su. SEVENTEENTH-CENTURY LYRISTS. The tradition of the Elizabethan lyric traced in the work of the metaphysical and cavalier schools of poetry. (3 cr.; jr., sr.; prereq., A-B-C or equiv.;[2] VIII; MTWThF and 1 hr. ar.; 204F.) MR. SPENCER.

58su. NINETEENTH-CENTURY PROSE. The more important prose of the nineteenth century, not including fiction. This course carries university credit for the first quarter of English 58-59. (3 cr.; jr., sr.; prereq., A-B-C or equiv.;[2] VII; MTWThF and 1 hr. ar.; 205F.) MR. RAYSOR.

70su. ELIZABETHAN DRAMA. The chief Elizabethan and Jacobean dramatists, excluding Shakespeare. (3 cr.; jr., sr.; prereq., Course 8; VII; MTWThF and 1 hr. ar.; 204F.) MR. SPENCER.

[2] A-B-C, as a prerequisite, has for its equivalent any two quarters of English 1-2-3 and 9 credits in rhetoric.

80su. TEACHERS' COURSE IN ENGLISH. (See College of Education statement, page 114.)

110su. ROMANTIC POETS. This course carries university credit for the second quarter of English 109-110. (3 cr.; jr., sr., grad.; prereq., 6 or 8 and one other course numbered above 5; VI; MTWThF and 1 hr. ar.; 205F.) MR. RAYSOR.

140su. ADVANCED CHAUCER. The more important of Chaucer's poems aside from *The Canterbury Tales;* the sources and chronology of Chaucer's work. (3 cr.; jr., sr., grad.; prereq., 6, and one other course numbered above 5;[3] III; MTWThFS; 205F.) MR. RUUD.

153su. SEVENTEENTH-CENTURY LYRISTS. A modification of 53su to suit the needs of graduate students. They will be required to attend the meetings of 53su and to do such additional work as the instructor may assign. (See schedule under Course 53su.) MR. SPENCER.

158su. NINETEENTH-CENTURY PROSE. A modification of 58su to suit the needs of graduate students. They will be required to attend the meetings of 58su and to do such additional work as the instructor may assign. (See schedule under Course 58su.) MR. RAYSOR.

170su. ELIZABETHAN DRAMA. A modification of 70su to suit the needs of graduate students. They will be required to attend the meetings of 70su and to do such additional work as the instructor may assign. (See schedule under Course 70su.) MR. SPENCER.

Second Term

2su. ENGLISH SURVEY. See First Term, Course 2su. (3 cr.; soph., jr., sr.; prereq., 9 cr. in rhet.; II; MTWThFS; 305F.) MR. BENDER.

3su. ENGLISH SURVEY. See First Term, Course 3su. (3 cr.; soph., jr., sr.; prereq., 9 cr. in rhet.; IV; MTWThFS; 303F.) MR. GRIGGS.

44su. EARLY AMERICAN LITERATURE. Facts and backgrounds of American literature in the seventeenth and eighteenth centuries. This course carries university credit for the first quarter of English 44-45. (3 cr.; jr., sr.; prereq., A-B-C or equiv.;[2] IV; MTWThFS; 205F.) MR. SPENCER.

62su. MILTON. (3 cr.; jr,, sr.; prereq., A-B-C or equiv.;[2] I; MTWThFS; 204F.) MR. MALONE.

71su. SEVENTEENTH-CENTURY DRAMA. The principal dramatists of the Caroline and Restoration periods. (3 cr.; jr., sr.; prereq., Course 8; III; MTWFS and 1 hr. ar.; 205F.) MR. SPENCER.

136su. ADVANCED SHAKESPEARE. Shakespeare's development traced to the end. A careful analysis of four plays. Problems in the interpretation of Shakespeare's dramatic methods. (3 cr.; jr., sr., grad.; prereq., grade of B in English 8; II; MTWThFS; 204F.) MR. MALONE.

162su. MILTON. A modification of 62su to suit the needs of graduate students. They will be required to attend the meetings of 62su and to do such additional work as the instructor may assign. (See schedule under Course 62su.) MR. MALONE.

[2] A-B-C, as a prerequisite, has for its equivalent any two quarters of English 1-2-3 and 9 credits in rhetoric.

[3] Open without further prerequisites to students receiving B in English 6.

171su. SEVENTEENTH-CENTURY DRAMA. A modification of 71su to suit the needs of graduate students. They will be required to attend the meetings of 71su and to do such additional work as the instructor may assign. (See schedule under Course 71su.) MR. SPENCER.

COURSES IN RHETORIC

First Term

Asu. FRESHMAN ENGLISH. The study of the fundamental principles of composition; training in the art of writing; an historical survey of the classics of English literature. This course carries university credit for the first quarter of English-Rhetoric A-B-C. (5 cr.; all; no prereq.; IV; MTWThFS; VII; MTWThF; 303F.) MISS ARMSTRONG, MR. KIERZEK.

Bsu. FRESHMAN ENGLISH. A continuation of Asu. This course carries university credit for the second quarter of English-Rhetoric A-B-C. (5 cr.; all; prereq., Rhet. A; II; MTWThFS; VI; MTWThF; 305F.) MR. CREAMER.

Csu. FRESHMAN ENGLISH. A continuation of Bsu. This course carries university credit for the third quarter of English-Rhetoric A-B-C. (5 cr.; all; prereq., Rhet. A, B; I; MTWThFS; VI; MTWThF; 311F.) MR. FRANTZ.

4su. COMPOSITION FOR TECHNICAL STUDENTS. Practical training in the art of writing; the principles of structure, and analysis of specimens of good prose. This course carries university credit for the first quarter of Rhetoric 4-5-6, or of Rhetoric 1-2-3 of preceding years. (3 cr.; all; no prereq.; VII; MTWThF; 303F.) MISS ARMSTRONG, MR. KIERZEK.

5su. COMPOSITION FOR TECHNICAL STUDENTS. A continuation of 4su. This course carries university credit for the second quarter of Rhetoric 4-5-6. (3 cr.; all; prereq., Rhet. 4; VI; MTWThF; 305F.) MR. CREAMER.

6su. COMPOSITION FOR TECHNICAL STUDENTS. A continuation of 5su. This course carries university credit for the third quarter of Rhetoric 4-5-6. (3 cr.; all; prereq., Rhet. 4, 5; VI; MTWThF; 311F.) MR. FRANTZ.

20su. INFORMAL EXPOSITION. Description and narration as a means of exposition, and the informal essay. (3 cr.; soph., jr., grad.; prereq., 11-12 or 18 or 47-48; not open to students who have credit for Rhet. 13 or 19; IV; MTWThFS; 306F.) MRS. DEL PLAINE.

67su. IMITATIVE WRITING. The principles of structure, diction, and style which underlie the work of leading English writers; application of these principles in both imitative and original composition. This course carries university credit for the first half of Rhetoric 67-68. (3 cr.; jr. sr.; prereq., a grade of B in each quarter of 11-12, or 15-16, or 18-19, or 47-48; II; MTWThFS; 306F.) MRS. DEL PLAINE.

Second Term

Bsu. FRESHMAN ENGLISH. See First Term, Course Bsu. (5 cr.; all; prereq., Rhet. A; II; MTWThFS; VI; MTWThF; 305F.) MR. BENDER.

Csu. FRESHMAN ENGLISH. See First Term, Course Csu. (5 cr.; all; prereq., Rhet. A, B; IV; MTWThFS; VII; MTWThF; 303F.) MR. GRIGGS.

5su. COMPOSITION FOR TECHNICAL STUDENTS. See First Term, Course 5su. (3 cr.; all; prereq., Rhet. 4; VI; MTWThF; 305F.) MR. BENDER.

6su. COMPOSITION FOR TECHNICAL STUDENTS. A continuation of 5su. This (3 cr.; all; prereq., Rhet. 4, 5; VII; MTWThF; 303F.) MR. GRIGGS.

COURSES IN PUBLIC SPEAKING

First Term

VOICE AND SPEECH CORRECTION. A special course, open to all students, for the correction of such disorders as wrong placement, faulty resonance, huskiness, indistinctness, and vocal fatigue. All students in Public Speaking required to attend. (No cr.; all; no prereq.; IX; TTh; 308F.) MRS. DINGWALL, MR. BRINGS, MR. ROGERS.

41su. PUBLIC SPEAKING. Effective speaking, breathing, voice production, enunciation, and action; delivery of selections from the works of well-known writers and speakers; principles of speech-making applied in both oral and written compositions. Voice and speech correction. This course carries university credit for the first quarter of Public Speaking 41-42-43. (3 cr.; soph., jr., sr.; prereq., Rhet. A-B-C, 1-2-3, or 4-5-6; Sec. 1, I; MTWThFS; 308F; Sec. 2, IV; MTWThFS; 308F.) MR. ROGERS.

43su. PUBLIC SPEAKING. A continuation of 42su. This course carries university credit for the third quarter of Public Speaking 41-42-43. (3 cr.; soph., jr., sr.; prereq., Rhet. A-B-C, 1-2-3, or 4-5-6, and 41; IV; MTWThFS; 306F.) MR. BRINGS.

55su. DEBATE AND ARGUMENTATION. Short course for teachers. Theory and practice of argumentation. Phrasing debatable propositions; analysis, evidence, reasoning. Practice debating. Problems of coaching. Sources of materials. This course carries university credit for the first quarter of Public Speaking 55-56-57. (3 cr.; jr., sr.; prereq., 41-42-43 or 45-46; II; MTWThFS; 308F.) MR. BRINGS.

81su. INTERPRETATIVE READING. The interpretation and oral reading of the various forms of literature, such as prose narrative, lyric and narrative poetry, the essay, and the drama. This course carries university credit for the first quarter of Public Speaking 81-82-83. (3 cr.; jr., sr.; prereq., 41-42-43 or 45-46; VI; MTWThF and 1 hr. to be arranged; 19Mu.) MRS. DINGWALL.

91su. PLAY PRODUCTION. Putting on the school play. Short course for teachers. Examination of plays, casting, coaching, movement, grouping, principles of stage color and of design in costuming and setting; stage management, lighting, mechanics, make-up. This course carries university credit for the first quarter of Public Speaking 91-92-93. (3 cr.; jr., sr.; prereq., Eng. 8, Pub. Sp. 81-82-83; VII; MTWThF and 1 hr. to be arranged; 19Mu.) MRS. DINGWALL.

Second Term

41su. PUBLIC SPEAKING. Effective speaking, breathing, voice production, enunciation, and action, delivery of selections from the works of well-known writers and speakers, principles of speech-making applied in both oral and written compositions. Voice and speech correction. This course carries university credit for the first quarter of Public Speaking 41-42-43. (3 cr.; soph., jr., sr.; prereq., Rhet. A-B-C, 1-2-3, or 4-5-6; I; MTWThFS; 308F.) MR. ROGERS.

42su. PUBLIC SPEAKING. A continuation of 41su. This course carries university credit for the second quarter of Public Speaking 41-42-43. (3 cr.; soph., jr., sr.; prereq., Rhet. A-B-C, 1-2-3, or 4-5-6 and 41; II; MTWThFS; 308F.) MR. ROGERS.

GEOLOGY

COURSES

First Term

1su. GENERAL GEOLOGY. An introductory study of the earth materials together with the processes and events that have marked the earth's development. Lectures, laboratory work, and field excursions. (5 cr.; not limited; no prereq.; I-II; TWThFS; 110P.) MR. STAUFFER.

61su. GEOGRAPHY OF COMMERCIAL PRODUCTION. The principal commodities of world trade, with reference to areas of origin and consumption and the geographic elements in their production. (3 cr.; soph., jr., sr.; no prereq.; II; MTWThF; 202aP.) MR. DAVIS.

71su. GEOGRAPHY OF NORTH AMERICA. A regional study of the United States, Canada, Alaska, Mexico, and the West Indies, with special reference to industrial and commercial conditions and opportunities and the distribution of population. (3 cr.; soph., jr., sr.; no prereq.; I; MTWThF; 202aP.) MR. DAVIS.

GERMAN

COURSES

First Term

1su. BEGINNING A. Pronunciation, conversation, grammar, and composition; selected readings in easy prose and verse. (5 cr.; not limited; no prereq.; I-II; MTWThF; 209F.) MR. DOWNS.

3su. BEGINNING C. Selected texts from modern writers. (5 cr.; prereq., 2; VII-VIII; MTWThF; 209½F.) MR. LUSSKY.

4su. RAPID READING. Selections from modern narrative prose. (5 cr.; not limited; prereq., 1-2-3; I-II; MTWThF; 207F.) MR. DAVIES.

63su. MODERN DRAMA. Plays of modern dramatists, Hauptmann, Sudermann, Fulda, and others. (3 cr.; jr. sr.; prereq., 4 or 8; III-IV; MWF; 209F.) MR. DOWNS.

125su. LITERARY PROBLEMS. Reformation and Renaissance (1500-1700) intended primarily for graduates. (3 cr.; sr., grad.; prereq., ar.; ar.; 209½F.) MR. LUSSKY.

160su. LYRIC POETRY OF THE EIGHTEENTH AND NINETEENTH CENTURY. Historical review and study of the best lyric poetry and chief writers. The work this quarter limited to eighteenth-century lyrics and poets. (3 cr.; sr., grad.; prereq., 66-67 or equiv.; ar.; 207F.) MR. DAVIES.

Second Term

2su. BEGINNING B. Continuation of Course 1. (5 cr.; fr., soph.; prereq., 1; I-II; MTWThF; 207F.) MR. KROESCH.

126su. LITERARY PROBLEMS: THE MIDDLE HIGH GERMAN POPULAR EPIC. The Nibelungenlied. (3 cr.; grad.; ar.; 208F.) MR. KROESCH.

GREEK

COURSES

First Term

1su. BEGINNING GREEK. Grammar, composition, word formations, oral exercises, and selected readings in simple prose. (4 cr.; all; no prereq.; I-II; MTWTh; 113F.) MISS STRONG.

7su. EVERYDAY GREEK. A brief course in Greek sources of English words. The practical purpose is to enable students to trace the origin and feel the force of English words derived from Greek, and especially of scientific terms. (2 cr.; all; prereq., 1 yr. of language; IV; MTWTh; 113F.) MISS STRONG.

COURSES FOR WHICH NO KNOWLEDGE OF GREEK IS REQUIRED

42su. GREEK SCULPTURE. Development of Greek sculpture from its beginnings will be traced; famous statues, friezes, reliefs, and monuments will be shown and described; personalities of the great sculptors and their special contributions to art will be considered. (2 cr.; all; no prereq.; II; MTWTh; 114F.) MR. SAVAGE.

44su. GREEK LITERATURE AND LIFE. Lectures, textbook work, illustrative and assigned readings. The character and influence of Greek culture, especially in literature, philosophy, and art, will be discussed; the whole course will be richly illustrated with the stereopticon. (2 cr.; all; no prereq.; III; MTWF; 114F.) MR. SAVAGE.

45su. GREEK MYTHOLOGY. Lectures, readings, and textbook work dealing with the legends which appear in the literature and art of ancient Greece; stereopticon illustrations. The myth will be presented and interpreted; its origin, evolution, and influence will be discussed. (2 cr.; all; no prereq.; IV; MTWTh; 114F.) MR. SAVAGE.

HISTORY

COURSES

First Term

2Asu. MODERN WORLD, 1799-1852. A survey of the leading political, social, and economic phases of this period, stressing those which were most influential in producing the modern world. (2½ cr.; fr., soph., jr., sr.; no prereq.; VII; MTWFS; 111Lib.) MR. NEWHALL.

4Bsu. ENGLAND, 1760-1914. A historical survey dealing chiefly with those political, social, and economic movements which have combined to create the England of today. (2½ cr.; fr., soph., jr., sr.; no prereq., III; MTWFS; 112Lib.) MR. STEPHENSON.

15su. RECENT UNITED STATES. A general survey of the period since 1877. (3 cr.; soph., jr., sr.; no prereq.; II; MTWThFS; 111Lib.) MR. SHIPPEE.

18su. POLITICAL HISTORY OF GREECE. A history of Greece to the death of Alexander the Great. (3 cr.; fr., soph., jr., sr.; no prereq.; I; MTWThFS; 109F.) MR. CRAM.

22su. UNITED STATES, 1844-77. The second half of the general course in American history required of all majors in history. (5 cr.; soph., jr., sr.; no prereq.; I, III; MTWThF; 111Lib.) MR. SHIPPEE and assistant.

101su. FRENCH REVOLUTION, 1789-95. A study of the formative side of the French Revolution based on a preliminary consideration of the old régime. (3 cr.; jr., sr., grad.; prereq., 20 cr. in social science including 10 cr. in history. Reading knowledge of French desirable; IV; MTWThFS; 112Lib.) MR. ROBINSON.

116su. BRITISH EMPIRE SINCE 1815. A study of the British oversea empire as it has taken form during the last hundred years. (3 cr.; jr., sr., grad.; prereq., 20 cr. in social science or 15 cr. in history; V; MTWThFS; 112Lib.) MR. ROBINSON.

123su. THE RENAISSANCE. A study of political, cultural, and artistic movements. (3 cr.; jr., sr., grad.; prereq., 15 cr. in history; V; MTWThFS; 111Lib.) MR. NEWHALL.

141su. THE WEST IN AMERICAN HISTORY TO 1815. (3 cr.; jr., sr., grad.; prereq. 20 cr. in social sciences including a general course in American history; I; MTWThFS; 112Lib.) MR. BUCK.

143su. AMERICAN POLITICAL PARTIES. Rise and development of the parties and party system, with some attention to the more important presidential campaigns. (3 cr.; jr., sr., grad.; prereq., 20 cr. in social sciences including general course in American history; II; MTWThFS; 112Lib.) MR. STEPHENSON.

169su. SELECT TOPICS: HISTORY OF THE WEST. Students registered in this course will be required to attend lectures in History 141 and may be asked to do a part of the work in the library of the Historical Society, St. Paul. (3 cr.; sr., grad.; prereq., 20 cr. including the general course in American history; ar.) MR. BUCK.

173su. SELECT TOPICS: HISTORY OF AMERICAN PARTIES. Students registered for this course will be required to attend lectures in History 143. (3 cr.; sr., grad.; prereq., 20 cr. including general course in American history; ar.) MR. STEPHENSON.

176su. SELECTED TOPICS IN LATER MIDDLE AGES AND RENAISSANCE. Students will be required to attend meetings of History 123su. (3 cr.; sr., grad.; prereq., 20 cr., reading knowledge of French or German and high school Latin; ar.) MR. NEWHALL.

185su. SELECT TOPICS: BRITISH EMPIRE. Students registered in this course will be required to attend the lectures in History 110. (3 cr.; sr., grad.; prereq., 20 cr. in history; ar.) MR. ROBINSON.

Second Term

2Bsu. MODERN WORLD, 1852-1914. A survey of the leading political, social and economic factors which produce the world of today. (2½ cr.; fr., soph., jr., sr.; no prereq.; II; MTWThF; 112Lib.) MR. KREY.

20su. AMERICAN COLONIAL HISTORY. A general survey of the colonial period, with some emphasis on the struggle between the French and British, and the causes of the American Revolution. (3 cr.; fr., soph., jr., sr.; no prereq.; I; MTWThFS; 111Lib.) MR. STEVENS.

138su. WORLD WAR. A study of the world war with especial attention to its diplomatic features, some consideration of post-war Europe. 3 cr.; jr., sr., grad.; prereq., 20 cr. in social science group including general course in European history; III; MTWThFS; 111Lib.) MR. STEVENS.

175su. TOPICS IN MEDIEVAL CIVILIZATION. (3 cr.; sr., grad.; 20 cr., knowledge of at least high school Latin; ar.; 220Lib.) MR. KREY.

LATIN

COURSES

First Term

18su. POLITICAL HISTORY OF GREECE. A political history of Greece to the death of Alexander the Great. (3 cr.; soph., jr., sr., grad.; no prereq.; I; MTWThFS; 109F.) MR. CRAM.

131su. JUVENAL. Translation and study of the principal satires of Juvenal. (3 cr.; jr., sr., grad.; prereq., any two of the Courses 51, 52, 53 or six years of Latin (with credit). Without credit consult instructor; II; MTWThFS; 109F.) MR. CRAM.

LIBRARY METHODS

COURSES

A group of courses in library methods, supplementing those given last year, will be offered at the University of Minnesota Summer Session, June 21 to July 31. The subjects in which it is expected courses will be offered are: principles of book selection, cataloging, classification, and subject headings. The last two courses will be very elementary and are intended both for teacher librarians and as a preliminary to more advanced courses to be

offered later. Courses in school library administration and book selection for school libraries (based on the lists of the Minnesota State Department of Education) will be offered by Miss Alma Penrose, of the University High School.

A separate circular will be published later and sent on request.

MATHEMATICS

COURSES

First Term

1su. HIGHER ALGEBRA. A review and a collegiate treatment of the topics of elementary algebra for those who have had one year of elementary algebra. Not open to those who presented higher algebra for entrance. (5 cr.; all; prereq., 1 yr. elementary algebra; VI-VII; MTWThF; 105F.) MR. MCEWEN.

6su. TRIGONOMETRY. Logarithms and plane trigonometry. (5 cr.; all; prereq., 1 or prep. higher algebra; VI-VII; MTWThF; 104F.) MR. PHIPPS.

7su. COLLEGE ALGEBRA. Quadratic equations, equations in the quadratic form, simultaneous quadratic equations, graphical representation, progressions, mathematical induction, the binomial theorem, permutations, combinations, probability, determinants, and the theory of equations with special reference to graphical methods. (5 cr.; all; prereq., 1 or prep. higher algebra.; III; MTWThF; IV; MTWFS; 101F.) MR. JACKSON, MR. MCEWEN.

30su. ANALYTICAL GEOMETRY. The elements of plane analytical geometry including the geometry of the conic sections, with a brief introduction to solid analytical geometry. (5 cr.; all; prereq., 6, 7; I-II; MTWThF; 102F.) MR. BRINK, MR. PHIPPS.

50su. CALCULUS I. Differential calculus. (5 cr.; pr., sr.; prereq., 30; I-II; MTWThF; 105F.) MR. UNDERHILL.

165su.* SELECTED TOPICS IN ADVANCED MATHEMATICS. An intensive course open to juniors, seniors, and graduates, who will be guided through conferences and criticism in the study of assigned topics. (Cr. ar.; jr., sr., grad.; prereq., 50, 51, differential and integral calculus; ar.) MR. BRINK, MR. JACKSON, MR. UNDERHILL.

Second Term

6su. TRIGONOMETRY. Logarithms and plane trigonometry. (5 cr.; all; prereq., 1 or prep. higher algebra; III, IV; MTWThF; 104F.) MR. PHIPPS.

* The number of credits is three or more according to the amount of work done. The following topics, each for at least 3 credits, will be given in 1924. Students interested in one or more of them should reserve the hour indicated: "Vector Analysis" by Mr. Jackson (II hour), "Differential Equations" by Mr. Underhill (I hour), "Interpolation" by Mr. Brink (III hour).

51su. CALCULUS II. Integral calculus. (5 cr.; jr., sr.; prereq., 50; I, II; MTWThF; 105F.) MR. HART, MR. PHIPPS.

165su.[1] SELECTED TOPICS IN ADVANCED MATHEMATICS. (Cr. ar.; jr., sr., grad.; prereq., 50, 51; ar.) MR. HART.

MUSIC

FEES

The courses below, for which no special fee is indicated, may be taken by Summer Session students on payment of the regular Summer Session fee. Students who pay as much as $36 per term for special music fees may enroll for other courses in any department of the Summer Session, for an additional fee of $14 per term, making a total of $50 for general and special fees. All students who register for either the general courses or the special fee courses must pay the $2 deposit.

COURSES

First Term

1su. HARMONY. The study of chords, their construction, relations, and progressions. Written exercises on bases, the harmonization of given melodies. (3 cr.; no prereq.; VI-VII; MWF; 103Mu.) MR. SCOTT.

3su. HARMONY. A continuation of Harmony 1su, which offers the work of the third quarter of the regular year. (3 cr.; prereq., 1-2; III-IV; MWF; Mu.) MR. SCOTT.

13su.[2] CLASS INSTRUMENT-TEACHING. Three classes, string, wood winds, and brass and percussion. Students may enter any or all classes. The course will contain drills, methods, and material for use in class instrument-teaching in the public schools. (1 cr. each; strings, II; wood winds, III; brass, IV; TS; 3Mu.) MR. PEPINSKY.

39su. PIANO. Open to those who have mastered technical difficulties of the degree of Czerny's *School of Velocity* and the easier Haydn and Mozart sonatas. Two lessons a week. Fee $36. (2 cr.; ar.; Mu.) MISS KENDALL, MR. ———

42su. ORCHESTRA. Laboratory for the study of orchestral literature, symphonic and miscellaneous. Orchestra will assist in campus functions and enter with the student body in the maintenance of a true campus spirit. Applicants will bring their own instruments. (1 cr.; IX, X; M; Mu Aud.) MR. PEPINSKY.

45su. CHORUS. Choral singing. Open to all University students. (1 cr.; IX; TTh; Mu.) MR. KILLEEN.

51su. VIOLIN. Open to students who are qualified to play the first ten of Kreutzer's *Forty Etudes*, and the easier Handel and Mozart sonatas. Two lessons a week. Fee $36. (2 cr.; ar.; Mu.) MR. SCHEURER.

63su. VOICE. Thoro training in relaxation and breath control, the foundation of tone production. Advantages offered to advanced singers in

[1] The number of credits is 3 or more according to the amount of work done.

[2] The three subjects may be taken concurrently.

study of the best in vocal literature, songs, oratorio, and opera. Two lessons a week. Fee $36. (2 cr.; ar.; Mu.) Mr. Killeen, Miss Hull.

75su. Public School Music for the Grades. Grade methods. (See College of Education announcement, page 105.) (3 cr.; I-II; MWF.) Mr. Beattie.

78su. Public School Music for High Schools. (See College of Education announcement, page 105.) (3 cr.; prereq., 75; III-IV; MWF; Mu.) Mr. Beattie.

93su. Normal Course for Teaching of Voice. A lecture course in which principles of teaching, breathing, voice-placing, and development of vocal technique are discussed. (2 cr.; VII-VIII; TTh; ar.; Mu.) Mr. Killeen.

94su. Sight Reading, Accompanying, and Ensemble Playing. Study of chamber music literature, for various combinations of instruments. Simple sonata literature used for sight reading and accompanying, after which the more serious ensemble literature will be reviewed. (2 cr.; VI, VII; TTh; 3Mu.) Mr. Pepinsky.

100su. Organ. Open to students who play piano music of an intermediate grade. Two lessons a week. Fee $36. (2 cr.; ar.; Mu.) Mr. Fairclough.

Second Term

Piano, voice, violin, and organ, if registration warrants.

PHILOSOPHY

COURSES

First Term

2su. Logic. An introduction to a theory of knowledge, a survey of the more common intellectual fallacies, with training in the appreciation and use of distinctions. (5 cr.; open to all; no prereq.; I-II; MTWThF; 322F.) Mr. Swenson.

102su. Philosophy of Religion. A study of typical religious attitudes towards life, compared with other, non-religious life-attitudes; a critical evaluation of the scientific and metaphysical "proofs" and objections pertinent to religious belief. (3 cr.; jr., sr., grad.; prereq., 10 credits in philosophy or psychology; mature students by special permission; VII; MTWThFS; 322F.) Mr. Swenson.

PHYSICS

COURSES

First Term

1su. Elements of Mechanics. Mechanics of solids, liquids, and wave motion. Study of the simple fundamental principles. The first part of the General Course 1, 21, 31, 41. Course 2 should be taken in conjunction with this course. Part of the required work in physics in

the pre-medical and engineering courses. (3 cr.; prereq., trig. the equiv. of 6; lect., I, II; MWF; quiz, I; S; 30Ph.) MR. TATE.

2su.[1] MECHANICS LABORATORY PRACTICE. Measurements in the mechanics of solids, liquids, and wave motion. The laboratory part supplements Course 1. (1 cr.; prereq., 1 or reg. in 1; lab. I, II; TTh; 16Ph.) MR. TATE.

41su. MAGNETISM AND ELECTRICITY. A study of the principles underlying magnetic and electrical phenomena. Course 42 should be taken in conjunction with this course. This course is a part of the required work in physics in the pre-medical and engineering courses. (3 cr.; prereq., 1; lect., I-II; TThS; quiz, I; M; 30Ph.) MR. ZELENY.

42su.[1] ELECTRICAL LABORATORY. The laboratory part supplementing Course 41. Two two-hour sessions in laboratory a week. (1 cr.; prereq., 1, 41 or reg. in 41; lab., III-IV; WF; 32Ph.) MR. ZELENY.

102su.[1] ADVANCED PHYSICAL MEASUREMENTS. Individual work in the laboratory on topics especially chosen to serve the best needs and capacity of each student. (3 cr.; prereq., 12 cr. in phys.; V-VIII; MWF.) MR. ERIKSON.

125su. ATOMIC STRUCTURE. The Bohr-Somerfeld theory of atomic structure and its application to a study of X-rays, radioactivity, resonance, and ionization potentials; photoelectricity; spectrum series and fine structure. Three two-hour lectures a week. (3 cr.; prereq., 12 cr. in phys., Math. 51; III-IV; MWF; 16Ph.) MR. TATE.

142su.[1] ADVANCED ELECTRICAL MEASUREMENTS. Devoted mainly to the study of potentiometer methods, capacity, inductance, resistance, magnetic flux. (3 cr.; prereq., 12 cr. in phys.; V-VIII; MWF; 32Ph.) MR. ZELENY.

145su.[1] RADIOACTIVITY AND X-RAYS. The various theories and methods of investigation. (3 cr.; prereq., 12 cr. in phys.; I-IV; MWF.) MR. ERIKSON.

Second Term

21su. HEAT. A study of the principles underlying heat phenomena. Course 22 should be taken in conjunction with this course. This course is a part of the required work in physics in the pre-medical and engineering courses. (3 cr.; prereq., 1; lect., I, II; MWF; quiz; I; S; 30Ph.) MR. MILLER.

22su.[1] HEAT LABORATORY. The laboratory part supplementing Course 21. Two two-hour sessions in the laboratory a week. (1 cr.; lab., I, II; TTh; 23Ph.) MR. MILLER.

31su. OPTICS. A study of the principles underlying light phenomena. Course 32 should be taken in conjunction with this course. (3 cr.; prereq., 1; lect., I-II; TThS; quiz, I; F; 30Ph.) MR. VALASEK.

[1] A laboratory fee of $1.50 is charged for this course.

32su.[1] OPTICS LABORATORY. The laboratory part supplementing Course 31. Two two-hour sessions in the laboratory a week. (1 cr.; lab., I-II; MW; 23Ph.) MR. VALASEK.

122su. PYROMETRY AND HEAT. An experimental study of pyrometry, heat quantity, heat transfer, hygrometry, and gas liquefaction. One lecture, two three-hour sessions in the laboratory a week. (3 cr.; prereq., 12 cr. in phys.; V-VIII; MWF; 23Ph.) MR. MILLER.

132su. APPLIED OPTICS. Experimental work on special optical problems. (3 cr.; V-VIII; MWF; 23Ph.) MR. VALASEK.

POLITICAL SCIENCE

COURSES

First Term

1su. AMERICAN GOVERNMENT. Origin and nature of the American governmental system; organization and actual workings of the national government today. (4 cr.; no prereq.; III-IV; TWTh; 102B.) MR. WEST.

11su. MUNICIPAL GOVERNMENT. The growth of cities; their legal status; municipal organization in the United States including the mayor and council commission and city manager plans; municipal organization abroad. (4 cr.; prereq., 1 or 7; I-II; TWThF; 102B.) MR. ANDERSON.

25su. WORLD POLITICS. A study of the foreign policies and international relations of the leading European powers today. (4 cr.; 3rd quarter fr., soph., jr., sr., grad.; prereq., History 1-2 or Political Science 1 and 10 credits in history; VI-VII; TWThF; 109B.) MR. QUIGLEY.

102su. POLITICAL PARTIES. The nature, function, organization, and methods of political parties; legal control of parties and elections; public opinion as factor in popular government. (2 cr.; jr., sr., grad.; prereq., 10 cr.; I; TWThF; 213B.) MR. WEST.

111su. MUNICIPAL FUNCTIONS. The historical development and present range of municipal activities; problems of police, welfare, education, streets, water supply, sanitation, and public utilities, municipal ownership; city-planning. (2 cr.; jr., sr., grad.; prereq., Courses 11, or 20 credits in social science; III; TWThF; 213B.) MR. ANDERSON.

137su. FAR EASTERN DIPLOMACY. Early contacts between Japan and China, the policy of exclusion gradually overcome by western powers; the opening of the Far East in the nineteenth century; the contemporary situation. (2 cr.; jr., sr., grad.; prereq., 20 credits in social science; IV; TWThF; 213B.) MR. QUIGLEY.

Second Term

1su. AMERICAN GOVERNMENT. See description for first term. (4 cr.; no prereq.; I-II; TWThF; 102B.) MR. ALLIN.

7su. STATE GOVERNMENT. A comparative study of American state governments. The adoption and amendment of constitutions; organization,

[1] A laboratory fee of $1.50 is charged for this course.

powers, and methods of the three departments; problems of administrative reorganization. (4 cr.; prereq., 1 or reg. in 1; III-IV; TWThF; 209B.) MR. LAMBIE.

131su. PUBLIC ADMINISTRATION. Source of administrative power; administrative areas; organization of departments; personnel, and related civil service problems including classification, training, appointment, promotion, salary determination, and superannuation; the budget; purchasing; control over administration; public service as a career. (2 cr.; jr., sr., grad.; prereq., 20 cr. in social science; I; TWThF; 209B.) MR. LAMBIE.

161su. COMPARATIVE FEDERAL GOVERNMENT. Ancient and modern federal unions and confederations. (2 cr.; prereq., 20 cr. in social science; IV; TWThF; 102B.) MR. ALLIN.

PSYCHOLOGY

COURSES

1su,2su. GENERAL PSYCHOLOGY. The fundamental facts and laws of mental life with emphasis upon the results of experimental methods of investigation. Lectures, recitations, and demonstrations. (6 cr.; soph., jr., sr.; no prereq.; lect., V; MTWThFS; MuAud; Sec. 1, I; MTWThF; 115Psy; Sec. 2, II; MTWThF; 115Psy; Sec. 3, III; MTWThF; 115Psy; Sec. 4, VI; MTWThF; 115Psy; Sec. 5, VII; MTWThF; 115Psy.) MR. FOSTER, MR. BIRD, MR. ————.

3su. PSYCHOLOGY APPLIED TO DAILY LIFE. The application of psychology to selected problems in medicine, law, education, sociology, and daily life. (3 cr.; soph., jr., sr.; prereq., 1, 2; II; MTWThFS; 109Psy.) MR. PATERSON.

107su. VOCATIONAL AND EMPLOYMENT PSYCHOLOGY. Psychology of individual differences in intelligence, aptitudes, interests, and training with special reference to vocational guidance and personnel methods in education and industry. (3 cr.; soph., jr., sr., grad.; prereq., elementary psychology; IV; MTWThFS; 109Psy.) MR. PATERSON.

111su. RESEARCH PROBLEMS IN APPLIED PSYCHOLOGY. Permission of the instructor to elect this course must be secured. (2 cr.; permission of instructor required; prereq., advanced preparation; ar.; ar.) MR. PATERSON.

131su. RESEARCH PROBLEMS IN GENERAL OR EXPERIMENTAL PSYCHOLOGY. For students qualified for research work in experimental problems in general psychology through intensive work in the literature of the subject. Students will be guided through conferences; the hours to be arranged. (2 cr.; permission of instructor required; prereq., advanced preparation; ar.; ar.) MR. FOSTER.

Second Term

1su,2su. GENERAL PSYCHOLOGY. (See 1su, 2su above.) (5 cr.; soph., jr., sr.; no prereq.; lect., V; MTWThFS; 115Psy; Sec. 1, I; MTWThF;

115Psy; Sec. 2, III; MTWThF; 115Psy; Sec. 3, VI; MTWThF; 115Psy.) MR. BIRD, MR. ————.

ROMANCE LANGUAGES

COURSES IN FRENCH

First Term

1su. BEGINNING COURSE. For beginners in French. Attention given to teaching of pronunciation by aid of phonetic symbols, to systematic presentation of grammar, to conversation, to reading, and to methods of teaching. Modified direct method used throughout course. (4 cr.; no prereq.; III; MTWF; IV; TWThF; 202F.) MR. BARTON.

2su. BEGINNING COURSE (second quarter). Special attention is given to conversation and pronunciation. Complete review of grammar. Reading and composition. (4 cr.; all; prereq., 1; VI-VII; TWThF; 202F.) MR. SEARLES.

3su. INTERMEDIATE COURSE. Reading and discussion in French of representative modern authors. Composition. (4 cr.; prereq., 1, 2; I-II; TWThF; 202F.) MR. GILLET.

20su. ORAL AND WRITTEN FRENCH. Conversation and composition. Conducted in French. (2 cr.; prereq., 4; V; TWThF; 202F.) MR. CLEFTON.

83su. LECTURES IN FRENCH. Readings and discussion, conducted in French. (2 cr.; soph., jr., sr.; prereq., 20; VII; TWThF; 202F.) MR. GILLET.

111su. RESEARCH. Adapted to individual needs of advanced students. (Cr. ar.; ar.) MR. SEARLES.

Second Term

2su.* BEGINNING FRENCH (second quarter). Continuation of French 1su. (4 cr.; prereq., 1; III; MTWF; IV; TWThF; 202F.) MR. LUNDEBERG.

4su.* INTERMEDIATE FRENCH. A continuation of French 2 and 3. (4 cr.; prereq., 2, 3; VI-VII; TWThF; 202F.) MR. KING.

20asu. ORAL AND WRITTEN FRENCH. Continuation of French 20. (2 cr.; all; prereq., 4 or 20; V; TWThF; 202F.) MR. LUNDEBERG.

COURSES IN SPANISH

First Term

1su. BEGINNING COURSE. This course is intended for beginners in Spanish. Particular attention will be given to pronunciation, thoro grammar drill, reading of selected prose, and methods of teaching. Modified direct method will be used throughout the course. (4 cr.; no prereq.; III; MTWF; IV; TWThF; 201F.) MR. CLEFTON.

3su. INTERMEDIATE COURSE. Reading and discussion in Spanish of representative modern authors. Composition. (4 cr.; all; prereq., 1-2; I-II; TWThF; 201F.) MR. TORRES.

* French 2su and 4su (second term) cannot both be offered. The course having the larger registration will be given.

20su. ORAL AND WRITTEN SPANISH. Conversation and composition. (2 cr.; all; prereq., 3-4; V; TWThF; 201F.) MR. BARTON.

83su. SPANISH LECTURES. Reading and discussion. Conducted in Spanish. (2 cr.; soph., jr., sr.; prereq., 20; VI; TWThF; 201F.) MR. TORRES.

Second Term

2su.* BEGINNING SPANISH. A continuation of Spanish 1. (4 cr.; all; prereq., 1; III-IV; TWThF; 201F.) MR. GILLET.

4su.* INTERMEDIATE SPANISH. A continuation of Spanish 2 and 3. (4 cr.; all; prereq., 2 or 3; I-II; TWThF; 201F.)

20asu. ORAL AND WRITTEN SPANISH. A continuation of 20su. (2 cr.; all; prereq., 4 or 20su; V; TWThF; 201F.) MR. GILLET.

SCANDINAVIAN

COURSES

First Term

1su. BEGINNING NORWEGIAN. Grammar, composition, select readings in easy prose and poetry. (5 cr.; no prereq.; MTWThF; ar.; 206F.) MR. BOTHNE.

5su. NORWEGIAN SURVEY. Prose and poetry. (5 cr.; prereq., 1-4 or equiv.; MTWThF; ar.; 206F.) MR. BOTHNE.

110su. IBSEN (in Norwegian). Lectures, reading, and interpretation. (3 cr.; jr., sr., grad.; prereq., 101-103 or equiv.; ar.; 206F.) MR. BOTHNE.

SOCIOLOGY

COURSES

First Term

1su. INTRODUCTION TO SOCIOLOGY. A study of the origin and development of human societies; various agencies which have determined the type of social life; social organization, institutions, and progress; bearing of sociology upon other social sciences and arts. (3 cr.; no prereq.; Sec. 1; I; MTWThFS; Sec. 2, V; MTWThFS; 5F.) MR. PHIPPS, MR. MARKEY.

6su. MODERN SOCIAL REFORM MOVEMENTS. A survey of attempts to overcome certain social maladjustments; child labor; the city, bad housing, poverty, degeneracy; movements for public health, industrial democracy, social insurance, protection of infancy and youth, public recreation, etc. (3 cr.; prereq., Soc. 1; VI; MTWThFS; 5F.) MR. CLARKE.

14su. RURAL SOCIOLOGY. The background and evolution of country life; rural conveniences, communication, co-operation; rural social institutions, especially the family, school, church, and social center; rural leadership, surveys, organization, social agencies. (3 cr.; prereq., Soc. 1; IV; MTWThFS; 5F.) MR. HOFFER.

* Spanish 2su and Spanish 4su (second term) cannot both be offered. The course having the larger registration will be given.

45su. SOCIAL STATISTICS. Statistical method applied to the study of population and problems of group living. Especially designed to give social workers and public health officers the training necessary to carry on their work successfully. (5 cr.; soph., jr., sr.; prereq., Soc. 1; II-III; MTWThF.) MR. CHAPIN.

51su. THE SOCIALLY INADEQUATE. The occurrence of the socially inadequate; discussion of causative factors; outline of plans and theories of treatment. (3 cr.; jr., sr.; prereq., 10 cred. in soc.; or Soc. 1 and 10 cred. in soc. sci. or psych.; MTWThFS; I; 9F.) MR. BRUNO.

90su. ELEMENTARY FIELD WORK. Designed to give first-hand knowledge of the conditions out of which dependency develops by field work with a social service agency. (2 cr.; prereq., Soc. 51; ar.) MISS SALSBERRY.

92su. ELEMENTARY FIELD WORK. Field work on special research problems, depending upon proficiency attained in 9 and 91. (2 cr.; prereq., 91; jr., sr.; ar.) MISS SALSBERRY.

102su. SOCIAL CONTROL. Nature, purpose, and methods of social control; institutional and non-institutional controls; the evolution of sanctions in social control; the revision of the social controls under the influence of modern science. (3 cr.; jr., sr., grad.; prereq., 4 courses in soc. or Soc. 1, and 15 cred. in soc. sci., educ., phil., or psych.; VI; MTWThFS; 9F.) MR. FINNEY.

103su. SOCIOLOGY OF CONFLICT. An appraisal of competition, combat, and co-operation; causes, manifestations, results, and cures of conflict between nations, races, religions, and economic and social classes. (3 cr.; jr., sr., grad.; prereq., 4 courses in soc. or Soc. 1, and 15 cr. in soc. sci., educ., phil., or psych.; VI; MTWThFS; 9F.) MR. FINNEY.

119su. THE FAMILY. The evolution of the family; its various forms and their relation to other social institutions; the rôle of the family in social evolution; contemporary problems of the family. (3 cr.; jr., sr., grad.; prereq., 4 courses in soc. or Soc. 1 and 15 cr. in soc. sci., educ., phil., or psych.; VI; MTWThF and 1 hr. ar.; 6F.) MR. ELMER.

122su. METHODS OF SOCIAL INVESTIGATION. A study of progress in methods of social investigation; a critical study of the scientific method applied to social phenomena; survey of some specific community or study of a specific problem; field work and analysis of material (in lieu of textbooks, a laboratory fee of $2 is charged to cover necessary materials). (3 cr.; jr., sr., grad.; prereq., 4 courses in soc., or Soc. 1 and 15 cr. in soc. sci., educ., phil., or psych; III, IV; MWF; 9F.) MR. ELMER.

134su. LEGAL PROTECTION OF THE CHILD. A study of the relations of law to child welfare. A survey of existing children's protective legislation, of its administration, and its future development. (3 cr.; prereq., 51, 52; I; MTWThFS; 6F.) MR. HODSON.

143su. APPLICATIONS OF SOCIAL PSYCHIATRY IN SOCIAL WORK AND EDUCATION. Special attention will be given to the rural problem. (3 cr.; prereq., Soc. 1 or 14 and 52. V.) DR. LOWREY.

153su. ADVANCED FIELD WORK. This is a course in technique open to such students as wish to strengthen their experience in case work. (3 cr.; jr., sr., grad.; prereq., Soc. 90 and 91; ar.) MISS SALSBERRY.

200su. RESEARCH SEMINAR. Research on special problems. Open only to graduates on approval of instructors. Offers the opportunity for investigation of special problems under supervision. Credit will be assigned according to the amount and quality of work done. (Grad.; ar.) MR. BRUNO, MR. CHAPIN, MR. CLARKE, MR. ELMER, MR. FINNEY, DR. LOWREY.

Second Term

1su. Same as course given first term.

6su. Same as course given first term.

14su. Same as course given first term.

158su. THE SOCIOLOGY OF REVOLUTION with special reference to the Russian situation. (3 cr.; jr., sr., grad.; prereq., one course in soc.) MR. SOROKIN.

159su. SOCIAL MORPHOLOGY AND SOCIAL PROCESSES. (3 cr.; jr., sr., grad.; prereq., two courses in soc.) MR. SOROKIN.

PHYSICAL EDUCATION AND ATHLETICS

PHYSICAL EDUCATION FOR MEN

The gymnasium, tennis courts, baseball diamonds, and running track will be available to men students at all times except on Sundays.

COURSES

First Term

A. General Exercise. Volleyball, baseball, handball, playground ball, basket-ball, tennis, golf, horseshoes, gymnastic games. No registration required. Open to students and faculty. (No cr.; no prereq.; all; IX; MTWThF; A.) Mr. Smith.

B. General Swimming. No instruction. No registration required. (No cr.; no prereq.; all; Sec. 1, V; Sec. 2, IX; Sec. 3, X; MTWThF; A.) Mr. Thorpe.

13. Elementary Swimming. Individual instruction for those who cannot swim. (No cr.; no prereq.; all; IV; MTWThF; A.) Mr. Thorpe.

14. Intermediate Swimming. Individual instruction given. (No cr.; no prereq.; all; VII; MTWThF; A.) Mr. Thorpe.

15. Advanced Swimming. For teachers and coaches. Instruction in form and speed swimming, diving, plunging, water sports, life-saving. (1 cr; no prereq.; soph., jr., sr.; VIII; MTWThF; A.) Mr. Thorpe.

17. School Gymnastics. Tactics, free exercises, tumbling and apparatus work, suitable for upper grades and high schools, in the school room and in the gymnasium. (1 cr.; no prereq.; jr., sr.; IV; MTWThF; A.) Mr. Taylor.

19. Playground and Gymnasium Games. Lectures on the place of play in education, on organization and supervision of competitive athletics, rules, theory, form and methods of coaching playground ball, baseball, basket-ball, tennis, volley-ball, handball, dodge-ball, soccer, tumbling, track athletics. (1 cr.; no prereq.; soph., jr., sr.; VI; MWF; A.) Mr. Smith.

20. Playground Supervision. Open also to women. Practice coaching and supervising with a group of forty junior high school boys. (1 cr.; no prereq. if taken with Course 19; soph., jr., sr.; Sec. 1, VII; Sec. 2, VIII; Sec. 3, IX; MTWThF; A.) Mr. Smith, Mr. Taylor.

23. Technique on Gymnastic Teaching. Lectures and quizzes on terminology and methods of teaching. (1 cr.; no prereq.; jr., sr.; VI; TTh; A.) Mr. Taylor.

27. Scouting. Backgrounds of scouting; organizing and conducting a troop; program for meetings and special events; games and stunts; scoutcraft; tenderfoot and second class tests; first aid, map-making; signalling, handicraft and woodcraft; nature study; hiking; camping. (2 cr.; no prereq.; all; VII; 3 hrs. field work to be arranged; MTWThF; A.)

30. ATHLETIC TRAINING AND FIRST AID. Principles governing conditioning of men for various sports; diet, sleep, exercise, bathing, massage. Overtraining; its cause, diagnosis, prevention, and cure. Prevention, first aid treatment and care of common injuries of the athletic field and gymnasium. (1 cr.; no prereq.; jr., sr.; I; MWF; A.) MR. METCALF.

34. PHYSICAL EDUCATION IN THE PUBLIC SCHOOLS. Aims and scope of physical education in the schools. Comparative value of different activities; activities suitable to different ages, sexes, and varying conditions. Problems of organization, administration, and supervision. Open also to women. (2 cr.; no prereq.; jr., sr.; VII; TWThF; A.) MR. LUEHRING.

35. ATHLETIC ORGANIZATION AND ADMINISTRATION. Discussion of place of athletics in physical education program; organization for athletic control; schedule-making; construction and maintenance of athletic fields; purchase and care of equipment; eligibility problems; management of contests; financial accounting; insignia; awards. (1 cr.; no prereq.; jr., sr.; III; TS; A.) MR. LUEHRING.

37. FOOTBALL. Lectures on history, rules, and theory, strategy, and generalship, styles of attack and defense, methods of organizing practice and handling men, development of team spirit, officiating. Demonstrations and practice in the technique of position, play and the mechanics of football fundamentals. (3 cr.; no prereq.; sr.; II, III; MWF; A.) MR. METCALF, MR. SPAULDING.

38. BASKET-BALL. Lectures on rules, styles of offense and defense, the conditioning and handling of a team. Practice in fundamentals of footwork, passing, dribbling, goal throwing, etc. (2 cr.; no prereq.; sr.; I, II; TThS; A.) MR. LUEHRING, MR. TAYLOR.

39. TRACK ATHLETICS. Instruction and practice in the standard track and field events. Lectures on conduct of meets, rules of competition, officiating, track strategy, regulation of practice, and preparing contestants for competition. (2 cr.; no prereq.; sr.; IV; MTWThF; A.) MR. METCALF.

See also Courses 1su and 2su in Physical Education for Women.

Second Term

A. GENERAL EXERCISE. See Course A above. (No. cr.; all; IX; MTWThF; A.) MR. TAYLOR.

B. GENERAL SWIMMING. No instruction. No registration required. (No cr.; no prereq.; all; Sec. 1, IX; Sec. 2, X; MTWThF; A.) MR. THORPE.

13. ELEMENTARY SWIMMING. See Course 13 above. (No cr.; no prereq.; all; VIII; MTWThF; A.) MR. THORPE.

14. INTERMEDIATE SWIMMING. See Course 14 above. (No cr.; no prereq.; all; VII; MTWThF; A.) MR. THORPE.

38. BASKET-BALL. See Course 38 above. (2 cr.; no prereq.; sr.; VII, VIII (4 weeks' course); MTWF; A.) MR. TAYLOR.

PHYSICAL EDUCATION FOR WOMEN

COURSES

First Term

1su. TEACHERS' COURSE IN GYMNASTICS. The technique is planned to help both those who are and who are not accustomed to some other method The practical part of the course will include some of the recent innovations in gymnastics. Open also to men. (2 cr.; no prereq.; III-IV; MTWFS; 201,153WGm.) MISS BAKER.

2su. TEACHERS' COURSE IN PLAY. Brief consideration of the nature and function of play, and adaptation to various groups of children; technique, rules and practice of games for Grades I-VI; practice teaching of children on playground. Open also to men. (3 cr.; no prereq.; II; MTWFS; VII-VIII, MTWThF; 201, 151WGm.) MISS GLASGOW, MISS CAMPBELL.

3su. INTERPRETIVE DANCING. An art and a phase of physical education designed to develop a sense of beauty and body control through rhythmic movements prompted by the imagination. (1 cr.; no prereq.; VI; MTWThF; 151WGm.) MISS BAKER.

31su. GENERAL SWIMMING. No registration necessary. (No cr.; no prereq.; 12:00 WF and VIII, TTh; 51WGm.) MISS CAMPBELL.

32su. ELEMENTARY SWIMMING. Class instruction given. Shower bath fee $1.50. Sections limited to 25. (No cr.; prereq., phys. exam.; Sec. 1, III; MWF; Sec. 2, IV; MWF; Sec. 3, IV; TThS; Sec. 4, IV ½; MWF; Sec. 5, VII; MWF; Sec. 6, VII ½; MWF; 51WGm.) MISS NELSON, MISS CAMPBELL.

33su. INTERMEDIATE SWIMMING. Class instruction given. Shower bath fee $1. (No cr.; all; prereq., swim. exam., phys. exam.; VII; TTh; 51WGm.) MISS NELSON.

34su. ADVANCED SWIMMING. Class instruction given. Shower bath fee $1. (No cr.; all; prereq., swim. exam., phys. exam.; VII½; TTh; 51WGm.) MISS CAMPBELL.

35su. TEACHERS' COURSE IN SWIMMING. Technique of strokes, methods of teaching beginners in classes; life-saving, theory and practice. Shower bath fee $2. (1 cr.; prereq., swim. exam., phys. exam.; VI; MTWThF; 51WGm.) MISS NELSON.

37su. ELEMENTARY AND INTERMEDIATE SWIMMING. Individual instruction. (No cr.; prereq., phys. exam.; IX; M; 7:30, Th; Gy.(F).) MISS NELSON.

See also Courses 20su and 34su in Physical Education for Men.

Second Term

The swimming pool will be open for general swimming without instruction 12 to 12:30, T, Th, and VII, MWF.

Courses 1su (Teachers' Course in Gymnastics) and 2su (Teachers' Course in Play) are open for registration by men students under regular enrolment or as auditors.

Courses in the Department of Physical Education and Athletics which are open to women:

Physical Education in Public Schools. MR. LUEHRING.

Playground Supervision. MR. SMITH.

Except for Courses 32, 33, 34, 35, in which shower bath fees are charged, students may procure shower bath tickets from the matron at fifteen cents apiece or at the rate of ten for one dollar.

COLLEGE OF ENGINEERING AND ARCHITECTURE

ARCHITECTURE

COURSES

First Term

31su. ELEMENTS OF ARCHITECTURE. Exercises in instrumental drawing and architectural lettering. Theory and practice of wash rendering. Library research. (3 cr.; fr. arch.; no prereq.; I, IV; MTWThF; 317E.) MR. DAWSON.

32su. ELEMENTS OF ARCHITECTURE. Original problems in the architectural treatment of walls, floors, windows, and moldings. Lectures and library research. (3 cr.; fr. arch.; prereq., 31; I, IV; MTWThF; 317E.) MR. DAWSON.

33su. ELEMENTS OF ARCHITECTURE. Study of the elements, forms, and principles of architecture. Original problems in their use in elementary architectural design. Lectures and library research. (5 cr.; fr. arch.; prereq., 32; I, IV; MTWThF; 317E.) MR. DAWSON.

34-35-36su. ARCHITECTURAL DESIGN, GRADE I. Long and short problems done under individual criticism dealing in general with the elements of plan and elevation. Sketch problems dealing with the simple compositions. Summer credit limited to two credit hours. (2 cr.; prereq., Arch. 33; I-IV; MTWThFS; 317E.) MR. DAWSON.

CIVIL ENGINEERING

The registration fee for the eight weeks required for these courses is $30. In addition the student will make the usual deposit of $5.

COURSES

(Eight weeks, June 19 to August 13, 1924)

131su. BRIDGE ANALYSIS. Stresses in simple span railway bridge trusses of the larger type. Baltimore, Petit, Whipple, and "K" trusses. Eight weeks. (3 cr.; sr. C.E.; prereq., C.E. 33; ar.; 227E.) MR. PARCEL.

132su. BRIDGE DESIGN. Design and detail drawing of railway plate girder viaduct. Eight weeks. (3 cr.; sr. C.E.; prereq., C.E. 131; ar.; 227E.) MR. PARCEL.

141su. REINFORCED CONCRETE. Principles of reinforced concrete. Theory of beams, slabs, and columns and the application to ordinary structures. Eight weeks. (3 cr.; sr. C.E.; prereq., M.M. 141; ar.; 227E.) MR. PARCEL.

DRAWING AND DESCRIPTIVE GEOMETRY

COURSES

First Term

1su. ENGINEERING DRAWING. The elements of drafting including an introductory course in the methods of representation and constructive geometry. Graphs and formulas. Sketching, lettering, working drawings, conventions, standards, tracing, and blue printing. (3 cr.; all; prereq., solid geom.; 2 lect., 16 hrs. lab.; ar.; 201E.) MR. MYERS, MR. POTTER.

2su. ENGINEERING DRAWING. A continuation of Course 1. (3 cr.; all; prereq., Dr. 1; 2 lect., 16 hrs. lab.; ar.; 201E.) MR. MYERS, MR. POTTER.

3su. DESCRIPTIVE GEOMETRY. An elementary course in the methods of representation, correlated in part with analytical geometry. Graphical and algebraic solutions. Lectures, demonstrations, and drawing room exercises. (3 cr.; Dr. 2, Math. 12; lect., I; TWThF; lab, 14 hrs. ar.; 201E.) MR. EGGERS, MR. MYERS.

4-5-6su. ENGINEERING DRAWING AND DESCRIPTIVE GEOMETRY. The elements of drafting. Descriptive geometry including graphical methods of representation, correlated in part with analytical geometry. Required of freshmen in the course in chemical engineering who satisfy the entrance requirements in mathematics. (2 cr. each; prereq., sol. geom.; ar.; 201E.) MR. POTTER.

10su. SOLID GEOMETRY. Lines and planes in space, dihedral and polyhedral angles; polyhedrons, cylinders, cones, similarity, prismoid formula, sphere area, volumes, numerical exercises in area, weights. Entrance credit for the College of Engineering and Architecture. (3 cr.; all; prereq., pl. geom.; II; MTWThF; 104E.) MR. POTTER.

21su. DRAFTING. (C.E.) Drawing of structures and machines. Details, assembly, and construction drawings. The solution of problems of simple structures. The application of descriptive geometry to drafting room problems. (2 cr.; soph. C.E.; prereq., Dr. 3; 12 hrs.; ar.; 206E.) MR. MYERS.

22su. DRAFTING. (C.E.) Continuation of Course 21. Drafting problems in concrete, highway, and topographical work as met by the civil engineering draftsman in practice. Intersections, developments, and other practical geometric problems. (2 cr.; soph. C.E.; prereq., Dr. 21; 12 hrs.; ar.; 206E.) MR. MYERS.

23su. DRAFTING. (C.E.) A continuation of Course 22. (2 cr.; soph. C.E.; prereq. Dr. 22; 12 hrs. ar.; 206E. MR. MYERS.

26su. DRAFTING. (E.E.) The application of descriptive geometry to drafting room problems. Sheet metal work, belting, conveyors, and connections. Working drawings and tracing. (2 cr.; soph. E.E.; prereq., Dr. 3; 12 hrs.; ar.; 201E.) MR. WILLIAMS.

27su. DRAFTING. (E.E.) The application of elementary formulas in the proportioning of simple machine parts. Outline and assembly drawings, electrical conventions, circuit diagrams, the development of simple formulas, and graphical methods. (2 cr.; soph. E.E.; prereq., Dr. 26; 12 hrs. ar.; 201E.) MR. EGGERS, MR. WILLIAMS.

28su. DRAFTING. (M.E.) The application of descriptive geometry to drafting room problems. Sheet metal work, belting, conveyors, and connections. Working drawings and tracing. (2 cr.; soph. M.E.; prereq., Dr. 3; 12 hrs.; ar.; 201E.) MR. WILLIAMS.

29su. DRAFTING. (M.E.) The application of elementary formulas in the proportioning of simple machine parts. Outline and assembly drawings, structural drafting, the development of simple formulas, and graphical methods. (2 cr.; soph. M.E.; prereq., Dr. 28; 12 hrs.; ar.; 201E.) MR. EGGERS, MR. WILLIAMS.

41-42-43su. TECHNICAL DRAWING. Theory and practice of drawing. Sketching, lettering, tracing, conventions, renderings, blue printing, and mechanical drawing. Preparation of conventional charts and diagrams of particular interest to dentists, designed for dental students. (2-6 cr.; fr. dent.; 12 hrs. ar.; 101E.) MR. WILLIAMS.

69su. LETTERING FOR NURSES. A practical course in plain lettering and the making of graphs and charts. (1 cr.; 11 weeks; no prereq.; IV; T; 205E.) MR. POTTER.

Second Term

1su. ENGINEERING DRAWING. See statement for first term. MR. SCHUCK.

2su. ENGINEERING DRAWING. A continuation of Course 1. (3 cr.; all; prereq., Dr. 1; 2 lect., 16 hrs. lab.; ar.; 201E.) MR. SCHUCK.

3su. DESCRIPTIVE GEOMETRY. See statement for first term. MR. SCHUCK.

4-5-6su. ENGINEERING DRAWING AND DESCRIPTIVE GEOMETRY. See statement for first term. MR. WILLIAMS.

10su. SOLID GEOMETRY. See statement for first term. MR. SCHUCK.

21su. DRAFTING. (C.E.) See statement for first term. MR. WILLIAMS.

22su. DRAFTING. (C.E.) See statement for first term. MR. WILLIAMS.

23su. DRAFTING. (C.E.) See statement for first term. MR. WILLIAMS.

26su. DRAFTING. (E.E.) See statement for first term. MR. FRENCH.

27su. DRAFTING. (E.E.) See statement for first term. MR. FRENCH.

28su. DRAFTING. (M.E.) See statement for first term. MR. FRENCH.

29su. DRAFTING. (M.E.) See statement for first term. MR. FRENCH.

41-42-43su. TECHNICAL DRAWING. See statement for first term. MR. WILLIAMS.

69su. LETTERING FOR NURSES. See statement for first term. MR. SCHUCK.

ELECTRICAL ENGINEERING

COURSES

First Term

66su. ELEMENTS OF RADIO COMMUNICATION. Primarily for high school teachers and others desiring a fundamental course covering the theory of radio transmitting and receiving apparatus and the operation of

experimental stations. The international code, message forms. Five lectures and 3 laboratory hours per week. (3 cr.; no credit for electrical engineers; prereq., 1 yr. college physics or its equivalent; VI; MTWThF; 313EE.) MR. JANSKY.

MATHEMATICS AND MECHANICS

COURSES

First Term

9su. HIGHER ALGEBRA. Fundamental rules, fractions, linear simultaneous equations, graphs, theory of exponents, surds, complex quantities, quadratic equations, numerical exercises. (No cr.; fr.; prereq., 1 yr. elementary algebra; III-IV; MTWF; V-VI; Th; 217E.) MR. DOERINGSFELD.

10su. SOLID GEOMETRY. (See Drawing and Descriptive Geometry, page 55.)

11su. COLLEGE ALGEBRA. Theory of quadratic equations, interpretation of complex results, graphical representation, indeterminate equation, ratio, proportion, variation, progressions, series, undetermined coefficients, binomial theorem, logarithms, theory of equations, derivatives, Horner's method. (5 cr.; fr. eng. arch., chem.; prereq., higher algebra and solid geometry; III, IV; MTWF; V, VI; Th; 215E.) MR. HOLMAN.

12su. TRIGONOMETRY. Rectangular co-ordinates, angles, trigonometric functions, solution of plane right triangles, reduction formulas, fundamental relations, addition formulas, double angles, half angles, identities and equations, inverse functions, oblique triangles, De Moivre's theorem, spherical right triangles. (5 cr.; fr. eng., arch., chem.; prereq., 11; III, IV; MTWF; V, VI; Th; 106E.) MR. BROOKE.

13su. ANALYTICAL GEOMETRY. Co-ordinate systems, equation, locus, straight line, second degree equations, polar co-ordinates, parametric equations, derivatives, tangents, normals, conic sections, rotation of axes, empirical equations. Space co-ordinates, plane, line, quadric surfaces, cylinders, space curves, tangent lines, planes. (5 cr.; fr. eng., arch., chem.; prereq., 12; Sec. 1, I, II; MTWThF; Sec. 2, III, IV; MTWF; V, VI; Th; 136E.) MR. SILER, MR. HARTIG.

25su. INTEGRAL CALCULUS. Standard elementary forms, definite integral, rational fractions, integration by substitution, integration by parts, reduction formulas, integration a process of summation, successive and partial integrations, elementary ordinary differential equations. (5 cr.; soph. eng.; prereq., 24; III, IV; MTWF; V, VI; Th; 205E.) MR. DALAKER.

26su. TECHNICAL MECHANICS. *Statics and Kinematics.* Characteristics of a force, parallelogram law, moments, couples resultant of a force system, equilibrium of a force system, friction, centroids, moment of inertia. Motion of particle, motion of a rigid body. (5 cr.; soph. eng.; prereq., 25; Sec. 1, I, II; MTWThF; 203E; Sec. 2, III, IV; MTWF; V, VI; Th; 203E.) MR. HERRICK, MR. PRIESTER.

127su. TECHNICAL MECHANICS. *Dynamics.* Force, mass, acceleration, translation and rotation, gyroscope, governors, work, energy, power, conservation of energy, impulse, momentum, loss of kinetic energy, conservation of momentum. (5 cr.; jr. eng.; prereq., 26; I-II; MTWThF; 215E.) MR. JOHNSON.

Second Term

12su. TRIGONOMETRY. See statement for first term. (5 cr.; fr. eng., arch., chem.; prereq., 11; III, IV; MTWF; V-VI, Th; 106E.) MR. WARNE.

13su. ANALYTICAL GEOMETRY. See statement for first term. (5 cr.; fr. eng., arch., chem.; prereq., 12; III, IV; MTWF; V-VI, Th; 205E.) MR. BOEHNLEIN.

26su. TECHNICAL MECHANICS. *Statics and Kinematics.* See statement for first term. (5 cr.; soph. eng.; prereq., 25; III, IV; MTWF; V-VI, Th; 203E.) MR. HARTIG.

127su. TECHNICAL MECHANICS. *Dynamics.* See statement for first term. (5 cr.; jr. eng.; prereq., 26; I-II; MTWThF; 215E.) MR. WILCOX.

MECHANICAL ENGINEERING

WOOD-WORKING COURSES

First Term

1su.[1] MACHINE WOOD-WORKING FOR TEACHERS. Cabinet wood construction. Care, use, manipulation, and adjustment of wood-working machinery. Layout and plan of equipment, and course for a high school. (2-4 cr.; all; no prereq.; I-IV; MTWF; IV; Th; ME.) MR. RICHARDS.

4su.[1] TEACHERS' COURSE IN WOOD-TURNING. Use and care of wood-turning tools. Plain and split turning in centers. Plain and segmental face-plate work. Plan and arrangement of a course. (2-4 cr.; all; no prereq.; I-II; MTWThF; ME.) MR. RICHARDS.

5su.[1] TEACHERS' COURSE IN WOOD-FINISHING AND STAINING. Preparatory treatment of wood, color-mixing, applications of oil and acid stains, shellacing, varnishing, rubbing, and finishing. (2 cr.; all; prereq., 1 or equiv.; I-IV; MTWF; I-II; Th; ME.) MR. RICHARDS.

6su.[1] TEACHERS' COURSE IN PATTERN WORK. Materials used. Application of draft, shrinkage, finish to patterns. Core box-making. The relation of pattern work to the foundry. Industrial problems and methods. Organizing a typical course. (2-4 cr.; all; prereq., 4; I-IV; MTWF; I-II; Th; ME.) MR. RICHARDS.

11su.[1] PATTERN SHOP PRACTICE FOR ENGINEERING STUDENTS AND OTHERS. Wood-working, pattern-making, and principles. Turning and core box work. Industrial problems and methods showing relation of pattern and foundry practice. (2 cr.; fr. eng.; no prereq.; I-IX; M; I-IV; TWF; I-II; Th; ME.) MR. RICHARDS.

[1] A laboratory fee of $1.50 is charged for this course.

20su.[1] FURNITURE-MAKING FOR TEACHERS. Details of designs and construction. Doweling, mortise and tenon work. Bending and setting of shapers. Value and materials used in built up work. Laying of veneer. Layout of a course in high school furniture-making. (2-4 cr.; all; prereq., 1; I-IV; MTWF; I-II; Th; ME.) MR. RICHARDS.

MACHINE SHOP WORK

First Term

2su.[1] BENCH WORK FOR TEACHERS. Bench and vise work in metal-chipping, filing, scraping, fitting, polishing, and layout practice; planning of courses of study for school work. (2 cr.; all; no prereq.; I-IX, except III hr. Thursday, MTWThF; ME.) MR. ROGERS.

3su.[1] ELEMENTARY MACHINE SHOP PRACTICE FOR TEACHERS. Lathe, shaper, planer, and drill press manipulation; the grinding, care, and kinds of cutting tools. Layout of courses and exercises for high school courses. This course can be arranged to include part of 2su. (2-4 cr.; all; no prereq.; I-IX; M; I-IV; MTWF; I-II; Th; ME.) MR. ROGERS.

7su.[1] ADVANCED MACHINE SHOP FOR TEACHERS. Advanced lathe work, milling machine operation, gear calculation, and cutting. Precision grinding. Layout of typical course. (4 cr.; all; prereq., 3; I-IX; M; I-IV; TWF; I-II; Th; ME.) MR. ROGERS.

8su.[1] MACHINE SHOP PRODUCTION METHODS FOR TEACHERS. Turret lathe, gang drill, production miller. Automatic lathe set up and operation. The use of fixtures, jigs, and tools with proper feeds and speeds. Time studies. Estimating production. (2-4 cr.; all; prereq., 7; I-IX; M; I-IV; TWF; I-II; Th; ME.) MR. SHIPLEY.

14su.[1] MACHINE SHOP PRACTICE FOR MECHANICAL ENGINEERING STUDENTS. Bench work, lathe, planer, shaper, drill press work. (4 cr.; soph. mech.; no prereq.; I-IX; M; I-IV; TWF; I-II; Th; ME.) MR. ROGERS.

15su.[1] ADVANCED MACHINE SHOP PRACTICE FOR MECHANICAL ENGINEERING STUDENTS. Milling machine, precision grinding, production work, acetylene welding. (4 cr.; soph. mech.; prereq., 14; I-IX; M; I-IV; TWF; I-II; Th; ME.) MR. ROGERS.

16su.[1] ELEMENTARY MACHINE SHOP FOR ELECTRICAL ENGINEERING STUDENTS. Bench work, lathe, planer, shaper, drill press, and milling machine operation. (2 cr.; soph. elec.; no prereq.; I-IX; M; I-IV; TWF; I-II; Th; ME.) MR. ROGERS.

111su.[1] TOOL CONSTRUCTION. The planning and making of tools, jigs, fixtures for manufacturing interchangeable parts. This course is open to engineering students and teachers. (4 cr.; all; prereq., 7 or 14; ar.; ME.) MR. SHIPLEY.

[1] A laboratory fee of $1.50 is charged for this course.

INDUSTRIAL ENGINEERING

First Term

121su. PRODUCTION METHODS. Principles and practice involved in economical production. Standardization. Requirements for uniformity and interchangeability. Jigs, fixtures, and special equipment; gauges and inspection systems. Divisions of labor. Lighting, heating, and sanitation. (3 cr.; sr.; prereq., 15 or 16; ar.; ar.; ME.) MR. SHIPLEY.

AUTOMOTIVES

First Term

41su. AUTOMOTIVES. History, types. Power, efficiency, styles of engines, ignition systems, carburetors, transmissions, clutches, lubrication, and cooling. Methods of testing. Models and sectioned apparatus are used in lecture work supplemented by laboratory demonstrations. Analysis of trouble. (2-4 cr.; all; no prereq.; VI-VII; TWTh; ME.) MR. SHIPLEY.

THE COLLEGE OF AGRICULTURE, FORESTRY, AND HOME ECONOMICS

GENERAL INFORMATION

Through the Summer Session the field plots, orchards, livestock, libraries, laboratories, museums, shops, machinery, classrooms, instruction, and other facilities used by students during the regular college year are made available to those who for any reason find it more convenient to attend during the summer months.

The work offered in agriculture, and home economics seeks to meet the needs of graduates of arts colleges and normal schools, teachers of secondary schools, principals of schools (especially of consolidated schools), superintendents of schools, and others who desire courses in agriculture or home economics, and who wish to obtain therefor college credit, as well as to meet the needs of students seeking to complete the undergraduate college work.

GRADUATE STUDY

Opportunity is offered in several divisions for graduate study either for the first six-week term of the Summer Session or for the entire session of eleven weeks. In some divisions both course and thesis work may be carried for the entire quarter. In a number of other divisions thesis work only may be pursued through the summer quarter. Students intending to register for any phase of graduate work and who expect to obtain credit in the Graduate School should make arrangements through the proper committees and with the dean of the Graduate School. Information concerning graduate work during the summer, in any division, may be obtained from the head of the division. Thesis and problem work is correlated in most divisions with the work in the Experiment Station and the facilities offered during the summer are in most divisions especially attractive on account of the field work possible only at that time.

ADMISSION

The undergraduate courses of the Summer Session are open to all mature men and women who are considered qualified to pursue the chosen work to advantage, but college credit will be given only when college entrance requirements have been fulfilled.

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

For details of admission requirements and definition of "unit" see the bulletin of general information.

CONSOLIDATED SCHOOL PRINCIPALS

In small schools the superintendent or principal may act as special teacher of agriculture by fulfilling the requirements established by the State Board. These include the regular qualifications for a teacher of agriculture and also the qualifications for superintendent or principal.

The Summer Session of the University offers opportunity to take courses preparatory for the fulfillment of these requirements.

Intensive Training Course for Teachers of Vocational Agriculture

The Department of Agricultural Education of the University of Minnesota, represented by its faculty, and the State Board for Vocational Education, represented by the director of vocational education and the state supervisor of agriculture, have for several years conducted a brief Intensive Training Course for agricultural teachers in service.

A week of similar character will be conducted this year at University Farm during week of June 16-21.

This intensive training work will in no way supplant the regular six weeks' Summer Session, June 21 to August 1, when regular college courses in education, agricultural education, and agriculture are offered by the University.

Men now in service will do well to take the regular Summer Session courses in order to be prepared to obtain greater value from the Special Intensive Training Week.

AGRICULTURAL BIOCHEMISTRY

COURSES

First Term

2su. QUANTITATIVE METHODS. A brief course in the principles of quantitative analysis, including a study of stoichiometric problems, practice in the use of the balance and in typical gravimetric and volumetric manipulations. (5 cr.; jr., sr.; prereq., 1 yr. chem.; I, II, III, IV; MTWF; I, II; Th.) MR. ———.

3su. TYPES OF CARBON COMPOUNDS. An elementary study of the different groups of carbon compounds, with special reference to their relationships and their occurrence in plant and animal materials used as food. (6 cr.; soph., jr., sr.; prereq., 1 yr. chem.; I, II; MTWThFS; 201Ch.) MR. ———.

7su.[1] GENERAL AGRICULTURAL BIOCHEMISTRY. A qualitative and quantitative study of the types of organic and inorganic compounds found in plants and animals and of the chemical changes involved in metabolism, growth, and maintenance. Lecture and laboratory. (5 cr.; soph., jr., sr.; prereq., 10 cr. in chem.; I, II, III, IV; MTWF; I, II Th; 203Ch.) MR. HAAG, MR. ———.

111su. PHYTOCHEMISTRY. An advanced course dealing with the colloidal state, and the chemistry of proteins, carbohydrates, glucosides, tan-

[1] A laboratory fee of $1.50 is charged for this course.

nins, fats, plant acids, enzymes and pigments, and their physicochemical relations to the vital processes involved in growth and nutrition. (3 cr.; sr., grad.; prereq., biol. 10 cr., org. chem.; I, II; MWF; 251Ch.) MR. SANDSTROM.

113su.[1] BIOCHEMICAL LABORATORY METHODS. A laboratory course paralleling the lectures in 111-112, using recent methods for the investigation of biologically important compounds with especial reference to the detection and estimation of such compounds in cells or tissues. (2 or 3 cr.; sr., grad.; prereq., quant. anal. parallel, 111-112; I, II, III, IV; T; I, II, IV; Th; III, IV; MW; 7Ch.) MR. SANDSTROM.

118asu.[1] LABORATORY PROBLEMS IN BIOCHEMISTRY. Special laboratory work in the preparation and isolation of pure compounds which occur in living cells, in the study of biochemical reactions, and in special methods of identification or determination of biochemical products. (1½ or 2½ cr.; sr., grad.; prereq., 111-112, 113-114, or 103 or 110; ar.) MR. GORTNER, MR. BAILEY, MR. PALMER, MR. WILLAMAN.

203asu.[1] RESEARCH PROBLEMS. Special work on particular research problems other than the student's major thesis. Facilities are provided for biochemical investigations and for advanced studies in plant, animal, or human nutrition. (1½ or 2½ cr.; grad.; ar.) MR. GORTNER, MR. BAILEY, MR. PALMER, MR. WILLAMAN.

Second Term

8su.[1] GENERAL AGRICULTURAL BIOCHEMISTRY. Second part of Course 7su. (5 cr.; soph., jr., sr.; prereq., 7; I, II, III, IV; MTWF; I, II; Th; 203Ch.) MR. HAAG.

112su. PHYTOCHEMISTRY. Second part of Course 111su. (3 cr.; sr., grad.; prereq., 111; I, II; MWF; 251Ch.) MR. SANDSTROM.

114su.[1] BIOCHEMICAL LABORATORY METHODS. Second part of Course 113su. (2 or 3 cr.; sr., grad.; prereq., 113; I, II, III, IV; T; I, II, IV; Th; III, IV; MW; 7Ch.) MR. SANDSTROM.

118bsu.[1] LABORATORY PROBLEMS IN BIOCHEMISTRY. Second part of Course 118su. (1½ or 2½ cr.; sr., grad.; prereq., 118a; ar.) MR. GORTNER, MR. BAILEY, MR. PALMER, MR. WILLAMAN.

203bsu.[1] RESEARCH PROBLEMS. Second part of Course 203asu. (1½ or 2½ cr.; grad.; prereq., 203a; ar.) MR. GORTNER, MR. BAILEY, MR. PALMER, MR. WILLAMAN.

AGRICULTURAL ECONOMICS*

COURSES

First Term

Ag. Econ. 107, 108, 109su. SURVEY COURSE IN AGRICULTURAL ECONOMICS. Suited to high school teachers of agriculture and others desiring a general introduction to the field. A survey of the field and its literature with analysis of its major problems.

Ag. Econ. 107su. AGRICULTURAL PRODUCTION AND PRICES. (Offered in 1925 and 1927. 3 cr.; sr., grad.; prereq., a course in principles of eco-

* See also courses in the School of Business, page 110.

[1] A laboratory fee of $1.50 is charged for this course.

nomics. Not open to students attending other quarters except upon permission. IV; MTWThFS; Ad.) MR. BLACK.

Ag. Econ. 108su. AGRICULTURAL MARKETING AND CO-OPERATION. (Offered in 1924 and 1925. 3 cr.; sr., grad.; prereq., a course in principles of economics. Not open to students attending other quarters except upon permission. IV; MTWThFS; Ad.) MR. PRICE, MR. ZIMMERMAN.

Ag. Econ. 109su. LAND ECONOMICS AND AGRICULTURAL FINANCE. (Offered in 1926 and 1927. 3 cr.; sr., grad.; prereq., a course in principles of economics. Not open to students attending other quarters except upon permission. IV; MTWThFS; Ad.) MR. BLACK.

Ag. Econ. 135su. PRICE OF FARM PRODUCTS. (3 cr.; jr., sr., grad.; prereq., a course in principles of economics; II; MTWThFS.) MR. WORKING, MR. WIECKING.

Ag. Econ. 140su. MARKETING OF FARM PRODUCTS.[2] (3 cr.; jr., sr., grad.; prereq., a course in principles of economics; I; MTWThFS.) MR. PRICE, MR. ZIMMERMAN.

Second Term

Ag. Econ. 141su. MARKETING ORGANIZATION. (3 cr.; jr., sr., grad.; prereq., Ag. Econ. 85 or 135su; VI; VIII; MWF; 323Ad.) MR. BLACK, MR. ZIMMERMAN.

Ag. Econ. 200su. SEMINAR IN ECONOMICS OF AGRICULTURAL PRODUCTION. (3 cr.; VI, VII, VIII; TTh; 323Ad.) MR. BLACK, MR. WIECKING.

AGRONOMY AND FARM MANAGEMENT

COURSES

First Term

*121su.[1] CEREAL CROPS. An advanced study of the cereal crops. Structure group classification, improvement, growing, and utilization. Brief score card practice and a limited amount of placing on intrinsic value included. (3 cr.; jr., sr.; prereq., 1 and 10 cr. in botany; III, IV; MTWFS; 2Ad.) MR. ARNY, MR. MCGINNIS.

*122su.[1] CORN AND POTATO CROPS. A study of the corn and potato crops similar to that outlined for Course 121. (3 cr.; jr., sr.; prereq., 1 and 10 cr. in botany; III, IV; MTWFS; 2Ad.) MR. ARNY, MR. MCGINNIS.

*123.[1] FORAGE AND FIBER CROPS. A study of forage plants through assigned reading, laboratory, and field work. Following the study of each crop some attention is given to score card practice and comparative placing of representative samples. MR. ARNY, MR. STEINMETZ.

124su. ADVANCED FARM CROPS. This course includes a survey of modern farm practices and emphasizes the application of recent discoveries in

* Course 121, Course 122, or Course 123 will be given but not all. Choice by the class enrolled will be permitted.

[1] A laboratory fee of $1.50 is charged for this course.

[2] Offered on Minneapolis campus.

agricultural science to crop production problems. It is especially designed to meet the needs of instructors in Smith-Hughes schools. (3 cr., prereq., Courses 1, 121, 122, and 123, or equivalent.) MR. ARNY, MR. STEINMETZ.

131su. PRINCIPLES OF GENETICS. Fundamental principles of breeding, heredity, variation, biometry, and evolution. Same as Hort. 109. MR. GRIFFEE. MR. BEAUMONT.

ANIMAL HUSBANDRY

COURSE

15su. LIVESTOCK FEEDING AND MANAGEMENT. A review of recent literature on livestock production. Discussion of recent results in animal husbandry research. Practice in livestock management problems. Includes market stock and purebred livestock production. Primarily for Smith-Hughes teachers. (3 cr.; no prereq.; IV; MTWTh; VI, VII, VIII; TTh; center St.) MR. PETERS.

BEE CULTURE

COURSES

First and Second Terms

4su. QUEEN-RAISING. Principles of reproduction. Technique of queen-breeding. Queen- and drone-judging. Production of virgin queens and drones. Building of nuclei. Mating. Mailing, introducing, and requeening. In connection with the University Farm queen-raising project. (5 cr.; prereq., 1, 2, 3.) Ten hours a week, to be arranged. MR. JAGER.

7su. BEEKEEPING COMPENDIUM. (For beginners and amateurs.) Study of chief bee instincts and functions leading to management of bees for production of comb and extracted honey. MR. JAGER.

DAIRY HUSBANDRY

COURSE

First Term

1su. PROBLEMS IN DAIRY HUSBANDRY. A study of special problems in dairy feeding, selection, and management for the teacher and extension worker. (3 cr.; prereq., 1, 101, one year's experience as high school teacher, county agent, or extension specialist; III.) MR. SCHAEFER.

208su. RESEARCH IN DAIRY HUSBANDRY. Facilities offered for study and investigation of subjects pertaining to dairy cattle. Students are allowed to assist at times with investigations under way in the experiment station. Arranged to meet the needs of individual students. Open in Summer Session only to students who have had preliminary graduate work. MR. ECKLES.

209su. RESEARCH IN DAIRY PRODUCTS. Opportunity and facilities are offered for the study and investigation of problems concerning common dairy products. The work is arranged to meet the needs of the individual student. Open in Summer Session only to students who have had preliminary graduate work. MR. ECKLES.

Second Term

210su. RESEARCH IN DAIRY HUSBANDRY. Continuation of 208su. MR. ECKLES.

211su. RESEARCH IN DAIRY PRODUCTS. Continuation of 209su. MR. ECKLES.

ENTOMOLOGY AND ECONOMIC ZOOLOGY

COURSES

First Term

3su.[1] ELEMENTARY ECONOMIC ENTOMOLOGY. A brief course dealing with the characteristics and habits of insect pests and methods of control. Methods of collecting and preserving insects and practice in the determination of species. (3 cr.; no prereq.; VI, VII, VIII; MTWTh; 306Ad.) MR. DAWSON.

12su.[1] ECONOMIC VERTEBRATE ZOOLOGY. Relation of birds and other wild animals to agriculture. Identification and study of Minnesota birds and other wild animals affecting the farm and orchard. Methods of combating injurious, and conserving useful forms. Habits, range, usefulness, and manner of protecting Minnesota's important large and small game, fish, and birds. (3 cr.; prereq., zool. 1 yr.; II, III, IV, V; MWF; 306Ad.) MR. WASHBURN.

44su.[1] ANIMAL PARASITES. A study of the more common animal parasites of man and domestic animals, and of methods of avoidance and control. (3 cr.; soph., jr., sr.; prereq., zool. 1 yr.; VI, VII, VIII; MWF; 202AB.) MR. RILEY, MR. PHILIP.

120su.[1] GENERAL ECOLOGY OF INSECTS. General ecology with special reference to insects. Lectures, laboratory, and frequent field trips. (3 cr.; prereq., gen. zool., gen. ent., and at least 5 other cr. in ent.; ar.) MR. CHAPMAN.

144su.[1] ANIMAL PARASITES AND PARASITISM. Lectures and laboratory work. Origin and biological significance of parasitism; structure, life history, and economic relations of representative parasites. (3 cr.; jr., sr., grad.; prereq., zool. 1 yr.; VI, VII, VIII; MWF; 202AB.) MR. RILEY.

197su.[1] INTRODUCTION TO RESEARCH. Preparation for investigational work in lines of entomology and parasitology. Advanced laboratory, field, and library work; training in the preparation of bibliographies and manuscripts; special problems. The following lines of work are open:

Systematic Entomology, MR. KNIGHT, MR. OESTLUND.
General Economic Entomology, MR. RUGGLES.

[1] A laboratory fee of $1.50 is charged for this course.

Insect Ecology, MR. CHAPMAN.

Insect Morphology, Parisitology, MR. RILEY.

(2½ or more cr.; sr.; prereq., 37-38-39 or 44, 45, and other prescribed work; ar.)

RESEARCH. Ample opportunity for research work in various phases of entomology and parasitology will be afforded properly qualified students. This work will be individual and it is advised that students planning to undertake special problems correspond with the division relative to methods of collection and preparation of material.

Second Term

121su.[1] GENERAL ECOLOGY OF INSECTS. Continuation of Course 120. (3 cr.; jr., sr.; prereq., 120; ar.) MR. CHAPMAN.

145su.[1] Continuation of 144 with special consideration of insects to the diseases of man and animals. 3 cr.; prereq., 144; ar.) MR. RILEY.

197su.[1] INTRODUCTION TO RESEARCH. See statement for first term.

RESEARCH. See statement for first term.

FARM ENGINEERING

COURSES

First Term

3su. MECHANICAL DRAWING. Materials, instruments and their uses. The conventions, lettering, scale-reading, kinds of drawings, practice in cabinet projection, and drawing building plans. (3 cr.; no prereq., III, IV; MTWFS; 303En.) MR. JACOBSON.

5su. FARM BUILDING CONSTRUCTION. Instruction and practice in framing, construction, and painting of farm buildings. (3 cr.; no prereq.; II, IV; MTWFS; 48En.) MR. WHITE.

35su.[1] HOUSEHOLD ELECTRICITY AND LIGHT. A course with laboratory work on the fundamental principles of electricity and the use of electrical appliances in the home, with a special study of light, color, and lighting. (3 cr.; prereq., elem. physics; lect., III; MTWFS; lab., IV; MTWF; 103En.) MR. STEWART.

40su.[1] MECHANICAL TRAINING. Instruction and laboratory practice in mechanical trades, embracing rope work; belt-lacing and pulleys; cement work; soldering; sharpening tools; pipe-fitting; cold metal work; electric wiring; babbitting; glazing; painting; wood-finishing; harness repair, etc. (3 cr.; no prereq.; VII, VIII, IX; MTWTh; 106En.) MR. DENT.

45su. MECHANICAL TRAINING II. Advanced course. Instruction and laboratory practice in mechanical trades embracing metal work, tool-sharpening, glazing, painting, wood-finishing, cement construction, machinery repairs. Special attention is given to practical application of

[1] A laboratory fee of $1.50 is charged for this course.

the subject and presenting of features of especial interest to teachers. (3 cr.; prereq., 40; VII, VIII, IX; MTWTh; 106En.) MR. DENT, MR. WHITE.

HOME ECONOMICS

COURSES

First Term

3su.[1] TEXTILES. A consideration of the fundamentals of textiles essential to training for purchasing fabrics, with special emphasis on fiber study, analysis of fabrics, and manufacturing processes. (5 cr.; no prereq.; VI, VII, VIII, IX; MTWThF; 311HE.) MISS SELL.

11su.[1] GARMENT-MAKING. Instruction and laboratory practice in hand sewing; reading and adaptation of commercial patterns; construction and use of the sewing machine; designing, cutting, and making simple outer garments from washable materials. (3 cr.; no prereq.; III, IV, 2 hrs. to be ar.; MTWFS; 114HE.) ———

*13su.[1] DRESSMAKING. Laboratory problems, preparation of dress form, construction of wool skirt and tailored silk shirt waist, choice of wool service dress or wool sport suit with a remodeling problem; consideration of textile applications and art principles in selection of materials and designs; dress form is required. (5 cr.; soph., jr., sr.; prereq., 3, 11, 51; I, II, III, IV; MTWFS; 304HE.) ———

17su.[1] ADVANCED CLOTHING CONSTRUCTION. Laboratory problems in costume-modeling and construction. (3 cr.;[2] jr., sr.; prereq., 13, 53; I, II; MTWThFS; 303HE.) ———

20su. ECONOMIC ASPECTS OF THE FOOD SUPPLY. A study of the quality and cost of foods on the market. Laboratory field work. (2 cr.; no prereq.; VI, VII; MTThF.) MISS KOLSHORN.

22su.[1] FOOD ECONOMICS. A short review of food nutrients and food principles. Food requirements of the family group. Meal-planning, serving of meals; marketing. Cost of food bearing a definite relation to the family budget. Study of dietaries. Table service. (5 cr.; soph., jr., sr.; prereq., 21 or parallel; I, II, III, IV; MTWFS; 103HE.) MISS SOBYE.

30su. PROBLEMS IN HOME-PLANNING AND FURNISHING. (For teachers.) A study of the problems involved in choosing, planning, and furnishing a home. Emphasis will be placed on the choice of projects; sources for illustrative material and methods of presenting such problems to students of high school age. (3 cr.; prereq., H.E.51; III, IV; MTWF; 106HE.) MISS VETTA GOLDSTEIN.

*34u. HOME MANAGEMENT: OPERATION AND MAINTENANCE, LECTURES. Discussion of management responsibilities of home maker with special emphasis on budgets and household accounts. (3 cr.; jr., sr.; prereq., 22, Econ. 5; VIII; MTWThF; 203HE.) MISS OSBECK, MISS NICKELL.

[1] A laboratory fee of $1.50 is charged for this course.

[2] With the approval of the division the work in millinery included in this course may be registered for separately as a one-credit course.

* Prerequisites waived for teachers of home economics.

35su. HOME MANAGEMENT: OPERATION AND MAINTENANCE, LABORATORY PRACTICE. Twelve weeks actual experience in a home management house with various household management problems including the care and training of a child of pre-school age. (6 cr.; jr., sr.; prereq., 22; ar.) MISS OSBECK, MISS NICKELL.

45su. HOME ECONOMICS SURVEY. A discussion of the historical development of home economics with special emphasis upon current problems. (2 cr.; sr.; no prereq.; V; MTThF; 203HE.) MISS MCNEAL.

51su.[1] DRAWING AND DESIGN. Composition, perspective, color theory, and color harmonies applied to costume design and interiors; harmony, proportion, emphasis, balance, and rhythm in design. (3 cr.; no prereq.; I, II; MTWThFS; 112HE.) MISS HARRIET GOLDSTEIN.

53su. ADVANCED DESIGN. Problems in design for house furnishings and for costume including dress-modeling. (4 cr.; jr., sr.; prereq., 51; VI, VII, VIII, IX; MTThF; 114HE.) MISS HARRIET GOLDSTEIN, MISS VETTA GOLDSTEIN.

70su.[1] FOOD PREPARATION IN RELATION TO SOCIAL WORK. A study of the principles underlying cookery with special emphasis on the preparation of foods to be used in homes with limited incomes. (3 cr.; soph., jr., sr.; prereq., 10 credits in a laboratory science; III, IV; MTWFS; 107HE.) MISS OSBECK.

103su.[1] DIETETICS. The fundamental principles of human nutrition as applied to the feeding of individuals and groups under conditions of health, and under such pathological conditions as are chiefly dependent upon dietetic treatment. (5 cr.; sr.; prereq., 108; I, II, III, IV; MTWFS; 106, 107HE.) MISS MCMAHON, MISS PETERSON.

105su.[1] EXPERIMENTAL COOKERY. An intensive study of problems in foods and food preparation with individual laboratory problems. (3 cr.; prereq., 22, 23; I, II, III; MTWF; 207HE.) MISS KOLSHORN.

108su. NUTRITION II. Metabolism including work on tissues, blood, milk, and urine. (5 cr.; jr., sr.; prereq., 23; VI, VII, VIII, IX; MTWThF; 211, 213HE.) MISS MCMAHON, MISS PETERSON.

122su.[1] ADVANCED TEXTILES. An experimental study of textile problems such as shrinkage and other laundering applications; textile legislation; and special economic problems. (3 cr.; jr., sr.; prereq., 3, Econ. 5 or parallel; VI, VII, VIII; MTW; 305-311HE.) MISS WELLER.

123su. CLOTHING ECONOMICS. General consideration of economics function of women with reference to clothing and textiles in the home and in industry; study of clothing budget, hygiene, and standardization of dress. (2 cr.; jr., sr.; prereq., 13, Econ. 5; V; MTWF; 309HE.) MISS WELLER.

Second Term

13su.[1] DRESSMAKING. See statement for first term. (5 cr.; soph., jr., sr.; prereq., 3, 11, 51, and home practice in garment-making; I, II, III, IV; MTWFS; 304HE.)

[1] A laboratory fee of $1.50 is charged for this course.

22su.[1] FOOD ECONOMICS. See statement for first term. (5 cr.; soph., jr., sr.; prereq., 21 or parallel; VI, VII, VIII, IX; MTWThF.) ———

*34su. HOME MANAGEMENT: OPERATION AND MAINTENANCE, LECTURES. See statement for first term. (3 cr.; jr., sr.; prereq., 22, Econ. 5; III; MTWFS; 203HE.) MISS OSBECK, MISS NICKELL.

35su.[1] HOME MANAGEMENT: OPERATION AND MAINTENANCE, LABORATORY. See statement for first term. MISS OSBECK, MISS NICKELL.

HOME ECONOMICS EDUCATION

For announcement of courses see statement under College of Education, page 104.

HORTICULTURE

COURSES

First Term

6su.[1] FRUIT-GROWING. The fundamental principles of fruit-growing. Sites, soils, nursery stock, planting and planting plans, tillage, fertilization, cover crops, pollination, frost avoidance, pruning, and thinning. Lectures, recitations, references, and laboratory work. (3 cr.; soph., jr., sr.; prereq., bot. 10 cr.; lect., II; MTWTh; 102Hr; lab., III, IV; F; VII, VIII; M; 8Hr.) MR. BRIERLEY and MR. ———

21su. SMALL FRUIT CULTURE. Cultural practices for each of the small fruits. Brief consideration is given to their botanical relationships and the history of their commercial development. Lectures, problems, and survey of literature. (3 cr.; no prereq.; lect., IV; MTWTh; 102Hr; lab., I, II; FS; 8Hr.) MR. BRIERLEY.

32su. VEGETABLE-GROWING. Fundamentals of vegetable-growing applied to commercial and home gardens, scope of vegetable-gardening and place in agriculture. Capital required, locations, soil equipment, marketing, storage, systems of production. Cultural methods for the various crops. (3 cr.; no prereq.; lect. I; MTWTh; 102Hr; lab., VII, VIII; WF; 8Hr.) MR. BURRELL.

71su. LANDSCAPE GARDENING. The practice and principles of landscape gardening as applied to the home and community. Lectures and field trips to parks and private grounds. (3 cr.; no prereq.; lect. III; MTWF; 102Hr; lab., VII, VIII; TTh; 8Hr.) MR. CARY.

192su. SPECIAL PROBLEMS. Problem based on the work given in the preceding courses. Mr. Alderman and horticultural staff.

[1] A laboratory fee of $1.50 is charged for this course.

* Prerequisites waived for teachers of home economics.

PLANT PATHOLOGY AND BOTANY*

COURSES

First Term

1su.[1] PLANT PATHOLOGY. Elementary study of plant diseases due to fungi, bacteria, and slime molds; life histories and preventive methods. Lectures, laboratory, and reference. Not open to those who have completed 10. (5 cr.; jr., sr.; prereq., bot. 10 cr.; I, II, II, IV; MTWF; 2PP.)

14su.[1] PLANT DISEASE CONTROL. A detailed study of methods of controlling diseases of plants of parasitic origin. Spray materials and spray machinery. Practical applications. Not open to those who have completed 6. (5 cr.; jr., sr.; prereq., 1, Ent. 1 or 3; VI, VII, VIII, IX; TWThF; 1,2PP.)

111su.[1] DISEASES OF FIELD CROPS. Special detailed study of diseases of cereal and forage crops, including symptomatology, etiology, and practical methods of control. Laboratory, lecture, and greenhouse work. (3 cr.; jr., sr.; prereq., 1; ar.; 1,2PP.)

112su.[1] DISEASES OF FRUIT AND VEGETABLE CROPS. Special study of diseases of fruit and vegetable crops, especially of Minnesota crops, including diseases of crops raised under glass. Laboratory, lecture, and greenhouse work. (3 cr.; jr., sr.; prereq., 1; ar.; 1,2PP.)

COURSES PRIMARILY FOR GRADUATE STUDENTS

205su. Special assignment of work in laboratory and field problems in pathological research.

POULTRY HUSBANDRY

COURSES

First Term

1su. POULTRY. Best methods of housing, feeding, selecting for production; study of standard varieties. (3 cr.; no prereq.; MTWThFS; 104Ve.) MR. SMITH.

5su. ADVANCED POULTRY. Deals with the management and possibilities of flocks in large numbers. (3 cr.; prereq., 1; VI; MTWThF; 104Ve.) MR. SMITH.

* See also Department of Botany, page 31.

[1] A laboratory fee of $1.50 is charged for this course.

THE LAW SCHOOL

A number of courses will be offered by the Law School faculty for the summer quarter, June 24 to September 5. The quarter will be divided into two terms, the first from June 24 to July 31, and the second from August 1 to September 5. Students may attend either or both terms. Each course listed has four lectures each week and carries two quarter credits. The maximum number of credits which may be earned each term is six, twelve for the quarter. All classes will be held in the forenoon Monday to Friday inclusive.

The summer quarter courses in law are designed to enable students to lighten the burden of the regular academic year, or to supplement the course which is required for the degree. As the work in the Law School is organized on a year basis, attendance during the summer quarter will not accelerate graduation. Credits obtained in the summer quarter may be ap-applied toward the work for the law degree, but attendance for three regular academic years is required for the degree whether summer work is done or not. Students are urged to use the opportunity to supplement their course. Attention is called to the courses on Minnesota Criminal Procedure, Jurisprudence, and Interstate Commerce, which are not offered during the regular session.

No work is offered for beginning students. All students who have had one year of law are eligible for the subjects listed and can study them profitably. Regular entrance requirements will not be enforced during the summer quarter. The only prerequisite is the completion of one year of law study in this or another law school.

The tuition is $50 for the quarter, $25 for either term.[1]

COURSES

First Term

MINNESOTA CRIMINAL PROCEDURE. Jurisdiction and venue; arrest and bail; extradition; proceedings before the committing magistrate, the grand jury, and the trial court; pleadings; motions; appeals. Selected cases. MR. MILLER.

INSURANCE. Nature and requisites of the contract; premiums and assessments; insurable interests; concealment; representations and warranties; waiver and estoppel; rights under the policy; beneficiaries, assignees, and creditors; construction of the policy. Vance, *Cases on Insurance*. MR. MILLER.

QUASI CONTRACTS. Nature and scope of quasi contracts, benefits voluntarily conferred by mistake, in partial performance of a contract, in the absence of a contract; benefits conferred under duress; waiver of tort. Thurston, *Cases in Quasi Contracts*. MR. FLETCHER.

[1] These fees include the following in addition to tuition: health fee, Minnesota Union or Shevlin Hall fee, recreation fee, and post-office box rental. In addition a general deposit fee of $5 is charged, part of which is returned.

BANKRUPTCY. Origin, history, and nature of the bankruptcy law; jurisdiction of the courts; acts of bankruptcy; practice; receivers; claims; preferences; assets, trustees; liens; adverse claimants; summary jurisdiction; crimes, composition, discharge. Holbrook and Aigler, *Cases in Bankruptcy*. MR. FLETCHER.

Second Term

INTERSTATE COMMERCE. The Interstate Commerce Act as amended and the Transportation Act of 1920; the scope of commerce regulated; the duties of carriers under the acts; the functions of the Interstate Commerce Commission and Railroad Labor Board; the function of courts in the enforcement of the acts. Frankfurter, *Cases under the Interstate Commerce Act*, second edition. MR. ROTTSCHAEFER.

JURISPRUDENCE. Nature and purpose of jurisprudence; schools of jurisprudence; the end of law; its nature; its sources, forms and modes of growth; its scope and subject-matter; analysis of fundamental legal conceptions; relation to existing law. Textbook to be announced. MR. ROTTSCHAEFER.

DAMAGES. Exemplary damages; nominal damages; direct and consequential damages; elements of injury; functions of court and jury; liquidated damages; entire and prospective damages: limitations of interest; aggravation and mitigation. Special applications. Beale, *Cases on Damages*, second edition. MR. PAIGE.

PARTNERSHIP. The nature and formation of the partnership relation; the rights and liabilities of the partners, both *inter se* and as to third parties. Gilmore, *Cases on Partnership*. MR. PAIGE.

THE MEDICAL SCHOOL

GENERAL INFORMATION

THE SUMMER QUARTER—TERMS

The first term of the summer quarter will extend from June 21 to July 31, the second, from August 1 to September 5. Students may attend either or both terms.

GENERAL

Any of the courses offered by the departments of the Medical School are open to any student in the Summer Session, who has the necessary prerequisites.

COURSES FOR MEDICAL STUDENTS

CLINICAL YEARS

The Medical School offers full courses for the first and third quarters of the junior year, and the second quarter of the senior year. In order to receive legal time credit toward the degree of doctor of medicine or bachelor of medicine in this institution, students must be matriculated in the Medical School; see the annual bulletin of the Medical School for requirements for admission and regulations governing advanced standing. Medical students from other schools who desire to enter for the summer only may do so as unclassed students, receiving subject credits only. If such students desire legal time credit toward a medical degree they should arrange same with the institution from which they intend to take such degree. No obligation to accept such students into regular classes at this school may be attached to unclassed registration. Such students may take one of the programs listed below or make up a special program from the courses offered.

PROGRAMS FOR CLINICAL YEARS

The following are the required courses in the clinical years, to be offered, together with hours and days per week.

Students from other institutions should consult the Medical School bulletin to make sure in what degree the courses listed fulfill their respective needs. They should consult their own department heads as to the equivalence of courses offered at the University of Minnesota to those required in the medical school where they expect credit.

Fifth Year (Junior Medical)

The first clinical quarter of the fifth year, (junior medical) has been given in previous summers but will not be given in the summer of 1924. Therefore, the following courses, even tho described in the following pages, *will not* be offered:

Medicine 51su, 53su, 54su, 57su, 59su, 67su, and 79su. Obstetrics 51su, 54su, 60su, 61su, and 62su. Pediatrics 103su, and 104su. Pharmacology 105su. Surgery 51su, 59su, 60su, and 61su.

[1] Work in sections. An individual student gets half of these courses in the summer quarter. See special schedules at dean's office.

Fifth Year (Junior Medical)

Third Clinical Quarter—Clerkship Period—Class of June, 1925

The program for the summer quarter will consist of the following courses. For descriptions and schedules see departmental statements.

Medicine 56su, 58su, 65su[1]
Obstetrics 58su,[1] 59su,[1] 63su[1]
Ophthal. and Oto-Laryngology 77su, 83su,[1] 85su,[1] 87su,[1] 89su[1]
Pediatrics 101su, 106su,[1] 107su[1]
Pathology 109su
Surgery 56su, 63su,[1] 65su,[1] 70su,[1] 71su,[1] 77su[1]
Preventive Medicine and Public Health 56su[1]

Sixth Year (Senior Medical)

Fifth Clinical Quarter—Student Interneship Period—Class of December, 1924

The program for the summer quarter will consist of the following courses. For descriptions and schedules see departmental statements.

Medicine 63su
Obstetrics 56su
Roentgenology 79su
Student interneship or other electives 30 hours a week. See departmental statements and special schedules.

LABORATORY YEARS

No regular programs for freshman or sophomore medical students are offered, but many of the courses of these years will be given (see departmental statements for description of courses, program of hours, and laboratory fees). These courses may be taken by properly prepared students from other institutions as unclassed students, without matriculation. But students who desire to secure time credit toward the degree of doctor or bachelor of medicine in this school must matriculate in the regular way (see previous paragraph and requirements in the annual bulletin of the Medical School).

OPPORTUNITIES FOR PRACTITIONERS

All the courses offered are open to physicians, who will be registered as special students. Attention is also called to short courses in medicine and surgery to be given May 24 to June 7, under the Extension Division. Also to similar courses in obstetrics and pediatrics to be given, probably, from September 15 to September 29. These courses are for practitioners and are largely practical in nature.

The regular clinics in the University Hospital and Dispensary, the Minneapolis General Hospital, the St. Paul City and County Hospital, and the State Hospital for the Crippled and Deformed will go on as usual during the summer quarter, and will be open to visiting physicians.

FEES

Medical students electing the programs of clinical subjects in the junior and senior medical years must, and others may, pay the regular quarterly tuition fee of the Medical School, namely, $60 for residents

[1] Work in sections. An individual student gets half of these courses in the summer quarter. See special schedules at dean's office.

of Minnesota and $70 for non-residents. Less than a full program may be paid for on a clock hour basis, namely $2.50 (non-residents, $3), for each weekly clock hour of scheduled work per quarter.

Laboratory fees are not payable under this plan; but the following extra fees are charged: health fee, $2; Minnesota Union or Shevlin Hall fee, $1; deposit,[1] $10.

Term fees are, in each case, half the quarterly fees.

Students who do not desire time credit on the medical course may pay the regular Summer Session fee of $25 per term. No extra fees except the laboratory fees of the courses selected and the deposit fee are chargeable under this plan. Such students will register in the Summer Session and not in the Medical School.

ELECTIVES

Various electives will be offered in the clinical departments including dispensary and hospital clinics, clerkships, cadaver and animal surgery, electrocardiography, etc. See departmental statements in this bulletin and also special summer quarter programs of the Medical School (to be published later) for details.

The electives offered in the laboratory departments are also described in the departmental statements in this bulletin.

NURSING STUDENTS

No beginning students can be received in the summer quarter. For the regular courses, requirements, etc., see the bulletin of the School of Nursing.

FEES FOR STUDENTS IN THE SCHOOL OF NURSING

For students in the School of Nursing, whose work in the Summer Session is entirely in the hospitals, or in field service not involving instruction by members of the staff who are paid from the Summer Session budget, there will be no tuition fee. For students who take regular class work on the campus which is in charge of members of the staff who are paid from the Summer Session budget, a tuition fee at the rate of $1 per clock hour for the courses pursued shall be charged.

PUBLIC HEALTH NURSING

See Department of Preventive Medicine and Public Health in this bulletin.

COURSES FOR DENTAL STUDENTS

For appropriate courses in the laboratory sciences, dental students should consult the departmental statements which follow. For dental clinical courses see page 92.

[1] For students who pay the regular quarter fee in medicine a two-dollar recreation fee will be deducted from the general deposit fee.

ANATOMY

COURSES

First Term

5su. GROSS HUMAN ANATOMY. Dissection of abdomen and lower extremity. Disarticulated skeletons issued for study of osteology. (9 cr.; 3rd yr. med.; prereq., An. Biol. 1-2; I, II, III, IV; MTWThFS; VI, VII, VIII; TTh; 304,306IA.) Laboratory fee, $7.50. Class limited to 32. DR. ERDMANN and assistant.

9-10su. SYSTEMATIC ANATOMY. Human osteology and splanchnology, with dissection of the pig fetus. (10 cr.; 1st yr. dent.; prereq., An. Biol. 1-2; I, II, III, IV; MTWThFS; VI, VII, VIII; MWF; 313,301IA.) Laboratory fee, $7.50. Class limited to 32. MR. MILLER and assistant.

14su. HISTOLOGY AND EMBRYOLOGY. Minute structure and development of the tissues and organs, with special emphasis upon the oral region and digestive tract. (6 cr.; 2d yr. dent.; prereq., An. Biol. 1-2, Anat. 9-10-11; I, II, III, IV; MTWThFS; 102,213IA.) Laboratory fee, $5. DR. RASMUSSEN and assistant.

103su. HUMAN HISTOLOGY. Minute structure of the various tissues and organs. (9 cr.; 3d yr. med.; prereq., An. Biol. 1-2, Anat. 5-6-7; I, II, III, IV; MTWThFS; VI; MWF; 102,214IA.) Laboratory fee, $7.50. DR. RASMUSSEN and assistant.

133su. ANATOMY OF THE FETUS AND CHILD. A survey of prenatal and postnatal development. (2 cr.; prereq., Anat. 103; hrs. ar.) DR. SCAMMON.

156su. ADVANCED ANATOMY. Individual problems in gross anatomy, histology, embryology, or neurology. Includes advanced work for clinical graduate students. Permission by Dr. Scammon required. Laboratory fee, $1 per credit. Credits and hours arranged. DR. SCAMMON.

204su. RESEARCH IN ANATOMY. Research work in gross or miscroscopic anatomy, histology, embryology, or neurology. Permission by Dr. ——— required. Credits and hours arranged. DR. SCAMMON or DR. RASMUSSEN.

Second Term

6su. GROSS HUMAN ANATOMY. Dissection of head, neck, thorax, and upper extremity. Continuation of 5su. (Hours and days same, plus IX; TTh.) Laboratory fee, $7.50. Class limited to 32. MR. PAYTON and assistant.

11su. ANATOMY OF THE HEAD AND NECK. Human dissection. (First yr. dent. and others; prereq., Anat. 9-10; I, II, III, IV; MTWThFS; 304,307IA.) Laboratory fee, $4. Class limited to 32. MR. MILLER and assistant.

107su. HUMAN EMBRYOLOGY. Development of the human body. (6 cr.; 3rd yr. med. and others; prereq., Anat. 103; I, II, II MTWThFS; IV; MW; 102,213IA.) Laboratory fee, $5.

111su. HUMAN NEUROLOGY. Morphology of the central nervous system and sense organs. (6 cr.; 4th yr. med. and others; prereq., Anat. 103, 107; I, II, III, IV; MTWThF; I, II; S; 215IA.) Laboratory fee, $5. DR. RASMUSSEN.

156su. ADVANCED ANATOMY. (See under First Term, Course 156.) Permission by Dr. Jackson or Dr. Rasmussen required. Credits and hours arranged.

204su. RESEARCH IN ANATOMY. (See under First Term, Course 204.) Permission by Dr. Jackson or Dr. Rasmussen required. Credits and hours arranged.

BACTERIOLOGY

COURSES

First Term

51su.[1] GENERAL BACTERIOLOGY. Culture media; methods of staining and identification; principles of sterilization and disinfection; examination of air, water, milk; relation of bacteriology to the industries. (5 cr.; prereq., general chemistry and biology; VI, VII, VIII; MTWThF; 201MH.) Laboratory fee, $1.50. DR. HENRICI.

101su. SPECIAL BACTERIOLOGY. The pathogenic bacteria, especially in relation to definite disease; principles of infection and immunity. Fourth year medical students and others. (4 cr.; 4th yr. med. and others; prereq., general bacteriology; VI, VII, VIII; MTWThF; 201, 315MH.) Laboratory fee, $1.50. DR. GREEN.

114su. THE HIGHER BACTERIA. Study of morphology, cultivation, and classification of actinomycetes, yeasts, and molds. (3 cr.; prereq., general bacteriology, II, III; MTWF; 201MH.) Laboratory fee, $1.50. DR. HENRICI.

150su. ADVANCED BACTERIOLOGY. Opportunity of working out special problems. (Prereq., General Bacteriology; cr. and hr. ar.) Laboratory fee, $1 per credit. DR. LARSON.

201su. RESEARCH IN BACTERIOLOGY. Graduate students of the necessary preliminary training may elect research, either as major or minor, in bacteriology. (Permission required. Arrange hours and credits. 201MH.) DR. LARSON.

Second Term

51su. GENERAL BACTERIOLOGY. Will be given if sufficient number register.

116su. IMMUNITY. Laws of hemolysis. Quantitative relationship between antigen and antibody. Wasserman reaction. Opsonins. Vaccines. Precipitin reaction. Blood-grouping. Abderhalden reaction. Anaphylaxis. (3 cr.; prereq., general bacteriology; II, III; MTThF; 201MH.) Laboratory fee, $1.50. DR. GREEN.

150su. ADVANCED BACTERIOLOGY. Will be given if sufficient number register.

201su. RESEARCH IN BACTERIOLOGY. Will be given if sufficient number register.

[1] Will be repeated in second term if a sufficient number desire it.

HOSPITAL DEPARTMENT

DIVISION OF ROENTGENOLOGY

79su. ROENTGENOLOGY. Lectures and plate-reading. Sixth-year medical students. (W, 3:30-4:20; 214 MH.) DR. ALLISON.

80. PLATE-READING. Arrange hours and credit.

81. X-RAY TECHNIQUE. Arrange hours and credit.

82. X-RAY THERAPY. Arrange hours and credits.

PATHOLOGY

COURSES

Both Terms

101su. GENERAL PATHOLOGY. Circulatory disturbances, degenerations, inflammation, tuberculosis, syphilis, tumors, neuropathology. (9 cr.; prereq., histology, anatomy, embryology, biochemistry; 8:00-11:00; MTWThF; 104IA.) DR. BELL.

104su. AUTOPSIES. Postmortem technique; examination of fresh organs, etc. (Cr. ar.; prereq., 101; ar.; 110IA.) DR. BELL, DR. MCCARTNEY, DR. CLAWSON, DR. O'BRIEN.

106su. PATHOLOGIC TECHNIQUE. Methods of preparation of microscopic and gross specimens; practice with freezing microtome, embedding methods, stains, museum specimens, etc. Limited to three students. Either or both terms. Hours and credits arranged; 112IA. Laboratory fee, $1 per credit. Staff.

107su. APPLIED PATHOLOGY. Laboratory studies in the examination of routine operative and autopsy specimens. Limited to three students. Either or both terms. Hours and credits arranged; 110IA. Laboratory fee, $1 per credit. DR. BELL, DR. CLAWSON, DR. MCCARTNEY.

108su. DIAGNOSIS OF TUMORS. 1½ hours clinical demonstration. (3 cr.; 66 hrs.; prereq., Pathology 102; 2:30-5:30; TTh; 108IA.) Laboratory fee, $1.50. DR. BELL, DR. MCCARTNEY, DR. CAMERON.

109su. CLINICAL PATHOLOGICAL CONFERENCE. Presentation of clinical data on selected cases and of the pathological specimens from these same cases, with discussions of etiology and diagnosis. Required in clerkship period. Elective for others. (Eleven hours credit; 4:30-5:20; F; 104IA.) Staff.

113su. EXTERNSHIP IN PATHOLOGY. The student devotes his time to postmortem work, surgical pathology, and research. (Hours and credit arranged.)

115su. HISTOPATHOLOGY OF THE SKIN. Clinical and pathologic phases will be exemplified. (Eleven hours credit; prereq., Pathology 102; T, 2:30; 106IA.) DR. MICHELSON.

201su. RESEARCH. Students, of the necessary preliminary training, may elect research, either as major or minor in pathology. Permission required. Hours and credits to be arranged. DR. BELL.

PHARMACOLOGY

COURSES

First Term

1su. ELEMENTARY PHARMACOLOGY. A brief study of drugs for nurses and others. (3 cr.; 44 hrs.; prereq., physiology; M, 8:00-11:00 a.m.; W, 8:00-8:50 a.m.; 322MH.) DR. JENSEN.

4su. PHARMACOLOGY. The history, origin, nature, pharmacal preparations, and use of drugs. (33 hrs. cr.; limited to 2nd yr. dent.; prereq., physiology; TWF, 2:00-3:00 p.m.; T, 3:00-5:00 p.m.; 322MH.) DR. HIRSCHFELDER, DR. BROWN, DR. JENSEN.

102su. EXPERIMENTAL PHARMACOLOGY. Exercises illustrating the preparation and action of medicines. Laboratory fee, $3. (3 cr.; limited to 4th yr. med.; prereq., physiology; TTh, 3:00-6:00 p.m.; 322MH.) DR. HIRSCHFELDER, DR. BROWN, DR. JENSEN.

105su. GENERAL PHARMACOLOGY. Same as Course 102 in continuation. (22 hrs.; limited to 5th yr. med.; prereq., physiology; MW, 5:00-5:50 p.m.; 129MH.) DR. HIRSCHFELDER, DR. BROWN, DR. JENSEN.

109su. PHARMACOLOGICAL PROBLEMS. Experimental study of special topics in pharmacology, with a review of the literature. Laboratory fee of $1 per credit. (3 cr. or ar.; prereq., physiology; 3:00-6:00 p.m. or hrs. ar.; 322MH.) DR. HIRSCHFELDER, DR. BROWN.

203su. RESEARCH IN PHARMACOLOGY. Open to graduate and advanced students. Hours and credits arranged. DR. HIRSCHFELDER, DR. BROWN.

Second Term

Same courses offered as in first term.

PHYSIOLOGY

COURSES

First Term

4su. HUMAN PHYSIOLOGY. A brief course for academic and home economics students. Lectures and laboratory work. (5 cr.; prereq., high school or college biology and chemistry; lect., IV; MTWThF; rec. and dem., II, III; MWF; lab.,* I, II, III; T; I, II, V; Th; 314MH.) Laboratory fee, $1.50. MISS RUPP and MR. KING.

58-59su. HUMAN PHYSIOLOGY. An intermediate course for academic, dental, and physical education students, and others. (8 cr.; prereq., general chemistry and anatomy or zoology; lect., IV; MTWThF; rec. and dem., II, III; MWF; lab.,* I, II, III; T; I, II, V; Th; VI, VII, VIII; TTh or ar.; 129MH.) Laboratory fee, $3. MISS RUPP and MR. KING.

100su. PHYSIOLOGIC CHEMISTRY. The components of the animal body; foods, digestion, excreta, and metabolism. (6 cr.; prereq., organic chemistry and physics; I, II, III, IV; MTWF; I, II, IV, V; Th; 310MH.) Laboratory fee, $5. Lectures only; 3 cr. may be registered for as 100xsu. Laboratory only as 100ysu. DR. PETTIBONE.

* Students who find it more convenient, may arrange to do part of their laboratory work in the afternoon.

103su. PHYSIOLOGY OF MUSCLE, NERVE, BLOOD, CIRCULATION, DIGESTION. (8 cr.; 4th yr. med. and others; prereq., organic chemistry and animal biology; lect., I; lab., II, III, IV; MTWF; I, II, IV, V; Th; 214-301MH.) Laboratory fee, $5. Lectures only, 5 cr. may be registered for as 103xsu. DR. SCOTT and assistant.

113su. PROBLEMS IN PHYSIOLOGY. Arranged by instructor with qualified students. Each student will be assigned a topic for special laboratory study, leading in some cases to original investigation. Conferences and reading. May be taken one or more terms. (3 cr. or ar.; prereq., Courses 103, 104, or equivalent; 310MH.) Laboratory fee, $1 per credit. DR. SCOTT.

153su. PROBLEMS IN PHYSIOLOGIC CHEMISTRY. Arranged by instructor with qualified students for special work. May be taken one or more terms. (3 cr. or ar.; prereq., Course 100-101; 2:30-5:30; TTh or ar.; 310MH.) Laboratory fee, $1 per credit. DR. MCCLENDON.

155su. ELECTRIC CONDUCTIVITY. Electric conductivity, hydrogen ion concentration. (Hours arranged, 310MH.) Lectures only, 2 cr., or with laboratory in addition under Course 153. DR. MCCLENDON

203su. RESEARCH IN PHYSIOLOGY. Hours and credits arranged. DR. SCOTT.

205su. RESEARCH IN PHYSIOLOGIC CHEMISTRY. Hours and credits arranged. DR. MCCLENDON, DR. PETTIBONE.

Second Term

101su. PHYSIOLOGIC CHEMISTRY. Continuation of Course 100su. (6 cr.; prereq., organic chemistry and physics; I, II, III, IV; MTWF; I, II, IV, V; Th; 310MH.) Laboratory fee, $5. Lectures only, 3 cr., may be registered for as 101xsu. Laboratory only as 101ysu. DR. MEDES.

104su. PHYSIOLOGY OF THE NERVOUS SYSTEM AND SPECIAL SENSES, RESPIRATION, METABOLISM, NUTRITION, AND EXCRETION. (8 cr.; 4th yr. med. and others; prereq., Course 103, or organic chemistry and neurology; lect., I; rec. and lab.,* II, III, IV; MTWThFS; 310MH.) Laboratory fee, $5. Lectures only, 5 cr., may be registered for as 104xsu. DR. GREISHEIMER and assistant.

113su. PROBLEMS IN PHYSIOLOGY. Continued as in first term. DR. GREISHEIMER.

153su. PROBLEMS IN PHYSIOLOGIC CHEMISTRY. Same as 153su, first term, given above.

155su. ELECTRIC CONDUCTIVITY. Same as 155su, first term, given above.

203su. RESEARCH. Continued as in first term. DR. GREISHEIMER.

205su. RESEARCH IN PHYSIOLOGIC CHEMISTRY. Same as 205su, first term, given above.

* Students who find it more convenient, may arrange to do part of their laboratory work in the afternoon.

PREVENTIVE MEDICINE AND PUBLIC HEALTH

COURSES

First Term

50su. PUBLIC AND PERSONAL HEALTH. Discusses the causes of diseases and of physical defects and presents the fundamental principles and working methods of health conservation and disease prevention. Lectures, demonstrations, discussions, inspection trips, and directed readings. (3 cr.; 48 hrs.; jr., sr., Arts and Educ.; prereq., Biology 1-2, Psychology 1-2; VI; MTWThFS; 129MH.)

53su. ELEMENTS OF PREVENTIVE MEDICINE. Susceptibility, resistance and immunity to disease; methods of spread and the prevention of communicable and degenerative diseases; importance of heredity and environment; protection of food, water, and milk. Vital statistics, school health work. (3 cr.; jr., sr.; prereq., Bacteriology 1, Physiology 4 or equiv.; VI; MTWF; V, VI, Th; 104IA.) DR. DIEHL.

56su. PUBLIC HEALTH ADMINISTRATIVE AND FIELD WORK. Demonstrations of health agencies at work; boards of health, laboratories, filtration, pasteurization, and garbage disposal plants. Presentation of actual health problems. Groups of 10 to 15 medical students for 8 weeks. 20 hrs.; sr. med.; prereq., 55; Th; see clerkship schedule; 129MH.) Staff.

58su. MATERNAL AND CHILD HYGIENE. Maternal welfare program; importance of breast feeding; origin and conduct, infant welfare clinics in cities and rural communities; consideration of child of pre-school and school age as to malnutrition, physical defects, cardiac and nervous disorders. (1½ cr.; 18 hr.; prereq., 50, 52, or 53; jr., sr.; I; MWF; 116MH.) DR. BOYNTON.

60su. THE TUBERCULOSIS PROBLEM. History of tuberculosis movement and campaign in the United States. Early diagnosis and sanatorium treatment. Tuberculosis in children. The psychology of tuberculosis; supervision of returned sanatoria patients. State program for the eradication of tuberculosis; legislation. (1 cr.; 12 hr.; jr., sr.; prereq., 50, 52, or 53; I; TS; 116MH.) DR. MYERS.

62su. PRINCIPLES OF PUBLIC HEALTH NURSING. Development, principles, technique of Public Health Nursing; methods of co-operative endeavor with social agencies; health teaching as an essential factor in promotion of individual, family and community well-being. Special fields are presented. (3 cr.; public health nurses; prereq., 53 or equiv.; VII; MTWTh; VII, VIII, F; 315MH.) MISS BUTZERIN.

63su. FIELD PRACTICE IN VISITING NURSING. For public health nurses. Lectures, demonstrations, supervision, and field practice in bedside care of general and maternity patients; communicable disease, tuberculosis and mental cases with special emphasis upon recognition of social problems, co-operation with social agencies and accurate record-keeping. (5 cr.; 176 hr.; prereq., 62; ar.; 112MH.) MISS HAUPT, MISS FULLER.

64su. FIELD PRACTICE IN INFANT WELFARE NURSING. For public health nurses. Supervised practice in teaching the value of breast feeding; of determining the eligibility for clinic; of keeping complete records. Practice in the conduct of infant welfare and pre-school age clinics with necessary follow-up visits. (3 cr.; 108 hr.; prereq., 62; ar.; 112MH.) MISS BUTZERIN, MISS PECK.

65su. FIELD PRACTICE IN SCHOOL NURSING. For public health nurses. Routine inspections with the school nurse; assistance at medical examinations; general sanitary inspections; home visits; visits to special classes as sight-saving, defective speech and hearing, subnormal, open air, and tuberculosis school. (2 cr.; 80 hrs.; prereq., 62; ar.; 112MH.) MISS BUTZERIN.

66su. FIELD PRACTICE IN COUNTY NURSING. For public health nurses. Student nurse observes and assists nurse on rounds in county, in routine physical inspection of school children, home calls, health talks and classes in home nursing, organizing, advertising, and conducting of the rural clinic. (2 cr.; 80 hr.; prereq., 62; ar.; 112MH.) MISS BUTZERIN.

67su. FIELD PRACTICE IN A TUBERCULOSIS SANATORIUM. For public health nurses. Observation and practical care of pulmonary, osseous, laryngeal tuberculosis; tuberculosis enteritis; general sanatorium treatment; special treatment; exercise; laboratory; occupational therapy and the reading of literature on tuberculosis. (2 cr.; 80 hr.; prereq., 60 and 62; ar.; 112MH.) DR. MARIETTE.

80su. EDUCATIONAL HYGIENE. Intended for teachers interested in health education. Consideration of hygiene of physical and mental growth, health supervision of school children, teaching of health subjects, and sanitation of the school plant. (3 cr.; jr., sr.; prereq., 50 or 52 or 53 or equiv.; I; MTWThFS; 112MH.) DR. DIEHL and others.

102su. SANITATION. Sanitary supervision of water and milk supplies, sewage, refuse, and garbage disposal systems. Practical work, including field investigations, laboratory examinations, interpretation of results, recommendations to correct unsatisfactory conditions, report-writing and office procedure. (Credits and hours arranged; grad.; prereq., Bacteriology 101, Chemistry 21 or 27, and 32 or 37; Physics 22, 32, 42; ar.; SBH.) MR. WHITTAKER, DR. ARCHIBALD, MR. CHILDS.

200. RESEARCH. Opportunities will be offered by the University and by the various co-ordinated organizations for qualified students to pursue research work. (Cr. ar.; grad.; ar.; 112MH.) Staff.

Second Term

56su. PUBLIC HEALTH ADMINISTRATIVE AND FIELD WORK. Same as first term.

63su. FIELD PRACTICE IN VISITING NURSING. Same as first term.

64su. FIELD PRACTICE IN INFANT WELFARE NURSING. Same as first term.

65su. FIELD PRACTICE IN SCHOOL NURSING. Same as first term.

66su. FIELD PRACTICE IN COUNTY NURSING. Same as first term.

67su. FIELD PRACTICE IN A TUBERCULOSIS SANATORIUM. Same as first term.
102su. SANITATION. Same as first term.
200su. RESEARCH. Same as first term.

DEPARTMENT OF MEDICINE

COURSES

First and Second Terms

51su. THE PRINCIPLES AND PRACTICE OF MEDICINE. Systematic lectures, exclusive of neurology and neurologic diagnosis, q.v. (33 hrs.; 5th yr. med.; 4:00-4:50; MWF; 129MH.) DR. SCHNEIDER, DR. FAHR, DR. COOK, DR. PEPPARD.

53su. PHYSICAL DIAGNOSIS AND CASE-TAKING. Conducted, with sections of the class, in the following dispensary clinics: (1) general medicine; (2) cardiac and vascular diseases; (3) respiratory diseases, and tuberculosis; (4) metabolic diseases; (5) gastro-intestinal diseases; (6) nervous diseases; (7) dermatology and syphilis. See also Courses 75 and 81. (99 hrs., 5th yr. med.; 1:00-3:00; see special schedule; MTWThFS; UD.) Staff.

54su. CLINICAL CHEMISTRY AND MICROSCOPY. Methods of laboratory examination for diagnostic purposes. (66 hrs.; 5th yr. med.; prereq., pathology and physiologic chemistry; 9:00-11:00, TTh; 8:00-10:00, S; 129MH.) DR. NOBLE.

56su. PRACTICAL THERAPY AND THERAPEUTIC TECHNIQUE. A study of special methods of therapeusis. (11 hrs.; 5th yr. med.; 8:00-8:50; M; UH.) DR. MCKINLAY.

57su. CLINIC IN MEDICINE. First clinical period. (11 hrs.; 3:00-3:50; W; UH.) DR. RICHARDS.

58su. CLINIC IN MEDICINE. Second clinical period. (11 hrs.; 3:30-4:20, F; UH.) DR. FAHR.

59su. SECTION CLINICS IN MEDICINE. Sections of Division A, fifth year. (17 hrs. cr.; see special schedule; Minneapolis General Hospital.) DR. ULRICH and staff.

63su. CLINIC IN MEDICINE. A study of cases and case histories. Advanced clinical period. (11 hrs.; 3:30-4:20, M; UH.) DR. MCKINLAY.

65su. CLINICAL CLERKSHIP. The personal observation of patients in hospital; taking and recording of case histories and making of provisional diagnoses, and study of treatment. Intermediate clinical period. Eight weeks for each student. 200 hrs. See special schedule. DR. BEARD, DR. FAHR, DR. C. A. MCKINLAY, DR. J. C. MCKINLEY, DR. RICHARDS.

67su. SECTION CLINICS IN MEDICINE. Sections of Division A, fifth year. (17 hrs. cr.; see special schedule; Ancker Hospital, St. Paul.) DR. HALL, DR. LEPAK, DR. OERTING.

101su. ASSISTANTSHIP IN THE DISPENSARY. In any of the out-patient services in medicine. Open to two students in medicine in each service and in each quarter. Prereq., Course 65; VI-VII; MTWThFS; permission required; UD.) DR. WRIGHT and staff.

103su. CLINIC IN MEDICINE. Bedside studies at the Ancker Hospital, St. Paul. Limited to six students. (17 hrs. cr.; 8:45-10:10, W.) DR. HALL, DR. LEPAK, DR. OERTING.

106su. ADVANCED PHYSICAL DIAGNOSIS. (17 hrs. cr.; 8:30-10:00, F; Minneapolis General Hospital.) DR. PEPPARD.

110su. STUDIES IN METABOLISM, CLINICAL AND EXPERIMENTAL. Six students. Hours and credits arranged; UH. DR. MCKINLAY.

112su. ADVANCED PHYSICAL DIAGNOSIS OF THE CHEST. Practical work on tuberculosis patients. Four to ten students. Hours and credits arranged; UD.) DR. WITTICH and associates.

114su. DIAGNOSIS AND TREATMENT OF DISEASES OF LUNGS. More common diseases demonstrated. History, symptoms, physical examination, and X-ray findings. Treatment demonstrated and discussed. Two lectures a week. Lectures taken with or without practical work. (Cr. and hrs. ar.; prereq., Med. 113, 48; practical, 3:00-5:00, TTh; 7:00-9:00 p.m., MF.) DR. MYERS, DR. LEES.

115su. THE RESPIRATORY ORGANS IN HEALTH AND DISEASE. For students who desire training in preparation of scientific papers for publication. Student selects problem pertaining to some part of the respiratory tract, which he pursues independently or in collaboration with instructor. Five students. Hours and credits arranged. DR. MYERS.

116su. PHYSICAL SIGNS IN PULMONARY TUBERCULOSIS. Four to six students. (17 hrs. cr.; 10:15-11:40, W; tuberculosis pavilion, Ancker Hospital.) DR. GEER.

117su. EXTERNSHIP IN MEDICINE. Extension of clerkship. One to four students. (Hrs. and cr. ar.; prereq., Med. 65; permission required; UH.) DR. FAHR and staff.

118su. EXTERNSHIP AT MINNEAPOLIS GENERAL HOSPITAL. History-taking, physical examination, and laboratory diagnosis. (198 hrs. cr.; 9:00-12:00, MTWThFS; permission required.) DR. ULRICH, DR. PEPPARD, DR. MCCARTHY.

DIVISION OF NERVOUS AND MENTAL DISEASES

71su. CLINICAL NEUROLOGY AND PSYCHIATRY. Section clinics in nervous and mental disease at the Minneapolis General Hospital; part of Division A, fifth year required section clinics. (17 hrs. cr.; jr. A.; 8:45-10:10; MW; Section A, M; Section B, W.) DR. HAMILTON, DR. MORRISON.

71xsu. CLINICAL NEUROLOGY AND PSYCHIATRY. Section clinics in nervous and mental diseases at the Ancker Hospital, St. Paul; part of Division A, fifth-year required section clinics. (17 hrs. cr.; 10:15-11:40, MF; Section C, M; Section D, F.) DR. RUHBERG.

75su. NERVOUS AND MENTAL DISEASES. The personal observation and study of cases in the University Dispensary; a part of required clinics, clerkship division. See special schedule. DR. MICHAEL, DR. MCKINLEY.

119su. EXTERNSHIP IN MEDICINE. Nervous and mental diseases. (Hrs. and cr. ar.; prereq., Medicine 65; permission required; UH.) DR. HAMILTON and staff.

121su. SYPHILITIC NERVOUS AFFECTIONS. Referring particularly to dementia paralytica and tabes dorsalis. Limited to six students. (22 hrs. cr.; 8:30-10:20, W; Ancker Hospital, St. Paul.) DR. HENGSTLER.

125su. PROBLEMS IN NEUROPATHOLOGY. The student will be assigned a topic for special study. Limited to 2 students. (Cr. and hrs. ar.; prereq., Pathology 102; permission required; 138MH.) DR. MCKINLEY.

130su. ADVANCED NEUROPATHOLOGY. Individual gross and microscopic studies on existing preparations in neuropathology. Limited to 2 students. (Hrs. and cr. ar.; 138MH.) DR. MCKINLEY.

DIVISION OF DERMATOLOGY

79su. COURSE IN DERMATOLOGY. Clinical lectures upon the common skin diseases and syphilis, including diagnosis and treatment. Fifth year. (11 hrs. cr.; 2:00-2:50, F; 214MH.) DR. BUTLER.

81su. PHYSICAL DIAGNOSIS AND CASE-TAKING. Section of the class in dermatology and syphilis, in the Dispensary. Part of Course 53. See special schedule. DR. BUTLER, DR. MICHELSON, DR. OLSON.

127su. ASSISTANTSHIP IN DERMATOLOGY, IN THE OUT-PATIENT DEPARTMENT. Open to two students. Hrs. and cr. ar.; permission required. DR. BUTLER, DR. MICHELSON, DR. OLSON.

128su. NIGHT CLINIC IN DERMATOLOGY AND SYPHILIS IN THE OUT-PATIENT DEPARTMENT. Four students in each quarter. (33 hrs. cr.; 7:00-8:30, MTh; UD.) DR. MICHELSON.

129su. WARD CLINIC IN DERMATOLOGY. Four to eight students. (17 hrs. cr.; 8:30-10:00, W; Ancker Hospital, St. Paul.) DR. GAGER.

150su. HISTOPATHOLOGY OF THE SKIN. Clinical and pathologic phases will be exemplified. Same as Path. 115. (11 hrs. cr.; prereq., Path. 102; 2:30-3:20, T; 108IA.) DR. MICHELSON.

OBSTETRICS AND GYNECOLOGY

COURSES

First and Second Terms

51su. OBSTETRICS. The physiology of pregnancy, labor, and the puerperium. For fifth year medical students. (33 hrs.; 8:00-8:50, TTh; 10:00-10:50, S; 304, 104IA.) DR. LITZENBERG.

54su. Gynecology. A study of diagnostic methods in diseases of women. Fifth year medical students. (11 hrs.; 3:00-3:50, F; 102IA.) DR. CALKINS.

56su. OBSTETRICS AND GYNECOLOGY. Lectures, class clinics, demonstrations and case analysis of the pathology of pregnancy, labor, puerperium, and diseases of women. (22 hrs.; 4:30-5:20; 104IA.) DR. BARRY.

58su. CLINICAL CLERKSHIP IN OBSTETRICS AND GYNECOLOGY. Clinical study of assigned patients in the University Hospital and "The District"; history-taking, physical examinations, laboratory, parturition clinics; operations, manikin demonstrations and bedside clinics. 4 weeks for each student. (33 hrs.; see special schedule.) University Hospital staff.

59su. CLINIC IN OBSTETRICS AND GYNECOLOGY. History-taking, physical examination, demonstrations, clinics, and diagnosis in the University Dispensary. (17 hrs.; 6th yr. med.; see special schedule.) Dispensary staff.

60su. PARTURITION CLINICS. Sections of class on call for parturition clinics at the Minneapolis General Hospital. (No cr.; 5th yr. med.) DR. SIMONS, DR. WILLCUTT.

61su. CLINICS IN OBSTETRICS AND GYNECOLOGY. Conducted in the Minneapolis General Hospital; a part of the required section clinics. (17 hrs.; 5th yr.; Division A; see special schedule.) DR. ADAIR and associates.

62su. REQUIRED CLINICS IN OBSTETRICS AND GYNECOLOGY. (17 hrs.; 5th yr. med.; Division B, Ancker Hospital, St. Paul; see special schedule.) DR. HAMMOND, DR. SCHULZE.

63su. CLINIC IN OBSTETRICS AND GYNECOLOGY. Clinics in dispensary of Minneapolis General Hospital. (17 hrs.; 5th yr. med., limited to 2 students; see clerkship schedule.) DR. LAVAKE, DR. DORNBLASER.

101su. STUDENT INTERNESHIP. Part of a general student interneship including out-patient service in "The District." Elective. University Hospital staff.

104su. GYNECOLOGIC CLINIC. Diagnosis and treatment of diseases of women. (17 hrs; limited to 2 students; 1:00-2:30 W.; St. Paul Dispensary.) DR. BARRY.

105su. GYNECOLOGIC CLINIC. Diagnostic and operative clinic, diseases of women. (17 hrs.; 10:00-11:30 W; Ancker Hospital.) DR. HAMMOND,

106su. OBSTETRIC CLINIC. Diagnosis and treatment of obstetric conditions. (17 hrs.; 10:00-11:30, W; Ancker Hospital.) DR. SCHULZE.

108asu. CLINIC IN OBSTETRICS. (17 hrs.; 9:00-10:30, F; Minneapolis General Hospital.) DR. SIMONS and associates.

108bsu. CLINIC IN GYNECOLOGY. (17 hrs.; 9:00-10:30, F; Minneapolis General Hospital.) DR. SIMONS and associates.

110su. PRENATAL CLINICS. Antepartum care of pregnant women at the various prenatal stations; limited to one student at each station. (11 hrs.) Wells Memorial, 9:15, M, DR. SIMONS; Talmud Torah, 9:00, Th, DR. MALAND; South Town, 9:00, T, DR. NORDIN.

112su. PATHOLOGICAL OBSTETRICS. Demonstration of abnormal obstetric cases and operative procedures. Limited to six senior students. (14 hrs; elective; 9:15-10:30, F; Minneapolis General Hospital.) DR. ADAIR and staff.

113su. OPERATIVE GYNECOLOGY. Demonstration of gynecologic operations and postoperative treatment. (17 hrs.; 6 seniors.) DR. SIMONS, DR. SOUBA.

116su. GYNECOLOGIC CLINIC. Bedside gynecologic clinics at Ancker Hospital. (17 hrs.; elective; 10:00-11:30, W.) DR. HAMMOND.

OPHTHALMOLOGY AND OTO-LARYNGOLOGY

COURSES

First and Second Terms

77su. OPHTHALMOLOGY. A course of lectures upon the diseases and disorders of the eye, and their corrective, medical and surgical treatment. Sixth year. (22 hrs.; 8:00-9:00, TF; 129MH.) DR. BURCH.

83su. CLINICS IN EYE, EAR, NOSE, AND THROAT. Diagnostic and operative procedures. Sections, see clerkship schedule. (15 hrs.; 2:30-3:30, T; 9:-10:00, F; U.Hosp.) DR. MURRAY, DR. MACNIE.

85su. CLINIC IN DISEASES OF THE EYE. Study and treatment of cases in the Dispensary; part of required section clinics. See clerkship schedule (17 hrs.; 1:00-2:30, MTWThFS; UD.) DR. CLARK, DR. MACNIE, and assistants.

87su. CLINIC IN DISEASES OF THE EAR. Study and treatment of cases in the Dispensary; part of required section clinics. See clerkship schedule (17 hrs.; 1:00-2:30, MTWThFS; UD.) DR. NEWHART and assistants.

89su. CLINIC IN DISEASES OF THE NOSE AND THROAT. Study and treatment of cases in the Dispensary; part of required section clinics. See clerkship schedule. (17 hrs.; 1:00-2:30, MTWThFS; UD.) DR. PATTERSON, DR. F. J. PRATT, DR. J. A. PRATT, and assistants.

115su. CLINIC IN DISEASES OF THE EYE. The examination of patients, diagnosis of disease conditions, and supervised treatment. (99 hrs. cr. or ar.; 1:00-2:30, MTWThFS; UD.) DR. CLARK, DR. MACNIE, and assistants.

117su. CLINICS IN DISEASES OF THE EAR. Studies in examination of cases, diagnosis, and supervised treatment. (99 hrs. cr. or ar.; 1:00-2:30, MTWThFS; UD.) DR. NEWHART and assistants.

119su. CLINIC IN DISEASES OF THE NOSE AND THROAT. The examination of patients, diagnosis of disease conditions, and supervised treatment. (99 hrs. cr. or ar.; 1:00-2:30, MTWThFS; UD.) DR. PATTERSON, DR. F. J. PRATT, DR. J. A. PRATT, and assistants.

121su. OPERATIVE CLINICS IN EYE, EAR, NOSE, AND THROAT. Limited to ten students. (22 hrs. cr.; 2:30-3:30, T; 9:00-10:00, F; U.Hosp.) DR. MURRAY, DR. MACNIE, DR. PATTERSON.

PEDIATRICS

COURSES

First and Second Terms

101su. DISEASES OF CHILDREN. Diseases peculiar to, or distinctive of, children, with particular emphasis upon their differences from adult type. 22 hrs.; 5th yr.; I; MW; 129MH.) DR. SCHLUTZ.

103su. CLINIC OF PEDIATRICS. A part of course in required clinics. (17 hrs.; 5th yr.; see special schedule; Minneapolis General Hospital.) DR. HUENEKENS.

103xsu. CLINIC IN PEDIATRICS. A part of course in required clinics. (17 hrs.; 5th yr.; see special schedule; Ancker Hospital.) DR. HAGAMAN.

104su. CLINIC IN CONTAGIOUS DISEASES. A part of course in required clinics. (17 hrs.; 5th yr.; see special schedule; Minneapolis General Hospital.) DR. HUENEKENS and assistants.

104xsu. CLINIC IN CONTAGIOUS DISEASES. A part of course in required clinics. (17 hrs.; 5th yr.; see special schedule; Ancker Hospital.) DR. COLBY, DR. WARNER.

106su. OUT-PATIENT PEDIATRIC CLINIC. A practical study of the diseases of children in the Out-Patient Service. Sections of intermediate clinical division. (34 hrs.; 5th yr.; 10:30-12:00; MTWThFS; MH.) DR. SCHLUTZ, DR. SEHAM, and assistants.

107su. CLINICAL CLERKSHIP IN PEDIATRICS. The observation and study of patients in University Hospital; case histories; physical examinations and provisional diagnoses; treatment. Sections of intermediate, clinical division. Each student, four weeks. (34 hrs.; 5th yr.; see special schedule; University Hospital.) DR. SCHLUTZ.

108su. CHILD WELFARE CLINIC. (Cr. ar.; 5th yr.; ar.; Margaret Barry House; South Town Clinic, N. E. Neighborhood House.) DR. RICHDORF, DR. PLATON, DR. LIPPMAN.

113su. INFANT-FEEDING CLINIC. One to five students. (Cr. ar.; 5th yr.; ar.; Pillsbury House.) DR. STEWART.

114su. INFANT-FEEDING CLINIC. One to six students. (Cr. ar.; 5th yr.; ar.; H. A. Wilder Charity.) DR. RAMSEY.

121su. CLINIC IN CONTAGIOUS DISEASES. (Elective.) Limited to ten students. (17 hrs.; 5th yr.; ar.; W; Ancker Hospital.) DR. RAMSEY.

122su. CLINIC IN PEDIATRICS. Problems in nutrition and care of older children, pre-school and school age. One to six students. (Cr. ar.; hrs. ar.; 121MH.) DR. PEARCE.

123su. CLINIC IN PEDIATRICS. Diagnosis and treatment of nervous disorders in infants and older children. One to six students. (Cr. ar.; ar.; 121MH.) DR. TAYLOR.

200su. ADVANCED STUDY IN DISEASES OF INFANTS AND CHILDREN. (Cr. and hrs. ar.) DR. SCHLUTZ.

206su. RESEARCH IN PEDIATRICS. (Ar.; 121MH.) DR. SCHLUTZ.

SURGERY

First and Second Terms

51su. PRINCIPLES OF SURGERY. A study of the various surgical inflammations and processes; pathology and treatment. Principles underlying general surgical procedures. Lectures and demonstrations. (33 hrs.; jr.; prereq., 2 yrs. of general Medical School course; 3:00-3:50, M; 11:00-11:50, ThS; 214MH.) DR. CAMERON.

56su. REGIONAL SURGERY. The practical surgery of the anatomical regions of the body, head, neck, thorax, abdomen, and extremities. (22 hrs.; prereq., Surgery 55; 4:30-5:20, MW; 214MH.)

59su. DIAGNOSTIC CLINIC. A series of clinics on the diagnosis of surgical conditions as presented in the Out-Patient Department. (11 hrs.; jr.; prereq., 2 yrs. of general work in Medical School; IV; T; 129MH.) DR. JOHNSON.

60su. DIAGNOSTIC AND OPERATIVE CLINICS. Sections of fifth year class, Division A; part of required clinics. (17 hrs.; jr.; prereq., 2 yrs. general course in Medical School; see special schedule; Minneapolis General Hospital.) DR. WILCOX, DR. CORBETT, DR. OLSON, DR. ROBITSHEK, DR. ZIEROLD.

63su. CLINICAL CLERKSHIP. The personal study of assigned patients; case histories, laboratory examinations, provisional diagnosis with suggestions as to therapy; attendance at operations and observation of post-operative management. Practical instruction in anesthesia. (120 hrs.; sections of jr. class Division B.; prereq., 2 yrs. of jr. work; see special schedule; University and General Hospital.) DR. CAMERON, DR. DUNN, DR. ZIEROLD.

65su. MINOR SURGERY CLINICS. Sections of class assigned daily to Out-Patient Department; a part of required clinics. (17 hrs.; jr.; prereq., 2 yrs. of general course in Medical School; see special schedule; Dispensary, MH.) DR. JOHNSON, DR. MCKINNEY, DR. HAYES, DR. BRATRUD.

70su. ORTHOPEDIC SURGERY. A course of clinical lectures, demonstrations, and operations conducted at the Hospital for Crippled and Deformed Children, Phalen Park, St. Paul. (24 hrs.; jr.; prereq., 2 yrs. general course in Medical School; II, III, IV; Th; Phalen Park Hospital.) DR. CHATTERTON, DR. COLE.

71su. ORTHOPEDIC CLINIC. A study of orthopedic disease and treatment in the Out-Patient Department; a part of required section clinics. (11 hrs.; jr.; prereq., 2 yrs. general course in Medical School; see special schedule; Dispensary, MH.) DR. REED, DR. GIESSLER.

77su. GENITO-URINARY CLINICS. The observations, examination, and treatment of patients in the Out-Patient Department; a part of required section clinics. (22 hrs.; jr.; prereq., 2 yrs. general course in Medical School; see special schedule; Dispensary, MH.) DR. THOMAS, DR. WETHALL, DR. KREMER, DR. HUGHES.

101asu. MINOR SURGERY ASSISTANTSHIPS. Limited to two students who have had surgical clerkship. Permission required. (50 hrs.; sr.; prereq., 3 yrs. general course in Medical School; 10:30-12:00; MWF; Dispensary, MH.) DR. JOHNSON, DR. HAYES.

101bsu. MINOR SURGERY ASSISTANTSHIP. Limited to two students who have had surgical clerkship. Permission required. (50 hrs.; sr.; prereq., 3 yrs. general course in Medical School; 10:30-12:00; TThS; UD.) DR. MCKINNEY, DR. BRATRUD.

102su. PROCTOLOGY; ASSISTANTSHIP IN PROCTOLOGY. A clinical course conducted in the Out-Patient Department. Limited to two students who have had surgical clerkship. Permission required. (33 hrs.; jr.; prereq., 2 yrs. general course in Medical School; III, MWF; Dispensary, MH.) DR. FANSLER.

103su. OPERATIVE SURGERY ON ANIMALS. A study of surgical technique by cardinal operations on animals. (22 hrs.; jr., sr., Division A; prereq., Surgery 51, 53; II, III; F; 401MH.) DR. CAMERON, DR. JOANNIDES.

105su. BEDSIDE AND DIAGNOSTIC CLINIC. (11 hrs.; jr., sr., grad.; prereq., 2 yrs. general course in Medical School; I; F; Minneapolis General Hospital.) DR. ROBITSHEK.

106su. BEDSIDE AND DIAGNOSTIC CLINIC. (17 hrs.; jr., sr., grad.; prereq., 2 yrs. general course in Medical School; I, II; W; Ancker Hospital.) DR. COLVIN and staff.

108su. UROLOGIC CLINIC; ASSISTANTSHIP IN UROLOGY. Limited to two students who have had surgical clerkship. Permission required. (50 hrs.; jr., sr., grad.; prereq., 2 yrs. general course in Medical School; 1:00-2:30, MWF; UD.) DR. WETHALL, DR. HUGHES.

111su. ORTHOPEDIC CLINIC; ASSISTANTSHIP IN ORTHOPEDIC SURGERY. Limited to two students who have had surgical clerkship. Permission required. (50 hrs.; jr., sr., grad.; prereq., 2 yrs. general course in Medical School; 1:00-2:30, MWF; UD.) DR. REED, DR. GIESSLER.

113su. UROLOGIC CLINIC; ASSISTANTSHIP IN UROLOGY. Limited to two students who have had surgical clerkship. Permission required. (50 hrs.; jr., sr., grad.; prereq., 2 years general course in Medical School; 1:00-2:30, TThS; UD.) DR. KREMER, DR. HUGHES.

114su. UROLOGIC DIAGNOSIS; CYSTOSCOPY. (44 hrs.; jr., sr., grad.; prereq., 2 yrs. general course in Medical School; 8:30-10:30, TTh; University Hospital.) DR. THOMAS.

115su. NIGHT CLINIC IN G.U. (33 hrs.; jr., sr., grad.; prereq., 2 yrs. general course in Medical School; 7:00-8:30; UD.) DR. WETHALL, and assistants.

116su. CHILDREN'S ORTHOPEDIC CLINIC. (17 hrs.; jr., sr., grad.; prereq., 2 yrs. general course in Medical School; 8:30-10:00, W; Shriners Hospital.) DR. COLE, DR. REED.

COLLEGE OF DENTISTRY

Courses in contributing departments are announced elsewhere in this bulletin. See particularly Anatomy, Bacteriology and Immunology, Chemistry, Pathology, Pharmacology, Physiology, and Metallography.

Fees: full time, $40; half time, $20 for each term.

In addition each student pays the following:

Minnesota Union or Shevlin Hall fee	$0.50
Health fee	1.00
General deposit*	5.00

Courses in the Department of Dentistry as follows:

First and Second Term

21-22-23su. SOPHOMORE OPERATIVE TECHNIQUE. A course of lectures, recitations, demonstrations, and laboratory work, identical with the course offered during the regular session. Both terms must be taken before credit will be given for the course. (6 cr.; prereq., Oral Anatomy 11f-12w-13s; 2:00-5:00, MTWThF.) DR. WALLS and associates.

CLINICAL PRACTICE. Clinical work will be offered in each of the following divisions: Crown and Bridge Work, Oral Diagnosis, Operative Dentistry, Orthodontia, Prosthetic Dentistry, and Oral Surgery. (Jr., sr., grad.; 9:00-12:00 a.m., 2:00-5:00 p.m.; MTWThF.) DR. WALLS, DR. LASBY, DR. BREKHUS, DR. GRIFFITH, DR. WELLS, and associates.

* For students who pay regular term fees in dentistry $1 will be deducted from the general deposit fee to cover recreation.

THE SCHOOL OF CHEMISTRY

COURSES

First Term

1su.[1] GENERAL INORGANIC CHEMISTRY. A study of the general laws of chemistry and of the non-metals and their compounds. (4 cr.; no prereq.; lect., II; MTWThFS; lab., VI-VII; MTWTh; 210C.) MR. HENDERSON.

4su.[1] GENERAL INORGANIC CHEMISTRY. A study of the general laws of chemistry and of the non-metals and their compounds. (4 cr.; prereq., high school chem.; lect., II; MTWThFS; 225C; lab., VI-VII; MTWTh; 210C.) MR. REYERSON.

6su.[1] GENERAL INORGANIC CHEMISTRY. Includes a study of general laws of chemistry and of non-metals and their compounds. (5 cr.; no prereq.; lect., II; MTWThFS; 325C; lab., VI-VII; MTWThF; and VIII; TTh; 210C.) MR. HENDERSON.

9su.[1] GENERAL INORGANIC CHEMISTRY. A study of the general laws of chemistry and of non-metals and their compounds. (5 cr.; prereq., high school chem.; lect., II; MTWThFS; 225C; lab., VI-VII; MTWThF; VIII; TTh; 210C.) MR. REYERSON.

11su.[1] QUALITATIVE CHEMICAL ANALYSIS. Laboratory work in systematic qualitative analysis with lectures on solutions, ionization, chemical and physical equilibrium, oxidation, and reduction, etc. (4 cr.; prereq., 3 or 5; lect., II; MTWThFS; 111C; lab., VI-VII; MTWTh; 290C.) MR. SNEED.

12su.[1] QUALITATIVE CHEMICAL ANALYSIS. Laboratory work in systematic qualitative analysis with lectures on solutions, ionization, chemical and physical equilibrium, oxidation and reduction, etc. (5 cr.; prereq., 8 or 10; lect., II; MTWThFS; 111C; lab., VI-VII; MTWThF; VIII; TTh; 290C.) MR. SNEED.

19su. TEACHERS' COURSE. Consideration of the fundamental principles of chemistry with particular reference to the teaching of chemistry in high school. Discussion of such topics as training of the teacher, laboratory equipment, etc. (3 cr.; prereq., 13; lect., IV; MTWThFS; 315C.) MR. GEIGER.

27su.[1] QUANTITATIVE ANALYSIS. (Primarily for pre-medical students and teachers.) An introductory course covering the general principles and methods of quantitative analysis, both gravimetric and volumetric. Typical problems will be assigned and attention given to proper laboratory practice. (4 cr.; prereq., 11 or 13; lect. or rec., V; MTWTh; 315C; lab., VI-VII-VIII; MTWTh; V-VIII; F; 310C.) MR. GEIGER.

28su.[1] QUANTITATIVE ANALYSIS. (Primarily for engineers, dentists, and miners.) A short introductory course covering the general principles and methods of quantitative analysis, both gravimetric and volumetric.

[1] A laboratory fee of $1.50 is charged for this course.

Typical problems will be assigned and attention given to proper laboratory practice. (3 cr.; prereq., 11 or 16; lect., V; MT; 315C; lab., VI-VIII; MT; V-VIII; WTh; 310C.) MR. GEIGER.

31su.[1] ELEMENTARY ORGANIC CHEMISTRY. Discussion of important compounds of aliphatic and aromatic series, and preparation of typical substances. This course is primarily for students in professional schools and is not equivalent to Course 35 of students registered in the School of Chemistry. (4 cr.; prereq., 11 or 12; lect., II; MTWThF; rec., IV; TTh; lab., III, IV, V; MWF; IV, V; T; 315C.) MR. SMITH.

167su. TECHNICAL GAS AND FUEL ANALYSIS. (3 cr.; jr., sr., grad.; prereq., Chemistry 20-21; lect. or rec., V; MW; lab., VI-VII-VIII; MTWTh; lect., 215; lab., 10C.) MR. HARDING.

168su. PETROLEUM AND PETROLEUM PRODUCTS. (3 cr.; jr., sr., grad.; prereq., Chem. 20-21; lect. or rec., V; TTh; lab., VI-VII-VIII; MTWTh; lect. 215, lab. 10C.) MR. HARDING.

169su. GENERAL TECHNICAL ANALYSIS. Analysis of various industrial products including foods and food materials. (3 cr.; jr., sr., grad.; prereq., 20-21; lect. or rec., V-VI; F; lab., VI-VII-VIII; MTWTh; lect. 215, lab. 10C.) MR. HARDING.

†174su.[1] CHEMICAL MANUFACTURE. (Inorganic.) Part of the summer practice required of juniors in Chemical Engineering during the summer between the third and fourth years; must be accompanied by Course 175su. (3 cr.; prereq., 171; ar.; MTWThFS; ar.) MR. MANN.

†175su[1] CHEMICAL MANUFACTURE. (Organic.) Similar to Course 174, but in the organic field. Part of the summer practice required of juniors in Chemical Engineering during the summer between the third and fourth years; must be accompanied by Course 174su. (3 cr.; prereq., 171; ar.; MTWThFS; ar.) MR. MONTILLON.

304su. RESEARCH IN INORGANIC CHEMISTRY. Arranged. MR. SNEED.

Second Term

2su.[1] GENERAL INORGANIC CHEMISTRY. A continuation of 1su. (4 cr.; prereq., 1; lect., II; MTWThFS; lab., VI-VII; MTWTh; 210C.) MR. KIRK.

5su.[1] GENERAL INORGANIC CHEMISTRY. A continuation of 4su. (4 cr.; prereq., 4; lect., II; MTWThFS; 225C; lab., VI-VII; MTWTh; 210C.) MR. HEISIG.

7su.[1] GENERAL INORGANIC CHEMISTRY. A continuation of 6su. (5 cr.; prereq., 6; lect., II; MTWThFS; 325C; lab., VI-VII; MTWThF; VIII; TTh; 210C.) MR. KIRK.

10su.[1] GENERAL INORGANIC CHEMISTRY. A continuation of 9su. (5 cr.; prereq., 9; lect., II; MTWThFS; 225C; lab., VI-VII; MTWThF; VIII; TTh; 210C.) MR. HEISIG.

[1] A laboratory fee of $1.50 is charged for this course.

† Courses 174 and 175 must be taken together.

18su.[1] ELEMENTARY CHEMISTRY FOR NURSES. A brief study of chemical and physical changes; elements and compounds; the fundamental laws of chemistry; the qualitative and quantitative composition of foods, air, and water. Thirty-six actual hours. (I; TWThF; II; TWTh; 315C.) MR. HUMPHREY.

32su.[1] ELEMENTARY ORGANIC CHEMISTRY. A continuation of 31su. (4 cr.; prereq., 11 or 12 and 31; lect., II; MTWThF; rec., III; TTh; lab., III, IV, V; MWF; IV-V; T; 315C.) MR. LAUER.

[1] A laboratory fee of $1.50 is charged for this course.

THE COLLEGE OF EDUCATION

For courses in other colleges accepted in the College of Education, see the bulletin of the College of Education.

ADMISSION

Regular Students

To be admitted to regular standing in the College of Education, students must be able to satisfy either of the following requirements, (a) or (b).

(a) Completion of at least the Junior College requirements of the College of Science, Literature, and the Arts, or of some other approved college at the University of Minnesota or elsewhere, during which time an introductory course in general psychology shall have been pursued. No formal application is necessary for transfer from the Junior College to the College of Education if such transfer is made at the beginning of the junior year, nor is any loss of credits involved.

(b) The College of Education grants to graduates of the advanced graduate course of Minnesota state teachers' colleges 90 credits.

In special subjects like art education, physical education, public school music, etc., where a four-year curriculum is provided, students may register in the College of Education in the freshman year, provided they have completed the requirements for admission to the University. (See bulletin of general information, pages 24-25.

Unclassed Students

a. The College of Education grants to graduates of the advanced Latin and the advanced English courses of the Minnesota state teachers' colleges 63 credits. These students will be admitted as unclassed until they have satisfied the requirements for junior standing.

b. Teachers preparing for examination for the first grade professional certificate, but who are unable to meet the regular requirements for admission are admitted to the College of Education as unclassed students. Each case must, however, be dealt with individually as the result of formal application to the dean.

c. Teachers in service unable to meet the regular requirements for admission are admitted to the College of Education as unclassed students. Each case must, however, be dealt with individually as the result of formal application to the dean of the College of Education.

For specific and detailed information concerning entrance requirements, consult the bulletin of the College of Education.

ADVANCED STANDING

By Examination

The College of Education distinctly discourages any effort to secure advanced standing in professional subjects by examination. With the

establishment of correspondence courses in the General Extension Division, there are no longer the reasons which formerly existed for granting such examinations.

By Graduation from the Three-Year Course of Minnesota State Teachers' Colleges

Graduates of the three-year course in the state teachers' colleges of Minnesota may receive not more than 112½ credits in the College of Education at the University of Minnesota; credits earned in the three-year normal school course may be applied in case they are deemed of equivalent merit, in the College of Education, to courses leading to certificates for supervisors in elementary grades, as principals in state graded schools, as teachers in junior high schools or in normal school departments in high schools; students coming from the three-year course in normal schools shall not receive certificates in high school subjects from the University without completing the prescribed courses of the University of Minnesota for such certificates.

Students admitted to the College of Education from state teachers' colleges will not be permitted to elect the following courses for credit: Education 1; Psychology 1-2. Such students will be required to carry the advanced course in History of Education.

For a statement of records to be submitted, see bulletin of general information, pages 33-34.

By Credentials from Other Colleges

Advanced standing in the College of Education by the presentation of credentials from other colleges of the University of Minnesota or colleges of similar grade elsewhere may be secured only upon petition to the faculty of the College of Education. Students may shorten the two years of residence only by meeting such additional requirements in quality and quantity of professional work as in the opinion of the faculty will make the training of such students equal to that of students regularly registered for two full years in the College of Education.

Prescribed Course of Study for University Teacher's Certificate in a Secondary School Subject

The College of Education has adopted the following prescribed course of study, totaling 25 credits, for the University teacher's certificate, and for the degree of bachelor of science.

1	Brief Course in History of Education	5 credits
	or	
101-102-103	History of Education	9 credits
3	Educational Sociology	3 credits
55	Elementary Psychology	3 credits
15	Technique of High School Instruction	3 credits
65	The High School	3 credits
16	Practice Teaching	5 credits
	Special Methods	at least 3 credits

The following courses must be taken in the order named, each being regarded as a prerequisite to all the courses which follow it:

Educational Psychology 55
Technique of Teaching 15
Special Methods
Practice Teaching 16

In addition to the teachers' course in the subject in which the student wishes to do practice teaching, he will be required to satisfy all courses required by the subject-matter department concerned as prerequisite to the teachers' course. (See departmental statements in College of Education bulletin.)

Exceptions

(1) Students already holding a first grade professional certificate may be excused from complying with the requirements for the University teacher's certificate but in every case students will be required to carry the minimum number of professional courses required for qualifying for a certificate.

(2) Students preparing to pursue school work but not in need of a teacher's certificate may qualify for the degree of bachelor of science without meeting the professional requirements for any particular certificate. In every case, however, students must petition for this privilege and will be required to earn 36 or more credits in a major field and to meet a minor requirement in at least one minor field.

Graduate students.—Students wishing to work upon problems immediately concerned with the writing of a graduate thesis are advised to consult with the dean of the College of Education.

AGRICULTURAL EDUCATION

COURSES

First Term

11su. PRINCIPLES OF VOCATIONAL EDUCATION. The fundamental principles upon which education is based. Emphasis is placed on those phases which are most closely related to vocational education. (3 cr.; no prereq.; I; MTWThFS; 317Ad.) MR. DICKINSON.

75su. VISUAL PRESENTATION. To prepare persons for presenting materials by means of slides, films, charts, etc. Students assist in assembling materials for their own use and in acquiring skill and technique in preparation and operation of various mediums. (3 cr.; prereq., 11; ar.) MR. DICKINSON.

82su.† AGRICULTURAL EXTENSION FIELD WORK. Actual field practice in extension work on part salary in addition to credits. Number admitted to course limited by positions available. Usually will cover summer quarter, may extend into fall quarter. (3 to 10 cr.; prereq., 81; ar.)

141su. THE HOME PROJECT. A special methods course dealing with the selection, planning, utilizing, supervising, and summarizing of the

† Broad curriculum approved by the Agricultural Education Division and a position approved by the Agricultural Extension Division are also prerequisites to this course.

home project. Special emphasis on the project method of teaching and the use of the home project as a teaching device. (3 cr.; prereq., 11; II; MTWThFS; 317Ad.) MR. FIELD.

*153su. CONSOLIDATED RURAL SCHOOLS. To prepare principals to meet the problems of organization and management peculiar to consolidated rural schools, such as building arrangements, curriculum adjustments, transportation of pupils, and home project work. (3 cr.; no prereq.; II; MTWThFS; 112Ed.) MR. DYER.

*155su. CONSOLIDATED RURAL SCHOOL PROBLEMS. Opportunity for intensive study and research in special problems of administration and supervision in village and consolidated rural schools. (3 cr.; no prereq.; IV; MTWThFS; 112Ed.) MR. DYER.

171su. PROBLEMS IN PROCEDURE. Course for teachers of agriculture. Emphasis on working out problems in detail so the processes as formulated can be used in the teaching of the following year by those enrolled. Discussions, readings, papers, laboratory. (3 cr.; prereq., 131, 42, or equiv.; IV; MTWTh; lab., VI, VII; F; 317Ad.) MR. LATHROP.

221su. GRADUATE PROBLEMS. Making investigations, gathering data, and formulating plans regarding agricultural education. (Ar.; ar.) MR. FIELD, MR. LATHROP, MR. DYER.

Second Term

*153su. CONSOLIDATED RURAL SCHOOLS. See statement for first term. (3 cr.; no prereq.; II; MTWThFS; 101Ed.) MR. DYER.

*155su. CONSOLIDATED RURAL SCHOOL PROBLEMS. See statement for first term. (3 cr.; no prereq.; IV; MTWThFS; 101Ed.) MR. DYER.

ART EDUCATION

FINE ARTS

29su. FUNDAMENTAL PRINCIPLES OF DESIGN. Elementary problems involving space-breaking with parallel lines; subdivision of rectangular spaces; emphasis on value relations in bounded spaces and surfaces; applications to problems developed in the handicraft courses. (1 cr.; no prereq.; lect., I; MWF; lab., II; MWF; 402F.) MRS. MARTIN.

32-33-34Asu. STILL LIFE. Drawing from objects in charcoal and pencil. Emphasis on value relations, form, and perspective. (1 cr.; no prereq.; Sec. 1, III; Sec. 2, IV; MWF; 402F.) MRS. MARTIN.

32-33-34Csu. SKETCH DRAWING. From the posed figure in charcoal and pencil. Action and memory drawings; emphasis on action, form, and value relation. (1 cr. each; no prereq.; Sec. 1, lect., I; Sec. 2, lect., V; lab., II, III; TThS; 402F.) MRS. MARTIN.

* Offered on Minneapolis campus.

55su.[1] FUNDAMENTAL ART PRINCIPLES. A course for grade teachers and for teachers of academic subjects in high schools who wish to see the bearing of art on their work. Lectures, notebooks with three hours a week of laboratory work. (1 cr.; no prereq.; IV; TThS; 402F.) MRS. MARTIN.

CRAFTS

The work will be devoted to the needs of the schools, social service, and those students engaged in the teaching of subnormals. Lecture VI.

36Asu. CARDBOARD AND PAPER CONSTRUCTION. Boxes, toys, furniture, and other public school problems. (1 cr.; no prereq.; lect., Sec. 1, VI; Sec. 2, VIII; MWF; lab., VII; MWF; 404F.) MISS SUTORIUS.

37su. ELEMENTARY BASKETRY. Reed and raffia, splint, pine needles, caning, and native grasses and other native materials. (1 cr.; no prereq.; VI, VII, (VIII*); TTh; Sec. 1, lect., VI: Sec. 2, lect., VII; 406F.) MISS SUTORIUS.

38su. ALLIED CRAFTS. Elementary weaving, hand looms, simple Indian and colonial rugs of our own country. Bead work, chains, bands, belts, and bags. Knot work, bags, ropes, tennis nets, hammocks, etc. (1 cr.; no prereq.; VI, VII, (VIII*); MW; Sec. 1, lect., VI; Sec. 2, lect., VII; 406F.) MISS SUTORIUS.

39su. ADVANCED REED WORK. Principles of simple furniture, including fireside baskets, floor lamps, tables, bookcases, and chairs, and the more advanced basket weaves. (2 cr.; prereq., 37 or equiv.; VI, VII, (VIII*); lect., VI; MW; 404F.) MISS ROSS.

40su. ADVANCED WEAVING. Table and foot power looms. Sequence of problems from the simple hand loom to the threading and use of the four harness foot power loom. (2 cr.; prereq., 38su or equiv.; VI-VII, lect., VI; TTh.) MISS ROSS.

41su. ELEMENTARY POTTERY. Simple problems in clay, cement, and clay substitutes. Students will be given the opportunity to make and apply simple glazes and to observe the packing and firing of the kiln. (2 cr.; no prereq.; VI, VII, (VIII*); MW.) MISS ROSS.

Second Term

If demand is sufficient, courses in Art Education will be offered.

EDUCATIONAL ADMINISTRATION AND SUPERVISION

COURSES

First Term

65su. THE HIGH SCHOOL. For high school teachers in training. Recent growth in secondary education; types of reorganization; types of programs of study; types of high schools; plant; costs; standardization. (3 cr.; jr., sr.; prereq., Ed. 55; IV; MTWThFS; 113Ed.) MR. POWERS.

[1] A laboratory fee of $1.50 is charged for this course.

* The eighth hour is for laboratory work only.

113su. HIGH SCHOOL CURRICULUM. A study of types of programs of study, curricula, subjects of study, constants, variables, electives, distribution of subject-matter by years and units. (3 cr.; jr., sr., grad.; prereq., 1, 3; IV; MTWThFS; 204Ed.) MR. HUDELSON.

115su. ADMINISTRATION AND SUPERVISION OF RURAL SCHOOLS. Problems of organization, curriculum, finance; function of supervision of one-room and consolidated schools. (3 cr.; jr., sr., grad.; I; MTWThFS; 112Ed.) MR. SELKE.

119su. ELEMENTARY SCHOOL CURRICULUM. A study of the scientific principles underlying curriculum-making. Consideration will be given to a study of the results of scientific investigation in the various fields of the elementary school curriculum both as to content and organization. (3 cr.; sr., grad.; prereq., 1, 3; V; MTWThFS; 204Ed.) MR. LATHROP.

124su. EDUCATIONAL ADMINISTRATION. The present status and tendencies in the organization and administration of state and city school systems with interpretations. (3 cr.; sr., grad.; prereq., 10 hrs. in education; V; MTWThFS; LitTh.) MR. SELKE.

125su. CITY SCHOOL ADMINISTRATION. For superintendents and principals. Detailed study of the principles and practice of city school administration. (3 cr.; sr., grad.; prereq., 124; I; MTWThFS; 113Ed.) MR. PEIK.

160su. PRINCIPLES OF SUPERVISION. An analysis of the functions and duties of a supervisor as related to the improvement of instruction; specific supervisory technique; objective analysis of classroom activity; concrete application to present day problems; case studies. (2 cr.; sr., grad.; prereq., 15 or equiv.; II; TWThF; 204Ed.) MR. BRUECKNER.

161su. SUPERVISION: USES OF EDUCATIONAL TESTS IN IMPROVING INSTRUCTION. Objective evaluation of the results of teaching; classification of pupils on basis of educational tests; diagnosis of pupil difficulty; remedial work; tests as aids to teaching. (2 cr.; sr., grad.; prereq., 15 or equiv.; IV; TWThF; 205Ed.) MR. BRUECKNER.

164su. PROBLEMS OF HIGH SCHOOL ADMINISTRATION. A study of elimination from school, secondary vocational education, the marking system, classification of students, high school library, social organization and extra-curricular activities, community relationships, teaching schedule, building, costs. (2 cr.; sr., grad.; prereq., 10 hrs. in education; MR. KOOS.

167su. JUNIOR HIGH SCHOOL. A study of the special purposes of this institution and the appropriate reorganization to achieve them; the history of the movement. (2 cr.; sr., grad.; prereq., 1, 3; VIII; TWThF; 204Ed.) MR. KOOS.

175su. CITY SCHOOL FINANCE. Analysis of unit costs on various bases; comparative cost accounting systems, budgets, financial records, and reports. (3 cr.; sr., grad.; prereq., 124-125; II; MTWThFS; Psy. Lab.) MR. VON BORGERSRODE.

218su. SEMINAR IN SECONDARY SCHOOL PROBLEMS. (2 cr.; grad.; prereq., 15 cr. in educ.; ar.; MTWTh; ar.) MR. KOOS.

Second Term

126su. City School Administration. Advanced problems in financial accounting, pupil accounting, school-building programs, and school publicity. (2½ cr.; sr., grad.; prereq., 125; III; MTWFS; 206Ed.)

161su. Supervision of Elementary School Instruction. The technique of supervision in the elementary school. For superintendents, principals, and supervisors. (3 cr.; sr., grad.; prereq., 15 or equiv.; IV; MTWThFS; 204Ed.)

174su. Public School Finance. A critical study of problems of federal and state aid to public schools; sources, methods, principles, needed reforms. Students are strongly advised to take as preparatory or in conjunction with this course Economics 191f-192w, Public Finance, and Education 126f-127w, Methods of Educational Research. (2 cr.; sr., grad.; I; MTWF; 205Ed.) Mr. Swift.

215su. Seminar in Public Education in the United States. Research course devoted to intensive study of certain factors determining the problem of public education in the United States. The following may be considered typical problems: school support, school supervision, administrative units. (1 cr.; grad.; prereq., 1 or 101-102-103 and 3; I; ThS; ar.) Mr. Swift.

EDUCATIONAL PSYCHOLOGY

COURSES

First Term

55su. Educational Psychology. A survey of fundamental facts of human behavior involved in educational activities open to juniors and seniors. (3 cr.; jr., sr.; prereq., 6 cr. in psych.; I; MTWThFS; Law Aud.) Mr. Miller.

107su. Advanced Educational Psychology. Advanced work in genetic psychology, origin and nature of human organism, development and control of instincts. Methods of measuring rate of learning; study of typical learning experiments. Study of group and individual differences, and their relations to educational practice. (3 cr.; jr., sr., grad.; prereq., 55 or equiv.; I; MTWThFS; 205Ed.) Mr. Van Wagenen.

111su. Educational Diagnosis. The typical educational problems involving educational scales and standard tests. Nature of tests, methods of use, analysis of results obtained, and programs of remedial educational procedure based on the results of the tests. (3 cr.; jr., sr.; prereq., 55 or equiv.; IV; MTWThFS; 206Ed.) Mr. Van Wagenen.

116su. Statistical Methods in Education. A study of statistical methods as applied to educational investigation. This course is ordinarily required of all candidates for advanced degrees. (3 cr.; sr., grad.; prereq., 55; I; MTWThFS; 204Ed.) Mr. von Borgersrode.

134su. MENTAL TESTS. Study of mental variation in children, its nature, degrees, causes, and effects. A laboratory course in the study of individual differences by means of mental tests. A critical study of group tests. Methods of treating superior and subnormal children in schools. (2 cr.; jr., sr., grad.; prereq., 55; Sec. 1, II, III; MTWF; Sec. 2, III-IV; MTWF; Law Aud.) MR. MILLER.

143su. INDIVIDUAL MENTAL EXAMINATION. For teachers of subnormal children. Demonstration and practice in mental diagnosis. Careful study will be made of different groups and systems of mental tests, and other clinical methods with discussion of general theory involved. (3 cr.; jr., sr., grad.; prereq., 55 or equiv.; ar.) MR. ROCKWELL.

149su. PSYCHO-EDUCATIONAL CLINIC. Conducted in co-operation with the Department of Sociology and the Medical School clinics in pediatrics and nervous and mental diseases. Students will receive systematic instruction in giving psychological examinations and in scientific interpretation of data. (3 cr.; jr., sr., grad.; prereq., Ed. 134-135-136 or equiv.; VII-VIII; ar.) MR. ROCKWELL.

153su. RESEARCH PROBLEMS. Intended for properly prepared students who desire to pursue special investigation in the field of educational psychology. (1 cr.; sr., grad.; prereq., consent of instructor; ar.) MR. MILLER.

185su. THE PSYCHOLOGY OF BEHAVIOR PROBLEMS IN CHILDREN. Survey of the field. Polyphase nature of the causative factors. Conditioning factors in the environment. Psychological and psychiatric interpretations. Presentation of clinic studies. (2 cr.; prereq., Ed. Psych. 55 or equiv.; I; MTWF; Psy. Lab.) DR. LOWREY, MR. WICKMAN, and staff of Child Guidance Clinic.

194su. MEDICAL ASPECTS OF CHILDREN IN SPECIAL CLASSES. Physical defects, personal hygiene, anthropometric tests, heredity. Anatomical, physiological, and psychological causes and treatment of amentia, certain types of insanity, and neurosis. (1 cr.; VI; TTh; 101Ed.) DR. MEYERDING.

Second Term

55su. EDUCATIONAL PSYCHOLOGY. (For course description, see First Term, Course 55.) (3 cr.; jr., sr.; prereq., 6 cr. in psych.; I; MTWThFS; Psy. Amph.) MR. MILLER.

117su. STATISTICAL METHODS IN EDUCATION. A survey of statistical studies in education with special reference to the methods employed and the reliability of the results obtained. (3 cr.; sr., grad.; prereq., 116; I; MTWThFS; 113Ed.)

134su. MENTAL TESTS. (For course description, see First Term, Course 134.) (2 cr.; jr., sr., grad.; prereq., 55 or equiv.; II, III; MTWF; 211 Psy.) MR. MILLER.

154su. RESEARCH PROBLEMS. Intended for properly prepared students who desire to pursue special investigation in the field of educational psychology. (1 cr.; sr., grad.; prereq., consent of instructor; ar.) MR. MILLER.

191su. SYSTEMATIC EDUCATIONAL PSYCHOLOGY. Advanced course covering the field of psychology as related to education. Open to seniors and graduate students. Not open to students who receive credit for Educational Psychology 106-107-108. (3 cr.; sr., grad.; prereq., 12 cr. in psy. and ed. psy; V; MTWThFS; 101Ed.)

HISTORY OF EDUCATION

COURSES

First Term

3su. EDUCATIONAL SOCIOLOGY. A study of education as a means of solving social problems and directing the evolution of institutions. (3 cr.; jr., sr.; prereq., 6 cr. in psych.; V; MTWThFS; Law Aud.) MR. FINNEY.

101su. FOUNDATIONS OF MODERN EDUCATION. Historical analysis and interpretation of the more important elements in modern education derived from the Hebrews, Greeks, Romans, Middle Ages, and Renaissance. (3 cr.; jr., sr., grad.; prereq., 6 cr. in psych. and 6 cr. in hist.; V; MTWThFS; 101Ed.) MISS ALEXANDER.

103su. HISTORY OF MODERN ELEMENTARY EDUCATION. The institutions, theories, and problems of modern elementary education in the light of their history. Emphasis upon the rise of state systems and upon the history of modern educational reform. (3 cr.; jr., sr., grad.; prereq., 6 cr. in psych. and 6 cr. in hist.; II; MTWThFS; 205Ed.) MISS ALEXANDER.

Second Term

103su. HISTORY OF MODERN ELEMENTARY EDUCATION. (For course description, see First Term, Course 103.) (3 cr.; jr., sr., grad.; prereq., 6 cr. in psych. and 6 cr. in hist.; II; MTWThFS; 205Ed.) MR. SWIFT.

HOME ECONOMICS EDUCATION

COURSES

First Term

42su.* SPECIAL METHODS OF TEACHING HOME ECONOMICS. Curricula, equipment, methods of teaching for home economics. Actual class work illustrating principles of teaching. (5 cr.; jr., sr.; prereq., H.E. 13, 22, Psy. 1-2; Agr. Ed. 11 or Ed. Psy. 55; VII, VIII; MTWThF; 213HE.) MISS BROWN.

141su.* PROBLEMS IN HOME ECONOMICS EDUCATION. Problems of administration and supervision of home economics, study of curricula for the day, part-time, and evening schools, consideration of the home project and related work. (2 cr.; sr.; prereq., 42; IV; MTThF; 213HE.) MISS MCNEAL, MISS BROWN.

* Prerequisites waived for teachers of home economics.

LIBRARY TRAINING

COURSES

7. School Library Organization and Routine. Instruction in making and using simple library records, keeping books in order and repair, with practice in preparing books for the shelves, mending, etc. One hour class work, three hours' practice work. (3 cr.; jr., sr.; V; MTWThFS; 117Ed.) Miss Penrose.

9. Book Selection for the High School Library. Aims to give practical acquaintance with a variety of literature for adolescents. Two hours' class work, three hours' practice work in library. (3 cr.; jr., sr.; IV; MTWThFS; 117Ed.) Miss Penrose.

PUBLIC HEALTH

For courses in Preventive Medicine and Public Health, see Medical School, page 82.

PUBLIC SCHOOL MUSIC

COURSE

13su.* Class Instrument-Teaching. Three classes, string, wood winds, and brass and percussion. Students may enter any or all classes. The course will contain drills, methods, and material for use in class instrument-teaching in the public schools. (1 cr. each; strings, II; wood winds, III; brass, IV; TS; 3Mu.) Mr. Pepinsky.

75su. Public School Music for the Grades. Grade methods. (3 cr.; I-II; MWF; Mu.) Mr. Beattie.

78su. Public School Music for High Schools. (3 cr.; prereq., 75; III-IV; MWF; Mu.) Mr. Beattie.

THEORY AND PRACTICE OF TEACHING

COURSES

First Term

7su. Children's Literature. Acquaintance with gradation and adaptation of literature to children's interests in the school room and at home; bases of selection, materials for expressive and extensive reading; examination and evaluation of materials. (3 cr.; jr., sr.; no prereq.; I; MTWThFS; 111Ed.) Miss Lommen.

15su. Technique of High School Instruction. Types of classroom exercises; preparation of teaching plans; hygiene of instruction; methods of treating individual differences; classroom management; professional ethics of teaching; supervised study; marking systems; observation of high school work. (3 cr.; prereq., 55; II; MTWThFS; LitTh.) Mr. Hughes.

* The three subjects may be taken concurrently.

14su. TEACHING JUNIOR HIGH SCHOOL MATHEMATICS. For students prepared to teach mathematics in the junior high school. Discussion of the course of study and methods of presentation. (2 cr.; jr., sr.; prereq., 15; VI; TWThF; 113Ed.) MR. REEVE.

16su. PRACTICE TEACHING. Teaching under supervision in the Minneapolis city schools, in regular secondary school subjects. (5 cr.; sr., grad.; prereq., 15 and Special Methods Course; ar.) MR. HUGHES.

17su. PRACTICE TEACHING. A practice course in teaching subnormal children. Students will have opportunity to observe work with the special classes, and to teach under direction of the instructor. Conducted in co-operation with the public schools of Minneapolis and St. Paul. (2½ cr.; jr., sr.; II, III, IV; MTWFS; ar.) MISS BRYNE, DR. MEYERDING.

19su. TEACHERS' COURSE IN CHEMISTRY. Consideration of the fundamental principles of chemistry with particular reference to the teaching of chemistry in high school. Discussion of such topics as training of the teacher, laboratory equipment, etc. (2 cr.; prereq., 13; lect., IV; TWThF; 315C.) MR. GEIGER.

21asu. TEACHERS' COURSE IN ENGLISH COMPOSITION. (2 cr.; jr., sr.; prereq., Ed. 15; VI; TWThF; 206Ed.) MISS INGLIS.

21bsu. TEACHERS' COURSE IN ENGLISH LITERATURE. (2 cr.; jr., sr.; prereq., Ed. 15; VII; TWThF; 206Ed.) MISS INGLIS.

26su. TEACHERS' COURSE IN LATIN. Class drill and discussion of various problems connected with secondary school work in Latin. (3 cr.; jr., sr.; prereq., any 2 of Courses 51-53 or equiv. and Ed. 15; VII-VIII; MWF; 101Ed.) MISS DENNEEN.

37su. SOCIAL SCIENCE FOR SENIOR HIGH SCHOOLS. Selection and organization of content, preparation and presentation of data, and methods of teaching. Required of all students whose major is social science. (3 cr.; jr., sr.; prereq., in each of the following: pol. sci., econ., sociol., either American History or Modern European History and Ed. 15; VI-VII; MWF; 204Ed.) MR. TOHILL.

38su. METHODS AND PROBLEMS IN SECONDARY SCHOOL SCIENCE. Organization and methods of secondary school sciences. Attention to general science, lesson-planning, methods of presentation, assignments, measuring achievement. Open to students preparing to teach natural science. Required for practice teaching in science. (3 cr.; jr., sr.; prereq., consult instr.; VI-VII; MWF; 8Ed.) MR. SMITH.

42su. FUNDAMENTAL EDUCATIONAL THEORIES RELATED TO INSTRUCTION IN THE ELEMENTARY SCHOOL. A study of current educational concepts as related to problems in the elementary school. Not open to those who have had Ed. 160. (3 cr.; jr., sr.; II; MTWThFS; 101Ed.) MISS LOMMEN.

43su. THE TEACHING OF ENGLISH IN THE ELEMENTARY SCHOOL. A consideration of the materials and the means for improving instruction in spelling, language and reading processes; emphasis on silent reading technique in Grades 1-6. (2 cr.; jr., sr.; III; MTWF; 205Ed.)

54su. TEACHING SECONDARY SCHOOL MATHEMATICS. For students preparing to become teachers of secondary school mathematics. Lectures, readings, discussions, methods of presenting courses of study in general mathematics, algebra, and geometry. (4 cr.; jr., sr.; prereq., 15, Math. 50; VII, VIII; MTWF; 113Ed.) MR. REEVE.

75su. PUBLIC SCHOOL MUSIC FOR THE GRADES. (3 cr.; prereq., consult instructor; IV; MTWThFS; 8Ed.) MR. BEATTIE.

78su. PUBLIC SCHOOL MUSIC FOR THE HIGH SCHOOL. (3 cr.; prereq., 75; V; MTWThFS; 8Ed.) MR. BEATTIE.

181su. TECHNIQUE OF ELEMENTARY SCHOOL INSTRUCTION. Advanced course for teachers with experience in fundamental methods of teaching elementary school subjects. (3 cr.; jr., sr.; prereq., 55; V; MTWThFS; 113Ed.) MR. FIELD.

193su. FOUNDATIONS OF SECONDARY SCHOOL METHODS. A study of the investigations which form the bases of the technique of high school instruction, and the application of their results to high school subject-matter and to high school classroom procedure. (2 cr.; sr., grad.; prereq., Ed. 15; V; TWThF; 205Ed.) MR. HUDELSON.

222su. RESEARCH PROBLEMS IN TECHNIQUE OF INSTRUCTION IN SECONDARY SUBJECTS. (1 cr.; grad.; prereq., Ed. 15 and 113; ar.) MR. HUDELSON.

Second Term

15su. TECHNIQUE OF HIGH SCHOOL INSTRUCTION. (For course description, see First Term, Course 15.) (3 cr.; prereq., 55; IV; MTWThFS; 205Ed.) MR. FIELD.

56su. TEACHERS' COURSE IN HISTORY. Deals chiefly with the practical problems of teaching history and government in the secondary schools. (3 cr.; jr., sr.; prereq., Ed. 15, 18 cr. in hist. including one intensive course; II; MTWThFS; 111Ed.) MR. KREY.

151su. ELEMENTARY METHODS. The rural school curriculum. Different types of lessons, equipment, materials, adaptation to needs of rural community. (3 cr.; jr., sr., grad.; prereq., 15 cr. in educ.; V; MTWThFS; 206Ed.) MR. FIELD.

TRADE AND INDUSTRIAL EDUCATION

COURSES

First Term

Ind.20su. INDUSTRIAL HISTORY. A survey of the development of industry from the earliest times, with some discussion of the related social and economic phases of human life. Recent American developments are stressed. (2 cr.; no prereq.; III; TWThF; 111Ed.) MR. TOHILL.

Ind.25su. LITERATURE OF VOCATIONAL EDUCATION. Acquaintance and methods of use. Survey of useful books, periodicals, reports, and bibliographies. Students made familiar with reference facilities. Individual term assignments prepared under guidance, to teach sources, organization, and the writing of papers. (2 cr.; no prereq.; II; TWThF; 202Ed.) MR. SMITH.

Ind.40su. OCCUPATIONAL ANALYSIS. Necessity for, and general types of, vocational analysis, a survey of those available. Individual work upon a chosen occupation, break ups, classification of materials, and their organization for teaching purposes. (2 cr.; no prereq.; II; TWThF; 206Ed.)

Ind.61su. SOCIAL SIGNIFICANCE OF INDUSTRIAL EDUCATION. A study of the basic facts of economics and sociology which support efforts in the organization and administration of industrial education. Review of the movements which contributed to its introduction and development. Its social value and results. (2 cr.; III; TWThF; 206Ed.)

Ind.66su. METHODS, RELATED SUBJECTS. Theory, practices, and problems of related instruction; application charts in mathematics, drawing, science, and safety; group-study and unit-course preparation; usable methods and the means of supervision. Both incidental and scheduled teaching considered. (2 cr.; jr., sr.; prereq., 40, 41, or 42; I; TWThF; 202Ed.) MR. SMITH.

Ind.70su. METHODS OF SHOP TEACHING. Various methods of conducting shop classes, with and without reference to production work; lesson plans, grading, reports, and records; shop management and the assigning of jobs; standards of workmanship. (2 cr.; prereq., 40 or 41; IV; TWThF; 202Ed.) MR. CRAIGO.

Ind.80su. GENERAL INDUSTRIAL TRAINING. Organization and supervision of the industrial courses for grades and high schools in typical Minnesota towns. Aims of the work, offerings and schedules, teaching fitness, equipment, methods, and management. Consideration of the unifying opportunities within a department and a school. Report of a recent survey of 65 selected schools. (2 cr.; no prereq.; III; TWThF; 202Ed.) MR. SMITH.

Ind.172su. ADMINISTRATION OF INDUSTRIAL EDUCATION—EVENING SCHOOLS. Development of the after training of adults; agencies and scope of the movement; state supervision, national and state legislation; qualification of instructors, problems and difficulties, records and certification, fees and charges. Buildings, equipment, and instruction facilities. General versus unit course organization. Costs. (2 cr.; jr., sr., grad.; no prereq.; I; TWThF; 101Ed.) MR. BASS.

11su.[1] TEACHERS' COURSE IN PRIMARY GRADE WOOD WORK. This course is designed for primary grade teachers, teachers of subnormal children, and to teachers of art. The course consists of lectures and shop work. The shop work is divided into three parts: flat piece work, assembled and movable parts, and toy furniture. (1 or 2 cr.; no prereq.; II and 1 hr. ar.; MTW; 24Ed.) MR. STOCKWELL.

10su.[1] TEACHERS' COURSE IN ELEMENTARY WOOD WORK. This course is primarily a methods course. A very important part of the course is demonstration work by the students. The course also involves uses and care of tools, tool processes, and uses and care of wood-working machinery. (2 cr.; no prereq.; III, IV; MTWTh; 24 Ed.) MR. STOCKWELL.

[1] A laboratory fee of $1.50 is charged for this course.

13su. ORGANIZATION AND TEACHING OF MANUAL TRAINING. A study of the history of manual training, aims and values, selection and installation of equipment, supplies, courses of study for grade and high school manual training and methods of presenting manual training to grade and high school pupils. Minnesota "General Industrial Work" will be discussed. (2 cr.; prereq., 12 or equiv.; I; MTWTh; 115Ed.) MR. STOCKWELL.

Second Term

11su.[1] TEACHERS' COURSE IN PRIMARY GRADE WOOD WORK. (For course description, see First Term, Course 11.) (1 cr.; no prereq.; IV; MTW; 24Ed.) MR. STOCKWELL.

10su.[1] TEACHERS' COURSE IN ELEMENTARY WOOD WORK. (For course description, see First Term, Course 10.) (2 cr.; jr., sr.; no prereq.; II, III; MTWTh; 24Ed.) MR. STOCKWELL.

13su. ORGANIZATION AND TEACHING OF MANUAL TRAINING. (For course description, see First Term, Course 13.) (2 cr.; jr., sr.; prereq., 12 or equiv.; I; MTWTh; 115Ed.) MR. STOCKWELL.

NOTE.—Under the plan of co-operation between the University and the Dunwoody Industrial Institute, students registering in the College of Education may elect shop courses for college credit at Dunwoody without payment of additional fees. It is planned to have work done at the institute only on Mondays, but exception will be made in individual cases.

Students should be aware also that the various engineering colleges of the University offer excellent facilities for shop and related instruction.

[1] A laboratory fee of $1.50 is charged for this course.

THE SCHOOL OF BUSINESS

GENERAL INFORMATION

ADMISSION TO THE SCHOOL OF BUSINESS

For admission to the School of Business a student must have satisfied the requirements of one of the two-year pre-business courses, either in the College of Science, Literature, and the Arts, the College of Agriculture, Forestry, and Home Economics, or the College of Engineering. However, students entering from other colleges and universities of recognized standing may be admitted if deficient in not more than two of the following: accounting, psychology, statistics, provided (1) that this deficiency is removed during the first year in the School of Business, and (2) that a minimum of 90 credits and 90 honor points is granted by the University examiner for the work done elsewhere.

SPECIAL STUDENTS

A limited number of high school graduates who have reached the age of twenty-four and can furnish evidence to the effect that they have had at least three years of successful business experience in an executive capacity may be admitted as special students. They will be required to maintain a C average and must not elect more than 12 hours of work per quarter. If later they decide to become candidates for a degree they must complete the requirements of the pre-business course.

STUDENTS IN OTHER SCHOOLS OR COLLEGES OF THE UNIVERSITY

Regularly enrolled students in other schools or colleges of the University may be admitted to such courses in the School of Business as are authorized by the faculties of the School of Business and the school or college concerned. Such students are urged to select their business subjects in accordance with a definite plan, and as far as possible to complete a systematic course of business study. *Only those courses in the School of Business are open to students of other schools or colleges of the University which are announced in the bulletin of that school or college.*

DESCRIPTION OF COURSES[1]

COURSES

First Term

3su. PRINCIPLES OF ECONOMICS (elementary course). Principles that underlie the present industrial order with reference to production and consumption. Application of these principles to corporations and trusts, with a brief study of money and banking. (3 cr.; no prereq.; soph., jr., sr.; Sec. 1, III; MTWFS and 1 hr. ar.; 202B; Sec. 2, VI; MTWFS and 1 hr. ar.; 209B; Sec. 3, V; MTWThFS; 209B.) MR. MUDGETT, MR. TAYLOR.

[1] See also courses in Agricultural Economics, page 63.

14su. ELEMENTS OF STATISTICS. Elementary principles of classification, analysis, and presentation of statistical materials, with primary emphasis on economic data. Lectures, readings, and laboratory work. (5 cr.; prereq., 3, 4; soph., jr., sr.; II; MTWThFS; lab., V; MTWThFS; 303B.) MR. MUDGETT, MRS. YOUNGS.

25su. PRINCIPLES OF ACCOUNTING (First half). Purpose and principles of account classification; capital and revenue; accruals; valuation; depreciation; preparation and interpretation of balance sheets; income accounts, and other statements; introduction of partnership and corporation accounts. A laboratory course with supplementary lectures. (4 cr.; prereq., 3, 4, or concurrently; soph., jr., sr.; VI; MTWThFS; lab., Sec. 1, I; MTW; Sec. 2, I; ThFS; 301B.) MR. HEILMAN, MRS. YOUNGS.

103su. VALUE AND DISTRIBUTION. An advanced course in economic theory, prices and costs; the value theory. For the Summer Session this course is the equivalent of Course 101. (3 cr.; prereq., 3, 4; jr., sr., grad.; IV; MTWFS and 1 hr. ar.; 202B.) MR. GARVER.

131su. COST ACCOUNTING. General survey of principles and methods of cost accounting with some practice in cost routines, applications of cost accounting to problems of management. (3 cr.; prereq., 25, 26; jr., sr., grad.; V; MTWThFS; 303B.) MR. HEILMAN.

143su. THE FINANCIAL SYSTEM. Relation to industrial system. Monetary principles with special reference to United States. American banking and bank organization, principles of commercial banking, non-commercial banking, relation of government to banking, comparative study of leading foreign systems. (3 cr.; prereq., 3, 4; jr., sr., grad.; II; MTWThFS; 202B.) MR. MYERS.

149su. BUSINESS CYCLES. American business conditions since 1890 with regard to the great cycles of alternate prosperity and depression, and financial panics. Critical examination of all the available business barometers designed to forecast similar conditions. (3 cr.; prereq., 143, 144; jr., sr., grad.; III; MTWFS and 1 hr. ar.; 209B.) MR. MYERS.

176su. COMMERCIAL POLICIES. Theory of international commerce; free trade, reciprocity, subsidies, preferential treatment, the open door, international finance, commercial treaties, foreign politics, and other governmental and organized efforts to affect trade. American problems emphasized. (3 cr.; prereq., 3, 4; jr., sr., grad.; I; MTWThFS; 202B.) MR. BLAKEY.

191su. PUBLIC FINANCE. Government revenues, expenditures, and debts, special emphasis upon taxation. (3 cr.; jr., sr., grad.; prereq., 3, 4; II; MTWThFS; 202B.) MR. BLAKEY.

Second Term

4su. PRINCIPLES OF ECONOMICS. A continuation of Course 3su. (3 cr.; prereq., 3; soph., jr., sr.; II; MTWThFS; 209B.) MR. CUMMINGS.

72su. ECONOMICS OF TRANSPORTATION. The theory and practice of rate-making. Government regulation, the conflict between state and federal

authorities, and suggested improvements in control of transportation agencies. (3 cr.; prereq., 3, 4; jr., sr.; IV; MTWThFS; 202B.) MR. CUMMINGS.

104su. VALUE AND DISTRIBUTION. A continuation of Course 103su. Rent, wages, and profits. For the Summer Session this course is the equivalent of the Course 102. (3 cr.; prereq., 103; jr., sr., grad.; II; MTWThFS; 202B.) MR. GARVER.

144su. THE FINANCIAL SYSTEM. A continuation of Course 143su. (3 cr.; prereq., 143; jr., sr., grad.; I; MTWThFS; 202B.) MR. STEHMAN.

155su. CORPORATION FINANCE. The organizing, financing, and managing of corporations. A study of corporate securities for purposes of promotion and reorganization and of facilities for marketing them. (3 cr.; prereq., 143, 144; jr., sr., grad.; III; MTWFS and 1 hr. ar.; 202B.) MR. STEHMAN.

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