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of the University of
Minnesota

The College of Science, Literature,
and the Arts
1935-1936



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GENERAL INFORMATION

1. *Admission to the freshman year.*—Students are admitted to this college either by certificate from an accredited secondary school or by examination. For details concerning the requirements in either case consult the Bulletin of General Information for 1935-36, pages 29-35.

2. *Adult special students.*—Persons of maturity (at least 24 years of age) who desire to pursue a special and limited course of study may be admitted by the Students' Work Committee as adult special students. The registration of such students will be under the control of the committee.

Application for registration as an adult special student should be made not later than September 15, December 15, or March 15, depending upon the quarter the candidate desires to enter the college.

3. *Admission to advanced standing.*—The following rules govern students entering this college with advanced standing from some other institution.

- a. Credits of advanced standing are provisional and are finally adjusted by the Students' Work Committee after the student has completed a year's residence. Credits which have been forfeited may be recovered by special examination.
- b. A student entering with advanced standing must earn an average of one honor point per credit for all work in this college counted for graduation or for admission to the Senior College.
- c. A student admitted to the Senior College and failing to meet this requirement may be excluded from the Senior College at any time after the first quarter.

4. *Examinations for advanced standing.*—Any student upon first registration at the University may, with the approval of the Students' Work Committee, be allowed without charge to take examinations for advanced standing in subjects in which the student declares himself to be prepared. Such examinations must be taken within the first six weeks of residence.

5. *Examinations for credit.*—Credit for work done outside of class may be obtained by taking special examinations. Application should be made to the assistant dean for students' work.

6. No student may receive by means of such an examination more than 12 credits in one department or more than a total of 18 credits toward graduation.

7. No credit in beginning language courses may be gained by special examination.

8. *Registration.*—Students are required to register on the days announced in the university calendar. Only in very exceptional circumstances will a student be allowed to register thereafter, and no student will be enrolled after the first week of the quarter. (See section 11, Penalty Fees.)

9. No student will receive credit for work for which he is not properly registered.

10. *Fees.*—Tuition fee (per quarter)

| | |
|------------------------------|---------|
| Residents of Minnesota | \$20.00 |
| Nonresidents | 30.00 |

| | |
|--|--------------|
| Credit hour tuition fee (unclassified students, auditors, and others carrying less than full work) | |
| Residents of Minnesota | 1.75 |
| Nonresidents | 2.50 |
| Incidental fee (per quarter)..... | 6.00 |
| Matriculation deposit‡ (first quarter only) | |
| Men | 15.00 |
| Women | 5.00 |
| Special fees | |
| Fees for individual courses are specified in the course announcements. | |
| Examination for removal of condition..... | 1.00 |
| Examination for credit (after first 6 weeks in residence) | 5.00 |
| Special examination | 5.00 |
| Laboratory deposit (required of students registered for courses in chemistry) | 5.00 |
| Graduation fee | 7.50 |
| Music fees (in addition to tuition) for those electing music | |
| Courses 11 to 27 | |
| 1 individual lesson per week, 2 credits..... | 25.00 |
| 2 individual lessons per week, 4 credits..... | 50.00 |
| Class lessons in Courses 11C, 12C..... | 15.00 |
| Courses A, B, C and Courses D, E, F | |
| 1 individual lesson per week, no credit..... | 25.00 |
| Practice fees | |
| Organ (per hour) | 0.20 to 0.40 |
| Piano‡‡ (per quarter) | 5.00 |

11. *Penalty fees.*—A penalty fee for late registration, late change of registration, or late payment of fees shall be \$2 prior to the day classes begin, on and after which the penalty increases at the rate of \$1 per day, provided that no student shall pay more than \$10 of penalty in any given quarter.

12. *Auditors.*—Under certain conditions stated below students may be enrolled as auditors and may hear lectures and class discussions regularly without being required to do the work of the course. No regular student may be admitted to classes as an auditor until his senior year.

13. Any mature person not a regular student may be admitted as an auditor to any course under the following regulations:

- a. He shall secure the written approval of the dean and of the instructor in charge of the course.

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

‡‡ Six hours per week (fifty cents per quarter for each additional hour per week).

b. He shall present such approval to the registrar and pay the usual fee charged for regular membership in such a course. See section 10.

14. Attendance as an auditor does not entitle one to credit or to admission to regular examinations in the course.

15. Any senior whose high scholastic standing enables him to carry a small program may register as an auditor under the same regulations.

16. *Grades.*—Four grades, A, B, C, and D, are given for work of varying degrees of merit. The grade D permits a student to register for continuation or dependent courses; and work completed with this grade is counted toward graduation when combined with work of A or B grade in other courses. The grade C indicates work of a quality acceptable for graduation; the grades B and A are given for work of higher degrees of excellence.

Work of inferior grade is marked E (condition) or F (failure). Work which is of at least D grade but, because of circumstances beyond the student's control, not completed, may be marked I (incomplete).

17. *Credits and honor points* are used for convenience in indicating amount and quality of work.

Amount of work is expressed in *credits*. Each credit demands on the average three hours a week of a student's time; that is, one recitation with two hours of preparation, or three hours of laboratory work.

Quality of work is indicated by *honor points*. Honor points are assigned to the various grades on the assumption that work of a quality acceptable for graduation is graded at least C. (See section 16.) Each credit with the grade of C carries one honor point; each credit with the grade of B, two honor points; each credit with the grade of A, three honor points. The grade of D carries no honor points. The grade of F carries minus one honor point per credit. The penalty cannot be removed by repeating the course with a passing grade.

A student who maintains an average of one honor point per credit is proceeding normally to fulfill the requirements for graduation or for admission to the professional schools. By maintaining an average better than C, a student is able to reduce the amount of work which he is required to complete. (See sections 32 to 34.)

18. *The grade I (incomplete)* cannot be given when the work not completed represents more than one fourth of the quarter's work.

19. An *incomplete* not removed before the end of the first month of the student's next quarter in college becomes a *condition*. The Students' Work Committee may, in special cases, extend this time limit.

20. *The grade E (condition)* is a temporary grade, representing a deficiency which may be removed without repeating the course. A student who has received a condition in a course may register for the continuation or dependent course the following quarter.

21. *Removal of conditions.*—Conditions may be removed by additional work and an examination or, in certain cases, by satisfactory work in the next quarter of the course.

22. In English (courses in composition), Geology, Greek, History, Journalism, Latin, Music, Physical Education for Women, Physics, Scandinavian, Speech, and Zoology, conditions may sometimes be removed by passing a continuation course with a grade of C or better, in which case the grade of the first quarter will be recorded as D. A student who desires to remove a condition in this way must obtain the approval of the department, and must notify the registrar's office of his intention within the first week of the quarter. No student who has already failed in the condition examination is permitted to remove the condition by this second method.

23. In the following departments, conditions may be removed only by examination: Anthropology, Architecture, Astronomy, Botany, Chemistry, Drawing, Economics, English (courses in literature), Fine Arts, German, Geography, Library Instruction, Mathematics, Orientation, Philosophy, Physical Education for Men, Political Science, Psychology, Romance Languages, and Sociology.

24. The permanent grade resulting from the removal of a condition may in no case be higher than C.

25. Examinations for the removal of conditions incurred during the fall and winter quarters are given during the first thirty days of the succeeding quarter. Examinations for the removal of conditions incurred during the spring quarter are given the week before the opening of the fall quarter.

26. A student who desires to take a condition examination must notify the registrar in writing at least three days before the date scheduled for the examination. Any student failing to give such notice will not be allowed to take the examination.

27. A condition not made up within one quarter of residence becomes a failure subject to the rules governing failures.

28. *The grade F (failure)* represents a deficiency so serious that the student must repeat the course in order to obtain credit therein.

29. A student receiving a failure in any course shall not be allowed to pursue the continuation of that course the following quarter.

30. Any student receiving a failure in a course which is required in his curriculum must repeat the course the next time it is offered.

31. No course for which a student has received credit may be repeated by him to raise his grade except by special permission of the Students' Work Committee.

32. *Quality credits.*—For each five honor points in excess of one honor point per credit, the required number of credits will be diminished by one.

33. This regulation applies only to the total number of credits required. It does not apply to other specific requirements of the student's curriculum. It is in force as regards (a) admission to the Senior College, the College of Education, and the School of Business Administration, (b) graduation from the general course and from the special courses leading to the degrees of bachelor of arts and bachelor of science, and (c) the work done *in this college* in the following combined arts and professional courses: Arts and Medicine, Science and Medicine, and Arts and Dentistry.

34. This regulation is based on the well-known fact that students of high scholarship have accomplished more than those who have poorer records.

Students of higher attainment are thus given the opportunity of completing the work for the B.A. degree in less than four years and entering earlier on their graduate work. Seniors with high scholastic standing are allowed the privilege of visiting classes* and of reading under direction; and students who are handicapped by outside work or poor health can thus carry less than full work and still make a normal advance toward graduation.

35. *Junior and Senior colleges.*—The Junior College, consisting of the first two years, offers instruction in the fundamental branches which are required in preparation for the courses leading to the degrees B.A. and B.S., and for the professional schools. It is expected also that its courses of study will offer preparation for various vocations or will provide a general education for those who do not complete a longer course.

The Senior College, consisting of the third and fourth years, is concerned primarily with the advanced instruction leading to the Bachelor's degrees.

Each college is under the general direction of an assistant dean.

36. Students who are candidates for a degree are listed as freshmen when they have less than 39 credits; as sophomores when they have 39 credits or more.

37. The college distinguishes between Junior College courses, intended primarily for freshmen and sophomores, and Senior College courses, intended primarily for juniors and seniors.

38. Senior College courses appear in the announcement as open to "juniors and seniors" or to "juniors, seniors, and graduates."

39. Some Senior College courses are regularly open to Junior College students who have an average grade of at least C in the prerequisite courses. They are listed beneath the heading *Senior College Courses* in departmental statements in the Science, Literature, and the Arts section of the *Combined Class Schedule for 1935-36*. Other Senior College courses are open to Junior College students only by special permission of the Students' Work Committee. Courses which carry graduate credit may not be taken earlier than the third quarter of the student's sophomore year.

40. *Election of subjects in other colleges or schools.*—In the senior year, any student registered in the College of Science, Literature, and the Arts may elect not to exceed 6 credits per quarter in any other college or school of this University, provided that (1) the courses are indicated by the dean of the college or school in question and approved by the Advisory Committee of this college as suitable for such election; and (2) no duplication of subject occurs. Courses so taken are counted toward the bachelor of arts degree on the same terms as those taken in the College of Science, Literature, and the Arts.

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

Seniors desiring further information regarding courses open should consult the assistant dean for the Senior College.

* See sections 13 and 15.

GENERAL REGULATIONS

NOTE.—*Students are held individually responsible for the information contained in these pages. Failure to read and understand these regulations will not exempt a student from whatever penalties he may incur.*

1. *Number of credit hours.*—Students must elect at least 13 credits of work a quarter. To take less than that number, a student must secure permission from the Students' Work Committee.

2. Students ordinarily may not elect more than 17 credits. After two quarters of residence a student may register for 18 credits provided he has an average of $1\frac{1}{2}$ honor points per credit for the two quarters *previous to the time of registration*, and no condition or failure for the quarter immediately preceding registration. A student carrying 18 credits may be required to revise his program if his work shows a serious decline.

3. *Extension and Correspondence Study courses.*—No student enrolled in the college will be allowed to carry work in the Extension Division without permission of the Students' Work Committee. No student may enroll for an extension course if this would increase his credits beyond the maximum allowed.

4. Credits received in university extension courses are counted as credits in this college only after the student has completed one year of work in the college.

5. *Afternoon work.*—All freshmen and sophomores are expected to elect approximately one third of their work in the afternoon.

6. *Residence.*—To secure any degree from this college a student must earn 45 credits in residence. To secure a degree in a curriculum given entirely within this college, he must spend the last three quarters before graduation in residence in the Senior College and must earn in residence in the Senior College a minimum of 45 credits.

7. *Habitual bad English.*—Any student who either in speaking or in writing habitually uses bad English shall be reported by his instructor to the dean with all available evidence. If the dean considers this evidence sufficient, he will require the student to take without credit such further work in composition as the chairman of the Department of English may specify.

8. *Changes in registration.*—After classes have begun, no changes in registration, other than necessary changes, may be made without permission of the Students' Work Committee.

9. No student may drop out of class without permission of the Students' Work Committee. Students are warned that failure to obey the regulations in this paragraph may result in their exclusion from college.

10. When a student's registration in any subject is cancelled at his own request within the first two weeks of any quarter, no standing is recorded. After that time a record of his work is obtained from his instructor. Work of the grade of D or higher will be cancelled without grade; work below the grade of D will be recorded as "dropped with the grade of F."

11. If a student is in any doubt regarding his registration or desires to make any change in it, he should consult his major adviser, the assistant dean of his college, or the chairman of the Students' Work Committee.

12. *Absences.*—No absences without excuse are to be regarded as legitimate. Both tardiness and absence are dealt with by the individual instructor on the assumption that each student is expected to do the full work of the class.

13. A student absent for any reason whatsoever is expected to do the full work of the course. He must make up work lost through delay in registration as in the case of any other absences.

14. *Delinquent students.*—Continued residence in the college is conditioned upon reasonable success in the student's work. Any student who does not make satisfactory progress in the course in which he is registered may be placed on probation by the Students' Work Committee.

15. No student is considered to have a wholly satisfactory standing who fails to secure in the course of any year the normal advance of one honor point for each credit for which he is registered.

16. *Probation.*—A student in the Junior College will be placed on probation if at the close of any quarter or at the time of the midquarter report he is below passing grade in 50 per cent of his work. A student in the Senior College will be placed on probation if he is below passing grade in 40 per cent of his work.

17. A student on probation is in serious danger of being excluded from college if his work does not show immediate and rapid improvement. Subject to the regulations hereinafter stated, the condition and length of the probation are determined by the Students' Work Committee.

18. With the exception of students who refuse to take a serious interest in their work, no student will be excluded from college until he has been on probation at least six weeks.

19. The period of probation continues not more than two quarters. It may be extended if the committee is convinced that failure to show marked improvement is due to causes (other than incapacity) over which the student has no control, and that these causes may reasonably be expected to disappear.

20. Students excluded from this college shall be recorded as (a) transferred, (b) discontinued, (c) dropped.

a. *Transferred.*—Students whose attitude toward their work is satisfactory, but who evidently are pursuing the wrong course, may be transferred to another college at the close of any quarter with the approval of the two colleges concerned and the dean of student affairs.

b. *Discontinued.*—Students who are apparently pursuing the right course, but have been handicapped by conditions over which they have no control (ill health, necessary outside work, etc.) may be required to discontinue their registration until the committee is satisfied that the conditions under which they work are bettered. When such discontinuance takes place, at any time other than the

end of the quarter, the courses for which the student is registered are recorded as cancelled without grade.

- c. *Dropped*—Students who have clearly shown by their records that they are irresponsible, and who have failed to meet the terms of their probation, shall be dropped.

21. *Readmission*.—Students excluded from college shall be allowed to return only with the permission of the Students' Work Committee.

- a. Students classified as discontinued must present evidence that the conditions which hindered their work have been remedied.
- b. Students who have been dropped may be required to remain out of college until the term of the next year corresponding to that in which the delinquency occurred. Such students must present satisfactory evidence that they have been employed in an occupation demanding intelligence and responsibility, or have successfully pursued subjects of an approved character. At the time when the student is dropped the Students' Work Committee will inform him what type of studies will be accepted for readmission.

22. The cancellation of a student's registration, of his own accord, will not affect his status as a delinquent student or the terms of his readmission. When a student leaves college he will be notified by the registrar's office of his status under these regulations.

23. Students who return under the provision of section 21 will be registered on probation. Such students may be dropped at any time that their work is unsatisfactory to the Students' Work Committee.

24. *Eligibility*.—A student who is ineligible to participate in extracurricular activities because of a condition may become eligible by removing the condition.

A student who is ineligible because of failure in a course required for graduation may become eligible (a) by repeating the course with a passing grade, or (b) by earning an average of one honor point per credit on a program of at least fifteen credits during the quarter immediately preceding participation. The two terms of a summer quarter may count as a quarter for this purpose.

A student who is ineligible because of a failure in a course not required for graduation may become eligible by either of the above methods or by completing one full year of work.

25. *Petitions*.—A student who wishes exception made to any rule of the college should present his request in writing to the Students' Work Committee. Petition blanks may be obtained at 219 Administration Building or 106 or 219 Folwell Hall.

Every student who desires to be heard in regard to his petition will be given such an opportunity by the committee.

COURSES OF STUDY

SUMMARY OF COURSES

The individual subjects of study offered to students in the College of Science, Literature, and the Arts, with information about credits and pre-requisites and with a schedule of hours, days, and classrooms, are given in the University's *Combined Class Schedule for 1935-36*.

A student may, while registered in the College of Science, Literature, and the Arts, pursue one of the following courses, described on pages 13 to 33 of this bulletin. These curricula are subject to revision by action of the faculties of the colleges concerned.

Courses given within this college:

1. A course leading to the degree of bachelor of arts.
2. Special courses leading to the degree of bachelor of science.
 - a. Course in Library Training.
 - b. Course for Medical Technicians.
 - c. Course in Preprofessional Social Work.
3. Courses preparing for admission to the School of Business Administration, School of Dentistry, College of Education, the Course in Nursing Education, the Course in Interior Architecture in the College of Engineering and Architecture, the Law School, and the College of Pharmacy.
4. A four-year course leading to the degree either of bachelor of arts or of bachelor of science with special training in military science and tactics.

Combined arts and professional courses:

5. A seven-year course leading to the degrees of bachelor of science, bachelor of medicine, and doctor of medicine.
6. A six-year course leading to the degrees of bachelor of arts and bachelor of architecture.
7. A six-year course leading to the degrees of bachelor of science in law and bachelor of laws.
8. A six-year course leading to the degrees of bachelor of arts and bachelor of laws.
9. A six-year course leading to the degrees of bachelor of arts and doctor of dental surgery.
10. An eight-year course leading to the degrees of bachelor of arts, bachelor of medicine, and doctor of medicine.

NOTE.—A unit of the University known as University College arranges special courses of study for individual students whose intellectual interests or professional aims are not provided for by curricula offered in other colleges of the University. For further information, consult Professor Tate, Room 143, Physics Building.

ADMISSION

This college admits those students who have met the admission requirements as published in the Bulletin of General Information and give reasonable promise of carrying successfully the courses of study offered in this college. The case of each individual applicant will be decided on the evidence of his previous record either in secondary school or college, of his performance in such aptitude and placement tests as are found reliable for this purpose, and comments, advice, or recommendations received from teachers or officials of the institutions previously attended. In the case of students transferring from other collegiate institutions corresponding information will be taken into account in determining their status in this college.

NOTE.—High school graduates who have shown superior ability in their high school work but who cannot present the proper units for admission by certificate may avail themselves of the opportunity of admission by examination. See 1935-36 Bulletin of General Information, page 33.

The college welcomes students who have definite intellectual interests but who do not expect to graduate or to enter one of the professional schools. Such students may continue in college as long as they maintain a satisfactory standing in the studies they elect. During their junior college years a wide variety of courses is open to them. After that period they may continue work in their fields of interest as nonclassified students under the direction of the Students' Work Committee.

REGULATIONS APPLYING TO ALL COURSES

1. *Freshman English*.—Unless freed from the requirement by placement tests all students must complete three quarters of English A-B-C or Composition 4-5-6. On the basis of placement tests in English, students are:

Exempt from any requirement in English,

Permitted to choose between English A-B-C and Composition 4-5-6,

Assigned to Composition 4-5-6,

Required to make up minimum essentials as a preliminary to Composition 4-5-6.

Students who are exempt from Freshman English may register, if they wish, for English A-B-C or Composition 4-5-6, or for any Junior College courses in English, composition, or speech for which English A-B-C is the prerequisite.

2. *Beginning languages*.—A student may not receive credit for beginning courses (two quarters, 10 credits) in more than one of the foreign languages, exclusive of Greek and Italian, except by special permission of the Students' Work Committee.

3. *Studies for beginning freshmen*.—The following subjects of study are offered to beginning freshmen in the fall quarter of the college year:*

* For students who enter college in the winter or spring quarter the choice of subjects is more limited.

English literature and composition; Latin and Greek; German, French, Italian, Spanish, Norwegian, and Swedish; botany, chemistry, geology, and zoology; economics (production and marketing), history, and political science; mathematics; military science and tactics; music (theoretical and practical); philosophy (for prelegal students only); the history of ancient art, architecture and sculpture, and painting; freehand and technical drawing; home economics; orientation (an introduction to "science and civilization"). In addition to these subjects which may be studied throughout the year (fall, winter, and spring), the college offers the following short courses which some students may find possible to add to their programs at some time during the year: astronomy; human anatomy; human physiology; how to study; the use of books and libraries; personal health.

4. *Residence*.—To secure a degree from this college a student must earn at least 45 credits in residence at this college.

ADVISERS

Every freshman may have a faculty counselor to whom he can go for help in personal matters, in choosing a vocation, or in planning his study program. This counselor will put the student in touch with specialists in fields in which he may be interested and will arrange for special tests or other sources of information. For this service the student should go to Room 112, Psychology Building.

Each freshman student who has not decided on the general plan of his college course before entrance should begin at once to consider whether he will elect a major study or the curriculum in liberal arts (see page 15) or one of the professional courses—social work, journalism, law, medicine, etc. (see pages 18 to 33). He should seek the help of one of the faculty counselors who are appointed to deal with freshman problems. As soon as he has decided on a four-year course in this college, he will be assigned to an adviser who will assist him throughout the four years. In case a student changes his choice of a field of work he will be transferred to an adviser in the new field.

Every student is expected to make the planning of his study program a serious part of his work. The student should plan his program and bring it to his adviser for suggestions and approval. Advisers are available for discussion of student programs at any time during the year.

Freshmen or sophomores who do not have regular counselors should discuss their study programs with the assistant dean for the Junior College, Room 106, Folwell Hall, or with Senior College advisers in lines of work in which they are interested. Discussion with members of the faculty should be attended to early and not left to the registration period, because after registration begins, there may not be time to secure the information which is desirable or to make the necessary arrangements for courses of study which are important in the student's plan.

In no case should the planning of a program be left to the registration period. The chief responsibility of registration officers should be to check and tally the programs which have been prepared in advance.

I. COURSE LEADING TO THE DEGREE OF BACHELOR OF ARTS*

Two general plans of study are offered, one providing for specialization, the other offering opportunity for greater breadth of training. The first plan is the one which has been in effect in recent years, involving the pursuit of major and minor studies in the Senior College. The second is a curriculum in liberal arts intended for those who wish to get a broader view of the fields of knowledge or to draw upon a wider range of studies in preparing themselves for life. Graduation honors are open to candidates for the B.A. degree on either plan.

JUNIOR COLLEGE

1. For admission to the Senior College¶ the student must have completed the following work in the Junior College or the equivalent in another recognized institution.

NOTE.—Students who entered college as beginning freshmen before September, 1934, may substitute for paragraph (a) the following: "Ten credits‡ in one of the social studies and ten credits‡ in one of the natural sciences." These credits together with the required work in English and foreign languages given in paragraphs (b) and (c) below constitute the old group requirements for admission to the Senior College as published in the bulletin of the college for the year 1933-34.

- a. Preparation for Senior College courses in five subjects, one to be chosen from each of the Groups A, B, C, and two to be chosen at large from the groups A, B, C, D.

Group A. *Humanities*: English and foreign languages and literature, speech, music, fine arts.

Group B. *Social Studies*: Anthropology, economics, geography, history, political science, sociology.

Group C. *Natural Sciences*: Astronomy, botany, chemistry, geology (including laboratory), physics, psychology (including laboratory), zoology.

Group D. Philosophy, mathematics.

For the purpose of this requirement the student must offer in each of the five subjects at least 10 credits (or a year course of 9 credits) of Junior College or of Junior and Senior College courses.

- b. English A-B-C (15 credits) or Composition 4-5-6 (9 credits) or exemption from the requirement. All students are required to take a placement test before registering for any course in English or composition. See page 11.
- c. Foreign language, 0 to 20 credits, according to the following schedule:§

* For detailed information about the individual subjects of study in this curriculum, see the University's *Combined Class Schedule for 1935-36*.

‡ Or 9 credits in a year course.

§ Not required in the course in Preprofessional Social Work.

¶ For the requirements for admission to the Senior College in courses leading to the degree of B.S. see p. 13 and following.

| <i>Amount Presented for Entrance</i> | <i>Amount Required in Junior College</i> |
|--|--|
| Four years of one language | None |
| Three years of one language | 5 credits in same language |
| Two years of one language | 10 credits in same language |
| One year of one language | 15 credits in same language |
| Less than a year of one language | 20 credits in one language |

The work done in English or a foreign language may be counted toward the subject requirement in Group A.

Students majoring in Journalism may present the Junior College work required by that department as one of the two subjects chosen at large.

The student should read carefully the section headed Advisers on page 12.

2. If the student elects to carry a major sequence he must plan to secure the necessary preparation for it in consultation with a major adviser. He should apply at the departmental office and be assigned to a major adviser. If he elects the curriculum in liberal arts he will be assigned to an adviser by the Senior College office (219 Folwell Hall).

These decisions must be made by the student not later than the end of his sophomore year. He is at liberty to consult with Senior College advisers at any time that he desires and will be assigned to an adviser whenever he has chosen his course.

The student must earn a total of 90 credits, with an average of one honor point per credit,† or a smaller number of credits determined as follows: For every five honor points in excess of one honor point per credit, the number 90 is diminished by one.

A student entering with advanced standing from some other institution must secure a total of 90 credits, and an average of one honor point per credit for the work done in this college. (For every five honor points earned in this college, in excess of one honor point per credit, the number 90 is diminished by one.)

SENIOR COLLEGE

The student is expected to devote his time to Senior College studies except in so far as additional elementary studies in the judgment of his Senior College adviser definitely contribute to his intellectual development.

Requirements in the Curriculum for Specialization

1. Each student electing this curriculum must complete a coherent and progressive sequence of Senior College courses, known as a major sequence, as specified by the department which offers it. Such major sequences are offered by the following departments: Anthropology, Architecture, Astronomy, Bacteriology, Botany, Chemistry, Classical Languages, Economics,

† Students with a lower honor point average who have been in residence in the Junior College for seven quarters or more, and who have a "C" average over the last three full quarters of work, may, upon petition to the Senior College office, be admitted to the Senior College on probation.

English, Fine Arts, Geography, Geology and Mineralogy, German, History, Human Physiology, Journalism, Mathematics, Music, Philosophy, Physics, Political Science, Preventive Medicine and Public Health, Psychology, Romance Languages, Sociology, Speech, Zoology. The courses constituting a major sequence in any department are announced in the University's *Combined Class Schedule for 1935-36*.

Major work will be arranged individually for students whose plans require study in fields of practical or applied art.

A student must maintain an average of one honor point per credit in the work of the major sequence.

2. A minor sequence, 9 credits. A student must secure in some department other than his major department and in addition to his major sequence 9 credits in Senior College courses.

Requirements in the Curriculum in Liberal Arts

The student is expected to submit to his adviser a plan of study in which the subjects and courses chosen are related to one another and to the student's purpose and are intelligently arranged in a working program. The adviser will examine and discuss the plan with the student. The program as approved by the adviser is to be carried out in harmony with the general requirements.

An indefinite variety of study programs may be recognized under this heading. They may serve the purpose of the student who is interested in general culture, in literary or artistic pursuits, in comparative literature, in the integration of fields of study ordinarily separated by departmental organization, in critical interpretation, or in any activity, preparation for which requires the student to draw upon several fields. This curriculum is intended to provide for the making of programs by individuals to suit their own interests or needs. The adviser represents the college in approving the individual's program.

Requirements for Graduation

For graduation a student must earn 180 credits and 180 honor points, or a smaller number of credits determined as follows: for every five honor points in excess of one honor point per credit, the number 180 is diminished by one. He must spend the last three quarters before graduation in residence in the Senior College and must earn in residence in the Senior College a minimum of 45 credits.*

Any student who fails to complete the requirements for graduation within a normal period will, in order to complete the work, be required to continue in the Senior College for one or more university sessions. During this period he will be required to carry at least 13 credit hours of work and to secure an average of one honor point per credit.

* This regulation does not apply to students in the combined course in "Arts and Dentistry," or "Arts and Medicine," or to students in the combined course in "Arts and Law" which leads to the degrees of bachelor of arts and bachelor of laws.

A student entering the Senior College with advanced standing from some other institution must secure the same total, and an average of one honor point per credit for the work done in this college. (For every five honor points earned in this college in excess of one honor point per credit, the number of credits is diminished by one.)

HONORS COURSE PLAN

A student who has met all the requirements for admission to the Senior College may be enrolled for the Honors Course upon the approval of the department in which he wishes to pursue his major study.

Each student enrolled in the Honors Course will be put under the immediate direction of a member of his major department of professorial rank who shall be known as his tutor.

A part of the student's Senior College work will consist of reading or other individual studies done under the direction of his tutor. Work done in this way will be accepted as a substitute for a part or the whole of the major sequence and of the elective work of the usual curriculum.

A student electing this plan will be governed by the announcement of his major department and the direction of his tutor as to number of courses, attendance at classes, and general methods to be pursued.

The requirements for the minor study are not modified by this plan at present.

When the tutors of a department report at the end of any quarter that a student is not making satisfactory progress in the Honors Course, the student will be registered as a candidate in the regular course. In this case the tutors will report blanket credits equivalent to the work actually done. The student can then arrange to complete his major sequence either in the same department or in another.

For the year 1935-36 Honors Courses are offered by the Departments of Anthropology, Classical Languages, Economics, English, Political Science, Psychology, Romance Languages, Sociology, and Zoology.

GRADUATION HONORS†

The degree B.A. may be awarded *cum laude*, *magna cum laude*, or *summa cum laude* upon the recommendation of the Committee on Honors.

Honors are awarded only to students who have a scholastic record of two honor points per credit in all work carried. A student who has this record will be awarded the degree B.A. *cum laude*.

Students wishing to become candidates for the higher honors (*magna cum laude*, *summa cum laude*) must signify their intention not later than the beginning of the third quarter before graduation. Students are admitted as candidates upon the recommendation of the Senior College adviser with the approval of the Committee on Honors. The committee will not admit as a candidate a student who has limited his Senior College work to the minimum requirements in major and minor subjects.

† Students who enter with advanced standing are eligible to become candidates for honors if they will have earned 75 credits of work in residence before graduation.

With the approval of the Committee on Honors the candidate may pursue a course of reading in lieu of any or all elective courses. Near the close of the senior year the candidate will take a special examination which may touch upon any part of the field of his college course. In this comprehensive examination the candidate should show (a) an acquaintance with the chief literature and sources of information in the fields studied, and (b) ability to discuss with intelligence and clear reasoning, questions or problems upon which he has had opportunity to secure the necessary information. Such questions may be new to the student. The object is to test the student's ability to bring facts and theories to bear upon problems presented in the examination. The examination should be a test not of memory but of assimilation, of culture, and of power to command or use the knowledge which courses of study have put within the student's reach. Candidates who pass this examination will, upon recommendation of the committee, be awarded the degree B.A. *magna cum laude*.

A candidate whose standing in the comprehensive examination is satisfactory and who in addition presents an acceptable critical paper, a piece of creative work, or a thesis embodying the results of original research will, upon recommendation of the committee, be awarded the degree of B.A. *summa cum laude*. The preparation of the paper should be begun early in the senior year.

The degree B.S. *cum laude* will be awarded to students who have an average of two honor points per credit in all their work.

Students may be accepted as candidates for the higher honors in courses leading to the B.S. degree and in combined arts and professional courses provided they present an equivalent of the work required for graduation honors in the general course leading to the B.A. degree.

COURSES IN THE GENERAL EXTENSION DIVISION

A student who takes courses in the General Extension Division in classes in St. Paul, Minneapolis, or Duluth and wishes to count them toward a Bachelor's degree given by the College of Science, Literature, and the Arts must meet all curricular requirements of this college as stated in the bulletin. This means that:

- a. Before beginning work in the Senior College with a view to graduation, the student shall apply for Senior College standing and be enrolled by the assistant dean for the Senior College.
- b. He shall be assigned to a major adviser and shall complete all the Senior College studies under the direction of the adviser.
- c. He shall complete any required work, either of major or minor sequences or of any other nature, in this college if it is not offered in the General Extension Division.
- d. He must observe any specific requirements which may be adopted hereafter, such as comprehensive examinations on either Junior College or Senior College work.

For the adjustment of irregularities in his curriculum the student will get advice from the assistant dean for the Senior College or from his major adviser.

A student who does not conform to these regulations may apply for standing in the Senior College on the same terms as a student transferred from some other institution.

Students who have not taken class work in one of the cities named must meet both curricular and residence requirements.

CREDIT IN THE GRADUATE SCHOOL

A student lacking not more than nine credits toward graduation may, upon petition, receive graduate credit for a limited amount of work taken as an undergraduate. No graduate credit will be given unless the student has made previous arrangements with the Graduate School. Courses taken for graduate credit will not carry credit toward the Bachelor's degree.

With the permission of the assistant dean for the Senior College, undergraduates lacking not more than nine credits toward graduation may be registered also in the Graduate School. Permission will be granted only in exceptional cases.

II. COURSES LEADING TO THE DEGREE OF BACHELOR OF SCIENCE

Students in these courses who complete the work with an average of two honor points per credit will receive the degree B.S. *cum laude*. Candidates for the higher honors may be accepted if they offer an equivalent of the work required for graduation in the general course leading to the B.A. degree. See page 16.

A. COURSE IN LIBRARY TRAINING*

For a special course in library training, leading to the degree of bachelor of science, a student must first complete satisfactorily three years of academic work. During these three years the student must secure at least 135 credits, and an average of one honor point per credit for all credits earned. (For each five honor points in excess of one honor point per credit, the required number of credits will be diminished by one.) The student must complete the requirements for admission to the Senior College, which are given on page 13, and is subject to all the regulations which govern the work of other Arts students. During his third year the student will elect work in this college, subject to the approval of the assistant dean for the Senior College. He must complete his academic requirements before beginning the courses in Library Instruction. During the fourth year a student will elect not less than 45 credits from courses given by the Division of Library Instruction, and must maintain an average of one honor point per credit for all the credits earned. Under present conditions of unemployment it is a decided advantage to take this course *after* the completion of a full four-year collegiate course leading to the degree of B.A. or B.S. rather than as the fourth year of such a course. For specific information see the Bulletin of the Division of Library Instruction obtainable from the registrar.

* For detailed information about the individual subjects of study in this curriculum, see the University's *Combined Class Schedule for 1935-36*.

B. COURSE FOR MEDICAL TECHNICIANS*

A four-year course in medical technology is offered by the College of Science, Literature, and the Arts and the Medical School.

With the development of laboratories in clinics, hospitals, and medical schools, medical technology is a fair field for women at the present time. Men, as a rule, are not advised to take the course.

The satisfactory completion of the prescribed course leads to the degree of bachelor of science. During the first two years, the student is registered in this college and must earn 90 credits, with an average of one honor point per credit. (For each five honor points in excess of one honor point per credit, the number 90 is diminished by one.) The required courses are listed below. High school physics is a prerequisite, but General Physics 23, given by the Division of Agricultural Engineering or Course G.C. 88f, The Physics of Sound, Heat, Light, and Motion, given in the General College of the University, may be taken as a substitute after admission.

- | | |
|---|--|
| 1. English A-B-C or Composition 4-5-6 or exemption from the requirement. (See p. 11.) | 5. Organic Chemistry 1-2 |
| 2. Zoology 1-2-3, 21,† 51† | 6. A reading knowledge§ of French or scientific German |
| 3. Inorganic Chemistry 1-2-3 or 4-5; 11 | 7. Bacteriology 41†¶ |
| 4. Analytical Chemistry 7 | 8. Human Physiology 4† |

Advisers.—During their freshman year students in this curriculum may consult advisers in the Junior College office (Room 106, Folwell Hall). After their freshman year they must submit their registrations for approval to special advisers in the main laboratory on the fourth floor of Elliot Memorial Hospital.

For the work in the Medical School consult the special bulletin obtainable at the office of the registrar.

Further information may be obtained by addressing Dr. W. A. O'Brien at the University of Minnesota Hospitals, Minneapolis, Minnesota.

Students transferring from other colleges without these courses must complete them before entering the Medical School.

C. PREPROFESSIONAL SOCIAL WORK*

This curriculum is in preparation for the professional course in social work which is a graduate course requiring not less than four quarters to complete and more often six quarters. In order to plan the work wisely, students are advised to consult with the social work advisers in the offices of the Department of Sociology and Social Work as early as the freshman year. The organization of the course aims to give the undergraduate the fundamentals of a broad modern education.

* For detailed information about the individual subjects of study in this curriculum, see the University's *Combined Class Schedule for 1935-36*.

† Should be taken during the first two years if possible.

§ Courses 1, 2, 3, 4 in French (20 credits) or Course 1, 2, 3A, 30, 31, 32 in German (24 credits) ordinarily give a student the required reading knowledge.

¶ By special permission of their advisers, students may take Course 101 (Medical Bacteriology) instead of Course 41 (General Bacteriology); and, if properly qualified, they may take Bacteriology 116 (Immunity) before entering the Medical School.

The first two years of work taken in the Junior College consist of the regular academic requirements, with the usual language requirement optional, and fundamental courses in sociology, economics, psychology, and political science required.

For admission to the Senior College the student must earn 90 credits with an average of one honor point per credit. In the Senior College he must earn 90 credits and 90 honor points in addition to the number required for admission. (For each five honor points in excess of one honor point per credit the required number of credits will be diminished by one.)

In the Senior College students continue background theory courses and begin orientation courses in social work.

A student must spend the last three quarters before graduation in residence in the Senior College and must earn in residence in the Senior College a minimum of 45 credits.

Satisfactory completion of four years' work leads to a degree of bachelor of science but not certification in social work.

The graduate years offer courses in field work with individuals and groups including social case work with families and children, medical social work, group work, rural social work, public welfare administration, visiting teacher's work, and work with Indians. All students must meet the general requirements of the Graduate School. Upon completion of the requirements of the Graduate School, which include an approved thesis, the student will receive the degree of master of arts and a certificate of social work. Completion of all the graduate requirements except the thesis entitles the student to a certificate of social work.

A special bulletin is prepared for students in this course and should be consulted for a statement of undergraduate and graduate requirements in preparation for professional social work.

First and Second Years, Junior College

English A-B-C or Composition 4-5-6 or exemption from the requirement. (See p. 11.)

Sociology 1, 6 or 14, 45, 49

Economics 6-7†

Political Science 1-2-3 or A-B

Psychology 1-2

Zoology 1-2-3 or Human Physiology 1 and 2

Electives to make the total at least 90 credits.

Recommended electives are: History 1-2, 3, or Philosophy 1, 2, 3; Speech 1-2-3 or 5-6, or Composition 27-28, 29; Modern Language.

† Students may omit Economics 6-7 and take Economics 82, 83, 84 instead in their junior or senior year.

Third and Fourth Years, Senior College

Sociology 52, 53, 60, 70, 71, 72, 90, 119; Preventive Medicine 53, 57, 61; Home Economics 70; Psychology 144-145; Economics 82, 83, 84 (unless the student has taken Economics 6-7, "Principles of Economics," or its equivalent); nine credits from Sociology 100, 101, 102, 103, 114, 120, 123, 160.

Fifth Year, Graduate

For the graduate course in social work, see the Bulletin of the Graduate School and the special bulletin on graduate social work published by the department.

III. COURSES PREPARING FOR ADMISSION TO THE PROFESSIONAL SCHOOLS

A. PREBUSINESS COURSE*

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

Quality credits earned in the Junior College may be applied only toward the ninety credits required for admission to the School of Business Administration. In other words, a student who has a surplus of honor points above the number required to complete 90 credits may not apply these for credit in the School of Business Administration. Any excess credits, however, other than quality credits, may be applied toward electives in the School of Business Administration.

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

A. Required Credits:

1. English A-B-C or Composition 4-5-6, or exemption from the requirement. (See page 11.)
2. Nine credits in mathematics or in *one* of the following laboratory sciences: botany, chemistry, physics, zoology, geology.
3. Nine credits in *one* of the following social sciences: geography, history, political science, sociology.†
4. Ten credits in the Principles of Economics. This requirement may be satisfied by the completion of Principles of Economics: General Course (Econ. 6-7) or the equivalent. It is recommended that beginning freshmen take Business Organization: Production (Econ. 1); Business Organization: Marketing (Econ. 2); The Mechanism of Exchange (Econ. 3); and Principles of Economics (Econ. 4).

* For detailed information about the individual subjects of study in this curriculum, see the University's *Combined Class Schedule for 1935-36*.

† Social Statistics (Soc. 45) is not accepted in fulfillment of this requirement.

B. Elective Credits:

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

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

The Mechanism of Exchange (Econ. 3)

Elements of Statistics (Econ. 14)†

Principles of Accounting (Econ. 25-26)§

Students who do not elect the above courses during the freshman and sophomore years will be required to take Money and Banking (B.A. 57); Elementary Accounting: Combined Course (B.A. 62); and Statistics Survey (B.A. 70) during the first quarter in residence in the School of Business Administration.

2. Courses required as prerequisites to courses in certain sequences in the School of Business Administration and recommended for all students:

a. General Psychology (Psy. 1-2). This course is a prerequisite for courses in Advertising, Foreign Trade, Merchandising, Personnel Management, Secretarial Training, and Insurance.

b. Commerce Algebra (Math. 8) and Mathematics of Investment (Math. 20) are required of students who take the Accounting, Insurance, or Finance sequence.

c. Commerce Algebra (Math. 8) and Trigonometry (Math. 6) are required of students who take the Statistics sequence.

d. Students in the Foreign Trade sequence are required to have a reading knowledge of at least one foreign language. Nine credits in political science are prerequisite for International Law (Pol. Sci. 181-182), required in this sequence.

e. Secretarial Training: Typewriting (Econ. 32-33) is required of students who take the Secretarial sequence.

B. TWO-YEAR PREEDENTAL COURSE*†

The two-year preedental course required for admission to the School of Dentistry is a part of the five-year course in Dentistry leading to the degree of doctor of dental surgery. During the two years of prescribed work students are registered in this college and subject to its regulations. It is desirable that students should have had chemistry and higher algebra in high school. The required courses are listed below.

1. Inorganic Chemistry 1-2-3 or 4-5
2. Inorganic Chemistry 11 (Qualitative Analysis)
3. Organic Chemistry 1-2
4. English A-B-C or Composition 4-5-6 or exemption from the requirement. (See page 11.)
5. Mathematics 3-4 or 4 or 6
6. Physics 3 and 4 and one of the combinations 23 and 24, 33 and 34, 43 and 44
7. Zoology 1-2-3
8. Drawing, economics, history, Latin or a modern language (high school or college), political science, psychology, sociology, and speech are recommended as electives to make up a total of 90 quarter credits. (For each five honor points in excess of one honor point per credit, the number 90 is diminished by one.)

NOTE.—Students who have had no chemistry in high school are advised to take Inorganic Chemistry 11 (Qualitative Analysis) in the summer of their first year.

* For detailed information about the individual subjects of study in this curriculum, see the University's *Combined Class Schedule for 1935-36*.

† For the three-year preedental course, which is a part of the six-year course in Arts and Dentistry, see page 32.

§ Students who have had a high school course or experience in bookkeeping will be admitted to Econ. 25 upon passing a placement test. For other students Elements of Accounting (Econ. 20) is prerequisite to Econ. 25.

¶ Credit may not be received for both Economics 14 and Sociology 45.

C. COURSES PRELIMINARY TO THE COLLEGE OF EDUCATION

All students who desire to receive a state teacher's certificate upon graduation from the University of Minnesota must be graduates of the College of Education. In most cases students register in that college at the beginning of their junior year. In certain special four-year curricula, however, they should register in the College of Education at the beginning of their freshman year or as soon thereafter as they have made their curriculum choice. These special four-year curricula are:

| | |
|----------------------------|------------------------------|
| Art Education | Physical Education for Women |
| Industrial Education | Public School Music |
| Physical Education for Men | School Health Work |

In curricula for Agricultural and Home Economics Education the preliminary work is done in the College of Agriculture, Forestry, and Home Economics. (See the bulletin of that college or the Bulletin of the College of Education.)

For all other general and special curricula the prescribed work of the first two years† is done in the College of Science, Literature, and the Arts.

The following general requirements apply to all students entering the College of Education at the beginning of their junior year:

1. A minimum of 93 credits for men and 95 credits for women, carried with an average of one honor point per credit. (For each five honor points in excess of one honor point per credit, the number 93 or 95 is diminished by one.) For men 3 of these credits and for women 5 credits shall be in physical education. (No credit is granted for physical education courses by the College of Science, Literature, and the Arts; but upon transfer to the College of Education, the student will receive the credits and honor points earned in those courses.)
2. The student must have completed 6 credits in general psychology.
3. At the time of entrance to the College of Education a student must present a certificate from the Students' Health Service indicating that he is free from physical defects that would prevent the successful pursuit of educational work.
4. At the time of entrance to the College of Education each student will be given a general examination designed to show his capacities to pursue professional curricula in education.

*Curricula Which Include Preliminary Work in the College of
Science, Literature, and the Arts*

I. A GENERAL COURSE PRELIMINARY TO THE COLLEGE OF EDUCATION WITH MAJORS AND MINORS IN ACADEMIC SUBJECTS*

Students preparing to teach academic subjects in senior high schools and to qualify for the state high school standard certificate must have one major and one or more minors in subjects taught in high schools. The

* For detailed information about the individual subjects of study in this curriculum, see the University's *Combined Class Schedule for 1935-36*.

† Five quarters in the curriculum in Nursing Education and Public Health Nursing. See page 25.

College of Education offers majors and minors in the following fields: English, speech, journalism; German, Latin, French, Scandinavian, Spanish; geography, history, political science, sociology; botany, chemistry, physics, zoology; mathematics. Special combinations of majors and minors are provided in the natural sciences and social studies curricula.

Students looking forward to high school teaching should enroll as pre-education students as early in their course as possible. They should select majors and minors early and with regard to the demands of high schools. Before entering the College of Education the student must meet certain specific requirements in addition to those listed above:

1. The credits presented for entrance, exclusive of credits in physical education, must be earned in the following groups of college courses:

- Group A English
- Group B Foreign languages: German, Greek, Latin, Romance Languages, Scandinavian
- Group C Social sciences: Anthropology, Economics, Geography, History, Political Science, Sociology
- Group D Natural sciences: Astronomy, Botany, Chemistry, Geology and Mineralogy, Human Physiology, Physics, Psychology, Zoology
- Group E Mathematics
- Group F Journalism, Fine Arts, Orientation, Speech, or such other courses in other colleges or departments of the University as are approved by the College of Education

2. Within the general requirements listed above the student during his high school and Junior College years must have completed the required work indicated under A, B, C, and D below. At least 20 credits in Groups B, C, and D must be completed in college.

| When Taken | In High School | In College |
|---------------------|-------------------------|---------------------------------|
| A. English | 3 years | and 9 credits in composition |
| B. Language | 3 years in one language | or 20 credits in one language |
| | or | |
| | 2 years in one language | and 10 credits in same language |
| C. Social sciences | or | |
| | 1 year in one language | and 15 credits in same language |
| D. Natural sciences | 2 years | or 10 credits in one department |
| | 2 years | or 10 credits in one department |

NOTE.—In lieu of the specific course requirements indicated in the language group a student may take a comprehensive examination in an elected language to be conducted by a committee appointed by the dean of the College of Education.

3. Within the total credits stipulated under section 1 a student must meet, in fields of study which are represented in prevailing high school curricula, the following requirement: at least 15 credits in a major field and at least 10 credits in each of two minor fields. The purpose of this requirement is to prepare the student for the study of the advanced courses necessary to the completion of satisfactory teaching majors and minors.

II. COURSES PRELIMINARY TO THE FOUR- AND FIVE-YEAR SPECIALIZED CURRICULA IN THE COLLEGE OF EDUCATION

The College of Education provides training for many different kinds of educational work: for positions as superintendents of schools, high school and elementary school principals, elementary school supervisors, teachers in

normal schools and teachers colleges, educational counselors, school psychologists; teachers of special subjects and of special classes; school librarians, visiting teachers; positions in junior high schools, elementary schools, kindergartens, nursery schools, public health nursing, nursing education, and school health work. In all cases except the special four-year curricula previously mentioned the preliminary work is done in the College of Science, Literature, and the Arts. The Junior College work, however, is selected to meet the professional needs, and specific courses are required. The student should consult the Bulletin of the College of Education for the requirements of his curriculum and should confer with the adviser for that curriculum early in his course.

The specialized curricula offered by the College of Education based upon two years' work in the College of Science, Literature, and the Arts are:

| | |
|---|---|
| Commercial Education | Speech Pathology |
| Library Methods | Teachers of Subnormal Children |
| Natural Sciences | Visiting Teachers |
| Social Studies | Educational Administration or Supervision |
| Junior High School Education | Educational Psychology |
| Elementary Education | Professional Education of Teachers |
| Kindergarten and Nursery School Education | |

Credits earned in required courses in Art Education and Physical Education will be granted upon transfer to the College of Education.

III. COURSE PRELIMINARY TO NURSING EDUCATION AND PUBLIC HEALTH NURSING IN THE COLLEGE OF EDUCATION*

For the first five quarters of the five-year course in Nursing Education, the student is registered in the Junior College. She must complete the requirements listed below, and must earn an average of one honor point per credit.

English A-B-C or Composition 4-5-6 or exemption from the requirement. (See page 11.)

One of these laboratory sciences: chemistry, bacteriology, human anatomy, human physiology.

Sociology 1.

Psychology 1-2.

Electives to make a total of 75 credits exclusive of physical education.† (For each five honor points in excess of one honor point per credit, the number 75 is diminished by one.)

Physical Education, six quarters. One quarter of this requirement may be completed after registering in the School of Nursing. No credit is granted for physical education courses in the College of Science, Literature, and the Arts; but upon transfer to the College of Education, the student will receive the credits and honor points earned in those courses.

Upon completion of the above requirement the student registers in the School of Nursing for two and a half years, followed by three quarters in the College of Education, with a major in Nursing Education or Public Health Nursing.

* For detailed information about the individual subjects of study in this curriculum, see the University's *Combined Class Schedule for 1935-36*.

† Recommended electives are: history, zoology, Sociology 49 (Social Pathology), and more natural science.

D. COURSE PRELIMINARY TO TRAINING IN INTERIOR ARCHITECTURE IN THE COLLEGE OF ENGINEERING AND ARCHITECTURE*

This course offers to students of the College of Science, Literature, and the Arts the opportunity to prepare themselves for certain lines of work such as domestic architecture and interior architecture and decoration without taking the full technical course in Architecture.

During the first two years, the student is registered in this college. He must complete the requirements stated below and must earn 90 credits and 90 honor points. At the beginning of his course, he should consult the School of Architecture regarding electives.

During the third and fourth years, the student registers in the College of Engineering and Architecture and upon the satisfactory completion of the prescribed work, amounting to 102 additional credits, receives the degree of bachelor of interior architecture. (See Bulletin of the College of Engineering and Architecture.)

| COURSES REQUIRED IN THE FIRST TWO YEARS | CREDITS |
|--|---------|
| English A-B-C or Composition 4-5-6 or exemption from the requirement. (See page 11)..... | 0 to 15 |
| Mathematics 4 or 6 (with prerequisite)..... | 4 to 10 |
| French (see Junior College Requirements, page 13)..... | 0 to 20 |
| History 11-12-13, or Fine Arts 1-2-3..... | 9 |
| Physics or Inorganic Chemistry..... | 8 |
| Architecture 11-12-13..... | 3 |
| Architecture 21-22-23..... | 6 |
| Architecture 24-25-26..... | 6 |
| Architecture 31-32-33..... | 9 |
| Architecture 61, 62, 63..... | 6 |

E. COURSES PRELIMINARY TO THE LAW SCHOOL*

Students in the University preparing to enter the Law School register in the College of Science, Literature, and the Arts. Ninety credits of academic work are required for admission to the two-year (2-2)† course or to the four-year (2-4)† course in the Law School, and 135 credits for admission to the three-year (3-3)† law course. The faculty of the Law School recommends the (2-4) course for students who intend to practice law. An average of one honor point for each credit earned up to the time of admission is also required. Excess honor points do not reduce the number of credits required.

The (2-2) course leads to the degree of bachelor of science in law; the (2-4) course leads to that degree and also to the degree of bachelor of laws. (See the statement of the combined course in arts and law on page 31.)

The (3-3) course leads to the degrees of bachelor of arts and bachelor

* For detailed information about the individual subjects of study in this curriculum, see the University's *Combined Class Schedule for 1935-36*.

† The first of the two numbers within the parentheses refers to years of work in the College of Science, Literature, and the Arts, the second to years of work in the Law School.

of laws. (See the statement of the combined course in arts and law on page 31.)

After November 1, 1937, only students with a B.A. or equivalent degree at the time of transfer will be admitted to the three-year law course.

The following course has been outlined by the faculty of the Law School for the two years of college study required in the (2-2) and (2-4) courses.

| | CREDITS |
|---|---------|
| 1. English A-B-C* or Composition 4-5-6* | 15 or 9 |
| 2. Philosophy† 1, 2, 3 (Problems of Philosophy, Logic, Ethics)..... | 15 |
| 3. Political Science 1-2-3 or A-B (American Government and Politics)..... | 9 |
| 4. Economics 6-7 (Principles of Economics)..... | 10 |
| 5. History 70-71-72 (English Constitutional History)..... | 9 |
| 6. Psychology 1-2 (General Psychology) | 6 |
| 7. Electives to make the total at least 90 credits. | |

Suggested electives are: English History or American History, Natural Science, Economics, Political Science, Sociology, and Speech.

Students in the (3-3) course may not be able to take in their first two college years all of the subjects recommended in the preceding paragraph for students in the (2-2) and (2-4) courses because there are other requirements which they are expected to meet before the beginning of their third year in college. Before trying to plan their work for their freshman and sophomore years they should read carefully the whole statement about the combined course in Arts and Law which is given on page 31. That statement makes a reference to the requirements for admission to the Senior College which are given on page 13 of this bulletin. Students should note especially the requirements of foreign language and natural science.

F. PREPHARMACY COURSE

For recommendations for one year's work preliminary to the College of Pharmacy, consult the bulletin of that college.

IV. MILITARY SCIENCE AND TACTICS

Credit for advanced military science.—Students who have completed the Basic Course, R.O.T.C., and are selected for advanced work by the professor of military science and tactics, and who sign an agreement with the government to continue this work for the remainder of their college course (not to exceed two years) and to attend one summer training camp, are eligible for the Advanced Course, R.O.T.C., prescribed in War Department regulations.

The faculty will recommend for graduation, in any course of study (given entirely in this college), leading to the degree of bachelor of arts

* If a student takes Composition 4-5-6 rather than English A-B-C, or if he omits freshman English composition because he is exempted from that requirement, the Law School recommends that he get at least six credits in more advanced courses offered by the Department of English.

† "Problems of Philosophy" and "Ethics" have not been announced in previous bulletins as required in the (2-2) or (2-4) law course. They are optional for students who will enter the Law School in 1935 or 1936.

or bachelor of science, any student who has completed in addition to this requirement 78 credits, 78 honor points, and the work of the Advanced Course of the R.O.T.C.

A student must spend the last three quarters before graduation in residence in the Senior College and must earn in residence in the Senior College a minimum of 45 credits.

Students enrolled in the Advanced Course, R.O.T.C., are furnished with a special uniform and receive from the government a fixed allowance per day while enrolled in this course, except during the period in which they are actually at a training camp, when they are paid at the rate prescribed for the seventh grade in the army.

All students who complete the Advanced Course, R.O.T.C., will, if recommended by the professor of military science and tactics and the president of the University, be commissioned in the Officers' Reserve Corps of the United States Army.

V. SEVEN-YEAR COURSE IN SCIENCE AND MEDICINE, LEADING TO THE DEGREES OF BACHELOR OF SCIENCE, BACHELOR OF MEDICINE, AND DOCTOR OF MEDICINE*†

During the first two years the student is registered in the College of Science, Literature, and the Arts. He must complete the courses listed below or their equivalent, as approved by the Students' Work Committee of the Medical School, and must secure 90 credits, with an average of one honor point per credit. (For each five honor points in excess of one honor point per credit, the required number of credits will be diminished by one.)

Required Courses

Composition 4-5-6 or English A-B C, or exemption from requirement. (See page 11.)

Zoology 1-2-3.

Inorganic Chemistry 11, Analytical Chemistry 7, and Organic Chemistry 1-2, with the elementary courses prerequisite to them.

Physics 3 (with prerequisite mathematics) and any three of Courses 13, 23, 33, and 43.

German sufficient to secure a reading knowledge. Students may meet this requirement by passing German 31-32, or by taking a special examination after completing two college years of German. This examination is conducted by the German Department.

The following subjects are recommended as electives: advanced zoology (such as comparative anatomy), physics, physical chemistry, freehand drawing, Latin, French, higher mathematics, statistics, psychology, sociology, and cultural subjects generally. General Bacteriology, a Medical School subject, may not be presented for admission to the Medical School. With the

* For detailed information about the individual subjects of study in this curriculum, see the University's *Combined Class Schedule for 1935-36*.

† For the eight-year course in Arts and Medicine, which involves three years of premedical work, and which is recommended in preference to the seven-year course, see page 32.

approval of the Students' Work Committee of the Medical School and the assistant dean for students' work in the College of Science, Literature, and the Arts, a premedical student may take one subject in the Medical School in any quarter.

For admission to the Medical School, a candidate's record must show a number of honor points equal to the total number of credits in the required subjects of zoology, chemistry, physics, and composition; also a number of honor points equal to the total number of credits in all subjects; and the student must be accepted by the Medical School under the limited registration regulation of that school. He must take a medical student's aptitude test. The scores of this test are considered by the Students' Work Committee in advising students and determining admission. A student applying for admission for the fall quarter must have satisfied all requirements before July 1.

PROGRAM FOR THOSE WHO ENTER IN THE FALL WITHOUT LANGUAGE
AND WITHOUT HIGHER ALGEBRA

First Year

Inorganic Chemistry 1-2-3 or 4-5, and 11
German 1-2-3A
Mathematics 3 and 4, and Physics 3
Zoology 1-2-3

Second Year

Inorganic Chemistry 11, if not already completed
Analytical Chemistry 7
Organic Chemistry 1-2
German 30-31-32
Any three of these courses: Physics 13, 23, 33, and 43
Composition 4-5-6 or English A-B-C, or an elective for those exempted from the requirement

NOTE.—Students who have had no chemistry in high school are advised to take Inorganic Chemistry 11 in the summer of their first year.

PROGRAM FOR THOSE WHO ENTER IN THE FALL WITH TWO YEARS
OF GERMAN

First Year

Inorganic Chemistry 1-2-3 or 4-5, and 11
German 3A, 30-31
Mathematics 3 and 4, and Physics 3
or
Mathematics 4 and Physics, one or more of Courses 3, 13, 23, 33, 43
Zoology 1-2-3

Second Year

Inorganic Chemistry 11, if not already completed
Analytical Chemistry 7
German 32
Organic Chemistry 1-2
Physics to complete the requirement. (See page 28.)
Composition 4-5-6 or English A-B-C, or an elective for those exempted from the requirement
Electives to make a total of 90 credits

The work during the third and fourth years is taken in the Medical School and is credited toward the degree of bachelor of science. To secure this degree, a student, in addition to the requirements for admission, must have completed the first two years of the medical course in accordance with the standards of the Medical School and have passed, with a "C" average, the comprehensive examinations in these years.

Students who have completed elsewhere two or more years of collegiate or university work which includes the required subjects specified above and which is in other respects the full equivalent of the two years of academic work required in this seven-year combined course, will be awarded the degree of bachelor of science on recommendation of the faculty of the Medical School, provided they meet the scholarship requirements stated above.

The foregoing regulations governing the quality and amount of pre-medical training required for admission to the Medical School will be enforced for those who present the minimum amount of work. In cases of mature and superior students, especially such as have taken degrees and have made special progress along some line (even tho it may not have been closely related to medicine), concessions may be made. Cases under this paragraph will be considered individually and upon petition to the dean of the Medical School.

It should be borne in mind that no student can pursue the medical course to advantage without knowledge of biology, chemistry, and physics.

VI. SIX-YEAR COURSE IN ARTS AND ARCHITECTURE*

This course is designed to combine with the full technical course in Architecture the broad cultural training recognized as most desirable in preparation for the practice of this profession. The course leads to the degrees of bachelor of arts at the end of four years and bachelor of architecture at the end of six years.

Students wishing to elect this course should consult the School of Architecture. For the first two years the requirements include the technical studies listed in the course in Interior Architecture, page 26 of this bulletin, and also Courses 6†, 7, 30 in mathematics (Trigonometry, College Algebra, Analytic Geometry) or their equivalent, which must be completed by the end of the sophomore year.

During the first four years of this course the student is registered in the College of Science, Literature, and the Arts. He must complete the requirements for admission to the Senior College which are given on page 13, and is subject to the regulations governing other students in this college.

* For detailed information about the individual subjects of study in this curriculum, see the University's *Combined Class Schedule for 1935-36*.

† Course 6 should be taken instead of the shorter Course 4 which is given as an option on page 26.

VII. COMBINED COURSE IN ARTS AND LAW, LEADING TO
THE DEGREES OF BACHELOR OF SCIENCE IN
LAW AND BACHELOR OF LAWS†

Students who complete the courses of the two years of college work outlined on page 27, or acceptable substitutes,§ in the College of Science, Literature, and the Arts of this University or in some other accredited college, and have 90 credits, *exclusive of quality credits*, with an average of one honor point per credit for all credits earned, become eligible for the degree of bachelor of science in law upon completion of two years in the Law School with satisfactory grades. The law work may be selected to suit the needs of the student, and may be restricted to commercial law for students desiring a preparation for business. The degree of bachelor of laws is conferred upon completion of two additional years of work in the Law School. This course of two years academic work and four years in the Law School is recommended by the faculty of the Law School as the best available for students preparing for the profession of law.

VIII. COMBINED COURSE IN ARTS AND LAW, LEADING TO
THE DEGREES OF BACHELOR OF ARTS AND
BACHELOR OF LAWS*¶

The work of the first three years of this course is done in the College of Science, Literature, and the Arts, or not exceeding two years in some other accredited college, and the third year in this college. The student must complete the requirements for admission to the Senior College, which are given on page 13, and is subject to all the regulations which govern the work of other Arts students. During these three years the student must secure at least 135 credits, *exclusive of quality credits*, and an average of one honor point per credit for all credits earned. For a student who has 135 earned credits, when he enters the Law School, the course for the degree of bachelor of laws is three years; for a student who has less than 135 earned credits, when he enters the Law School, the course for the degree of bachelor of laws is four years.

The course in this college should include as far as possible the subjects specified in the prelegal course on page 27. During his third year the student will elect work in this college subject to the approval of the assistant dean for the Senior College. The first year of the course in the Law School, when completed with the standing required by that school for gradu-

* There are two combined courses in Arts and Law. This one is called the (3-3) course. The other one, known as the (2-2) or (2-4) course, is described above.

† There are two combined courses in Arts and Law. This one is called the (2-2) or (2-4) course. The other one, known as the (3-3) course, is described below.

§ Substitutes, to be acceptable, must be approved by the dean of the Law School.

¶ Only students who have completed the required work in the College of Science, Literature, and the Arts before entering the professional school will be permitted to avail themselves of the privilege of securing the B.A. degree in this combined course.

ation, counts as the equivalent of the fourth year (45 credits) of the Arts course.

After November 1, 1937, for students transferring to the Law School with three years of college work, the law course will be four years.

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

During the first three years of this course, the student does his work in the College of Science, Literature, and the Arts, subject to the regulations of the college, and must secure at least 135 credits, with an average of one honor point per credit for all credits earned. (For each five honor points in excess of one honor point per credit, the required number of credits will be diminished by one.) He must complete the requirements for admission to the Senior College, which are given on page 13, and also the work in chemistry, mathematics, physics, and zoology prescribed for admission to the School of Dentistry (see page 22).

During his third year, the student elects work in this college subject to the approval of the assistant dean for the Senior College. The work of the prejunior and junior years in the School of Dentistry, exclusive of technical and practical work, when completed according to the standards required by that school, counts as the equivalent of the fourth year (45 credits) of the Arts course.

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

During the first three years of this course, the student is registered in the College of Science, Literature, and the Arts, subject to the regulations of the college, and must secure at least 135 credits, with an average of one honor point per credit for all credits earned. (For each five honor points in excess of one honor point per credit, the required number of credits will be diminished by one.) He must complete the requirements for admission to the Senior College, which are given on page 13, and also the work in chemistry, mathematics, physics, zoology, and foreign language prescribed for the seven-year course in Science and Medicine (page 28).†

During his third year, the student elects work in this college subject to the approval of the assistant dean for the Senior College. The first year of the course in the Medical School, when completed with the standards required by that school, counts as the equivalent of the fourth year (45 credits) of the Arts course.

* Only students who have completed the required work in the College of Science, Literature, and the Arts before entering the professional school will be permitted to avail themselves of the privilege of securing the B.A. degree in this combined course.

† For recommended electives and the restrictions governing them, see page 28.

By spending three years in the College of Science, Literature, and the Arts a student can arrange a better sequence of courses required for admission to medicine and secure a wider sampling of cultural and background subjects. At least three years of premedical study is recommended by the Medical School.

For admission to the Medical School, a student's record must show a number of honor points equal to the number of credits in the required subjects of English or composition, chemistry, physics, and zoology; and also a number of honor points equal to the total number of credits. The student must have a reading knowledge of German and must be accepted by the Medical School under the limited registration regulations of that school.

INDEX

| | Pages | | Pages |
|---|----------|--|-----------|
| Absences | 8 | Incompletes | 4 |
| Admission | 2, 11 | Interior Architecture, course preliminary to | 26 |
| Adult special students | 2 | Junior and Senior colleges | 6 |
| Advanced standing | 2 | Junior College | 6, 13 |
| Advisers for students | 12 | Law, courses in Arts and..... | 31 |
| Afternoon work | 7 | prelegal course | 26 |
| Architecture, six-year course in Arts and | 30 | Liberal Arts curriculum | 13, 15 |
| Auditors | 3 | Library Training | 18 |
| Bachelor of arts, course leading to | 13 | Medical Technicians | 19 |
| Bachelor of science, special courses | 18 | Medicine | |
| Beginning languages, rule governing | 11 | Arts and | 32 |
| Business administration | 21 | Science and | 28 |
| Changes in registration | 7 | Military Science and Tactics credit for advanced | 27 |
| Combined arts and professional courses | 10, 28ff | Nursing Education | 25 |
| Conditions, removal of | 4, 5 | Penalty fees | 3 |
| Correspondence and Extension courses | 7, 17 | Petitions | 9 |
| Courses of study | 10 | Prebusiness course | 21 |
| Credits | 4 | Predental course | 22 |
| Delinquent students | 8 | Prelegal course | 26 |
| Dentistry | 22, 32 | Premedical course | 28 |
| Discontinued students | 8 | Prepharmacy course | 27 |
| Dropped students | 8, 9 | Probation | 8 |
| Education, College of, preliminary courses | 23 | Program. <i>See Combined Class Schedule for 1935-36</i> | |
| Eighteen credits, registration for .. | 7 | Public Health Nursing | 25 |
| Eligibility | 9 | Quality credits | 5 |
| English | | Readmission | 9 |
| examinations in | 11 | Registration | 2 |
| exemption from requirement | 11 | changes in | 7 |
| habitual bad English | 7 | penalty fees | 3 |
| Examinations | | Regulations applying to all courses | 11 |
| English | 11 | Residence requirement | 7, 12, 15 |
| for advanced standing | 2 | Senior College | 6, 14 |
| for credit | 2 | Senior College courses | 6 |
| Extension courses | 7, 17 | election by Junior College students | 6 |
| Faculty advisers for students | 12 | Social Work | 19 |
| Failures, rules governing | 5 | Sophomores | 6 |
| Fees | 2 | Special courses leading to the de- gree of bachelor of science..... | 18 |
| Freshmen | 6 | Special fees | 3 |
| studies for | 11 | Special students | 2 |
| General Extension, courses in | 7, 17 | Subjects in other colleges, election of | 6 |
| General information | 2 | Transferred students | 8 |
| General regulations | 7 | Tuition | 2 |
| Grades | 4 | University College | 10 |
| Graduate School, credit in | 18 | | |
| Graduation honors | 16 | | |
| Honor points | 4 | | |
| Honors, graduation | 16 | | |
| Honors course plan | 16 | | |
| Hours, number of | 7 | | |

Students should retain this bulletin for use throughout the year.

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

College of Engineering and Architecture
and
School of Chemistry
1935-1936



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UNIVERSITY CALENDAR

1935-36

Fall Quarter

| | | | |
|-----------|-------|-----------|---|
| 1935 | | | |
| September | 19 | Thursday | Payment of fees closes, except for new students* |
| September | 23 | Monday | Entrance tests |
| September | 23-24 | | Registration for Freshman Week for all new students entering the freshman class |
| September | 23-27 | | Examinations for removal of conditions Physical examinations |
| September | 25 | Wednesday | Senior qualifying examinations for chemists and chemical engineers (general inorganic) 8:00 a.m., (quantitative) 2:00 p.m. |
| September | 25-28 | | Freshman Week |
| September | 27 | Friday | Payment of fees for new students closes* at 4:30 p.m. |
| September | 28 | Saturday | Registration day† for the College of Engineering and Architecture and the School of Chemistry Registration closes at 1:00 p.m. |
| September | 30 | Monday | Fall quarter classes begin 8:30 a.m.§ |
| October | 17 | Thursday | Senate meeting, 4:30 p.m. |
| October | 26 | Saturday | Homecoming Day |
| November | 2 | Saturday | Dad's Day |
| November | 6 | Wednesday | Mid-quarter grades due |
| November | 11 | Monday | Armistice Day Convocation |
| November | 28 | Thursday | Thanksgiving Day; a holiday |
| December | 5 | Thursday | State Day Convocation |
| December | 16-21 | | Final examination period |
| December | 19 | Thursday | Commencement Convocation |
| December | 21 | Saturday | Senate meeting, 4:30 p.m. Fall quarter ends, 6:00 p.m. |

Winter Quarter

| | | | |
|----------|----|----------|--|
| December | 26 | Thursday | Payment of fees closes for all students in residence fall quarter* |
| 1936 | | | |
| January | 3 | Friday | Entrance tests |
| January | 4 | Saturday | Registration day† for all students in the College of Engineering and Architecture and the School of Chemistry Payment of fees for new students closes at 12 m.* Registration closes at 1:00 p.m. |

*†§ See footnotes on page 4.

| | | | |
|----------|-------|-----------|---|
| January | 6 | Monday | Winter quarter classes begin 8:30 a.m.§ |
| February | 5 | Wednesday | Mid-quarter grades due |
| February | 12 | Wednesday | Lincoln's Birthday; a holiday |
| February | 20 | Thursday | Charter Day Convocation Senate meeting, 4:30 p.m. |
| February | 22 | Saturday | Washington's Birthday; a holiday |
| March | 16-21 | | Final examination period |
| March | 19 | Thursday | Commencement Convocation Payment of fees closes for all students* in residence winter quarter |
| March | 21 | Saturday | Winter quarter ends 6:00 p.m. |

Spring Quarter

| | | | |
|-------|-------------|-----------|---|
| March | 27 | Friday | Entrance tests |
| March | 28 | Saturday | Registration day† for all students in the College of Engineering and Architec- ture and the School of Chemistry Payment of fees closes at 12 m.* Registration closes at 1:00 p.m. |
| March | 30 | Monday | Spring quarter classes begin, 8:30 a.m.§ |
| April | 10 | Friday | Good Friday; a holiday |
| May | 6 | Wednesday | Mid-quarter grades due |
| May | 9 | Saturday | Mother's Day Senior qualifying examination (general inorganic) for chemists and chemical engineers, 1:30 p.m. |
| May | 14 | Thursday | Cap and Gown Day Convocation Senate meeting, 4:30 p.m. |
| May | 23 | Saturday | Senior qualifying examination (quanti- tative) for chemists and chemical engi- neers, 1:30 p.m. |
| May | 30 | Saturday | Memorial Day; a holiday |
| June | 5, 6 & 8-12 | | Final examination period |
| June | 12 | Friday | Spring quarter ends 6:00 p.m. |
| June | 14 | Sunday | Baccalaureate service |
| June | 15 | Monday | Sixty-fourth annual commencement |

Summer Quarter

| | | | |
|--------|-------|-----------|---|
| June | 15-16 | | Registration, first term |
| June | 17 | Wednesday | Summer quarter classes begin, 8:00 a.m. |
| July | 4 | Saturday | Independence Day; a holiday |
| July | 23 | Thursday | Commencement Convocation |
| July | 25 | Saturday | Registration and payment of fees for second term close at 12 m. First term closes |
| July | 27 | Monday | Second term classes begin, 8:00 a.m. |
| August | 29 | Saturday | Second term closes |

*†§ See footnotes on page 4.

Entrance Examinations

Entrance examinations for admission to the College of Engineering and Architecture and School of Chemistry will be conducted for students whose credentials do not meet the requirements.

Candidates wishing to take any of these examinations should notify the registrar in writing not later than September 1, December 1, or March 1.

For further information concerning these examinations see "Admission by Examination," page 18.

* New students must pay fees on dates announced for registration. Fees of graduate students are due one week after their registration is approved by the dean of the Graduate School.

† Registration subsequent to the date specified will necessitate the approval of the college concerned. See also penalty fees for late registration, page 19. No student will be allowed to register in the University after one week from the beginning of the quarter excepting in unusual cases wherein special circumstances shall justify the appropriate committee of the college concerned permitting registration at a later date.

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

COLLEGE OF ENGINEERING AND ARCHITECTURE AND SCHOOL OF CHEMISTRY

FACULTY AND STAFF

ADMINISTRATION

- Lotus Delta Coffman, Ph.D., LL.D., President
Ora Miner Leland, B.S., C.E., Dean of the College of Engineering and Architecture and the School of Chemistry
Samuel Colville Lind, Ph.D., Professor of Chemistry and Director of the School of Chemistry
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Carl A. Herrick, M.E., Chairman of Registration and Schedule Committees (Engineering and Architecture)
Howard D. Myers, B.S.(C.E.), Chairman of Advanced Standing Committee (Engineering and Architecture)
Hervey H. Barber, Ph.D., Superintendent of Supply and Equipment (Chemistry)
Lillian Cohen, Ph.D., Chairman of Registration and Schedule Committees (Chemistry)
I. William Geiger, Ph.D., Chairman of Advanced Standing Committee (Chemistry)
Norville C. Pervier, Ph.D., Chairman of Students' Work Committee (Chemistry)

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 S. Chatwood Burton, M.A., Professor of Fine Arts
 Robert T. Jones, B.S.(Arch.), Professor of Architectural Construction
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 Elmer E. Young, Assistant Professor of Fine Arts
 ———, Lecturer in Landscape Architecture
 Leon H. Sault, B.S.(C.E.), Lecturer in Estimating
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 Ivan Doseff, B.S., Instructor in Drawing and Painting
 Donald C. Heath, M.S.(Arch.), Instructor in Architecture

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 Shelby A. Miller, B.S. in Ch.E., Assistant in Chemical Engineering
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 John A. Anthes, B.Ch.E., Assistant in Inorganic Chemistry
 Norman H. Cromwell, B.S., Assistant in Inorganic Chemistry
 John E. Dorn, Jr., B.S., Assistant in Inorganic Chemistry

* On exchange for R. C. Jones, first half of year.

† At Massachusetts Institute of Technology on exchange for L. B. Anderson, first half of year.

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ORGANIC CHEMISTRY

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 Ralph E. Peck, B.Ch.E., Assistant in Physical Chemistry
 William W. Prichard, B.Ch., Assistant in Physical Chemistry
 Frederick T. Wall, B.Ch., Shevlin Fellow

CIVIL ENGINEERING

Frederic H. Bass, B.S., Professor of Municipal and Sanitary Engineering and
 Chairman of the Department
 Alvin S. Cutler, C.E., Professor of Railway Engineering
 Fred C. Lang, C.E., Professor of Highway Engineering
 John I. Parcel, B.A., B.S.(C.E.), Professor of Structural Engineering
 Chester A. Hughes, M.A.Sc., Associate Professor of Structural Engineering
 Joseph A. Wise, B.S.(C.E.), Associate Professor of Structural Engineering
 Otto S. Zelner, B.S.(C.E.), Associate Professor of Surveying
 Leonard F. Boon, B.S.(C.E.), C.E., Assistant Professor of Civil Engineering
 Miles S. Kersten, B.S.(C.E.), Teaching Fellow in Civil Engineering

DRAWING AND DESCRIPTIVE GEOMETRY

William H. Kirchner, B.S., Professor of Drawing and Descriptive Geometry and
 Head of the Department
 Robert W. French, B.S.(C.E.), Professor of Drawing and Descriptive Geometry
 Howard D. Myers, B.S.(C.E.), Associate Professor of Drawing and Descriptive
 Geometry
 Henry C. T. Eggers, E.E., Ph.D., Assistant Professor of Drawing and Descriptive
 Geometry
 Alex S. Levens, M.S.(C.E.), C.E., Assistant Professor of Drawing and Descriptive
 Geometry
 Orrin W. Potter, E.M., M.S., Assistant Professor of Drawing and Descriptive
 Geometry
 Robert F. Schuck, B.S.(E.E.), Assistant Professor of Drawing and Descriptive
 Geometry
 William S. Williams, B.S.(E.E.), Assistant Professor of Drawing and Descriptive
 Geometry
 Charles L. Brainard, B.S.(Arch.), Instructor in Drawing and Descriptive
 Geometry
 Fred T. Cruzen, B.S.(E.E.), Instructor in Drawing and Descriptive Geometry
 Lloyd J. Quaid, B.S.(E.E.), Instructor in Drawing and Descriptive Geometry
 Emmett O. Shultz, B.S.(M.E.), Instructor in Drawing and Descriptive Geometry

ELECTRICAL ENGINEERING

John M. Bryant, M.S., E.E., Professor of Electrical Engineering and Head of
 the Department
 William T. Ryan, E.E., Professor of Electric Power Engineering
 Henry E. Hartig, B.S.(E.E.), Ph.D., Associate Professor of Telephone and
 Telegraph Engineering
 Elmer W. Johnson, B.S., M.E., E.E., Associate Professor of Electric Power
 Engineering
 John H. Kuhlmann, B.A., B.E., E.E., Associate Professor of Electrical Design
 James S. Webb, M.S., Ph.D., Associate Professor of Radio Engineering

Loyst C. Caverley, M.S.(E.E.), Assistant Professor of Electric Power Engineering
 Milo E. Todd, B.A., E.E., Assistant Professor of Electric Power Engineering
 Cleo Brunetti, B.E.E., Teaching Fellow in Electrical Engineering
 Walter A. Specht, B.E.E., Teaching Fellow in Electrical Engineering

ENGINEERING ENGLISH

Harlow C. Richardson, B.A., Assistant Professor of English, in charge of Engineering English
 Luther N. Becklund, B.A., Instructor in English
 Ledru O. Guthrie, M.A., Instructor in English
 Clifford I. Haga, B.A., Instructor in English

GENERAL ENGINEERING

Victor L. Fixen, E.M., LL.B., Lecturer in Engineering Contracts and Specifications

MATHEMATICS AND MECHANICS

William E. Brooke, B.C.E., M.A., Professor of Mathematics and Mechanics and Head of the Department
 Hans H. Dalaker, Ph.D., Professor of Mathematics and Mechanics
 George C. Priester, Ph.D., Professor of Materials of Engineering
 Lorenz G. Straub, Ph.D., C.E., Professor of Hydraulics
 Carl A. Herrick, M.E., Associate Professor of Mathematics and Mechanics
 Hugh B. Wilcox, B.S.(E.E.), M.S., Associate Professor of Mathematics and Mechanics
 Charles Boehnlein, B.S., M.E., Assistant Professor of Aerodynamics
 Harry A. Doeringsfeld, C.E., Assistant Professor of Mathematics and Mechanics
 William M. McClintock, M.A., Assistant Professor of Mathematics and Mechanics
 Forrest E. Miller, M.S., Assistant Professor of Mathematics and Mechanics
 Roderick W. Siler, B.S., Assistant Professor of Mathematics and Mechanics
 Charles L. Barker, B.A., M.S., Instructor in Mathematics and Mechanics
 John A. Henry, B.S.(C.E.), Instructor in Mathematics and Mechanics
 Glenn H. Peebles, M.S., Instructor in Mathematics and Mechanics
 Max G. Scherberg, Ph.D., Instructor in Mathematics and Mechanics
 Carl E. Swanson, B.S.(E.E.), Instructor in Mathematics and Mechanics

MECHANICAL ENGINEERING

John R. DuPriest, B.S.(E.E.), M.E., M.M.E., Professor of Mechanical Engineering and Head of the Department
 Frank B. Rowley, B.S., M.E., Professor of Mechanical Engineering and Director of the Experimental Engineering Laboratories
 Charles F. Shoop, B.S., B.S.(M.E.), Professor of Steam Engineering
 Charles A. Koepke, M.S.(M.E.), Associate Professor of Industrial Engineering and Superintendent of Shops
 John V. Martenis, M.E., Associate Professor of Machine Design
 Burton J. Robertson, B.S., E.E., Associate Professor of Internal Combustion Engines
 Axel B. Algren, M.S.(M.E.), Assistant Professor of Mechanical Engineering and Assistant Director of the Experimental Engineering Laboratories

Arthur R. Ford, M.S.(M.E.), Assistant Professor of Internal Combustion Engines
 Russell E. Gibbs, B.S.(M.E.), M.E., Assistant Professor of Steam Engineering
 William H. Richards, Assistant Professor of Woodworking
 James J. Ryan, M.S.(M.E.), Assistant Professor of Machine Design
 Jesse M. Campbell, B.S.(M.E.), Instructor in Mechanical Engineering
 Alexander Cowie, B.S.(M.E.), M.S., Instructor in Machine Shop Practice
 William H. Easton, B.S.(M.E.), Instructor in Mechanical Engineering
 Fulton Holtby, M.E., Instructor in Foundry Practice
 Thomas P. Hughes, M.S., Instructor in Forging
 Herald K. Palmer, B.S., B.S.(E.E.), Instructor in Mechanical Engineering
 Harry N. Martinson, Assistant in Machine Shop Practice
 Carl T. Peterson, Assistant in Woodworking
 Fred Teal, Assistant in Forging

COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

ASTRONOMY

Willem J. Luyten, Ph.D., Associate Professor of Astronomy

BOTANY

Carl O. Rosendahl, Ph.D., Professor of Botany and Chairman of the Department
 George O. Burr, Ph.D., Professor of Botany
 Frederic K. Butters, Ph.D., Professor of Botany
 William S. Cooper, Ph.D., Professor of Botany
 Josephine E. Tilden, M.S., Professor of Botany
 Ned L. Huff, M.A., Assistant Professor of Botany
 Alan E. Trelcar, Ph.D., Assistant Professor of Botany

FRENCH

Everett W. Olmsted, Ph.D., Litt.D., Professor and Head of the Department

GEOLOGY AND MINERALOGY

William H. Emmons, Ph.D., Professor of Geology and Mineralogy and Head
 of the Department
 Frank F. Grout, Ph.D., Professor of Geology and Mineralogy
 Clinton R. Stauffer, Ph.D., Professor of Geology and Mineralogy
 John W. Gruner, Ph.D., Associate Professor of Geology and Mineralogy
 George M. Schwartz, Ph.D., Associate Professor of Geology and Mineralogy
 George A. Thiel, Ph.D., Associate Professor of Geology and Mineralogy
 Carl E. Dutton, Ph.D., Instructor in Geology and Mineralogy
 Reuben B. Ellestad, Ph.D., Instructor in Rock Analysis
 August Willman, Ph.D., Instructor in Rock Analysis

GERMAN

Samuel Kroesch, Ph.D., Professor of German and Chairman of the Department
 James Davies, Ph.D., Assistant Professor of German
 Fred B. Gerstung, M.A., Instructor in German

HISTORY

Lester B. Shippee, Ph.D., Professor of History and Chairman of Department
 Guy Stanton Ford, Ph.D., LL.D., Litt.D., Professor of History
 Herbert Heaton, M.A., M.Com., Litt.D., Professor of History

PHYSICS

Henry A. Erikson, B.E.E., Ph.D., Professor of Physics and Chairman of the Department
 Louallen F. Miller, Ph.D., Professor of Physics
 John T. Tate, Ph.D., Professor of Physics
 Anthony Zeleny, Ph.D., Professor of Physics
 J. William Buchta, Ph.D., Associate Professor of Physics
 Joseph Valasek, Ph.D., Associate Professor of Physics
 Edward L. Hill, Ph.D., Assistant Professor of Theoretical Physics
 John H. Williams, Ph.D., Assistant Professor of Physics

POLITICAL SCIENCE

Harold S. Quigley, Ph.D., Professor of Political Science and Chairman of the Department
 Oliver P. Field, M.A., LL.B., S.J.D., Professor of Political Science

ZOOLOGY

Dwight E. Minnich, Ph.D., Professor of Zoology and Chairman of the Department
 Ralph Dawson, Ph.D., Assistant Professor of Zoology

COLLEGE OF AGRICULTURE, FORESTRY, AND HOME ECONOMICS

AGRICULTURAL BIOCHEMISTRY

Ross A. Gortner, Ph.D., D.Sc., Professor of Agricultural Biochemistry and Chief of the Division
 Clyde H. Bailey, Ph.D., Professor of Agricultural Biochemistry
 Henry B. Bull, Ph.D., Assistant Professor of Agricultural Biochemistry
 William M. Sandstrom, Ph.D., Assistant Professor of Agricultural Biochemistry

AGRICULTURAL ECONOMICS

Oscar B. Jesness, Ph.D., Professor of Agricultural Economics and Chief of the Division
 Andrew Boss, D.Sc., Professor of Farm Management and Vice-Director of Agricultural Experiment Station
 Lewis F. Garey, Ph.D., Assistant Professor of Agricultural Economics

AGRONOMY AND PLANT GENETICS

Herbert K. Hayes, D.Sc., Professor and Chief of the Division
 Iver J. Johnson, Ph.D., Assistant Professor of Agronomy and Plant Genetics

ANIMAL HUSBANDRY

Walter H. Peters, M.Agr., Professor of Animal Husbandry and Chief of the Division

DAIRY HUSBANDRY

James B. Fitch, Ph.D., Professor of Dairy Husbandry and Chief of the Division
 Willes B. Combs, M.A., Professor of Dairy Husbandry

FORESTRY

Henry Schmitz, Ph.D., Professor of Forestry and Chief of the Division
 Edward G. Cheyney, B.A., Professor of Forestry

HORTICULTURE

William H. Alderman, B.S.A., Professor of Horticulture and Chief of the Division

Lewis E. Longley, Ph.D., Assistant Professor of Horticulture

Ernest Angelo, Ph.D., Instructor in Horticulture

RHETORIC

Robert C. Lansing, M.A., Assistant Professor of Rhetoric

William J. Routledge, B.A., Assistant Professor of Rhetoric

James I. Brown, M.A., Instructor in Rhetoric

Marjorie H. Thurston, M.A., Instructor in Rhetoric

SOILS

Frederick J. Alway, Ph.D., Professor of Soils and Chief of the Division

Clayton O. Rost, Ph.D., Professor of Soils

Paul R. McMiller, M.S., Assistant Professor of Soils

MEDICAL SCHOOL

BACTERIOLOGY AND IMMUNOLOGY

Winford P. Larson, M.D., Professor of Bacteriology and Immunology and Head of the Department

Robert G. Green, M.A., M.D., Professor of Bacteriology and Immunology

H. Orin Halvorson, Ch.E., Ph.D., Associate Professor of Bacteriology and Immunology

PHYSIOLOGIC CHEMISTRY

Jesse F. McClendon, Ph.D., Professor of Physiologic Chemistry

Allan Hemingway, Ph.D., Assistant Professor of Physiologic Chemistry

L. Earle Arnow, Ph.D., Instructor in Physiologic Chemistry

Jesse W. Cavett, Ph.D., Instructor in Physiologic Chemistry

SCHOOL OF MINES AND METALLURGY

Ralph L. Dowdell, Met.E., Ph.D., Professor of Metallography

Levi B. Pease, M.S., Professor of Metallurgy

Henry S. Jerabek, M.S., Assistant Professor of Metallography

Arthur C. Forsyth, Met.E., M.S., Instructor in Metallography

SCHOOL OF BUSINESS ADMINISTRATION

Russell A. Stevenson, Ph.D., Dean of the School of Business Administration

George Filipetti, Ph.D., Professor of Economics and Business Administration and Adviser in Engineering Business Courses

Roy G. Blakey, Ph.D., Professor of Economics

Frederic B. Garver, Ph.D., Professor of Economics

Alvin H. Hansen, Ph.D., Professor of Economics

Arthur W. Marget, Ph.D., Professor of Economics and Finance

Bruce D. Mudgett, Ph.D., Professor of Economics and Statistics

J. Warren Stehman, Ph.D., Professor of Finance

Roland S. Vaile, M.A., Professor of Economics and Marketing
 Ernest A. Heilman, Ph.D., Associate Professor of Accounting
 Ralph Cassady, Ph.D., Assistant Professor of Marketing
 Richard L. Kozelka, Ph.D., Assistant Professor of Economics and Statistics
 Walter R. Myers, Ph.D., Assistant Professor of Economics and Finance
 Harry J. Ostlund, B.A., Assistant Professor of Accounting
 Emerson P. Schmidt, M.A., Assistant Professor of Economics
 John P. Dalzell, B.A., LL.B., Lecturer in Business Law
 Ben W. Palmer, M.A., LL.B., Lecturer in Business Law
 Richard H. Crawford, B.A., Instructor in Economics and Business Administration
 Erwin A. Gaumnitz, B.B.A., Ph.D., Instructor in Economics and Statistics
 Reuel I. Lund, C.P.A., M.A., Instructor in Economics and Accounting

MILITARY SCIENCE AND TACTICS

Adam E. Potts, Major, Coast Artillery Corps, Professor of Military Science and Tactics and Head of the Coast Artillery Corps Unit
 Richard A. Ericson, Captain, Coast Artillery Corps, Assistant Professor of Military Science and Tactics
 Layton A. Zimmer, First Lieutenant, Coast Artillery Corps, Assistant Professor of Military Science and Tactics
 Charles B. Brown, First Lieutenant, Signal Corps, Assistant Professor of Military Science and Tactics
 Aubrey R. Dunkum, Master Sergeant, Coast Artillery Corps, Instructor in Military Science and Tactics
 Roy Cunningham, Staff Sergeant, Infantry, Instructor in Military Science and Tactics
 John E. Seay, Staff Sergeant, Infantry, Instructor in Military Science and Tactics
 Ernest R. Mylke, Staff Sergeant, Coast Artillery Corps, Instructor in Military Science and Tactics

PHYSICAL EDUCATION

PHYSICAL EDUCATION FOR MEN

Frank McCormick, B.A., LL.B., Professor of Physical Education for Men and Director of Athletics
 Bernard W. Bierman, B.A., Professor of Physical Education for Men and Head Football Coach
 Louis J. Cooke, M.D., Professor of Physical Education and Athletics for Men and Assistant Director
 Louis F. Keller, M.A., Associate Professor of Physical Education for Men
 Sherman W. Finger,* Ph.B., Associate Professor of Physical Education for Men
 David MacMillan, B.S., Assistant Professor of Physical Education for Men
 Phil Brain, Instructor in Physical Education for Men
 Lowell P. Dawson, B.S., Instructor in Physical Education for Men
 Blaine McKusick, B.A., LL.B., Instructor in Physical Education for Men
 Clarence R. Osell, B.S., Instructor in Physical Education for Men
 Ralph A. Piper, B.Phys.Ed., Instructor in Physical Education for Men
 Niels Thorpe, Instructor in Physical Education for Men

* Absent on leave, 1935-36.

PHYSICAL EDUCATION FOR WOMEN

J. Anna Norris, M.D., Professor of Physical Education for Women and Director
of Physical Education for Women

Gertrude M. Baker, M.A., Associate Professor of Physical Education for Women

May S. Kissock, M.A., Assistant Professor of Physical Education for Women

Catherine Snell, B.S., Assistant Professor of Physical Education for Women

Florence M. Warnock, M.A., Assistant Professor of Physical Education for
Women

Elizabeth Brogdon, M.S., Instructor in Physical Education for Women

Grace Christensen, B.S., Instructor in Physical Education for Women

Marie Eibner, B.S., Instructor in Physical Education for Women

Margaret Isaacs, B.S., Instructor in Physical Education for Women

Elizabeth Zimmerli, M.A., Instructor in Physical Education for Women

GENERAL INFORMATION

COLLEGE OF ENGINEERING AND ARCHITECTURE

The College of Engineering and Architecture had its beginning in the College of Agriculture and the Mechanic Arts which was authorized by the legislative act of 1868. Courses in civil and mechanical engineering were first offered in 1871. In the reorganization of the University, in 1872, the College of the Mechanic Arts was established. It became the College of Engineering, Metallurgy, and the Mechanic Arts in 1892, the College of Engineering and the Mechanic Arts in 1897, and the College of Engineering and Architecture in 1916. A course in Electrical Engineering was first offered in 1887. Architecture and Architectural Engineering were announced in 1912. In 1925, the name of the Department of Architecture was changed to the School of Architecture. The course in Interior Architecture was established in 1923 being called Interior Decoration until 1929. The Agricultural Engineering course was offered in 1925, and the courses in Aeronautical Engineering and Landscape Architecture in 1928. Combined courses with Business Administration were established in 1934.

The purpose of this college is to give the students a broad foundation in the fundamental principles of engineering and architecture, together with sufficient knowledge of professional practice to enable them to apply those principles successfully. It is not possible in college to educate a fully trained engineer, as the application of the principles to the practice of engineering is to be learned through experience. There are certain subjects, such as surveying and drafting, in which some proficiency is required. This enables a student upon graduation to fill satisfactorily a subordinate position while obtaining a basis for growth and advancement.

It is intended that all of the technical courses given in this college shall be taught by men who have had practical experience in their respective fields in addition to their professional training.

The field of engineering is very broad and is continually becoming more extensive. From the technical lines of design, construction, maintenance, and operation of engineering works, which have always belonged to him, the trained engineer has been drawn into the business world to occupy positions of an executive character. To meet the demand for such service, the importance of the broader training in economic and commercial principles and industrial relations is recognized.

Withal, it is intended that the young graduate shall have obtained material assistance in developing those traits of character which will make him a loyal and exemplary citizen and a true gentleman.

SCHOOL OF CHEMISTRY

The School of Chemistry was established in 1897 as a school of analytical and applied chemistry, subsidiary to the College of Science, Literature, and the Arts. In 1904 it was made a separate unit of the University, and in 1919, its present name was adopted.

It occupies a large modern building, 180 by 200 feet, having six floors. Its laboratories are designed to afford facilities for instruction in the various branches of chemistry. The chemistry library is well provided with complete sets of journals and compendia of chemical literature, among which are important

sets not frequently found in university libraries. Many special laboratories for private research have been provided and facilities are available for graduate work leading to the higher degrees.

COURSES AND DEGREES

The College of Engineering and Architecture offers four-year courses of study in Aeronautical, Agricultural, Civil, Electrical, and Mechanical Engineering, and Landscape Architecture, and a five-year course in Architecture. These courses lead to the degree of bachelor of aeronautical, agricultural, civil, electrical, or mechanical engineering, landscape architecture, or architecture. In some of the courses, optional groups of electives are arranged for the guidance of students who desire to devote special attention to certain fields.

A four-year course in Interior Architecture is provided, of which the first two years are taken in the College of Science, Literature, and the Arts and the last two years in the College of Engineering and Architecture, leading to the degree of bachelor of interior architecture.

The Engineering Pre-Business course requires the first two years of work in this college. This is followed by two years in the School of Business Administration upon the completion of which the degree of bachelor of business administration is conferred.

In co-operation with the College of Science, Literature, and the Arts, a six-year course in Arts and Architecture is offered. It leads to the degrees of bachelor of arts, at the end of four years in the College of Science, Literature, and the Arts, and bachelor of architecture at the end of the sixth year in the College of Engineering and Architecture.

The School of Chemistry offers four-year courses in Chemistry and Chemical Engineering, leading to the degree of bachelor of chemistry or bachelor of chemical engineering, respectively.

Five-year combined courses in Engineering or Chemistry with Business Administration lead to two bachelor's degrees, one in each of the two fields.

These colleges also offer work in the Graduate School leading to the Master's degree in the appropriate branch of engineering, in architecture, or in chemistry, or to the Doctor's degree.

The professional degree of aeronautical, agricultural, chemical, civil, electrical, or mechanical engineer will be conferred upon those who have received the degree of bachelor of aeronautical, agricultural, chemical, civil, electrical, or mechanical engineering, when they have completed the equivalent of one additional year's college work, four years of engineering experience in positions of responsibility, and have presented a satisfactory professional thesis.

Graduates of these colleges may be granted permission to pursue the year of graduate study *in absentia* under the direction of the faculty. It is recommended, however, that this year be spent in residence at this University and that the Master's degree be obtained in this manner. There are many advantages in taking this year immediately following graduation from the four-year course, thus making a five-year course leading to the Master's degree in the corresponding branch of engineering or in architecture. Then after four years of approved experience and the preparation of the professional thesis, the Engineer degree may be obtained. This procedure is especially recommended to those students whose undergraduate work is of high grade and who desire additional preparation for the higher positions which require strong character and leadership.

Candidates for the Engineer degrees register in the Graduate School.

ADMISSION

Detailed information concerning admission, entrance requirements, advanced standing, and expenses will be found in the bulletin of General Information which will be sent to any address upon application to the registrar, University of Minnesota.

Students are admitted on certificate or by examination. In special cases, with the approval of the dean of the college, persons of mature age (twenty-four years or older) and experience may be admitted as adult special students to pursue specific courses of study.

Admission by certificate.—Applicants must present twelve units of work obtained in the last three years of high school (senior high school) of which at least nine must be included in Groups A, B, C, D, and E as listed below. These nine units must include a major of three units in one group and two minors of two units each in two other groups. Subject to these requirements, the applicant for admission to Engineering, Architecture, or Chemistry must include at least two units of English and three units of mathematics, including higher algebra and solid geometry. One unit of mathematics and one unit of foreign language taken in the ninth grade may be counted in these groups. Applicants who stand in the upper 60 per cent of their high school class on the basis of their scholastic records, will be admitted directly; those in the lowest 40 per cent will be given individual consideration and may be permitted to take special tests to qualify for admission. Chemistry is required for admission to the School of Chemistry.

Students who expect to enter the College of Engineering and Architecture or School of Chemistry are urged to include in their high school courses additional mathematics, beyond the three years required; Latin, two units; German or French, two units; chemistry, one unit; physics, one unit; ancient, modern, and American history; and American government or civics. French is desirable for students in architecture. German is important for students entering the School of Chemistry; students who have had two years of high school German or one year of college German take placement tests in the fall to determine whether or not they may take German 27-28-29, nine credits, instead of 24-25-26, twelve credits.

List of entrance subjects.—Only those subjects included in the following groups may be counted toward admission.

The term *unit* means not less than five recitations of forty minutes each per week for a school year of thirty-six weeks. In laboratory, drawing, and other manual courses, twice this amount of class time is required for one unit.

- Group A English: 2 or 3 units.
- Group B Foreign languages: Latin, Greek, German, French, Spanish, Scandinavian, 1 to 4 units each.
- Group C History and social sciences: European history, $\frac{1}{2}$ to 2 units; English and American history, $\frac{1}{2}$ or 1 unit each; economics and sociology, $\frac{1}{2}$ unit each; American government, commercial geography, and history of commerce, $\frac{1}{2}$ or 1 unit each.
- Group D Mathematics: elementary algebra and plane geometry, 1 unit each; unified mathematics, 2 units; higher algebra, $\frac{1}{2}$ or 1 unit; solid geometry and trigonometry, $\frac{1}{2}$ unit each.
- Group E Natural sciences: biology, physics, and chemistry, 1 unit each; botany and zoology, $\frac{1}{2}$ or 1 unit each; physiology, astronomy, and geology, $\frac{1}{2}$ unit each.
- Group F Vocational and miscellaneous subjects: The three units which are not required to be in Groups A, B, C, D, E, may be in work which the superintendent certifies as being of acceptable nature and as having been counted toward the applicant's graduation.

Admission by examination.—Applicants who are high school graduates or at least nineteen years of age may be admitted provisionally and subject to one year of satisfactory work, upon passing the following tests:

- a. College aptitude test
- b. Test of proficiency in English
- c. Test in mathematics including arithmetic, algebra, and geometry
- d. Test in chemistry, if entering School of Chemistry.

Applicants failing to pass test (b), (c) or (d) may apply for a subsequent examination at any scheduled date on payment of a fee of five dollars. Those failing to pass test (a) may enter only upon satisfactorily meeting the entrance requirements by the certificate method.

Time of admission.—The regular time to enter the college is in September. However, students will be admitted at the beginning of the winter quarter in January, but they should have had high school chemistry. Admission at the opening of the spring quarter is permitted altho not recommended.

ADVANCED STANDING

Students who have pursued courses of study in other colleges of recognized standing may receive advanced credit under the rules of the University and of the college. See Requirements for Graduation.

Students who have taken college algebra or trigonometry in high school with satisfactory records may be permitted to take comprehensive examinations for credit in these subjects, if they apply before registration day at the office of the Department of Mathematics and Mechanics.

REGISTRATION

All undergraduate students are required, at the beginning of each quarter of residence, to pay the prescribed fees to the university bursar, to fill and file at the Main Engineering Building (Chemistry Building for students registering in School of Chemistry except freshmen) the necessary classification blanks showing the courses they expect to pursue during the quarter, and to enroll for their various classes.

All students entering the college for the first time must send or present their credentials to the registrar of the University, who will notify each applicant with regard to his admission. Before registering, all new matriculants are required to take a physical examination.

Students should consult the university calendar in regard to registration dates and the *Handbook for Students in the College of Engineering and Architecture* or *Handbook for Students in the School of Chemistry* for regulations governing registration and scholastic work.

Students will not be allowed to register for more than 19 credit hours without the approval of the Students' Work Committee.

No change in registration will be permitted later than 10 days after the beginning of the quarter.

FEEES AND EXPENSES

The annual fee for students in this college is \$90 for residents and \$120 for non-residents, one third of which is due at the beginning of each quarter. Fellows, scholars, assistants, and instructors are not required to pay university fees or tuition when they are regularly enrolled in the Graduate School.

| | |
|--|---------|
| Tuition fee (per quarter): | |
| Residents of Minnesota | \$30.00 |
| Non-residents | 40.00 |
| Matriculation deposit* (first quarter only) | |
| Men | 15.00 |
| Women | 5.00 |
| Incidental fee, per quarter | 6.40 |
| Special fees: | |
| Examination for removal of condition | 1.00 |
| Examination for credit (after the first six weeks in residence) | 5.00 |
| Special examination | 5.00 |
| Chemistry deposits, including laboratory fee of \$2.00 per quarter | 10.00 |
| Graduation fee | 7.50 |

Penalty fees.—A penalty fee for late registration, or late payment of fees shall be \$2 prior to the day classes begin, on and after which the penalty increases at the rate of \$1 per day, provided that no student shall pay more than \$10 of penalty in any given quarter.

A penalty fee of three dollars (\$3) is charged for change of registration beginning the third day after classes begin. After this date the penalty will increase at the rate of one dollar (\$1) per day to a maximum of ten dollars (\$10).

Living expenses.—Detailed statements regarding living expenses may be found in the bulletin of General Information. For students not living at home, the approximate expense of a year in this college has been estimated at about \$500 minimum, \$800 average, and \$1,000 liberal, not including clothing, traveling, or vacations. The average estimate is based upon the following details:

| | |
|-----------------------------|----------|
| Tuition and fees | \$135.00 |
| Laundry | 40.00 |
| Room rent | 120.00 |
| Meals | 270.00 |
| Books and instruments | 35.00 |
| Incidentals | 200.00 |
| Total | \$800.00 |

For non-residents of Minnesota, \$30 should be added for tuition.

A great deal depends upon the frugality of the student. By reducing the amount spent for incidentals and by obtaining cheaper board and room many students will be able to live for less than the amount estimated above. Likewise other students will pay more for board, room, and incidentals and will not be able to live within these amounts. To live within the minimum amount, a student should expect to forego all luxuries and economize in every way possible.

When coming to the University for the first time, the student should have money enough to cover the full expense for at least the first quarter without depending upon outside employment for his support. After a term at the University, he will know more about the possibilities of supplementing his income by employment, especially as regards the spare time at his disposal for such work.

THE UNIT OF CREDIT

The standard unit of credit in the University is the quarter credit, or simply, the *credit*. It corresponds to one class period per week for one quarter. This class period may be a one-hour lecture or recitation, or a two- or three-hour

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

class in laboratory, drawing, surveying, or computations, but in any case one credit is supposed to require three actual hours of the average student's time per week for one quarter. One hour of recitation is assumed to require two hours of preparation or study. A two-hour laboratory period may require one hour of home work to complete the credit. A three-hour period usually carries one credit without additional work outside of class. The credit allowed for a lecture may be from one-third to one hour depending upon the amount of outside work or study required in connection with it.

CREDIT FOR OUTSIDE WORK

Credit for certain courses, as a result of work done outside of the regular classes, may be obtained by satisfactorily passing comprehensive examinations. This includes work done in extension classes, by correspondence study, by the aid of a private tutor, by individual study, through practical experience, or otherwise.

The comprehensive examination will be of such thoro and searching character as to determine whether the student has done all the work of the course. It should require at least three times the work of the usual final or condition examination and will be conducted by a committee appointed by the head of the department in which the course is given.

Permission to take the examination must be obtained from the Students' Work Committee, and the usual fee of \$5 for each special examination must be paid unless it be taken within six weeks after first entering the University.

EXTENSION COURSES

Certain courses in engineering, architecture, and chemistry are offered by the Extension Division of the University in evening classes and by correspondence. Persons who are unable to attend the regular university courses may obtain valuable instruction in this manner.

Credit for certain required courses in the College of Engineering and Architecture or the School of Chemistry on the basis of work done in the Extension Division is obtainable on petition by passing a comprehensive examination in each course given by the department concerned. A fee of five dollars (\$5) is charged for each examination except when taken within six weeks after admission. Definite information regarding extension work will be found in the bulletins of the General Extension Division.

ATTENDANCE

It is expected that all students will be regular in attendance at all class exercises and that they will do all the work of their courses. Neglect of work, as indicated by irregularity in attendance or low scholarship, will be sufficient reason for exclusion from class. Any student who has unexcused absences equal to the number of credits in a course, but in no case less than two, may be dropped from the class with a record of failure in the course.

SENIOR QUALIFYING EXAMINATIONS IN CHEMISTRY

The Senior Qualifying Examinations, courses Inorganic Chemistry 51 (4 hours), and Analytical Chemistry 53 (3 hours), are required of all students registered in the School of Chemistry, but not of students in other colleges who may be taking chemistry courses. The following rules apply to students registered in the School of Chemistry.

1. The requirement of the two Senior Qualifying Examinations must be satisfied before registration for any required courses of the student's senior year or the summer courses in chemical manufacture (Ch.E: 151-152) or the senior courses in the minor groups in bacteriology, biochemistry, or geology.

2. They will be held regularly each year in the latter part of the spring quarter and prior to the opening of the fall quarter on specified dates. They need not be taken simultaneously, but each must be preceded by Analytical Chemistry 1 and 2, Quantitative Analysis, or registration in these.

3. Students who have taken their general inorganic and qualitative courses, or their quantitative courses in the School of Chemistry and with an average in either of these groups higher than "C," will be excused from the corresponding Senior Qualifying Examination.

4. A special examination requires a fee of \$5 and the permission of the Students' Work Committee.

5. Students who transfer to the School of Chemistry from another college or another institution will be required to take and pass the Senior Qualifying Examinations in those subjects for which they have received advanced standing, before entering the courses specified in Rule 1.

CHEMICAL ENGINEERING INSPECTION TRIP

All seniors registered in Chemical Engineering are required to go on a trip of inspection and observation through certain large industrial plants. This trip is usually taken during the spring vacation and is under the personal supervision and guidance of members of the faculty. It includes plants in Milwaukee, Chicago, and near-by points. The expenses of the trip are minimized as far as possible, and must be defrayed by the individual student. They amount to from \$75 to \$100 per student.

REQUIREMENTS FOR GRADUATION

To be recommended for the degree of bachelor of aeronautical, civil, electrical, or mechanical engineering, or of landscape architecture, the student must satisfactorily complete all of the courses prescribed in the corresponding curriculum together with sufficient electives to make a total of at least 204 credits. In the 5-year course in architecture, 225 credits are required for graduation. In agricultural engineering and chemistry, 210 credits are required for graduation. For the degree of bachelor of interior architecture, the requirements are 192 credits, including all required courses, plus 90 honor points from the first two years. For the degree of bachelor of chemical engineering, 218 credits are required. For the degree of bachelor of business administration in combination with engineering or chemistry, a student must complete the requirements for the Bachelor's degree in one of the engineering or chemistry curricula and include the 74 prescribed credits in business subjects.

In cases of continued low scholarship, even tho all the courses of the curriculum have been passed, the faculty reserves the right to require additional work to be completed, over and above the regular curriculum, and with a specified grade, before the degree will be recommended.

Students entering the College of Engineering and Architecture or School of Chemistry with advanced standing from other colleges or universities must spend at least one year in residence here before they will be recommended for graduation. If the term of residence is only one year it must be the senior year; and in any case such a student must spend two "quarters" of his senior year in residence.

SCHOLARSHIPS AND PRIZES

Research fellowships.—In the Engineering Experiment Station research fellowships are available from time to time which are open to engineering graduates, including chemical engineers. The holder is required to give twenty hours per week, that is, about half of his time, to such research service as may be assigned him. In addition he is expected to carry half-time work in the Graduate School toward an advanced degree.

Teaching fellowships in civil and electrical engineering are open to graduates in these fields. Each fellow renders part time service in instruction while pursuing graduate study.

The Shevlin Fellowship in Chemistry.—The Shevlin Fellowship in Chemistry, established by the late Thomas H. Shevlin, of Minneapolis, is awarded annually and yields \$500. Candidates for this fellowship should file their applications before March 1 with the dean of the Graduate School. The Shevlin fellow devotes his entire time to graduate work and is not required to render any service to the University.

The du Pont Fellowship in Chemistry.—This fellowship was founded by E. I. du Pont de Nemours and Company, Wilmington, Delaware, and yields \$750 annually. The holder devotes his entire time to graduate work and is not required to render any service to the University. Applications for this fellowship should be submitted to the dean of the School of Chemistry before March 15. (Not available in 1935-36.)

The Albert Moorman Memorial Fellowship in Architecture.—This covers the traveling expenses of the recipient on a trip to study notable examples of architecture in this country. It is awarded for excellence in architectural design as determined by competition in the senior class. (Not offered in 1935-36.)

Assistants.—The School of Chemistry employs 43 graduate assistants at from \$300 to \$600 per year, on part time. They devote from eight to twelve hours per week to instruction and other assigned work, thereby obtaining valuable experience in laboratory teaching under competent direction. In addition to these duties, each assistant is expected to pursue graduate work toward a higher degree. Application should be made to the dean of the School of Chemistry.

Prizes.—Various prizes in the University are open to students in these colleges. A list of them is given in the General Information bulletin. Certain prizes are awarded to students in Engineering only, such as the prizes of the Northwestern Section of the American Society of Civil Engineers and the Twin Cities sections of the American Society of Mechanical Engineers. The Tau Beta Pi, Chi Epsilon, Eta Kappa Nu, and Pi Tau Sigma honorary engineering fraternities also offer prizes.

Two prizes are open to sophomores in chemistry and chemical engineering. These have been established by the Phi Lambda Upsilon honorary chemical fraternity and the Twin City Alumni Association of the Alpha Chi Sigma chemical fraternity. The chemistry faculty offers a prize to seniors.

Ten prizes and two medals are open to students registered in the School of Architecture. Medals are offered by the American Institute of Architects, Alpha Rho Chi, and the Scarab Fraternity. The prizes were established respectively by the Minnesota section of the American Institute of Architects, the faculty of the school, Alpha Alpha Gamma Sorority, the Gargoyle Club, and the Northern States Power Company.

Loan funds.—Various loan funds are available from which worthy students may obtain financial assistance after they have been in attendance a sufficient

length of time to establish satisfactory records of accomplishment. Application should be made to the dean of student affairs.

RESERVE OFFICERS TRAINING CORPS

The War Department has established at this University units of coast (anti-aircraft) artillery, and signal corps, in which both basic and advanced courses are given. The artillery and signal corps units are made up almost entirely of students in engineering, architecture, chemistry, and mines, for whom this technical and military training is particularly valuable. The Basic Course is open to freshmen and sophomores for the first two years and carries one credit per quarter for six quarters; the Advanced Course is open to selected students for the third and fourth years who have completed the Basic Course.

Students in this college who are admitted to the Advanced Course of the signal corps, or artillery under the prescribed regulations, receive for this work eighteen elective credits toward graduation. They receive an allowance of cash and clothing from the government during the two years of the course, pay and transportation to attend a special training camp in the summer, and if successful, a commission in the Officers' Reserve Corps of the U. S. Army after graduation. Special arrangements may be made in the student's program to enable him to take this course, the advantages of which are recognized.

Besides receiving technical instruction, the student in the Advanced Course has the opportunity to develop and exercise leadership and discipline which will be of value to him in his professional career. The students who qualify in the Basic Course and are selected for the Advanced Course possess many advantages over others who are less fortunate.

SELF-SUPPORT AND OUTSIDE ACTIVITIES

A large number of students contribute to their financial support by means of part time work during the college year. Frequently such students undertake too much. They are advised to carry a lighter program of studies and to plan to spend more than four years in the college course if outside work requires a large amount of their time. Information regarding work for self-support during the college course may be obtained from the University Employment Service or the University Young Men's Christian Association.

Freshmen, in particular, are advised that the work of the first year in this college will require their closest attention and application if they are to succeed. They should refrain from participation in unnecessary outside activities, while bearing in mind the importance of physical as well as mental development.

HANDBOOK FOR STUDENTS

Regulations and instructions for the guidance of students are issued at the time of registration in the form of a small pamphlet. Each student is expected to observe these instructions.

CHANGES IN BULLETIN

The faculties of the College of Engineering and Architecture and the School of Chemistry reserve the right to change their curricula and to cancel or change without notice any course printed in this bulletin. The bulletin is a statement of present conditions, and is subject to modification in any particular by faculty action.

SOCIETIES

Branches of the following national professional societies are maintained at the University of Minnesota by students and faculty members: American Chemical Society, American Institute of Chemical Engineers, American Institute of Electrical Engineers, American Society of Civil Engineers, American Society of Mechanical Engineers, and American Society of Agricultural Engineers. In addition there are the Architectural Society and the Minnesota Society of Aeronautical Engineers.

CURRICULA

COLLEGE OF ENGINEERING AND ARCHITECTURE

| | |
|---------------------------------|--|
| Aeronautical Engineering, p. 26 | Engineering and Business Administration, p. 45 |
| Agricultural Engineering, p. 28 | Engineering Pre-Business, p. 47 |
| Architecture, p. 31 | Interior Architecture, p. 49 |
| Civil Engineering, p. 40 | Landscape Architecture, p. 50 |
| Electrical Engineering, p. 42 | Mechanical Engineering, p. 53 |

SCHOOL OF CHEMISTRY

| | |
|--------------------------|------------------------------------|
| Chemistry, pp. 34 and 35 | Chemical Engineering, p. 34 and 38 |
|--------------------------|------------------------------------|

FRESHMAN YEAR

The freshman year for the courses in Aeronautical, Agricultural, Civil, Electrical, and Mechanical Engineering, and Engineering Pre-Business is shown below. The freshman year for Architecture, is shown on page 31, for Landscape Architecture on page 51, and for Chemistry and Chemical Engineering on page 34.

Chemistry.—Students entering the College of Engineering and Architecture who have not had high school chemistry will take Inorganic Chemistry 14f-15w, five credits per quarter, instead of Inorganic Chemistry 4f-5w, four credits per quarter.

REGULAR FRESHMAN PROGRAM

(For Aeronautical, Agricultural,* Civil, Electrical, and Mechanical Engineering, and Pre-Business*)

| Course No. | Title | Credits | Rec. | Lect. | Lab. |
|-----------------------|---|---------|------|-------|------|
| <i>Fall Quarter</i> | | | | | |
| M.&M. 11 | College Algebra | 5 | 5 | .. | .. |
| Inorg. Chem. 4 | General Inorganic Chemistry | 4 | 1 | 3 | 3 |
| Engl. 4 | Composition | 3 | 3 | .. | .. |
| Draw. 1 | Engineering Drawing | 3 | .. | .. | 8 |
| M.E. 11, 12, or 13* | Shop Practice (for Agr.E. and Pre-bus.).... | 2 | .. | 1 | 4 |
| G.E. 11 | Orientation | 0 | .. | 1 | .. |
| <i>Winter Quarter</i> | | | | | |
| M.&M. 12 | Trigonometry | 5 | 5 | .. | .. |
| Inorg. Chem. 5 | General Inorganic Chemistry | 4 | 1 | 3 | 3 |
| Engl. 5 | Composition | 3 | 3 | .. | .. |
| Draw. 2 | Engineering Drawing | 3 | .. | .. | 8 |
| M.E. 11, 12, or 13* | Shop Practice (for Agr.E. and Pre-bus.).... | 2 | .. | 1 | 4 |
| G.E. 12 | Orientation | 0 | .. | 1 | .. |
| <i>Spring Quarter</i> | | | | | |
| M.&M. 13 | Analytical Geometry | 5 | 5 | .. | .. |
| Inorg. Chem. 16 | Qualitative Chemical Analysis | 5 | .. | 3 | 6 |
| Engl. 6 | Composition | 3 | 3 | .. | .. |
| Draw. 3 | Descriptive Geometry | 3 | .. | .. | 8 |
| M.E. 11, 12, or 13* | Shop Practice (for Agr.E. and Pre-bus.).... | 2 | .. | 1 | 4 |
| G.E. 13† | Orientation | 0 | .. | 1 | .. |

* Freshmen in Agricultural Engineering and Engineering Pre-Business are required to take Shop Practice, M.E. 11, 12, and 13, 2 credits per quarter; not required of the others.

† Not required of women students. Included in Phys.Ed. 7f,w,s for women.

AERONAUTICAL ENGINEERING

Four-year course leading to the degree of bachelor of aeronautical engineering, B.Aero.E.

In addition to the prescribed courses, sufficient electives must be taken to complete a total of at least 204 credits for graduation.

The course in aeronautical engineering is intended to provide instruction and training for students who wish to enter this field of engineering as a profession. With the rapid development of aviation in recent years, aeronautical engineering is assuming a prominent and important position among the engineering professions. The production of airplanes in the United States is increasing at a rapid rate. More attention is being given to lighter-than-air craft as well. Aeronautical engineers are required in all stages of the process, from the research work preliminary to improvements in design to the actual construction, testing, operation, and maintenance. Students trained in aerodynamics and the designing of light structures have been in demand in recent years in many industries.

The aeronautical engineering course is similar to other professional engineering courses. The first year of the course is the same as that of civil, electrical, and mechanical engineering. The fundamental studies are the same. As a result, the graduates in aeronautical engineering should be prepared to enter various branches of the engineering field if, for any reason, they should prefer to do so.

As in other technical courses, so in aeronautical engineering, mathematics plays an important part. No student should enter this course who feels poorly prepared in mathematics.

It should be understood that this is a professional engineering course and not a training course for airplane pilots. It deals with the preparation of students for research, design, construction, operation, management, and maintenance of aircraft from the standpoint of the engineer or manager. However, practical flight training is important for aeronautical engineers and students are urged to take advantage of their opportunities to obtain it through the University of Minnesota Flying Club, Army Air Corps, National Guard, Naval Reserve, or private organizations.

For freshman year, see page 25.

SOPHOMORE YEAR

| Course No. | Title | Credits | Rec. | Lect. | Lab. |
|-----------------------|--|---------|------|-------|------|
| <i>Fall Quarter</i> | | | | | |
| M.&M. 24 | Differential Calculus | 5 | 5 | .. | .. |
| Phys. 3 | Elements of Mechanics | 3 | 1 | 3 | .. |
| Phys. 4 | Elements of Mechanics Laboratory | 1 | .. | .. | 2 |
| Draw. 28‡ | Drafting | 2 | .. | .. | 6 |
| Aero.E. 1 | Aeronautics | 3 | 3 | .. | .. |
| M.E. 14 | Pattern Practice | 2 | .. | 1 | 4 |
| M.E. 70 | Mechanical Technology | 1 | .. | 2 | .. |
| <i>Winter Quarter</i> | | | | | |
| M.&M. 25 | Integral Calculus | 5 | 5 | .. | .. |
| Phys. 23 | Heat | 3 | 1 | 3 | .. |
| Phys. 24 | Heat Laboratory | 1 | .. | .. | 2 |
| Phys. 43 | Electricity | 3 | 1 | 3 | .. |
| Phys. 44 | Electricity Laboratory | 1 | .. | .. | 2 |
| Aero.E. 2 | Aircraft and Auto Engines | 3 | 2 | .. | 2 |
| M.E. 16 | Forge Practice | 2 | .. | 1 | 4 |

‡ For permissible substitute, see page 56.

| Course No. | Title | Credits | Rec. | Lect. | Lab. |
|-----------------------|-------------------------------------|---------|------|-------|------|
| <i>Spring Quarter</i> | | | | | |
| M.&M. 26 | Technical Mechanics (Statics) | 5 | 5 | .. | .. |
| Phys. 33 | Optics | 3 | 1 | 3 | .. |
| Phys. 34 | Optics Laboratory | 1 | .. | .. | 2 |
| Aero.E. 3 | Aeronautics | 3 | 3 | .. | .. |
| C.E. 17 | Surveying | 3 | .. | 1 | 7 |
| Draw. 29 | Drafting | 2 | .. | .. | 6 |

JUNIOR YEAR

Fall Quarter

| | | | | | |
|-------------|---------------------------------------|---|----|----|----|
| M.&M. 129 | Hydraulics | 4 | 3 | 1 | .. |
| M.&M. 143 | Hydraulic Laboratory | 1 | .. | .. | 2 |
| Aero.E. 100 | Aerodynamics | 3 | 3 | .. | .. |
| M.E. 30 | Steam Engineering | 3 | 3 | .. | .. |
| M.E. 33 | Elementary Mechanical Laboratory..... | 2 | .. | .. | 4 |
| M.E. 71 | Machine Shop Practice | 3 | .. | 1 | 7 |
| | Electives* | | | | |

Winter Quarter

| | | | | | |
|-------------|------------------------------------|---|----|----|----|
| M.&M. 128 | Strength of Materials | 5 | 5 | .. | .. |
| M.&M. 141 | Materials Testing Laboratory | 2 | .. | 1 | 3 |
| Aero.E. 101 | Aerodynamics | 3 | 3 | .. | .. |
| M.E. 26 | Mechanism and Kinematics | 3 | 3 | .. | .. |
| M.E. 31 | Thermodynamics | 3 | 2 | 1 | 2 |
| | Electives* | | | | |

Spring Quarter

| | | | | | |
|-------------|-------------------------------------|---|----|----|----|
| M.&M. 127 | Technical Mechanics (Dynamics)..... | 5 | 5 | .. | .. |
| Aero.E. 83 | Stresses in Simple Structures | 3 | 3 | .. | .. |
| Aero.E. 102 | Aerodynamics | 3 | 3 | .. | .. |
| M.E. 27 | Machine Design | 3 | .. | 1 | 6 |
| | Electives* | | | | |

SENIOR YEAR

Fall Quarter

| | | | | | |
|--------------|-----------------------------------|---|----|----|----|
| E.E. 46 | Electric Power | 3 | 2 | .. | 2 |
| M.E. 150 | Internal Combustion Engines | 3 | 3 | .. | .. |
| Met. 152 | Metallography | 3 | .. | 2 | 3 |
| Aero.E. 115† | Airplane Stresses | 3 | 2 | .. | 2 |
| Aero.E. 120 | Airplane Design | 2 | 1 | .. | 3 |
| Aero.E. 140 | Aeronautical Laboratory | 2 | .. | .. | 6 |
| Aero.E. 190 | Seminar | 1 | 1 | .. | .. |

Winter Quarter

| | | | | | |
|-------------|--|---|----|----|----|
| E.E. 47 | Electric Power | 3 | 2 | .. | 2 |
| M.E. 151† | Advanced Internal Combustion Engines | 3 | 3 | .. | .. |
| M.E. 154† | Design of Airplane Engines | 2 | .. | .. | 6 |
| Aero.E. 121 | Airplane Design | 4 | 2 | .. | 6 |
| Aero.E. 141 | Aerodynamics Laboratory | 2 | .. | .. | 6 |
| Aero.E. 191 | Seminar | 1 | 1 | .. | .. |
| | Electives* | | | | |

* For list of elective courses in other colleges, see page 56.

† See † footnote, page 28.

| Course No. | Title | Credits | Rec. | Lect. | Lab. |
|-----------------------|---------------------------|---------|------|-------|------|
| <i>Spring Quarter</i> | | | | | |
| E.E. 48 | Electric Power | 3 | 2 | .. | 2 |
| M.E. 158 | Aero Engine Testing | 2 | .. | .. | 6 |
| Aero.E. 122† | Airplane Design | 3 | 1 | .. | 6 |
| Aero.E. 160† | Airships | 3 | 2 | .. | 3 |
| Aero.E. 170 | Air Transport | 2 | 2 | .. | .. |
| Aero.E. 192 | Seminar | 1 | 1 | .. | .. |
| | Electives* | | | | |

AGRICULTURAL ENGINEERING

Four-year course leading to the degree of bachelor of agricultural engineering, B.Ag.E., in co-operation with the College of Agriculture, Forestry, and Home Economics.

Requirements for graduation include all prescribed courses with sufficient approved electives to make a total of at least 210 credits. This is an average of 17½ credits per quarter for 12 quarters.

Agricultural engineering activities are usually grouped under the heads of *farm machinery*, *farm structures*, and *land reclamation*. There is also need for service in the entire field necessitating general preparation in all three lines.

The farm machinery field covers the proper selection and operation of machinery and equipment best suited to produce good results locally on any given type of farm, the design and construction of such machinery or equipment where it does not yet exist, the improvement of such design to meet special needs, and the adaptation of available types of power to local farm conditions. The farm structures field covers arrangement of the structures on the farmstead for economy, convenience, and comfort, the design and construction of farm buildings and related structures, and the adaptation of available types of building materials to local farm conditions. The land reclamation field covers development of virgin lands suited to agriculture and the improvement of lands already under cultivation through economical clearing operations, and soil conditioning through efficient design and proper installation of drainage and irrigation works and control of soil erosion.

The field, as yet comparatively new and uncrowded, offers many opportunities among which the following are prominent: with manufacturers of farm machinery, equipment, and building materials; as executives, research engineers, publicity and sales managers, and technical field experts; as managers of large farms requiring extensive machinery or equipment; as reclamation engineers with the local, state, and federal governments, and with development companies; as agricultural advisers with power companies in development of rural service; as agricultural engineering editors for farm papers and trade journals; as rural architects and builders; as teachers, investigators, and extension specialists in state agricultural colleges, experiment stations, and in the United States Department of Agriculture; as consulting agricultural engineers in general practice.

For freshman year, see page 25.

* For list of elective courses in other colleges, see page 56.

† Any one or two of the following courses: Aero.E. 115, Airplane Stresses, Aero.E. 122, Airplane Design, Aero.E. 160, Airships, and M.E. 151, Advanced Internal Combustion Engines, or M.E. 154, Design of Airplane Engines, but not *both* of these M.E. courses, may be replaced by an equal number of approved elective credits in any of the following fields: aerodynamics, airplane design and stresses, internal combustion engines, and air transport and meteorology.

SOPHOMORE YEAR

| Course No. | Title | Credits | Rec. | Lect. | Lab. |
|---------------------|---------------------------------------|---------|------|-------|------|
| <i>Fall Quarter</i> | | | | | |
| M.&M. 24 | Differential Calculus | 5 | 5 | .. | .. |
| Phys. 3 | Elements of Mechanics | 3 | 1 | 3 | .. |
| Phys. 4 | Elements of Mechanics Laboratory..... | 1 | .. | .. | 2 |
| Ag.E. 19 | Elementary Surveying | 3 | .. | 1 | 6 |
| Ag.E. 91 | Agendum | 0 | .. | 1 | .. |
| Agron. 1 | General Farm Crops..... | 3 | 3 | .. | .. |
| Hort. 6 | Fruit Growing | 3 | .. | 2 | 4 |

Winter Quarter

| | | | | | |
|----------|----------------------------------|---|----|----|----|
| M.&M. 25 | Integral Calculus | 5 | 5 | .. | .. |
| Phys. 43 | Electricity | 3 | 1 | 3 | .. |
| Phys. 44 | Electricity Laboratory | 1 | .. | .. | 2 |
| Ag.E. 5 | Farm Building Construction | 3 | .. | 1 | 4 |
| Ag.E. 92 | Agendum | 0 | .. | 1 | .. |
| Soils 6 | Soils | 5 | 5 | .. | .. |

Spring Quarter

| | | | | | |
|-----------|--|---|----|----|----|
| M.&M. 84‡ | Technical Mechanics | 5 | 5 | .. | .. |
| Ag.E. 12 | Agricultural Machinery | 3 | .. | 2 | 3 |
| Ag.E. 13 | Gas Engines | 3 | .. | .. | 6 |
| Ag.E. 20 | Advanced Surveying | 3 | .. | 1 | 6 |
| Ag.E. 22 | Agricultural Machinery Laboratory..... | 1 | .. | .. | 3 |
| Ag.E. 43 | Mechanical Laboratory | 3 | .. | 1 | 5 |
| Ag.E. 93 | Agendum | 0 | .. | 1 | .. |

JUNIOR YEAR

Fall Quarter

| | | | | | |
|-----------|-----------------------------|---|----|----|----|
| C.E. 51 | Highways and Pavements..... | 3 | .. | 2 | 3 |
| M.&M. 128 | Strength of Materials..... | 5 | 5 | .. | .. |
| Phys. 23 | Heat | 3 | 1 | 3 | .. |
| Phys. 24 | Heat Laboratory | 1 | .. | .. | 2 |
| Econ. 8 | General Economics | 3 | 3 | .. | .. |
| Ag.E. 14 | Tractors | 3 | .. | 2 | 4 |
| Ag.E. 94 | Agendum | 0 | .. | 1 | .. |

Winter Quarter

| | | | | | |
|--------------|------------------------------------|---|----|----|----|
| M.&M. 86‡ | Hydraulics | 2 | 2 | .. | .. |
| M.&M. 143 | Hydraulic Laboratory | 1 | .. | .. | 2 |
| Econ. 9 | General Economics | 3 | 3 | .. | .. |
| Ag.Econ. 102 | Farm Management: Organization..... | 3 | .. | 3 | .. |
| Ag.E. 7 | Farm Structures | 3 | 1 | 1 | 3 |
| Ag.E. 72 | Applied Electricity | 3 | .. | 1 | 6 |
| or | | | | | |
| Soils 108 | Physical Properties of Soils..... | 3 | .. | 1 | 6 |
| M.E. 26 | Mechanism and Kinematics | 3 | 3 | .. | .. |
| Ag.E. 95 | Agendum | 0 | .. | 1 | .. |

‡ For permissible substitute, see page 56.

| Course No. | Title | Credits | Rec. | Lect. | Lab. |
|--|--|---------|------|-------|------|
| <i>Spring Quarter</i> | | | | | |
| Ag.E. 70 or A.H. 15 D.H. 7 M.E. 27 Ag.Econ. 103 Ag.E. 51 Ag.E. 96 | Steam Boilers and Engines..... | 3 | .. | 3 | .. |
| | Fundamentals of Livestock Production | 3 | 3 | .. | .. |
| | Elements of Dairying | 3 | .. | 3 | .. |
| | Machine Design | 3 | .. | 1 | 6 |
| | Farm Management: Operation | 3 | .. | 3 | .. |
| | Land Reclamation | 5 | 1 | 4 | .. |
| | Agendum | 0 | .. | 1 | .. |

SENIOR YEAR

Fall Quarter

| | | | | | |
|---|---|---|----|---|----|
| C.E. 146 Geol. 5 Ag.E. 67 Ag.E. 71 Ag.E. 97 | Plain Concrete | 3 | .. | 2 | 4 |
| | Engineering Geology | 3 | .. | 3 | .. |
| | Farm Structures Design | 3 | .. | 1 | 6 |
| | Design and Economics of Agricultural Machinery | 3 | .. | 2 | 3 |
| | Agendum | 0 | .. | 1 | .. |
| | Electives to complete program. | | | | |

Winter Quarter

| | | | | | |
|---|------------------------------------|---|----|----|----|
| Soils 108 or Ag.E. 72 G.E. 101 Rhet. 22 Ag.E. 37 Ag.E. 98 | Physical Properties of Soils | 3 | .. | 1 | 6 |
| | Applied Electricity | 3 | .. | 1 | 6 |
| | Contracts and Specifications | 3 | .. | 3 | .. |
| | Public Speaking | 3 | 3 | .. | .. |
| | Rural Sanitation | 3 | .. | 3 | .. |
| | Agendum | 0 | .. | 1 | .. |
| | Electives to complete program. | | | | |

Spring Quarter

| | | | | | |
|---|--|---|----|----|----|
| Ag.E. 70 or A.H. 15 Ag.E. 150 C.E. 37 G.E. 193 Ag.E. 99 | Steam Boilers and Engines..... | 3 | .. | 3 | .. |
| | Fundamentals of Livestock Production | 3 | 3 | .. | .. |
| | Seminar | 2 | 2 | .. | .. |
| | Structural Engineering | 3 | .. | 1 | 7 |
| | Engineering Practice | 2 | .. | 2 | .. |
| | Agendum | 0 | .. | 1 | .. |
| | Electives to complete program. | | | | |

RECOMMENDED ELECTIVES

The following courses are suggested for the guidance of students who wish to elect work along the general lines indicated.

| Course No. | Title | Credits |
|--|---|---------|
| <i>Farm Structures</i> | | |
| Ag.E.111f,112w,113s For. 27w Hort. 74w | Farm Building Problems, per quarter..... | 3-6 |
| | Farm Woodlots and Windbreaks..... | 3 |
| | Principles of Landscape Design | 3 |
| <i>Farm Mechanics</i> | | |
| Ag.E. 15f Ag.E. 28w Ag.E. 101f Ag.E. 121f,122w,123s Ag.E. 126w E.E. 43f,44w,45s M.E. 24s | Ignition and Carburetion | 3 |
| | Land Clearing | 3 |
| | Drainage Engineering and Works..... | 3 |
| | Farm Power and Machinery Problems, per quarter..... | 3-6 |
| | Selection of Farm Equipment | 3 |
| | Electric Power, per quarter | 3 |
| | Machine Design | 3 |

| Course No. | Title | Credits |
|-------------------------|--|---------|
| <i>Land Reclamation</i> | | |
| Ag.E. 28w | Land Clearing | 3 |
| Ag.E. 68f | Drainage Engineering and Works..... | 3 |
| Ag.E.101f,102w,103s | Advanced Drainage Problems, per quarter..... | 3-6 |
| Ag.E. 69s | Irrigation Engineering and Works..... | 3 |
| C.E. 18w | Land Surveying | 2 |
| C.E. 161f | Hydrology | 3 |
| Hort. 74w | Principles of Landscape Design..... | 3 |
| M.&M. 130f | Open Channel Flow..... | 3 |
| M.&M. 193w | Hydraulic Measurements..... | 3 |

ARCHITECTURE

Five-year course leading to the degree of bachelor of architecture, B.Arch. In addition to the prescribed courses, sufficient electives must be taken to complete a total of at least 225 credits.

The curriculum leading to the degree of bachelor of architecture is intended for students who expect to enter the professional practice of architecture in any of its recognized phases. It provides a basis of both general and technical training, which, when supplemented by practical experience in architects' offices, places the student in line for recognition as a practicing architect according to the registration laws of the various states.

The total requirements for the degree include certain minima in design, construction, engineering, history, and drawing which are necessary to an all-round understanding of architecture, and which are required of all students. They also include certain flexible electives through which each student may supplement his basic work by more concentrated effort along the lines of his special interests, whether in design or construction (including what is understood as "architectural engineering") in his later years. Completion of the requirements for the degree is arranged on a five-year basis for the normal student. Students who are especially qualified by ability, experience, or advanced standing through transfer from other institutions may shorten this time.

Students who wish further to broaden their training may arrange a combined program of studies leading to the degree of bachelor of arts, with a major in Architecture, in the College of Science, Literature, and the Arts and the degree of bachelor of architecture in the College of Engineering and Architecture.

FRESHMAN YEAR

| Course No. | Title | Credits | Rec. | Lect. | Lab. |
|------------------------------------|--------------------------------------|---------|------|-------|------|
| <i>Fall Quarter</i> | | | | | |
| M.&M. 11 | College Algebra | 5 | 5 | .. | .. |
| Engl. 4 | Composition | 3 | 3 | .. | .. |
| Arch. 11 | Introduction to Architecture | 1 | .. | 1 | .. |
| Arch. 21 | Freehand Drawing | 2 | .. | .. | 6 |
| G.E. 11 | Orientation | 0 | .. | 1 | .. |
| Also one of the following courses: | | | | | |
| Inorg.Chem. 1 | General Inorganic Chemistry, or..... | 4 | .. | 3 | 4 |
| Hist. 1 | Modern World, or | 5 | 2 | 3 | .. |
| French 1 | Beginning French | 5 | 5 | .. | .. |

| Course No. | Title | Credits | Rec. | Lect. | Lab. |
|-----------------------|---------------------------------------|---------|------|-------|------|
| <i>Winter Quarter</i> | | | | | |
| M.&M. 12 | Trigonometry | 5 | 5 | .. | .. |
| Engl. 5 | Composition | 3 | 3 | .. | .. |
| Arch. 12 | Introduction to Architecture | 1 | .. | 1 | .. |
| Arch. 22 | Freehand Drawing | 2 | .. | .. | 6 |
| G.E. 12 | Orientation | 0 | .. | 1 | .. |
| Also continuation of: | | | | | |
| Inorg.Chem. 2 | General Inorganic Chemistry, or | 4 | .. | 3 | 4 |
| Hist. 2 | Modern World, or | 5 | 2 | 3 | .. |
| French 2 | Continuation French | 5 | 5 | .. | .. |

| | | | | | |
|-----------------------|---------------------------------------|---|----|----|----|
| <i>Spring Quarter</i> | | | | | |
| M.&M. 13 | Analytical Geometry | 5 | 5 | .. | .. |
| Engl. 6 | Composition | 3 | 3 | .. | .. |
| Arch. 13 | Introduction to Architecture | 1 | .. | 1 | .. |
| Arch. 23 | Freehand Drawing | 2 | .. | .. | 6 |
| G.E. 13† | Orientation | 0 | .. | 1 | .. |
| Also continuation of: | | | | | |
| Inorg.Chem. 3 | General Inorganic Chemistry, or | 4 | .. | 3 | 4 |
| Hist. 3 | Modern Europe, or | 5 | 2 | 3 | .. |
| French 3 | Continuation French | 5 | 5 | .. | .. |

SOPHOMORE YEAR

| | | | | | |
|---------------------|-------------------------------|---|----|----|----|
| <i>Fall Quarter</i> | | | | | |
| M.&M. 91 | Calculus for Architects | 4 | 4 | .. | .. |
| Arch. 24 | Freehand Drawing | 2 | .. | .. | 6 |
| Arch. 31 | Architectural Design I | 3 | .. | 1 | 6 |
| Arch. 61 | Projections | 2 | .. | 1 | 3 |
| Phys. 3‡ | Elements of Mechanics | 3 | 1 | 3 | .. |
| Electives* | | | | | |

| | | | | | |
|-----------------------|--------------------------------|---|----|----|----|
| <i>Winter Quarter</i> | | | | | |
| M.&M. 92 | Mechanics for Architects | 4 | 4 | .. | .. |
| Arch. 25 | Freehand Drawing | 2 | .. | .. | 6 |
| Arch. 32 | Architectural Design I | 3 | .. | 1 | 6 |
| Arch. 62 | Shades and Shadows | 2 | .. | 1 | 3 |
| Phys. 23‡ | Heat | 3 | 1 | 3 | .. |
| Electives* | | | | | |

| | | | | | |
|-----------------------|--|---|----|----|----|
| <i>Spring Quarter</i> | | | | | |
| M.&M. 93 | Strength of Materials for Architects | 4 | 4 | .. | .. |
| Arch. 26 | Freehand Drawing | 2 | .. | .. | 6 |
| Arch. 33 | Architectural Design I | 3 | .. | 1 | 6 |
| Arch. 63 | Perspective | 2 | .. | 1 | 3 |
| Phys. 43‡ | Electricity | 3 | 1 | 3 | .. |
| Electives* | | | | | |

JUNIOR YEAR

| | | | | | |
|---------------------|-------------------------------|---|----|----|----|
| <i>Fall Quarter</i> | | | | | |
| Arch. 14 | Architectural History | 2 | .. | 2 | .. |
| Arch. 34 | Architectural Design II | 4 | .. | .. | 12 |
| Arch. 41 | Building Construction | 3 | 1 | 3 | .. |
| C.E. 38 | Stresses in Structures | 3 | .. | 3 | .. |
| Electives* | | | | | |

* See pages 34 and 56.

† Women take Phys.Ed. for Women, Phys.Ed. 7 in place of G.E. 13.

‡ Students who present one unit of high school physics may omit physics.

| Course No. | Title | Credits | Rec. | Lect. | Lab. |
|------------------------------|---------------------------------------|---------|------|-------|------|
| <i>Winter Quarter</i> | | | | | |
| Arch. 15 | Architectural History | 2 | .. | 2 | .. |
| Arch. 35 | Architectural Design II | 4 | .. | .. | 12 |
| Arch. 42 | Building Construction | 3 | 1 | 3 | .. |
| C.E. 39 | Structural Design | 3 | .. | 3 | .. |
| | Electives* | | | | |
| <i>Spring Quarter</i> | | | | | |
| Arch. 16 | Architectural History | 2 | .. | 2 | .. |
| Arch. 36 | Architectural Design II | 4 | .. | .. | 12 |
| Arch. 43 | Building Construction | 3 | 1 | 3 | .. |
| C.E. 41 | Reinforced Concrete | 3 | .. | 3 | .. |
| | Electives* | | | | |
| FOURTH YEAR | | | | | |
| <i>Fall Quarter</i> | | | | | |
| Arch. 17 | Architectural History | 2 | .. | 2 | .. |
| Arch. 37 | Architectural Design III | 6 | .. | .. | 18 |
| Arch. 141 | Building Construction | 2 | .. | 2 | .. |
| E.E. 40 | Electrical Wiring and Equipment | 2 | .. | 2 | .. |
| | Electives* | | | | |
| <i>Winter Quarter</i> | | | | | |
| Arch. 18 | Architectural History | 2 | .. | 2 | .. |
| Arch. 38 | Architectural Design III | 6 | .. | .. | 18 |
| Arch. 142 | Building Construction | 2 | .. | 2 | .. |
| C.E. 171 | Building Sanitation | 2 | .. | 2 | .. |
| | Electives* | | | | |
| <i>Spring Quarter</i> | | | | | |
| Arch. 19 | Architectural History | 2 | .. | 2 | .. |
| Arch. 39 | Architectural Design III | 6 | .. | .. | 18 |
| Arch. 143 | Building Construction | 2 | .. | 2 | .. |
| M.E. 164 | Heating and Ventilation | 2 | .. | 2 | .. |
| | Electives* | | | | |
| SENIOR YEAR | | | | | |
| <i>Fall Quarter</i> | | | | | |
| Arch. 131 or Arch. 144 | Architectural Design IV | 8 | .. | .. | 24 |
| | Construction Design | 6 | .. | .. | 18 |
| | Electives* | | | | |
| <i>Winter Quarter</i> | | | | | |
| Arch. 132 or Arch. 145 | Architectural Design IV | 8 | .. | .. | 24 |
| | Construction Design | 6 | .. | .. | 18 |
| | Electives* | | | | |
| <i>Spring Quarter</i> | | | | | |
| Arch. 133 or Arch. 146 | Architectural Design IV | 8 | .. | .. | 24 |
| Arch. 140 | Construction Design | 6 | .. | .. | 18 |
| Arch. 140 | Thesis | 8 | .. | .. | .. |
| Arch. 153 | Business Relations | 3 | .. | 3 | .. |

* See pages 34 and 56.

ARCHITECTURAL ELECTIVES

| Course No. | Title | Credits |
|----------------------------------|---|---------|
| Arch. 27f,w,s-28f,w,s-29f,w,s | Freehand Drawing, per quarter..... | 2 |
| Arch. 47f-48w | Building Construction, per quarter..... | 2 |
| Arch. 49s | Building Construction | 3 |
| Arch. 84f,w,s-85f,w,s-86f,w,s | Modeling, per quarter | 2 |
| Arch. 121f,w,s-122f,w,s-123f,w,s | Advanced Art, per quarter..... | 2 |
| Arch. 134f,w,s-135f,w,s-136f,w,s | Interior Design, per quarter..... | 7 |
| Arch. 152w | Estimating | 1 |
| Arch. 154w | Acoustics of Buildings..... | 2 |
| Arch. 161w | Decoration and Applied Arts..... | 2 |
| Arch. 163s | Theory of Form and Color | 2 |
| Arch. 165f | Housing | 3 |

For those who desire to specialize in Building Construction, various elective courses in the fields of civil, electrical, and mechanical engineering are available. These students should elect both chemistry and physics.

For a general list of elective courses in other colleges, see page 56 of this bulletin. Others will be found in the bulletin of the College of Science, Literature, and the Arts.

The choice and distribution of elective subjects should be arranged in advance by consultation with the faculty.

CHEMISTRY AND CHEMICAL ENGINEERING

FRESHMAN AND SOPHOMORE YEARS

The freshman year and the first two quarters of the sophomore year are the same in Chemistry as in Chemical Engineering, so that the student may change from one course to the other prior to the spring quarter.

FRESHMAN YEAR

| Course No. | Title | Credits | Rec. | Lect. | Lab. |
|-----------------------|--|---------|------|-------|------|
| <i>Fall Quarter</i> | | | | | |
| M.&M. 11 | College Algebra | 5 | 5 | .. | .. |
| Inorg.Chem. 9 | General Inorganic Chemistry | 5 | 1 | 3 | 5 |
| Engl. 4 | Composition | 3 | 3 | .. | .. |
| Draw. 4‡ | Drawing and Descriptive Geometry | 2 | .. | .. | 6 |
| M.E. 12, 13, or 17‡ | Shop Practice | 2 | .. | 1 | 4 |
| <i>Winter Quarter</i> | | | | | |
| M.&M. 12 | Trigonometry | 5 | 5 | .. | .. |
| Inorg.Chem. 10 | General Inorganic Chemistry | 5 | 1 | 3 | 5 |
| Engl. 5 | Composition | 3 | 3 | .. | .. |
| Draw. 5‡ | Drawing and Descriptive Geometry | 2 | .. | .. | 6 |
| M.E. 12, 13, or 17‡ | Shop Practice | 2 | .. | 1 | 4 |
| <i>Spring Quarter</i> | | | | | |
| M.&M. 13 | Analytic Geometry | 5 | 5 | .. | .. |
| Inorg.Chem. 12 | Qualitative Analysis | 5 | 2 | 1 | 6 |
| Engl. 6 | Composition | 3 | 3 | .. | .. |
| Draw. 6‡ | Drawing and Descriptive Geometry | 2 | .. | .. | 6 |
| M.E. 12, 13, or 17‡ | Shop Practice | 2 | .. | 1 | 4 |
| G.E. 13† | Orientation | 0 | .. | 1 | .. |

† Women take Phys.Ed. 7 in place of G.E. 13.

‡ For permissible substitute, see page 56.

SOPHOMORE YEAR

| Course No. | Title | Credits | Rec. | Lect. | Lab. |
|--|--|---------|------|-------|------|
| <i>Fall Quarter</i> | | | | | |
| M.&M. 24 | Differential Calculus | 5 | 5 | .. | .. |
| Inorg.Chem. 13 | Qualitative Analysis | 5 | 2 | .. | 9 |
| Phys. 3 | Elements of Mechanics | 3 | 1 | 3 | .. |
| Phys. 4 | Elements of Mechanics Laboratory | 1 | .. | .. | 2 |
| German 24§ | Chemical German | 4 | 4 | .. | .. |
| <i>Winter Quarter</i> | | | | | |
| M.&M. 25 | Integral Calculus | 5 | 5 | .. | .. |
| Anal.Chem. 1 | Quantitative Analysis | 5 | 1 | 1 | 10 |
| Phys. 23 | Heat | 3 | 1 | 3 | .. |
| Phys. 24 | Heat Laboratory | 1 | .. | .. | 2 |
| German 25§ | Chemical German | 4 | 4 | .. | .. |
| <i>Spring Quarter (Chemistry)</i> | | | | | |
| M.&M. 84‡ | Technical Mechanics | 5 | 5 | .. | .. |
| Anal.Chem. 2 | Quantitative Analysis | 5 | 1 | 1 | 10 |
| Phys. 43 | Electricity | 3 | 1 | 3 | .. |
| Phys. 44 | Electricity Laboratory | 1 | .. | .. | 2 |
| German 26§ | Chemical German | 4 | 4 | .. | .. |
| <i>Spring Quarter (Chemical Engineering)</i> | | | | | |
| M.&M. 84‡ | Technical Mechanics | 5 | 5 | .. | .. |
| Anal.Chem. 2 | Quantitative Analysis | 5 | 1 | 1 | 10 |
| Chem.E. 80 | Technical Engineering Materials | 1 | .. | 2 | .. |
| Phys. 43 | Electricity | 3 | 1 | 3 | .. |
| Phys. 44 | Electricity Laboratory | 1 | .. | .. | 2 |
| German 26§ | Chemical German | 4 | 4 | .. | .. |

CHEMISTRY

Four-year course leading to the degree of bachelor of chemistry, B.Chem.

In addition to the prescribed courses, sufficient approved electives must be taken to complete a total of at least 210 credits.

This professional course in Chemistry is designed to provide thoro training in the fundamentals of chemistry and related subjects. It serves as a basis for further specialization and a foundation for graduate work. Its graduates secure positions in practical chemistry, research, and teaching, in chemical industries, the government service, in colleges and laboratories, etc.

For freshman year see page 34.

JUNIOR YEAR

| Course No. | Title | Credits | Rec. | Lect. | Lab. |
|---------------------|--------------------------|---------|------|-------|------|
| <i>Fall Quarter</i> | | | | | |
| Org.Chem. 51 | Organic Chemistry | 5 | 0 | 5 | 6 |
| Phys.Chem. 101 | Physical Chemistry | 5 | 1 | 3 | 6 |
| Phys. 33 | Optics | 3 | 1 | 3 | .. |
| Phys. 34 | Optics Laboratory | 1 | .. | .. | 2 |
| | Electives* | | | | |

* For list of elective courses in other colleges, see page 56.

‡ For permissible substitute, see page 56.

§ Students who have had two years of high school German or one year of college German may take 27-28-29, three credits per quarter, instead of 24-25-26, four credits per quarter, subject to a placement test.

| Course No. | Title | Credits | Rec. | Lect. | Lab. |
|------------------------------|--|---------|------|-------|------|
| <i>Winter Quarter</i> | | | | | |
| Org.Chem. 52 | Organic Chemistry | 5 | 0 | 5 | 6 |
| Phys.Chem. 102 | Physical Chemistry | 5 | 1 | 3 | 6 |
| Ch.E. 131 | Industrial Inorganic Chemistry | 4 | 1 | 4 | .. |
| | Electives* | | | | |
| <i>Spring Quarter</i> | | | | | |
| Org.Chem. 153 | Organic Chemistry | 5 | 0 | 5 | 6 |
| Phys.Chem. 103 | Physical Chemistry | 5 | 1 | 3 | 6 |
| Ch.E. 132 | Industrial Organic Chemistry | 4 | 1 | 4 | .. |
| Inorg.Chem. 51 | Senior Qualifying Exam. (Inorg. and Qual.).. | 0 | .. | .. | .. |
| Anal.Chem. 53 | Senior Qualifying Exam. (Quant.) | 0 | .. | .. | .. |
| | Electives* | | | | |
| SENIOR YEAR (See note below) | | | | | |
| <i>Fall Quarter</i> | | | | | |
| Inorg.Chem. 103 | Advanced Inorganic Chemistry | 3 | .. | 3 | .. |
| Anal.Chem. 131 | Applications of Indicators | 3 | .. | 2 | 5 |
| Phys.Chem. 161 | Radioactivity | 2 | .. | 2 | .. |
| | Electives* | | | | |
| <i>Winter Quarter</i> | | | | | |
| Inorg.Chem. 104 | Advanced Inorganic Chemistry | 3 | .. | 3 | .. |
| Anal.Chem. 132† | Electrometric Measurements and Titrations .. | 3 | .. | 2 | 5 |
| Phys.Chem. 162 | Radioactivity | 2 | .. | 2 | .. |
| | Electives* | | | | |
| <i>Spring Quarter</i> | | | | | |
| Inorg.Chem. 105 | Advanced Inorganic Chemistry | 3 | .. | 3 | .. |
| Ch.E. 110‡ | Special Analytical Apparatus | 3 | .. | 1 | 6 |
| | Electives* | | | | |

NOTE.—Near the close of the junior year, each student will choose a major adviser from the following list. In consultation with the adviser he will plan a program of work for the entire senior year, based normally upon concentration of electives around a chosen field of chemistry.

LIST OF ADVISERS FOR SENIORS

Inorganic Chemistry: Professors Sneed, Cohen, Barber, Heisig, Pervier, Stephens.
 Analytical Chemistry: Professors Kolthoff, Geiger, Sarver.
 Organic Chemistry: Professors Smith, Koelsch, Lauer.
 Physical Chemistry: Professors Lind, MacDougall, Reyerson, Glockler, Livingston.
 Chemical Engineering: Professors Mann, Montillon, Montonna, Stoppel.

SPECIALIZATION IN BACTERIOLOGY, BIOCHEMISTRY, AND GEOLOGY

For the benefit of students in chemistry who may desire to specialize in related fields, minor groups of electives have been arranged in bacteriology, biochemistry, and geology which may be taken in the junior and senior years in

* For list of elective courses in other colleges, see page 56.

‡ For permissible substitute, see page 56.

addition to the required courses of the regular chemistry curriculum shown above. The completion of one of these groups will qualify the chemistry graduate to enter upon graduate work towards the Doctor's degree, in that department thus providing an exceptionally strong foundation in chemistry for specialization in the chosen field.

MINOR IN BACTERIOLOGY

JUNIOR YEAR

Four credits of botany or zoology are prerequisite to Bacteriology 41. Botany 1f, 4 credits, or Zoology 14f-15w, 6 credits, should be taken in the junior year to satisfy this requirement. By special arrangement it may be possible to take Bact. 41, 5 credits, in the winter or spring quarter of the junior year, if desired.

SENIOR YEAR

| Course No. | Title | Credits | Rec. | Lect. | Lab. |
|-----------------------|------------------------------|---------|------|-------|------|
| <i>Fall Quarter</i> | | | | | |
| Bact. 41 | General Bacteriology | 5 | .. | 3 | 6 |
| Bact. 121 | Physiology of Bacteria | 3 | .. | 3 | .. |
| <i>Winter Quarter</i> | | | | | |
| Bact. 122 | Physiology of Bacteria | 3 | .. | 3 | .. |
| <i>Spring Quarter</i> | | | | | |
| Bact. 123 | Applied Bacteriology | 3 | .. | 3 | .. |

MINOR IN BIOCHEMISTRY

JUNIOR YEAR

| Course No. | Title | Credits | Rec. | Lect. | Lab. |
|-----------------------|-----------------------|---------|------|-------|------|
| <i>Fall Quarter</i> | | | | | |
| Zool. 14† | General Zoology | 3 | .. | 2 | 4 |
| <i>Winter Quarter</i> | | | | | |
| Zool. 15† | General Zoology | 3 | .. | 2 | 4 |

SENIOR YEAR

| Course No. | Title | Credits | Rec. | Lect. | Lab. |
|-----------------------|--------------------------------------|---------|------|-------|------|
| <i>Fall Quarter</i> | | | | | |
| Ag.Biochem. 113 | Biochemical Laboratory Methods | 2 | .. | .. | 6 |
| Ag.Biochem. 119 | Colloids | 3 | .. | 3 | .. |
| Bact. 41 | General Bacteriology | 5 | .. | 3 | 6 |
| <i>Winter Quarter</i> | | | | | |
| Ag.Biochem. 114 | Biochemical Laboratory Methods | 2 | .. | .. | 6 |
| <i>Spring Quarter</i> | | | | | |
| Ag.Biochem. 115 | Biochemical Laboratory Methods | 2 | .. | .. | 6 |
| Ag.Biochem. 123 | Enzymes | 3 | .. | 3 | .. |

† Nine credits of Botany may be substituted for Zoology 14-15.

MINOR IN GEOLOGY

JUNIOR YEAR

| Course No. | Title | Credits | Rec. | Lect. | Lab. |
|-----------------------|------------------------------|---------|------|-------|------|
| <i>Winter Quarter</i> | | | | | |
| Min. 23 | Elements of Mineralogy | 4 | 1 | 2 | 4 |
| <i>Spring Quarter</i> | | | | | |
| Min. 24 | Elements of Mineralogy | 4 | 1 | 2 | 4 |

SENIOR YEAR

Fall Quarter

| | | | | | |
|-----------|----------------------------------|---|----|----|----|
| Geol. 1 | General Geology | 3 | 1 | 3 | .. |
| Geol. A | General Geology Laboratory | 2 | .. | .. | 4 |
| Geol. 121 | Crystallography | 3 | .. | 3 | 2 |

Winter Quarter

| | | | | | |
|---------|---|---|----|----|----|
| Geol. 3 | General Geology (Dynamic and Economic) .. | 3 | 1 | 3 | .. |
| Geol. C | General Geology Laboratory | 2 | .. | .. | 4 |

CHEMICAL ENGINEERING

Four-year course leading to the degree of bachelor of chemical engineering, B.Ch.E.

In addition to the prescribed courses, sufficient approved electives must be taken to complete a total of 218 credits.

The additional eight credits above the course in Chemistry are made up of two credits for the inspection trip in the spring vacation of the senior year and six credits for the two courses in Chemical Manufacture in the summer quarter following the junior year. Thus the term requirements of the two courses are equal in amount and average $17\frac{1}{2}$ credits per quarter for 12 quarters.

Chemical engineering deals with the unit operations, such as crushing, grinding, sifting, mixing, filtration, evaporation, drying, distillation, and crystallization that are so vital in making any industry based on a chemical transformation of matter a commercial success. The chemist uses these operations in the laboratory but in order to apply them to large scale industrial processes he must have a thorough understanding of the fundamental physico-chemical and engineering principles on which they are based. The study of such principles constitutes the applied science of chemical engineering. For this purpose the chemical engineer must be thoroughly trained in the various branches of chemistry, physics, and mathematics and he must have a good training in the fundamentals of mechanical and electrical engineering so that he can design, construct, and successfully operate a plant using these unit operations.

The chemical engineer is primarily a producer. It is his province to develop a process from the laboratory stage through semi-works equipment to the production stage which uses engineering materials for the manufacture of unit process equipment in accordance with fundamental chemical engineering principles.

As many industries are based on some chemical operation, the chemical engineer is much in demand. He may be engaged in the manufacture of inorganic prod-

ucts—the mineral acids, alkalis, ammonia, paint pigments, fertilizers; in the organic industries—dyes, explosives, lacquers, solvents, medicinals; in the manufacture of gases—coal gas, carbureted blue gas, hydrogen, acetylene, helium; in the electro-chemical industries such as the manufacture of graphite, calcium carbide, carborundum and other abrasives, wet and dry batteries, electroplating; in the metallurgical industries; and even in the food industries such as the manufacture of sugar, flour, salt, and starch. There are many others as leather, paper, textiles, soaps, petroleum, glass, and cement.

In these industries the chemical engineer does investigational work, development work, design of equipment, and plant operation. Some enter the field of sales engineering and technical writing.

For freshman and sophomore years see pages 34 and 35.

JUNIOR YEAR

| Course No. | Title | Credits | Rec. | Lect. | Lab. |
|-----------------------|--|---------|------|-------|------|
| <i>Fall Quarter</i> | | | | | |
| Chem. E. 101 | Unit Processes | 3 | .. | 5 | .. |
| Chem. E. 105 | Gas and Fuel Analysis | 3 | 1 | 1 | 4 |
| Org. Chem. 51 | Organic Chemistry | 5 | 0 | 5 | 6 |
| M.&M. 85‡ | Strength of Materials (with lab.) | 4 | 3 | .. | 2 |
| Phys. 33 | Optics | 3 | 1 | 3 | .. |
| <i>Winter Quarter</i> | | | | | |
| Chem. E. 106 | Petroleum and Petroleum Products | 3 | 1 | 1 | 4 |
| Chem. E. 131 | Industrial Inorganic Chemistry | 4 | 1 | 4 | .. |
| Org. Chem. 52 | Organic Chemistry | 5 | 0 | 5 | 6 |
| M.&M. 86‡ | Hydraulics | 2 | 2 | .. | .. |
| M.&M. 143 | Hydraulics Laboratory | 1 | .. | .. | 2 |
| M.E. 38 | Heat Engines | 3 | .. | 3 | .. |
| <i>Spring Quarter</i> | | | | | |
| Chem. E. 102 | Unit Processes | 3 | 3 | .. | .. |
| Chem. E. 132 | Industrial Organic Chemistry | 4 | 1 | 4 | .. |
| Chem. E. 150 | Unit Process Laboratory | 1 | .. | .. | 3 |
| Org. Chem. 153 | Organic Chemistry | 5 | 0 | 5 | 6 |
| M.E. 28 | Machine Design | 3 | .. | 1 | 6 |
| M.E. 39 | Heat Engines | 3 | .. | 2 | 4 |
| Inorg. Chem. 51 | Senior Qualifying Exam. (Inorg. and Qual.).. | 0 | .. | .. | .. |
| Anal. Chem. 53 | Senior Qualifying Exam. (Quant.) | 0 | .. | .. | .. |

Summer Quarter

Summer practice consisting of Ch.E. 151f,su-152w,su. Chemical Manufacture, 6 cred., will be taken by students in Chemical Engineering in the regular summer quarter between their junior and senior years. It is required for the degree of bachelor of chemical engineering.

SENIOR YEAR

| | | | | | |
|---------------------|-----------------------------|---|----|----|----|
| <i>Fall Quarter</i> | | | | | |
| Chem. E. 103 | Unit Process Problems | 3 | 3 | .. | .. |
| Phys. Chem. 101 | Physical Chemistry | 5 | 1 | 3 | 6 |
| E.E. 43 | Electric Power | 3 | .. | 2 | 2 |
| Met. 160 | Metallography | 3 | .. | 2 | 3 |
| | Electives* | | | | |

* For list of elective courses in other colleges, see page 56.

‡ For permissible substitute, see page 56.

| Course No. | Title | Credits | Rec. | Lect. | Lab. |
|-----------------------|--|---------|------|-------|------|
| <i>Winter Quarter</i> | | | | | |
| Chem. E. 104 | Unit Process Problems | 3 | 3 | .. | .. |
| Chem. E. 121 | Chemical Engineering Economics | 3 | 1 | 2 | .. |
| Phys. Chem. 102 | Physical Chemistry | 5 | 1 | 3 | 6 |
| E.E. 44 | Electric Power | 3 | .. | 2 | 2 |
| | Electives* | | | | |
| <i>Spring Quarter</i> | | | | | |
| Chem. E. 117 | Chemical Engineering Equipment Design | 3 | .. | 1 | 6 |
| Chem. E. 187 | Inspection Trip, spring vacation | 2 | .. | .. | .. |
| Phys. Chem. 103 | Physical Chemistry | 5 | 1 | 3 | 6 |
| E.E. 45 | Electric Power | 3 | .. | 2 | 2 |
| | Electives* | | | | |

CIVIL ENGINEERING

Four-year course leading to the degree of bachelor of civil engineering, B.C.E.

In addition to the prescribed courses, sufficient electives must be taken to complete a total of at least 204 credits for graduation. This is an average of 17 credits per quarter.

The principal aim of the course in civil engineering is to present to the student an opportunity to become familiar with the methods of science, so that in his attack upon any professional problem he may employ his abilities with economy and secure dependable conclusions. A secondary but important object of the course is to train the student in technique, so that at graduation he may be able to be an economic asset to his employer.

The technique of surveying and platting, drawing, and certain laboratory procedures is taught throughout the course. Typical problems of railroad, highway, hydraulic, structural, and municipal engineering occupy the greater part of the last two years. In the junior year, there is a course of lectures and conferences on the relations of engineering projects to business and to public affairs. Elective courses are available in each of the three upper years; these offer a wide range of choice to the student who desires to extend his range of interests to those fields of knowledge and action related to civil engineering, but not strictly included therein.

The field of civil engineering is so comprehensive that no attempt is made toward specialization in the regular course of four years. Special courses for graduate students are offered in all of the divisions of railroad, highway, structural, hydraulic, and municipal engineering.

For freshman year, see page 25.

SOPHOMORE YEAR

| Course No. | Title | Credits | Rec. | Lect. | Lab. |
|---------------------|--|---------|------|-------|------|
| <i>Fall Quarter</i> | | | | | |
| M.&M. 24 | Differential Calculus | 5 | 5 | .. | .. |
| Phys. 3 | Elements of Mechanics | 3 | 1 | 3 | .. |
| Phys. 4 | Elements of Mechanics Laboratory | 1 | .. | .. | 2 |
| Draw. 21 | Drafting | 2 | .. | .. | 6 |
| C.E. 11 | Surveying | 3 | 1 | .. | 7 |
| | Electives* | | | | |

* For list of elective courses in other colleges, see page 56.

| Course No. | Title | Credits | Rec. | Lect. | Lab. |
|-----------------------|-------------------------|---------|------|-------|------|
| <i>Winter Quarter</i> | | | | | |
| M.&M. 25 | Integral Calculus | 5 | 5 | .. | .. |
| Phys. 23 | Heat | 3 | 1 | 3 | .. |
| Phys. 24 | Heat Laboratory | 1 | .. | .. | 2 |
| Draw. 22 | Drafting | 2 | .. | .. | 6 |
| C.E. 12 | Surveying | 3 | 1 | .. | 7 |
| | Electives* | | | | |

| | | | | | |
|-----------------------|-------------------------------------|---|----|----|----|
| <i>Spring Quarter</i> | | | | | |
| M.&M. 26 | Technical Mechanics (Statics) | 5 | 5 | .. | .. |
| Phys. 43 | Electricity | 3 | 1 | 3 | .. |
| Phys. 44 | Electricity Laboratory | 1 | .. | .. | 2 |
| Draw. 23 | Drafting | 2 | .. | .. | 6 |
| C.E. 13 | Surveying | 3 | 1 | .. | 7 |
| | Electives* | | | | |

JUNIOR YEAR

| | | | | | |
|---------------------|------------------------------|---|----|----|----|
| <i>Fall Quarter</i> | | | | | |
| M.&M. 128 | Strength of Materials | 5 | 5 | .. | .. |
| M.&M. 141 | Materials Laboratory | 2 | .. | 1 | 3 |
| C.E. 14 | Surveying | 3 | .. | .. | 8 |
| C.E. 31 | Stresses in Structures | 2 | .. | 2 | 2 |
| C.E. 51 | Highways and Pavements | 3 | .. | 2 | 3 |
| | Electives* | | | | |

| | | | | | |
|-----------------------|------------------------------|---|----|----|----|
| <i>Winter Quarter</i> | | | | | |
| M.&M. 129 | Hydraulics | 4 | 3 | 1 | .. |
| M.&M. 143 | Hydraulics Laboratory | 1 | .. | .. | 2 |
| C.E. 15 | Surveying | 2 | .. | 4 | .. |
| C.E. 21 | Railway Engineering | 2 | 1 | .. | 4 |
| C.E. 32 | Stresses in Structures | 3 | .. | 2 | 4 |
| C.E. 52 | Highways and Pavements | 3 | .. | 1 | 6 |
| | Electives* | | | | |

| | | | | | |
|-----------------------|--------------------------------------|---|----|----|----|
| <i>Spring Quarter</i> | | | | | |
| M.&M. 127 | Technical Mechanics (Dynamics) | 5 | 5 | .. | .. |
| C.E. 16 | Surveying | 2 | .. | 4 | .. |
| C.E. 22 | Railway Engineering | 2 | 1 | .. | 4 |
| C.E. 33 | Elementary Structural Design | 4 | .. | 2 | 6 |
| C.E. 53 | Civil Engineering Practice | 3 | 1 | 2 | .. |
| | Electives* | | | | |

Summer Camp

C.E. 23 Summer camp is held in the vacation preceding the senior year for 6 weeks beginning about the middle of August. Nine credits. Required of all students taking the course in Civil Engineering. Fee, \$25.

* For list of elective courses in other colleges, see page 56.

| Course No. | Title | Credits | Rec. | Lect. | Lab. |
|-----------------------|---|---------|------|-------|------|
| SENIOR YEAR | | | | | |
| <i>Fall Quarter</i> | | | | | |
| C.E. 121 | Railway Engineering | 3 | .. | 1 | 6 |
| C.E. 134 | Statically Indeterminate Structures | 3 | 2 | .. | 2 |
| C.E. 141 | Reinforced Concrete | 3 | 1 | .. | 2 |
| C.E. 161 | Hydrology | 3 | 1 | 1 | 3 |
| C.E. 146 | Plain Concrete | 3 | .. | 2 | 4 |
| or | | | | | |
| C.E. 164 | Water Power | 3 | .. | 1 | 6 |
| C.E. 137† | Structural Laboratory | 2 | .. | .. | 6 |
| or | | | | | |
| M.E. 42† | Heat Engines | 4 | 3 | .. | 4 |
| | Electives* | | | | |
| <i>Winter Quarter</i> | | | | | |
| C.E. 131 | Bridge Analysis | 2 | .. | 1 | 3 |
| C.E. 142 | Reinforced Concrete Design | 3 | 1 | .. | 2 |
| C.E. 162 | Water Supply and Sewerage | 3 | .. | 2 | 4 |
| C.E. 109 | Cadastral Surveying | 2 | .. | 2 | .. |
| or | | | | | |
| C.E. 124 | Transportation | 3 | 3 | .. | .. |
| or | | | | | |
| C.E. 147 | Foundations | 2 | 2 | .. | .. |
| or | | | | | |
| C.E. 156 | Highway Transport | 3 | .. | 3 | .. |
| E.E. 42† | Electric Power | 4 | 3 | .. | 2 |
| or | | | | | |
| C.E. 137† | Structural Laboratory | 2 | .. | .. | 6 |
| | Electives* | | | | |
| <i>Spring Quarter</i> | | | | | |
| C.E. 132 | Bridge Design | 2 | .. | 1 | 3 |
| C.E. 163 | Water Supply and Sewerage | 3 | .. | 2 | 5 |
| C.E. 146 | Plain Concrete | 3 | .. | 2 | 4 |
| or | | | | | |
| C.E. 164 | Water Power | 3 | .. | 1 | 6 |
| M.E. 42† | Heat Engines | 4 | 3 | .. | 4 |
| or | | | | | |
| E.E. 42† | Electric Power | 4 | 3 | .. | 2 |
| and/or | | | | | |
| C.E. 137† | Structural Laboratory | 2 | .. | .. | 6 |
| | Electives* | | | | |

ELECTRICAL ENGINEERING

Four-year course leading to the degree of bachelor of electrical engineering, B.E.E.

In addition to the prescribed courses, sufficient electives must be taken to complete a total of at least 204 credits for graduation.

The course in Electrical Engineering is designed to fit the student for a position of responsibility in the electrical field. This work is based upon the principles of electricity and magnetism contained in the prescribed courses in general physics and upon the principles of mathematics. In the senior year,

* For list of elective courses in other colleges, see page 56.

† M.E. 42 and E.E. 42 must be taken in different quarters. C.E. 137 limited to 20 students each quarter.

specialized courses may be selected in the field of electric power generation, transmission, and utilization, in telephone and radio communication or in illumination.

The main laboratory of the department is well equipped for preliminary training in the operation of electrical machinery and for advanced research problems in this field. The communication laboratories contain, besides the general equipment for study of circuits and equipment, a complete commercial radio broadcasting station and an experimental high frequency, short wave station.

Graduate courses in this department, as well as in physics and mathematics, are available for those with exceptional ability who desire training beyond the usual four-year undergraduate curriculum.

For freshman year, see page 25.

SOPHOMORE YEAR

| Course No. | Title | Credits | Rec. | Lect. | Lab. |
|-----------------------|--|---------|------|-------|------|
| <i>Fall Quarter</i> | | | | | |
| M.&M. 24 | Differential Calculus | 5 | 5 | .. | .. |
| Phys. 3 | Elements of Mechanics | 3 | 1 | 3 | .. |
| Phys. 4 | Elements of Mechanics Laboratory | 1 | .. | .. | 2 |
| M.E. 16 | Forge Practice | 2 | .. | 1 | 4 |
| E.E. 11 | Elements of Electrical Engineering..... | 3 | 2 | 1 | .. |
| | Electives* | | | | |
| <i>Winter Quarter</i> | | | | | |
| M.&M. 25 | Integral Calculus | 5 | 5 | .. | .. |
| Phys. 23 | Heat | 3 | 1 | 3 | .. |
| Phys. 24 | Heat Laboratory | 1 | .. | .. | 2 |
| Draw. 26‡ | Drafting | 2 | .. | .. | 6 |
| E.E. 13 | Elements of Electrical Engineering | 3 | 2 | 1 | 2 |
| | Electives* | | | | |
| <i>Spring Quarter</i> | | | | | |
| M.&M. 26 | Technical Mechanics (Statics) | 5 | 5 | .. | .. |
| Phys. 43 | Electricity | 3 | 1 | 3 | .. |
| Phys. 44 | Electricity Laboratory | 1 | .. | .. | 2 |
| E.E. 15 | Elements of Electrical Engineering | 3 | 2 | 1 | 2 |
| M.E. 19 | Machine Shop Practice | 2 | .. | 1 | 4 |
| | Electives* | | | | |
| JUNIOR YEAR§ | | | | | |
| <i>Fall Quarter</i> | | | | | |
| M.&M. 129 | Hydraulics | 4 | 3 | 1 | .. |
| M.&M. 143 | Hydraulics Laboratory | 1 | .. | .. | 2 |
| E.E. 111 | Electrical Engineering | 5 | 5 | .. | .. |
| E.E. 112 | Electrical Engineering Laboratory | 2 | .. | .. | 4 |
| Phys. 144 | Electrical Measurements | 3 | 1 | 1 | 4 |
| | Electives* | | | | |
| <i>Winter Quarter</i> | | | | | |
| M.&M. 127 | Technical Mechanics (Dynamics) | 5 | 5 | .. | .. |
| E.E. 113 | Electrical Engineering | 5 | 5 | .. | .. |
| E.E. 114 | Electrical Engineering Laboratory | 2 | .. | .. | 4 |
| M.E. 26 | Mechanism and Kinematics | 3 | 3 | .. | .. |
| | Electives* | | | | |

* For list of elective courses in other colleges, see page 56.

‡ For permissible substitute, see page 56.

§ Students expecting to elect the communication option in the senior year must take E.E. 64-65-66, Elements of Communication, in the junior year.

| Course No. | Title | Credits | Rec. | Lect. | Lab. |
|------------------------|---|---------|------|-------|------|
| <i>Spring Quarter</i> | | | | | |
| M.&M. 128 | Strength of Materials | 5 | 5 | .. | .. |
| M.&M. 141 | Materials Laboratory | 2 | .. | 1 | 3 |
| E.E. 115 | Electrical Engineering | 5 | 5 | .. | .. |
| E.E. 116 | Electrical Engineering Laboratory | 2 | .. | .. | 4 |
| | Electives* | | | | |
| SENIOR YEAR | | | | | |
| POWER OPTION | | | | | |
| <i>Fall Quarter</i> | | | | | |
| E.E. 121 | Electrical Engineering | 3 | 3 | .. | .. |
| E.E. 122 | Electrical Engineering Laboratory | 2 | .. | .. | 4 |
| E.E. 132 | Electrical Design † | 2 | 2 | .. | .. |
| M.E. 40 | Heat Engines † | 3 | 2 | .. | 3 |
| | Electives* | | | | |
| <i>Winter Quarter</i> | | | | | |
| E.E. 123 | Electrical Engineering | 3 | 3 | .. | .. |
| E.E. 124 | Electrical Engineering Laboratory | 2 | .. | .. | 4 |
| E.E. 134 | Electrical Design † | 2 | 2 | .. | .. |
| M.E. 41 | Heat Engines † | 3 | 2 | .. | 3 |
| | Electives* | | | | |
| <i>Spring Quarter</i> | | | | | |
| E.E. 125 | Electrical Engineering | 3 | 3 | .. | .. |
| E.E. 126 | Electrical Engineering Laboratory | 2 | .. | .. | 4 |
| E.E. 136 | Electrical Design † ‡ | 2 | 2 | .. | .. |
| M.E. 55 | Internal Combustion Engines † | 3 | 2 | .. | 3 |
| | Electives* | | | | |
| COMMUNICATION OPTION § | | | | | |
| <i>Fall Quarter</i> | | | | | |
| E.E. 121 | Electrical Engineering | 3 | 3 | .. | .. |
| E.E. 122 | Electrical Engineering Laboratory | 2 | .. | .. | 4 |
| E.E. 161 | Radio Communication | 3 | .. | 2 | 3 |
| E.E. 164 | Electrical Communication | 3 | .. | 2 | 3 |
| | Electives* | | | | |
| <i>Winter Quarter</i> | | | | | |
| E.E. 123 | Electrical Engineering | 3 | 3 | .. | .. |
| E.E. 124 | Electrical Engineering Laboratory | 2 | .. | .. | 4 |
| E.E. 162 | Radio Communication | 3 | .. | 2 | 3 |
| E.E. 165 | Electrical Communication | 3 | .. | 2 | 3 |
| | Electives* | | | | |
| <i>Spring Quarter</i> | | | | | |
| E.E. 125 | Electrical Engineering | 3 | 3 | .. | .. |
| E.E. 126 | Electrical Engineering Laboratory | 2 | .. | .. | 4 |
| E.E. 163 | Radio Communication | 3 | .. | 2 | 3 |
| E.E. 166 | Electrical Communication | 3 | .. | 2 | 3 |
| | Electives* | | | | |

* For list of elective courses in other colleges, see page 56.

† Students specializing in chemistry, physics, or mathematics may substitute electives in that department for courses E.E. 132, 134, 136 and M.E. 40, 41, and 55. Such specialization requires at least 18 credits of elective work in chemistry, physics, or mathematics.

‡ Students specializing in business may substitute an approved elective in that department for Course E.E. 136.

§ Students expecting to elect the communication option in the senior year must take E.E. 64-65-66, Elements of Communication, in the junior year.

SPECIALIZED COURSES IN ELECTRICAL ENGINEERING

The number of electives in the electrical engineering course makes it practicable to obtain either a broad or a specialized education. Further to facilitate such election, certain courses (indicated by †) in the senior year may be replaced by substitutes in physics, chemistry, or mathematics, subject to the approval of the head of the department and the Students' Work Committee. By properly choosing prerequisite subjects during the sophomore or junior year, a far-seeing student may prepare for advanced specialized courses in the following undergraduate and graduate years. As examples, one may specialize in business, chemistry, communication, illumination, manufacturing, military science, physics, power generation and distribution, public utilities, railway engineering, or other chosen line. Students are advised to consult with their classifier, or with the head of the department, concerning desirable sequences of general or special courses.

ENGINEERING AND BUSINESS ADMINISTRATION

For many years engineers have recognized the importance of a knowledge of the principles of economics in connection with their profession. Engineering students are encouraged to elect courses of various kinds in the fields of economics and administration when it is possible for them to find time to do so. This is true in all of the branches of engineering.

With the vast expansion which has taken place in the manufacturing industries in the United States, there has arisen a need for engineers having more training in economics and administration than is usually possible in the four-year engineering courses. To meet this need special groups of elective courses have been arranged. The recent economic stress has further emphasized the importance of a combination of engineering and business training in preparation for the industrial problems of the future.

The *engineering pre-business course* described below provides a four-year combined curriculum in business administration with a background of the fundamental mathematics, chemistry, English, physics, and drawing, of the engineering courses.

As a further step to provide adequate training in engineering or chemistry, combined with business administration, a plan of *five-year courses leading to two degrees* has been arranged for the capable student who wishes to enter upon a comprehensive professional training in this combined field.

Students who desire to elect courses in economics and business administration without undertaking the five-year combined course may well include the economics, business law, accounting, and corporation finance of the first two years in this program and then select such other courses of the sequence as they may prefer. No special optional group of courses is necessary for this purpose.

FIVE-YEAR COMBINED COURSES WITH
BUSINESS ADMINISTRATION

The new plan of five-year combined courses in engineering, architecture, or chemistry with business administration enables the student to complete the requirements for the Bachelor's degrees in both fields, as for example, bachelor of electrical engineering and bachelor of business administration. Five years will usually be necessary for the completion of the combined course, but a longer

time, perhaps six years, may be required if suitable programs cannot be arranged for the five-year period. This will depend upon the particular curriculum with which the combination with business administration is made.

For this purpose the School of Business Administration will accept the 74 credits in business subjects shown in the following list in conjunction with one of the regular curricula in engineering, architecture, or chemistry as satisfying the requirements for the degree of bachelor of business administration. The student receives his engineering degree upon the completion of his regular course, altho this may not be until the end of the fifth year, and is not eligible for the degree in business administration on this 74-credit basis unless he has completed one of the regular curricula in this college.

The business courses are intended to be spread over three or four years. Generally, it will be most convenient to begin the business sequence in the sophomore year by taking economics and business law, 3 credits per quarter, as electives, in addition to the usual engineering program. If, however, this is not done in the sophomore year, it may be possible to take these courses along with accounting and corporation finance in the junior year, if the program permits. In this case the entire business sequence may be completed in three years.

Normally, some of the required technical work of the senior year will be postponed to the fifth year to make room for business courses, in order to secure a desirable distribution of the latter rather than to concentrate them in the fifth year. Not more than 28 credits of business should be left for the fifth year.

Under this plan the student will be registered in the College of Engineering and Architecture or the School of Chemistry for the entire combined program. His registration for each quarter beginning with the fourth year is subject to approval by the adviser representing the School of Business Administration, Professor Filipetti, as well as by the regular classifier.

Students at the beginning of their senior year who have had economics, business law, accounting, and possibly some of the other courses in business and who desire to complete this five-year program for the Business Administration degree should consult the adviser regarding the necessary procedure. Irregular students who for any reason find it necessary to extend their engineering courses over five years may wish to take advantage of this plan, in whole or in part. The business courses are appropriate as electives whether or not the entire list is taken.

It should be clearly understood that a student must complete one of the regular courses in engineering, architecture, or chemistry, in order to qualify for the degree of bachelor of business administration under this plan. He will however, receive his regular degree as soon as he has completed the requirements therefor.

The following order and distribution by years are suggested. Both may be varied, however, so as to accommodate individual programs, as long as the prerequisites (indicated in parentheses) are satisfied.

| Course No. | Title | Credits | | |
|----------------------|---------------------------------|---------|----|----|
| | | F | W | S |
| <i>Second Year</i> | | | | |
| Econ. 8f-9w | General Economics | 3 | 3 | .. |
| Econ. 28f,s | Business Law (8, 9) | .. | .. | 3 |
| <i>Third Year</i> | | | | |
| Econ. 29f,s, 26f,w,s | Principles of Accounting | 3 | 3 | .. |
| B.A. 155f,w,s | Corporation Finance (8, 9)..... | .. | .. | 3 |

| Course No. | Title | Credits | | |
|------------------------|--|---------|----|----|
| | | F | W | S |
| <i>Fourth Year</i> | | | | |
| B.A. 58f,w,s | Public Finance (8, 9) | .. | 3 | .. |
| B.A. 70f | Statistics Survey (8, 9) | 4 | .. | .. |
| B.A. 71f,w,s | Transportation: Services and Charges (8, 9)..... | .. | .. | 3 |
| B.A. 89f,w,s | Production Management (8, 9) | .. | .. | 3 |
| B.A. 112f,w,s | Business Statistics (70) | .. | 3 | .. |
| B.A. 130f,s | Survey of Cost Accounting (29) | .. | .. | 3 |
| B.A. 142f,w,s | Money and Banking (8, 9) | 3 | .. | .. |
| B.A. 167w | Personnel Administration (161) | .. | 3 | .. |
| Econ. 161f,w,s | Labor Problems (8, 9)..... | 3 | .. | .. |
| <i>Fifth Year*</i> | | | | |
| B.A. 77f,s | Survey of Marketing | 3 | .. | .. |
| B.A. 100f,w,s | Report Writing | .. | 1 | .. |
| B.A. 101f,w-102w,s | Advanced General Economics (8, 9) | 3 | 3 | .. |
| B.A. 139f,w,s | Advanced General Accounting (26) | .. | .. | 3 |
| B.A. 165f,w,s | Economics of Public Utilities (8, 9) | .. | .. | 3 |
| B.A. 180-181-182Gf,w,s | Senior Topics Course: Production Management (89, 130) | 3 | 3 | 3 |
| Econ. 149f,w,s | Business Cycles (142)..... | .. | 3 | .. |
| | Total Credits | .. | .. | 74 |

ENGINEERING PRE-BUSINESS

(Four-year course in Engineering and Business Administration)

This course has been arranged for students who wish to prepare for positions in industry for which basic technical training is necessary, accompanied by instruction in business administration. Such positions are found in the fields of purchasing, sales and sales promotion, cost accounting, employment and rate setting, and production control.

Upon the completion of two years of prescribed work in the College of Engineering and Architecture, the student transfers to the School of Business Administration, where the third and fourth years are taken. The combined course leads to the degree of bachelor of business administration.

For freshman year, see page 25.

SOPHOMORE YEAR

| Course No. | Title | Credits | | |
|---------------------|--|---------|-------|------|
| | | Rec. | Lect. | Lab. |
| <i>Fall Quarter</i> | | | | |
| M.&M. 91‡ | Calculus | 4 | 4 | .. |
| Phys. 3 | Elements of Mechanics | 3 | 1 | 3 |
| Phys. 4 | Elements of Mechanics Laboratory | 1 | .. | 2 |
| Econ. 8 | General Economics | 3 | .. | 3 |
| M.E. 17‡ | Machine Shop Practice | 2 | .. | 1 |
| M.E. 70 | Mechanical Technology | 1 | .. | 2 |
| | Electives* | | | |

* A comprehensive examination in the core group of economics and business administration courses is required for graduation in Business Administration.

‡ For permissible substitute, see page 56.

| Course No. | Title | Credits | Rec. | Lect. | Lab. |
|-----------------------|---------------------------------|---------|------|-------|------|
| <i>Winter Quarter</i> | | | | | |
| Phys. 23 | Heat | 3 | 1 | 3 | .. |
| Phys. 24 | Heat Laboratory | 1 | .. | .. | 2 |
| Econ. 3 | The Mechanism of Exchange | 5 | 3 | 2 | .. |
| Econ. 9 | General Economics | 3 | 3 | .. | .. |
| Econ. 20† | Elements of Accounting | 3 | 3 | .. | .. |
| | Electives* | | | | |
| <i>Spring Quarter</i> | | | | | |
| M.&M. 84‡ | Technical Mechanics | 5 | 5 | .. | .. |
| Phys. 43 | Electricity | 3 | 1 | 3 | .. |
| Phys. 44 | Electricity Laboratory | 1 | .. | .. | 2 |
| Econ. 14 | Elements of Statistics | 5 | 5 | .. | .. |
| Econ. 25 | Principles of Accounting | 3 | 3 | .. | .. |

JUNIOR YEAR§

(In the School of Business Administration)

| | Credits |
|--|---------|
| Strength of Materials (M. & M. 85f)† | 4 |
| Principles of Accounting (Econ. 26f,s) | 3 |
| Business Law (Bus. Adm. 51f,s-52w-53s) | 9 |
| Business Statistics (Bus. Adm. 112f,w,s) | 3 |
| Corporation Finance (Bus. Adm. 155f,w,s) | 3 |
| Money and Banking—Advanced Course (Bus. Adm. 142f,w,s) | 3 |
| Transportation: Services and Charges I (Bus. Adm. 71f,w,s) | 3 |
| Survey of Marketing (Bus. Adm. 77f,s) | 3 |
| Production Management (Bus. Adm. 89f,w,s) | 3 |
| Advanced General Accounting (Bus. Adm. 139f,w,s) | 3 |
| Report Writing (Bus. Adm. 100f,w,s) | 1 |
| Electives (See list below) | 4 |

SENIOR YEAR§

(In the School of Business Administration)

| | |
|--|----|
| Transportation: Services and Charges II (Bus. Adm. 72f) | 3 |
| Cost Accounting (Bus. Adm. 130f,s) | 3 |
| Advanced General Economics (Bus. Adm. 101f,w-102w,s) | 6 |
| Business Cycles (Econ. 149f,w,s) | 3 |
| Labor Problems (Econ. 161f,w,s) | 3 |
| Personnel Administration (Bus. Adm. 167w) | 3 |
| Public Finance (Bus. Adm. 58f,w,s) | 3 |
| The Economics of Public Utilities (Bus. Adm. 165f,w,s) | 3 |
| Senior Topics Course: Production Management (Bus. Adm. 180-181-182G) | 9 |
| Electives (See list below) | 12 |

* For list of electives in other colleges see page 56.

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

‡ For permissible substitute, see page 56.

§ In addition to the required courses in the junior and senior years, the student must earn approximately 10 credits per year.

ELECTIVES

Students may divide the time available for electives between Groups A, and B.

A. General and Business

| | Hours |
|--|-------|
| Economic History (Hist. 80f-81w-82s) | 9 |
| Finance Management (Bus. Adm. 156f) | 3 |
| Theory of Statistics (Econ. 113w-114s) | 3 |
| Geography of Commercial Production (Geog. 41f,w,s) | 5 |
| Fire and Marine Insurance (Bus. Adm. 60w) | 3 |
| Casualty Insurance (Bus. Adm. 61s) | 3 |

B. Engineering

| | Hours |
|--|-------|
| Auto and Airplane Engines (M.E. 50f,w,s) | 3 |
| Gas Manufacture and Distribution (Ch.E. 41s) | 3 |
| Civil Engineering Practice (C.E. 53s) | 3 |
| Contracts and Specifications (G.E. 101w) | 3 |
| Estimating (G.E. 81w) | 3 |
| Technical Writing (Engl. 36s) | 3 |

INTERIOR ARCHITECTURE

Four-year course leading to the degree of bachelor of interior architecture, B.Int.Arch.

The course in interior architecture is primarily designed to meet vocational needs of women who wish to prepare for the practice of architecture, or interior decoration. This course requires normally four years for its completion, the first two years in the College of Science, Literature, and the Arts, and the last two years in the College of Engineering and Architecture, including 192 credits.

For the freshman and sophomore years, students register in the College of Science, Literature, and the Arts and complete the requirements of the Junior College, including the required courses, 90 credits, and 90 honor points.

COURSES REQUIRED IN THE FIRST TWO YEARS

| | Credits |
|---|---------|
| Composition A-B-C or 4-5-6 or exemption from requirements (see page 39, Combined Class Schedule)..... | 0 to 15 |
| Mathematics 4 or 6 (with prerequisite) | 4 to 10 |
| French (see Junior College Requirements, page 78, Combined Class Schedule)..... | 0 to 20 |
| History 11-12-13 or Fine Arts 1-2-3..... | 9 |
| Physics or Chemistry | 8 |
| Architecture 11-12-13 | 3 |
| Architecture 21-22-23 | 6 |
| Architecture 24-25-26 | 6 |
| Architecture 31-32-33 | 9 |
| Architecture 61-62-63 | 6 |

In the freshman year students should register for Chem. 1f-2w, or if they have entrance credits in chemistry, for Chem. 4-5 and for Arch. 11-12-13 and 21-22-23. If possible, they should elect Arch. 84-85-86.

Having satisfied the requirements of the Junior College, the students transfer to the College of Engineering and Architecture and pursue the following curriculum, amounting to 102 credits for the remaining two years:

JUNIOR YEAR

| Course No. | Title | Credits | Rec. | Lect. | Lab. |
|---------------------|--------------------------------|---------|------|-------|------|
| <i>Fall Quarter</i> | | | | | |
| Arch. 14 | Architectural History | 2 | .. | 2 | .. |
| Arch. 34 | Architectural Design | 4 | .. | .. | 12 |
| Arch. 51 | Building Construction | 2 | .. | 2 | .. |
| Arch. 182 | Furniture and Decoration | 3 | .. | 3 | .. |
| | Non-technical electives | 6 | | | |

Winter Quarter

| | | | | | |
|-----------|--------------------------------------|---|----|----|----|
| Arch. 15 | Architectural History | 2 | .. | 2 | .. |
| Arch. 35 | Architectural Design | 4 | .. | .. | 12 |
| Arch. 52 | Building Construction | 2 | .. | 2 | .. |
| Arch. 183 | Furniture and Decoration | 3 | .. | 3 | .. |
| M.E. 5 | Woodworking and Wood-Finishing | 2 | .. | .. | 6 |
| | Non-technical electives | 4 | | | |

Spring Quarter

| | | | | | |
|-----------|-------------------------------|---|----|----|----|
| Arch. 16 | Architectural History | 2 | .. | 2 | .. |
| Arch. 36 | Architectural Design | 4 | .. | .. | 12 |
| Arch. 53 | Building Construction | 2 | .. | 2 | .. |
| Arch. 184 | Interior Perspective | 3 | .. | 3 | .. |
| | Non-technical electives | 6 | | | |

SENIOR YEAR

Fall Quarter

| | | | | | |
|-----------|-------------------------------|---|----|----|----|
| Arch. 17 | Architectural History | 2 | .. | 2 | .. |
| Arch. 27 | Freehand Drawing | 2 | .. | .. | 6 |
| Arch. 134 | Interior Design | 7 | .. | .. | 21 |
| | Non-technical electives | 6 | | | |

Winter Quarter

| | | | | | |
|-----------|-------------------------------|---|----|----|----|
| Arch. 18 | Architectural History | 2 | .. | 2 | .. |
| Arch. 28 | Freehand Drawing | 2 | .. | .. | 6 |
| Arch. 135 | Interior Design | 7 | .. | .. | 21 |
| | Non-technical electives | 6 | | | |

Spring Quarter

| | | | | | |
|-----------|--------------------------------|---|----|----|----|
| Arch. 19 | Architectural History | 2 | .. | 2 | .. |
| Arch. 29 | Freehand Drawing | 2 | .. | .. | 6 |
| Arch. 136 | Interior Design | 7 | .. | .. | 21 |
| Arch. 163 | Theory of Form and Color | 2 | .. | 2 | .. |
| | Non-technical electives | 3 | | | |

LANDSCAPE ARCHITECTURE

Four-year course leading to the degree of bachelor of landscape architecture, B.L.A.

In addition to the prescribed courses, sufficient electives must be taken to complete a total of at least 204 credits for graduation. This is an average of 17 credits per quarter for 12 quarters.

The course in landscape architecture is intended to provide instruction and training for students who desire to enter this profession. It involves the same

fundamental preparation as the course in architecture, and, also, special attention is given to architectural as well as landscape design.

The profession of landscape architecture is a broad one and should not be confused with the work of the landscape gardener. The landscape architect may be concerned in the design and construction involved in parks and park systems, real estate development of a high order, and on a large scale, university campuses, civic centers, municipal and state building plans, town and city planning, etc. His professional relations with architects are so intimate as to require familiarity with the architectural profession. This is given consideration in the close relationship between the course in landscape architecture and the course in architecture.

Students who desire to enter the profession of landscape architecture, and who wish to study at the University of Minnesota before transferring to another institution to complete their professional studies, can obtain the equivalent of the two years of the standard course in Landscape Architecture, by selecting certain courses in the School of Architecture, the College of Agriculture, and other departments of the University.

FRESHMAN YEAR

| Course No. | Title | Credits | Rec. | Lect. | Lab. |
|-----------------------|----------------------------|---------|------|-------|------|
| <i>Fall Quarter</i> | | | | | |
| M.&M. 11 | College Algebra | 5 | 5 | .. | .. |
| Engl. 4 | Composition | 3 | 3 | .. | .. |
| Arch. 21 | Freehand Drawing | 2 | .. | .. | 6 |
| Arch. 31 | Architectural Design | 3 | .. | 1 | 6 |
| Arch. 61 | Projections | 2 | .. | 1 | 3 |
| G.E. 11 | Orientation | 0 | .. | 1 | .. |
| <i>Winter Quarter</i> | | | | | |
| M.&M. 12 | Trigonometry | 5 | 5 | .. | .. |
| Engl. 5 | Composition | 3 | 3 | .. | .. |
| Arch. 22 | Freehand Drawing | 2 | .. | .. | 6 |
| Arch. 32 | Architectural Design | 3 | .. | 1 | 6 |
| Arch. 62 | Shades and Shadows | 2 | .. | 1 | 3 |
| G.E. 12 | Orientation | 0 | .. | 1 | .. |
| <i>Spring Quarter</i> | | | | | |
| M.&M. 13 | Analytical Geometry | 5 | 5 | .. | .. |
| Engl. 6 | Composition | 3 | 3 | .. | .. |
| Arch. 23 | Freehand Drawing | 2 | .. | .. | 6 |
| Arch. 33 | Architectural Design | 3 | .. | 1 | 6 |
| Arch. 63 | Perspective | 2 | .. | 1 | 3 |
| G.E. 13 | Orientation | 0 | .. | 1 | .. |

SOPHOMORE YEAR

| | | | | | |
|---------------------|-----------------------------|---|----|----|----|
| <i>Fall Quarter</i> | | | | | |
| M.&M. 91‡ | Calculus | 4 | 4 | .. | .. |
| Arch. 14 | Architectural History | 2 | .. | 2 | .. |
| Arch. 24 | Freehand Drawing | 2 | .. | .. | 6 |
| Arch. 34 | Architectural Design | 4 | .. | .. | 12 |
| Bot. 1 | General Botany | 4 | 1 | 3 | .. |

‡ For permissible substitute, see page 56.

| Course No. | Title | Credits | Rec. | Lect. | Lab. |
|-----------------------|-----------------------------|---------|------|-------|------|
| <i>Winter Quarter</i> | | | | | |
| M.&M. 92‡ | Technical Mechanics | 4 | 4 | .. | .. |
| Arch. 15 | Architectural History | 2 | .. | 2 | .. |
| Arch. 25 | Freehand Drawing | 2 | .. | .. | 6 |
| Arch. 35† | Architectural Design | 4 | .. | .. | 12 |
| Bot. 21 | Elementary Ecology | 3 | .. | .. | 6 |

| | | | | | |
|-----------------------|------------------------------------|---|----|----|----|
| <i>Spring Quarter</i> | | | | | |
| M.&M. 93‡ | Strength of Materials | 4 | 4 | .. | .. |
| Arch. 16 | Architectural History | 2 | .. | 2 | .. |
| Arch. 26 | Freehand Drawing | 2 | .. | .. | 6 |
| Arch. 36 | Architectural Design | 4 | .. | .. | 12 |
| Bot. 7 | Taxonomy of Flowering Plants | 3 | .. | 1 | 5 |

Summer Quarter between Sophomore and Junior Years

| | | | | | |
|-----------|-------------------------|---|--|--|--|
| Arch. 20 | Outdoor Sketching | 1 | | | |
| Geol. 1 | General Geology | 5 | | | |
| Hort. 70† | Plant Materials | 3 | | | |

JUNIOR YEAR

| | | | | | |
|---------------------|--|---|----|----|----|
| <i>Fall Quarter</i> | | | | | |
| Arch. 27 | Freehand Drawing | 2 | .. | .. | 6 |
| Arch. 84 | Modeling | 2 | .. | .. | 6 |
| C.E. 11 | Surveying | 3 | 1 | .. | 7 |
| Econ. 8 | General Economics | 3 | .. | 3 | .. |
| Hort. 71 | Plant Materials Used in Landscape Design.... | 3 | .. | 1 | 4 |
| Phys. 3 | Elements of Mechanics | 3 | 1 | 3 | .. |
| Phys. 4 | Elements of Mechanics Laboratory | 1 | .. | .. | 2 |

| | | | | | |
|-----------------------|--------------------------------------|---|----|----|----|
| <i>Winter Quarter</i> | | | | | |
| Arch. 28 | Freehand Drawing | 2 | .. | .. | 6 |
| Arch. 85 | Modeling | 2 | .. | .. | 6 |
| C.E. 12 | Surveying | 3 | 1 | .. | 7 |
| Econ. 9 | General Economics | 3 | 3 | .. | .. |
| Hort. 74 | Principles of Landscape Design | 3 | .. | 1 | 4 |
| Phys. 23 | Heat | 3 | 1 | 3 | .. |
| Phys. 24 | Heat Laboratory | 1 | .. | .. | 2 |

| | | | | | |
|-----------------------|------------------------------|---|----|----|----|
| <i>Spring Quarter</i> | | | | | |
| Arch. 29 | Freehand Drawing | 2 | .. | .. | 6 |
| Arch. 86 | Modeling | 2 | .. | .. | 6 |
| C.E. 13 | Surveying | 3 | 1 | .. | 7 |
| Econ. 28 | Business Law | 3 | 3 | .. | .. |
| Hort. 72 | Woody Plants | 2 | .. | 1 | 2 |
| Phys. 43 | Electricity | 3 | 1 | 3 | .. |
| Phys. 44 | Electricity Laboratory | 1 | .. | .. | 2 |

† Given by special arrangement.

‡ For permissible substitute, see page 56.

SENIOR YEAR

| Course No. | Title | Credits | Rec. | Lect. | Lab. |
|-----------------------|---|---------|------|-------|------|
| <i>Fall Quarter</i> | | | | | |
| Arch. 160 | History of Landscape Architecture | 2 | .. | 2 | .. |
| C.E. 14 | Surveying | 3 | .. | .. | 8 |
| C.E. 51 | Highways and Pavements | 3 | 2 | .. | 3 |
| For. 1 | General Forestry | 3 | .. | 3 | .. |
| | Electives* | | | | |
| <i>Winter Quarter</i> | | | | | |
| G.E. 81 | Estimating | 3 | 3 | .. | .. |
| Hort. 75 | Landscape Problems | 3 | .. | 1 | 4 |
| Phys. 33 | Optics | 3 | 1 | 3 | .. |
| Phys. 34 | Optics Laboratory | 1 | .. | .. | 2 |
| Engl. 37 | Technical Discussions | 3 | 3 | .. | .. |
| | Electives* | | | | |
| <i>Spring Quarter</i> | | | | | |
| Ag.E. 31 | Principles of Drainage | 3 | 1 | 2 | .. |
| C.E. 172 | City Planning | 3 | .. | 3 | .. |
| Engl. 36 | Technical Writing | 3 | 3 | .. | .. |
| Hort. 76 | Landscape Construction | 3 | .. | 1 | 4 |
| | Electives* | | | | |

RECOMMENDED ELECTIVES

| | | | | | |
|-------------------|-----------------------------|---|--|--|--|
| Arch. 41f,42w,43s | Building Construction | 3 | | | |
| Hort. 56s | Plant Propagation | 3 | | | |

MECHANICAL ENGINEERING

Four-year course leading to the degree of bachelor of mechanical engineering, B.M.E.

In addition to the prescribed courses, sufficient electives must be taken to complete a total of at least 204 credits for graduation.

The field of mechanical engineering is very broad. Graduates hold positions in technical or non-technical work in almost every kind of industry.

The profession includes the following major divisions: design of machinery and apparatus for all purposes; production and manufacturing methods; operation of industrial plants; steam power generation, internal combustion engines; heating, ventilation, refrigeration, and air conditioning; mechanical research and development; sales engineering; and the general field of management.

The course is planned to give broad training rather than highly specialized work. A reasonable amount of time is allowed for non-technical subjects. A course in speech is required.

It is recommended that students in Mechanical Engineering spend their summer vacations in industry if possible.

For freshman year, see page 25.

* For list of elective courses in other colleges, see page 56.

SOPHOMORE YEAR

| Course No. | Title | Credits | Rec. | Lect. | Lab. |
|-----------------------|--|---------|------|-------|------|
| <i>Fall Quarter</i> | | | | | |
| M.&M. 24 | Differential Calculus | 5 | 5 | .. | .. |
| Phys. 3 | Elements of Mechanics | 3 | 1 | 3 | .. |
| Phys. 4 | Elements of Mechanics Laboratory | 1 | .. | .. | 2 |
| M.E. 15 | Foundry Practice | 2 | .. | 1 | 4 |
| M.E. 20 | Elementary Machine Design | 2 | .. | .. | 6 |
| M.E. 70 | Mechanical Technology | 1 | .. | 2 | .. |
| | Electives*† | | | | |
| <i>Winter Quarter</i> | | | | | |
| M.&M. 25 | Integral Calculus | 5 | 5 | .. | .. |
| Phys. 23 | Heat | 3 | 1 | 3 | .. |
| Phys. 24 | Heat Laboratory | 1 | .. | .. | 2 |
| M.E. 14 | Pattern Practice | 2 | .. | 1 | 4 |
| Engl. 37 | Technical Discussions | 3 | 3 | .. | .. |
| or | | | | | |
| M.E. 50 | Auto and Airplane Engines | 3 | 3 | .. | .. |
| | Electives*† | | | | |
| <i>Spring Quarter</i> | | | | | |
| M.&M. 26 | Technical Mechanics (Statics) | 5 | 5 | .. | .. |
| Phys. 43 | Electricity | 3 | 1 | 3 | .. |
| Phys. 44 | Electricity Laboratory | 1 | .. | .. | 2 |
| M.E. 16 | Forge Practice | 2 | .. | 1 | 4 |
| M.E. 21 | Kinematics | 2 | .. | .. | 6 |
| Engl. 37 | Technical Discussions | 3 | 3 | .. | .. |
| or | | | | | |
| M.E. 50 | Auto and Airplane Engines | 3 | 3 | .. | .. |
| | Electives*† | | | | |

JUNIOR YEAR

| | | | | | |
|-----------------------|--|---|----|----|----|
| <i>Fall Quarter</i> | | | | | |
| M.&M. 127 | Technical Mechanics (Dynamics) | 5 | 5 | .. | .. |
| M.E. 22 | Mechanism | 3 | 3 | .. | .. |
| M.E. 30 | Steam Engineering | 3 | 3 | .. | .. |
| M.E. 33 | Elementary Mechanical Laboratory | 2 | .. | .. | 4 |
| M.E. 71 | Machine Shop Practice | 3 | .. | 1 | 7 |
| | Electives* | | | | |
| <i>Winter Quarter</i> | | | | | |
| M.&M. 128 | Strength of Materials | 5 | 5 | .. | .. |
| M.&M. 141 | Materials Laboratory | 2 | .. | 1 | 3 |
| M.E. 23 | Machine Design | 3 | .. | 2 | 6 |
| M.E. 31 | Thermodynamics | 3 | 2 | .. | 3 |
| M.E. 34 | Mechanical Laboratory | 2 | .. | .. | 4 |
| | Electives*† | | | | |

* For list of elective courses in other colleges, see page 56.

† Programs are arranged to accommodate M.E. 72, Machine Shop Practice and other electives.

‡ Programs are arranged to accommodate C.E. 17f,s Surveying; Chem.E. 1f,w, Power Plant Chemistry; Phys. 33f,w,s, Optics; and other electives. The Power Plant Chemistry sections are limited to 20 students each.

| Course No. | Title | Credits | Rec. | Lect. | Lab. |
|-----------------------|--|---------|------|-------|------|
| <i>Spring Quarter</i> | | | | | |
| M.&M. 129 | Hydraulics | 4 | 3 | 1 | .. |
| M.&M. 143 | Hydraulics Laboratory | 1 | .. | .. | 2 |
| M.E. 24 | Machine Design | 3 | 3 | .. | .. |
| M.E. 32 | Thermodynamics | 3 | 2 | .. | 3 |
| M.E. 35 | Elementary Steam and Power Laboratory | 2 | .. | .. | 4 |
| | Electives* | | | | |
| SENIOR YEAR | | | | | |
| <i>Fall Quarter</i> | | | | | |
| M.E. 121§ | General Engineering Design | 2 | .. | .. | 6 |
| M.E. 141§ | Power Plant Engineering | 3 | 3 | .. | .. |
| M.E. 149† | Advanced Steam Laboratory | 2 | .. | .. | 4 |
| M.E. 160 | Heating and Ventilation | 3 | 1 | 2 | .. |
| M.E. 190 | Seminar | 1 | 1 | .. | .. |
| E.E. 36 | Electric Power | 3 | 2 | .. | 2 |
| | Electives* | | | | |
| <i>Winter Quarter</i> | | | | | |
| M.E. 150§ | Internal Combustion Engines | 3 | 3 | .. | .. |
| M.E. 159† | Power and Gas Engine Laboratory | 2 | .. | .. | 4 |
| M.E. 171§ | Production Control | 3 | 3 | .. | .. |
| M.E. 191 | Seminar | 1 | 1 | .. | .. |
| | Engineering Design‡ | 2 | .. | .. | 6 |
| E.E. 37 | Electric Power | 3 | 2 | .. | 2 |
| | Electives* | | | | |
| <i>Spring Quarter</i> | | | | | |
| M.E. 169† | Heating and Ventilation Laboratory | 2 | .. | .. | 4 |
| M.E. 174† | Industrial Management Laboratory..... | 2 | .. | .. | 4 |
| M.E. 192 | Seminar | 1 | .. | 1 | 1 |
| | Engineering Design‡ | 2 | .. | .. | 6 |
| E.E. 38 | Electric Power | 3 | 2 | .. | 2 |
| G.E. 193 | Engineering Practice | 2 | .. | 2 | .. |
| | Electives* | | | | |

In addition to the regular four-year course in mechanical engineering, those who are qualified are urged to take a fifth year, that is, a year of graduate study. This year's work may lead to the Master's degree in mechanical engineering and also satisfy the requirement of graduate study towards the professional degree of mechanical engineer. (For detailed information as to procedure consult the Graduate School bulletin.)

* For list of elective courses in other colleges, see page 56.

† The four laboratory courses, M.E. 149, 159, 169, 174, must be taken in the three quarters and not more than two in any one quarter. All are given each quarter.

‡ The following courses are accepted for this requirement: M.E. 122w-123s, Mechanical Engineering Design; M.E. 147w, Design of Steam Machinery; M.E. 148s, Design of Power Plant Units; M.E. 156w, 157s, Design of Internal Combustion Engines; M.E. 168w, Heating and Ventilation Design; M.E. 170s, Tool Design and Construction; M.E. 175w, Materials Handling; C.E. 37s, Structural Engineering.

§ The three courses, M.E. 141, 150, and 171, must be taken in the fall and winter quarters. Each course is offered both quarters.

ELECTIVE COURSES IN OTHER COLLEGES

For detailed schedules of classes see the programs of respective departments.

| Course No. | Title | Credits | Prerequisites |
|---------------------|---------------------------------------|---------|---|
| Ast. 11f,s | Descriptive Astronomy | 5 | None |
| Geog. 11f,w,s | Human Geography | 5 | 3rd qtr. fr., soph., jr., sr.; none |
| Geog. 41f,w,s | Geography of Commercial Production.. | 5 | Soph., jr., sr.; none |
| Geog. 43f | Political Geography | 5 | Soph., jr., sr.; none |
| Geol. 8f,w,s | Introductory Geology | 5 | None |
| Geol. 27s | Outlines of Mineralogy | 1 | Jr., sr.; none |
| Ger. 1f,w,s | Beginning German A | 5 | None |
| Ger. 2f,w,s | Beginning German B | 5 | 1 or one year high school German |
| Ger. 3f,w,s | Beginning German C | 5 | Ger. 2 or two years high school German |
| Ger. 4f,w,s | Intermediate German | 5 | Ger. 3 or three years high school German |
| Greek 42s | Greek Sculpture | 2 | None |
| Hist. 7f-8w-9s | American History | 9 | Soph., jr., sr.; none |
| Hist. 11f-12w-13s | Medieval History | 9 | None (Arch. only) |
| Study 1f,w,s | How To Study | 2 | None |
| Italian 1f-2w | Beginning Italian | 10 | None |
| Jour. 5s | The American Newspaper | 3 | None |
| Lib. Meth. 1f,w,s | Use of Books and Libraries | 2 | None (fr. and soph. only) |
| Phil. 2f,w,s | Logic | 5 | Soph., jr., sr.; none |
| Phys. 146w | Advanced Electrical Measurements | 3 | Phys. 144 |
| P.M.&P.H. 3f,s,w | Personal Health | 2 | Fr., soph.; none |
| Pol. Sci. 1f,2w,3s | American Government and Politics.... | 9 | None |
| Psy. 1f,w,s-2w,s | General Psychology | 6 | None |
| Psy. 160f | Psychology in Personnel Work | 3 | Psy. 1-2, Econ. 8-9 |
| Soc. 1f,w,s | Introduction to Sociology | 5 | None |
| Span. 1f,w,s-2f,w,s | Beginning Spanish | 10 | None |
| Span. 3f,w,s-4f,w,s | Intermediate Spanish | 10 | Spanish 1-2 or two years' high school Spanish |
| Sp. 1f,w-2w,s-3f,s | Fundamentals of Speech | 9 | Engl. 6 |

SUBSTITUTIONS

In order that students who are irregular may avoid delays on account of program conflicts or other difficulties, the following substitutions will be approved by petition. Additional credits thus earned may be applied as elective credits.

| Course | Cred. | Substitute Course | Cred. |
|-----------------------------|-------|-------------------|--------|
| Draw. 4 | 2 | Draw. 1 | 3 |
| 5 | 2 | 2 | 3 |
| 6 | 2 | 3 | 3 |
| 4 and 5 and 6 | 6 | 7 and 8 | 6 |
| 26 | 2 | 28 | 2 |
| 28 | 2 | 26 | 2 |
| M.&M. 84 | 5 | M.&M. 26 and 127 | 10 |
| 85 | 4 | 128 and 141 | 7 |
| 86 | 2 | 129 | 4 |
| 91 | 4 | 24 and 25 | 10 |
| 92 | 4 | 26 or 84 | 5 |
| 93 | 4 | 85 or 128 | 4 or 5 |
| M.E. 17 | 2 | M.E. 19 | 2 |
| 19 | 2 | 17 | 2 |
| 19 | 2 | 71 | 3 |
| Anal.Chem. 132 or Ch.E. 110 | 3 | Anal. Chem. 105 | 3 |

DESCRIPTIONS OF COURSES

AERONAUTICAL ENGINEERING

- 1f—Aeronautics. History. Nomenclature. Resistance of simple bodies. Theory of flight. The airplane and its parts. Constructional details. Performance. 3 cred.; prereq., M.&M. 12. Mr. Barlow.
(1) III MWF; 202ME (2) I TThS; 202ME
- 2w—Aircraft and Auto Engines. Principles and Types. Electrical Systems. Lubrication and cooling. Carburetors. Accessories. (Open only to aeronautical engineers or by petition.) 3 cred.; prereq., 1. Mr. Barlow.
Lect. (1) I TS; 105A Lab. (1) I-II F; A
(2) III MF; 105A (2) VI-VII T; A
- 3s—Aeronautics. Instruments. Meteorology. Avigation. 3 cred.; prereq., 1 and 2. Mr. Barlow.
(1) II MWF; 105A (2) II TS, I F; 105A
- 83s—Stresses in Simple Structures. Statically determinate trusses and beams. Graphic statics. Space frameworks. Combined stresses. Airplane wing bracing. Short and long struts. 3 cred.; prereq., M.&M. 128; III MWF; 21E. Mr. Wise.
- 100f-101w-102s—Aerodynamics. Atmospheric properties. Fluid mechanics. Stream functions and velocity potential. Motion of body in liquids in three dimensions. Prandtl's wing theory. Dynamic loads, stability, maneuverability, controllability. 3 cred. per qtr.; prereq., 3 and M.&M. 25; I TThS; 136E. Mr. Boehlein.
- 115f—Airplane Stresses. Deflection of structures. Theory of statically indeterminate structures. Analysis of fuselage trusses, landing gear, wing beams. Structural details and connections. 3 cred.; prereq., 83. Mr. Wise.
Lect. III TS; 227E Lab. III-IV F; 229E
- 116w—Advanced Airplane Stresses. Theory and design of monocoque fuselages. Multispar and unit construction wings. Vibrations. Wing and control-surface flutter. Analysis and design of seaplane hulls and floats. 3 cred.; prereq., 115. Mr. Wise.
- 120f-121w-122s—Airplane Design. Stress analysis of wings, fuselages, chassis, control surfaces, etc. Specifications. Performance and design calculations. Propellers. 120f, 2 cred.; 121w, 4 cred.; 122s, 3 cred.; prereq., 83, 102, M.&M. 128. Messrs. Akerman and Barlow.
120f Lect. IV T; 105A
Lab. (1) II-IV W; 251ME (2) II-IV W; 255ME
121w Lect. IV TS; 105A
Lab. (1) II-IV WF; 151ME (2) II-IV WF; 255ME
122s Lect. IV T; 105A
Lab. (1) II-IV MF; 251ME (2) II-IV MF; 255ME
- 123f,w,s-124f,w,s-125f,w,s—Advanced Airplane Design. Problems in airplane design or development. 2 to 5 cred. per qtr.; prereq., 121. Mr. Akerman.
- 126f,w,s-127f,w,s-128f,w,s—Advanced Problems in Airscrew Design. Graphical and analytical methods of investigation. 2 to 5 cred. per qtr.; prereq., 122. Mr. Akerman.
- 140f—Aeronautical Laboratory. Study of airplane parts and their construction. Fittings. Rigging. Inspection and accessories. 2 cred.; prereq., 102. Messrs. Akerman and Barlow.
(1) VII-IX TF; 107A (2) II-IV M, VII-IX Th; 107A

- 141w—Aerodynamics Laboratory. Measurement of air flow. Calibration of Pitot tubes and anemometers. Distribution of air pressure on surfaces. Wind tunnel tests of wings, propellers, and airplane models. 2 cred.; prereq., 102. Messrs. Barlow and Boehnlein.
 (1) VII-IX TF; Ex (2) VII-IX MTh; Ex
- 160s—Airships. Theory and design. Rigid and non-rigid types. Stresses. Performance. 3 cred.; prereq., 83, 102, M.&M. 128. Mr. Akerman.
 Lect. III Th, IV S; 105A
 Lab. (1) II-IV W; 151ME (2) II-IV W; 251ME
- 170s—Air Transport. Economics. Airports and airways and their equipment. Air commerce rules and regulations. Communication. 2 cred.; prereq., open to sr.; II Th, III S; 105A. Mr. Barlow.
- 190f-191w-192s—Seminar. Readings, reports, conferences, and discussions. 1 cred. per qtr.; prereq., 101. Mr. Akerman.
 190f (1) VI T; 105A (2) VI Th; 105A
 191w (1) II Th; 105A (2) II T; 105A
 192s (1) III T; 105A (2) VI M; 105A
- 201f-202w-203s—Advanced Aerodynamics. 3 cred. per qtr.; prereq., 102 or special permission. Mr. Boehnlein.
- 260s—Advanced Airship Stresses. Coplanar and space rigid frameworks. Secondary stresses. Buckling and elastic instability. Framework of dirigibles, gondolas, and cabins. 3 cred.; prereq., 115. Mr. Wise.
- 272f-273w-274s—Research in Aeronautical Engineering. 2 to 5 cred. per qtr.; grad. Messrs. Akerman, Robertson, Wise, and Boehnlein.

AGRICULTURAL BIOCHEMISTRY

- 113f,su-114w,su-115s—Biochemical Laboratory Methods. A laboratory course paralleling the lectures in 119-123. 2 cred. per qtr.; prereq., quantitative analysis, reg. in 119-123. VI-VIII T; VII-IX Th; 202-208 BCh(UF). Mr. Sandstrom.
- 119f—Colloids. Lectures and assigned readings dealing with the colloidal state of matter, the preparation and properties of colloidal systems, and the relation of these to biochemical processes. 3 cred.; prereq., Org. Chem. 153 and one year of either zoology or botany. III MWF; 113 BCh(UF). Mr. Gortner.
- 120w—Proteins. Lectures and assigned readings on composition, structure, chemical and physical properties, and the functions of proteins and amino acids. 3 cred.; prereq., 119. II MWF; 113 BCh(UF). Mr. Gortner.
- 121w—Carbohydrates. Lectures and assigned readings on the composition, structure, chemical and physical properties, and the functions of the carbohydrates. 3 cred.; prereq., 119. III MWF; 113BCh(UF). Mr. Bailey.
- 122s—The Lipids and Fats. Lectures and assigned readings on the composition, structure, chemical and physical properties, and the functions of the fats and fat-like compounds. 3 cred.; prereq., 119. III TThS; 113BCh(UF). Mr. Bull.
- 123s—Enzymes. Lectures and assigned readings on enzyme action, including the methods of preparation and investigation of enzymes and their function in biological and industrial processes. 3 cred.; prereq., 119; III MWF; 113BCh(UF). Mr. Sandstrom.

- 22s—Agricultural Machinery Laboratory. Construction and adjustment of machines; measurement of drawbar horsepower; hitches. 1 cred.; prereq., 12 or reg. in 12; VI-VIII W; 49En(UF). Mr. Schwantes.
- 43s—Mechanical Laboratory. Instruction and laboratory practice in mechanical work, embracing cement work; soldering; welding; pipe fitting; electric wiring; harness repair, etc. 3 cred.; no prereq.; I-IV T, I-II Th; 20, 106En(UF). Mr. Dent.
- 70s—Steam Boilers and Engines. Construction, operation, and care of simple steam engines and boilers. 3 cred.; prereq., Phys. 23, 24; II MWF; 216En(UF). Mr. Boss.
- 71f—Design and Economics of Agricultural Machinery. Machine and power costs of farm operations; operating principles and design problems. 3 cred.; prereq., 12, 13, 22, M.E. 27; VII-VIII M; 105En(UF), VI-VIII F; 49En(UF). Mr. Schwantes.
- 72w—Applied Electricity. Laboratory work in direct and alternating current machines as used on farms, including generators, motors, storage batteries, transformers, and complete isolated electric and hydroelectric plants (offered only in alternate years, 1936-37, etc. Alternate with Soils 108). 3 cred.; prereq., Phys. 43, 44. Mr. Romness.
Lect. VI, T; 101En(UF) Lab. VII-IX T, VI-VIII Th; 101En(UF)
- 121f-122w-123s—Farm Power and Machinery Problems. Special studies of farm machinery and mechanical power for the farm. Tests, design, and adaptability to various farm conditions. 3 to 6 cred. per qtr.; prereq., 126; ar. Mr. Schwantes.
- 126w—Selection and Management of Agricultural Machinery. Special problems in economical power and machine combinations and their application to the farm. 3 cred.; prereq., 14, 71, Ag.Econ. 103; III MW; 106En(UF), lab. 3 hrs. ar.; 49En(UF). Mr. Schwantes.
- 221f-222w-223s—Farm Power and Machinery Research. Studies involving the design or utilization of power machinery used in connection with farm operation. 3 to 6 cred. per qtr.; prereq., 121; ar. Mr. Schwantes.

RECLAMATION

- 19f—Elementary Surveying. Use of tape, transit, level, and traverse board in field problems, e.g., mensuration surveys, traverses, differential and profile leveling; plotting and mapping. Care and adjustment of instruments. 3 cred.; prereq., Dr. 3, M.&M. 12. Messrs. Neal and Howe.
Lect. IV T; 105En(UF) Lab. I-III TTh; 305En(UF)
- 20s—Advanced Surveying. Topographic surveys by stadia and other methods, running simple curves, cross sectioning, plotting the survey, profile building, grade determination, and figuring of quantities in earth work. 3 cred.; prereq., 19. Messrs. Neal and Howe.
Lect. VI M; 105En(UF) Lab. VII-IX MF; 305En(UF)
- 28w—Land Clearing. Land clearing methods, explosives, and machinery. Farm development in cut over timber district. 3 cred.; no prereq.; I TThS; 103En(UF).
- 51s—Land Reclamation. Principles and practices of soil erosion control, land drainage, and irrigation in relation to plant growth, farm operation, land development, and community interest. 5 cred.; prereq., 19 or reg. in 19, Soils 6, M.&M. 143; IV MTWFS; 105En(UF). Messrs. Roe and Neal.
- 68f—Drainage Engineering and Works. Design, location, and construction of

public and private drainage systems and works; construction estimates, drainage engineering, and public records. 3 cred.; prereq., 31, M.&M. 86; ar.; 105En(UF). Mr. Roe.

69s—Irrigation Engineering and Works. Design, location, and construction of irrigation works; reservoir and transmission losses; general irrigation law; irrigation engineering and public records. 3 cred.; prereq., 42, M.&M. 86; ar.; 105En(UF). Mr. Roe.

101f-102w-103s—Advanced Drainage Problems. Special drainage problems including surface run-off, soil permeability, relation of soil and crop type to drainage, shape and regulation of water table in relation to root growth, etc. 3 to 6 cred. per qtr.; prereq., 68; ar.; 105En(UF). Messrs. Roe and Neal.

201f-202w-203s—Reclamation Research. Studies of design and functioning of reclamation works with special reference to soil types and soil water conditions. 3 to 6 cred. per qtr.; prereq., 101 and one qtr. Mathematical Theory of Statistics; ar. Mr. Roe.

GENERAL

91f-92w-93s-94f-95w-96s-97f-98w-99s—Agendum. General agricultural engineering seminar. Official conference of entire group: topics of broad general interest to agricultural engineers discussed; as, for example, research problems, state and government service, agricultural engineering functions and developments. All staff members and all students above freshman classification required to attend. No cred.; no prereq. Mr. Boss and staff.

91f-94f-97f II S (third S. of each month); 107En(UF)

92w-95w-98w I T (third T. of each month); 107En(UF)

93s-96s-99s II W (third W. of each month); 107En(UF)

150s—Seminar (Ag.E.). Students will give reports of their investigations on certain assigned problems for research. 2 cred.; prereq., required of all sr. Messrs. Roe, Schwantes, and White.

AGRONOMY AND PLANT GENETICS

1f,s—Farm Crops. Important field crops of the United States with emphasis upon those of local importance, distribution, economic importance, agricultural classification, cultural methods, and principles of improvement and seed selection. 3 cred.; no prereq.; IV MWF; 100Ad(UF). Mr. Johnson.

ANIMAL HUSBANDRY

15s—Fundamentals of Livestock Production. Basic principles involved in the breeding, feeding, and management of livestock. 3 cred.; jr., sr.; no prereq.; I TThS; 3St(UF). (For professional agricultural engineering students only.) Mr. Peters.

ARCHITECTURE

HISTORY

14f-15w-16s—Architectural History. Technical study of architecture: (f) Ancient Egypt, Assyria, Persia, and especially Greece; (w) Ancient Rome and beginning of the Renaissance in Italy; (s) Renaissance in Italy and Spain. Illustrated lectures and library research. 2 cred. per qtr.; prereq., 22, 32; III TTh; 320E. Mr. Mann.

17f-18w-19s—Architectural History. Technical study of architecture: (f) The Middle Ages in Italy, France, and England; (w) Developed Gothic archi-

ture and early Renaissance in France and England; sources and affecting influences; (s) Development from the seventeenth century to the present time, particularly in France, England, and America. Lectures and library research. 2 cred.; per qtr.; prereq., 15 for 17, 17 for 18, 16 for 19; IV MW; 320E. Mr. Mann.

219f,w,s—Special Researches in Architectural History. 5 cred. or less per qtr.; prereq., completion of undergraduate architectural history; ar. Mr. Mann.

DESIGN

31f,w,s-32f,w,s-33f,w,s—Architectural Design, Grade I. Long and short problems under individual criticism, dealing in general with the elements of plan and elevation. Sketch problems dealing with composition. 3 cred. per qtr.; no prereq. Mr. Beals.

Lect. IV S; 320E

Lab. VI-VIII MF; 402E

*34f,w,s-35f,w,s-36f,w,s—Architectural Design, Grade II. Long and short problems under individual criticism, dealing in general with the elements of plan and elevation. Sketch problems dealing with simple composition. 4 cred. per qtr.; prereq., 23, 33, 62; VI-VIII MTThF; 402E. Mr. Robertson.

*37f,w,s-38f,w,s-39f,w,s—Architectural Design, Grade III. Long and short problems under individual criticism, dealing with more advanced architectural composition. Sketch problems dealing with large composition or decorative detail. 6 cred. per qtr.; prereq., 36; VI-VIII MTWThF, II-IV S; 302E. Mr. R. C. Jones.

*131f,w,s-132f,w,s-133f,w,s—Architectural Design, Grade IV. Long, short, and sketch problems under individual criticism, dealing with complex compositions and with subjects involving special character and a decorative and imaginative interest. 8 cred. per qtr.; prereq., 39; VI-IX MTWThF, I-IV S, and 3 hrs. ar.; 317E. Mr. Arnal.

140—Thesis. An original problem in architecture chosen and developed by the individual student, with the approval and advice of the architectural faculty. At least one quarter should be allowed for its completion. 8 cred.; prereq., 133 or 146.

220f,w,s—Archeology. 3 cred. or less; prereq., completion of undergraduate architectural history; ar. Mr. Arnal.

239f,w,s—Advanced Architectural Design. 10 cred. or less per qtr.; prereq., completion of undergraduate design; VI-IX MTWThF, I-IV S; 317E. Mr. Arnal.

CONSTRUCTION

41f-42w-43s—Building Construction. General study of the principles, methods, and materials involved in the standard types of building construction. 3 cred. per qtr.; prereq., 33; I TThFS; 320E. Mr. Heath.

47f-48w-49s—Building Construction. Practical problems involving principles and details of various types of construction. Preparation of working drawings; drafting room practice. 2 cred. per qtr. for 47-48, 3 cred. for 49; prereq., 33 and reg. in 41; VI-IX W, II-IV S; 402E. Mr. Heath.

* Work in all design courses is carried on simultaneously and students pass from one grade to the next in sequence in varying lengths of time according to their accomplishment and irrespective of university time units. The normal time required to complete the design courses is four years; some students require more time and some less.

- 51f-52w-53s—Building Construction (Int.Arch.). Non-technical study of the principles, methods, and materials of ordinary construction, particularly as related to domestic architecture and interior finish. 2 cred. per qtr.; prereq., 33; IV TS; 206E. Mr. Heath.
- 141f-142w-143s—Building Construction. Advanced study of the technology of building materials, soils, foundations. 2 cred. per qtr.; prereq., C.E. 41 or M.&M. 26; III MW; 320E. Mr. _____
- 144f-145w-146s—Construction Design. Problems in design involving the structural and economic phases of buildings. 6 cred. per qtr.; prereq., 39, 43, C.E. 39, 41. Mr. _____
- 240f,w,s—Technology of Building Materials. 3 cred. per qtr.; prereq., 49 or 143; hrs. ar. Mr. _____

FINE ARTS

- 20su—Sketching. Sketching out-of-doors in water color and other media. 1 cred.; prereq., 23 or evidence of intermediate ability. Mr. Burton.
- 21f,w,su-22w,s,su-23s,su—Freehand Drawing. Freehand perspective and first principles of design and composition from geometrical solids. Drawing of ornament in pencil, charcoal, and wash. Indoor and outdoor sketching. 2 cred. per qtr.; no prereq. Messrs. Young and Doseff.
- 21f (1) VI-VIII TTh; 417E (Open to Arch. only) (3) I-III TTh; 417E
(2) VI-VIII MF; 417E (4) II-IV MW; 417E
- 21w-22s II-IV MW; 417E
- 22w-23s (1) VI-VIII TTh; 417E (Open to Arch. only) (3) I-III TTh; 417E
(2) VI-VIII TTh; 417E
- 24f,w,su-25f,w,s,su-26f,w,s,su—Freehand Drawing. Drawing and design in charcoal and water color from still life, figure details, and the antique. 2 cred. per qtr.; prereq., 23; VI-VIII TTh; 417E. Mr. Young.
- 27f,w,s,su-28f,w,s,su-29f,w,s,su—Freehand Drawing. Drawing, design, and painting from architectural detail, the antique, and life. 2 cred. per qtr.; prereq., 26; II-III MWF; 417E. Mr. Burton.
- 68s—Time Studies from Life. Drawing from head life and the costumed figure, in any medium. 1 cred.; no prereq. Mr. Burton.
- 70f,w,s—Pictorial Composition. Study of the arrangement of the pictorial art of all ages. Original compositions in all mediums. 1 cred.; prereq., 26 or equiv.; ar.; 405E. Mr. Burton.
- 71su—Painting. Still life, head, figure, and landscape. 3 or 6 cred.; prereq., evidence of elementary ability; VI-VII MWF; 405E. Mr. Burton.
- 72su—Sculpture. Modeling in clay. Head, figure, and composition. 3 or 6 cred.; prereq., evidence of elementary ability; I-III MWF; 405E. Mr. Burton.
- 84f,w,s-85f,w,s-86f,w,s—Modeling. Elementary course in clay modeling. Ornament, heads, and animals from casts and from life. 2 cred. per qtr.; prereq., 23; VI-VIII MW; 405E. Mr. Burton.
- 87f,w,s-88f,w,s-89f,w,s—Advanced Modeling. 2 cred. per qtr.; prereq., 86; VI-VIII MW; 405E. Mr. Burton.
- 90f,w,s-91f,w,s-92f,w,s—Illustration. Design of illustration as applied to the printed page. Magazine illustration, posters and books. 1 cred. per qtr.; prereq., 23; ar.; 405E. Mr. Young.
- 93f,w,s-94f,w,s-95f,w,s—Hand Print Processes. Making and printing wood engravings, etchings, drypoints, and lithographs. 2 cred. per qtr.; prereq., 23; ar.; 405E. Mr. Young.

- 121f,w,s,su-122f,w,s,su-123f,w,s,su—Advanced Art. Life drawing, painting, or modeling and decoration. 2 cred. per qtr.; prereq., 29; VI-VIII MW; 405E. Mr. Burton.
- 163s—Theory of Form and Color. Fundamentals of design. 2 cred.; prereq., 26; II TTh; 320E. Mr. Burton.
- 221f,w,s,su-222f,w,s-223f,w,s—Life Drawing and Figure Composition. 2 cred. per qtr.; prereq., 123; hrs. ar. Mr. Burton.
- 287f,w,s-288f,w,s-289f,w,s—Advanced Modeling. Continuation of Arch. 89. 2 cred. per qtr.; prereq., 89; hrs. ar.; 405E. Mr. Burton.

INTERIOR ARCHITECTURE

- 81f,w,su—Stage Design. Making of original models to solve stage problems in design. Form and color. For students interested in dramatics. 2 cred.; no prereq.; VI-VIII TTh; 405E. Mr. Burton.
- 82w,su—Advanced Stage Design. Original models and costumes for actual productions. 2 cred.; prereq., 81; VI-VIII TTh; 405E. Mr. Burton.
- *134f,w,s-135f,w,s-136f,w,s—Interior Design (Int.Arch.). Problems done under individual criticism dealing with the decorative treatment, furniture, and accessories of interiors. 7 cred. per qtr.; prereq., 36; VI-IX MTWThF; 317E. Miss Carter.
- 161w—Decoration and Applied Arts. Historical and technical study of decoration, furniture, etc., together with discussion of the use of color. 2 cred.; prereq., 16, 26; IV TF; 320E. Miss Carter.
- 180su—Architecture and Decoration. History and appreciation of interior architecture, furniture, and decoration. Illustrated lectures and research. 2 cred.; no prereq.; IV TWF; 320E. Mr. Mann.
- 182f-183w—Furniture and Decoration. Historical and technical study of ornament, decoration, furniture, textiles, etc. Discussion of the use of color in decoration. 3 cred. per qtr.; prereq., 16, 23; II TThS; 320E. Miss Carter.
- 184s—Interior Perspective. Principles and methods as applied to interior architecture. 3 cred.; prereq., 35; I-II TThS; 402E. Miss Carter.

LANDSCAPE ARCHITECTURE

- 160f—History of Landscape Architecture. Study of landscape architecture in Italy, France, England, and America. 2 cred.; prereq., 16. (Not offered in 1935-36.)
- 162w—Landscape Design. Theory and practice. Lecture and design problems. 2 cred.; prereq., 39. (Not offered in 1935-36.)
- 164s—Landscape Design. Particular attention to the relation of buildings to their sites and surroundings. 2 cred.; prereq., 162. (Not offered in 1935-36.)

GENERAL

- 11f-12w-13s—Introduction to Architecture. Orientation course. Architecture in its relations to civilization. Architecture in theory and practice. 1 cred. per qtr.; no prereq.; III F; 320E. Faculty of Architecture.

* Work in all design courses is carried on simultaneously and students pass from one grade to the next in sequence in varying lengths of time according to their accomplishment and irrespective of university time units. The normal time required to complete design courses is four years; some students require more time and some less.

- 61f—Projections. Elementary principles of descriptive geometry and their application to architectural problems of projections and intersections. 2 cred.; no prereq.; lect. VI W; 320E; lab. VII-IX W; 402E. Mr. Doseff.
- 62w—Shades and Shadows. Geometrical determination of shades and shadows on architectural forms. 2 cred.; prereq., 61; lect. VI W; 320E; lab. VII-IX W; 402E. Mr. Doseff.
- 63s—Perspective. Principles and methods of perspective as applied to architectural drawing. 2 cred.; prereq., 61; lect. VI W; 320E; lab. VII-IX W; 402E. Mr. Doseff.
- 152w—Estimating. Principles of the quantity survey; cost analysis. 1 cred.; prereq., sr. standing; I W; 320E. Mr. Sault.
- 153s—Business Relations. Relations of the architect, owner, and builder; professional ethics and practice; office administration. 3 cred.; prereq., jr. or sr. standing; II MWF; 320E. Mr. Mann.
- 154w—Acoustics of Buildings. Theory and applications in practice. 2 cred.; prereq., sr. standing; II MW; 320E. Mr. Mann.
- 165f—Housing. Social, economic, and city planning phases of modern group housing. 3 cred.; prereq., sr. and grad. standing; II MWF; 320E. Mr. ———

ASTRONOMY

- 51w—General Astronomy. A survey course covering the fundamental facts and principles of astronomy. 3 cred.; prereq., M.&M. 12; IV MWF; 133Ph. Mr. Luyten.
- 101f‡—Celestial Mechanics. 3 cred.; prereq., M.&M. 25; II MWF; Ph. Mr. Luyten.
- 140f‡—Method of Least Squares. The combination and adjustment of observations and the discussion of their precision as applied especially to engineering, physics, astronomy, and psychology. 3 cred.; prereq., 51 or 11 and M.&M. 24; ar.; Ph. Mr. Luyten.

BACTERIOLOGY AND IMMUNOLOGY

- 41f,w,s,su*—General Bacteriology. Principles and technique of general bacteriology; studies in the morphologic and biologic characters of the common bacteria; culture media; principles of sterilization and disinfection; examination of air, water, milk, food; relation of bacteriology to the industries. Lectures and laboratory. 5 cred.; prereq., 4 cred. of zoology or botany and Inorg.Chem. 10; VII-IX MWF; M.H.
- 121f-122w†—Physiology of Bacteria. Effect of environment on growth; enzymes; food requirements; carbohydrates, protein, and fat metabolism; products of growth; dormancy; death. 6 cred.; prereq., 41 and 8 cred. of organic chemistry or biochemistry; III TThS. Messrs. Green and Halvorson.
- 123s—Applied Bacteriology. Industrial fermentations; bacteriology of water and sewage; interpretation of bacteriological data. 3 cred.; prereq., 121-122; III TThS. Mr. Halvorson.

* Microscope required. Student (except medical) may obtain use of microscope by purchasing \$1.50 microscope card from bursar.

† To receive credit for any part of this course, a student must complete both quarters.

‡ Courses 101 and 140 are usually offered in alternate years, and only one will be given in each year, depending on the demand.

BOTANY

- 1f,w,s—General Botany. Structure, physiology, life histories, and evolution of plants. Lectures and quizzes. 4 cred.; no prereq. Mr. Huff.
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| 1f | Lect. Bot. Aud. (1) III TThS | (2) VI T, VI-VII Th |
| | Quiz Bot. Aud. (1) III M | (5) VI M |
| | (2) II T | (6) VII M |
| | (3) III W | (7) I M |
| | (4) V T | (8) IV T |
- 1w,s Lect. III TThS, Bot. Aud.
- | | | |
|--|------------------------|-----------|
| | Quiz Bot. Aud. (1) I T | (3) III W |
| | (2) II T | (4) IV W |
- 7f,s†—Taxonomy of Flowering Plants. A general study of the classification and relationship of flowering plants. 3 cred.; prereq., 1. Mr. Rosendahl.
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|----|-------------------------------|----------------------------------|
| 7f | I-II MWF; 1, 4, 5, 8, Bot. | |
| 7s | (1) I-II MWF; 1, 4, 5, 8 Bot. | (2) VI-VIII TTh; 1, 4, 5, 8 Bot. |
- 21f,w,s†—Elementary Ecology. An introductory course in the study of plants in relation to their environment. 3 cred.; prereq., 1. Mr. Cooper.
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| 21f | III-IV MWF; 1, 4, 5, 8 Bot. | |
| 21w | Lect. VI TTh; Bot. Aud. | Lab. I-II ThS; 1, 4, 5, 8 Bot. |
| 21s | VI-VIII TTh; 1, 4, 5, 8 Bot. | |

CHEMICAL ENGINEERING

- 1f,w—Power Plant Chemistry. (M.E.) Proximate analysis of coal, determination of calorific power; technical analysis of flue gases and furnace gases. 3 cred.; prereq., Inorg. Chem. 16. Mr. Stoppel.
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| 1f | Lect. II T; 215C | |
| | Rec. II Th; 215C | |
| | Lab. (1) I-III MF; 10C | |
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|----|--------------------|--|
| 1w | Lect. III T; 215C | |
| | Rec. III Th; 215C | |
| | Lab. II-IV MF; 10C | |
- 2s—Boiler Water. (Engineers and miners.) 2 or 3 cred.; prereq., 1 or Anal. Chem. 9 or by permission. Mr. Stoppel.
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|----|------------------|--|
| 2s | Lect. IV M; 215C | |
| | Lab. ar | |
- 31s—Chemistry of Engineering Materials. Application of general chemistry in engineering practice. Technology and properties of wood, iron, and steel, alloys, fuels, water, cements, coating materials, etc. 3 cred.; prereq., Inorg. Chem. 16. IV MWF; 115C. Mr. Montonna.
- 41s—Gas Manufacture and Distribution. Fundamental principles of manufacture of coal gas, carbureted water gas, and other industrial fuel gases, and the apparatus for manufacture and distribution. Lectures and recitations. 3 cred.; prereq., Inorg. Chem. 16; ar. Mr. Montillon.
- 76f-77w—Applied Electrochemistry. Application of the electric current to chemical processes. Laws and phenomena of electrochemistry, batteries, electroplating, electric furnace construction and operation, and electrochemical products. Open to engineers who have had one year of chemistry and one year of physics. Class and laboratory work. 3 cred. per qtr.
- 80s—Chemical Engineering Materials. The technology, physical and chemical properties, and economic considerations of materials used in the construction of chemical engineering equipment and plants. Ferrous and non-ferrous metals and alloys, woods, cement, and ceramic materials, textiles, rubber, pro-

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

- tective materials, etc. 1 cred.; prereq., Inorg. Chem. 13; II TS; 325C. Mr. Mann.
- 96f-97w-98s—Senior Thesis. 5 cred. per qtr.; sr.
- 101f,su—Unit Operations. Principles and materials of construction, operation, and uses of the unit operation equipment. Lectures and recitations. 3 cred.; prereq., 80, Anal. Chem. 1, 2; I MTWFS; 325C. Mr. Mann.
- 102s,su—Unit Operations. Industrial stoichiometry. Problems in combustion of fuels, heat balances. Manufacture of producer gas, industrial gases and burning of limestone. 3 cred.; prereq., 101. Messrs. McMillen and Ruth.
(1) II MWF; 325C (2) II MWF; 111C
- 103f—Unit Operations. Problems in fluid flow and heat transfer and their applications including economic balance. 3 cred.; prereq., 101. Messrs. McMillen and Ruth.
(1) II MWF; 111C (2) II MWF; 115C
- 104w—Unit Operations. Problems in evaporation, humidification and air conditioning, drying, distillation, and filtration. 3 cred.; prereq., 101. Messrs. McMillen and Ruth.
(1) II MWF; 111C (2) II MWF; 115C
- 105f—Gas and Fuel Analysis. The chemical analysis of solid and gaseous fuels with a determination of their calorific value and methods of testing industrial gases. 3 cred.; prereq., Anal. Chem. 1, 2. Mr. Stoppel.
Lect. I Th; 325C
Rec. II S; 225C
† Lab. (1) VI-IX M; 10C (4) VI-IX W; 10C
(2) II-V T; 10C (5) VI-IX Th; 10C
(3) VI-IX T; 10C
- 106w—Petroleum and Petroleum Products. Technology and testing of petroleum products, principally gasoline, illuminating, fuel, and lubricating oils. 3 cred.; prereq., Org. Chem. 51. Mr. Stoppel.
Lect. I Th; 225C
Rec. II S; 225C
† Lab. (1) VI-IX M; 10C (4) VI-IX Th; 10C
(2) II-V T; 10C (5) VI-IX F; 10C
(3) VI-IX T; 10C
- 108s—Unit Operations Problems. Problems in absorption, extraction, crystallization, crushing and grinding. Size separation. Discussion of equipment used. 3 cred.; prereq., 104; I MWF; 111C. Mr. Ruth.
- 110s*—Special Analytical Apparatus. The use of special apparatus for chemical and physical testing of chemical products including gas apparatus, calorimeters for gases, liquids and solids, optical apparatus, viscosimeters, turbidimeters, etc. 3 cred.; prereq., Anal. Chem. 1, 2. Mr. Stoppel.
Lect. II Th; 215C Lab. VI-VIII MW; 10C
- 111f-112w-113s—Chemical Engineering Plant Design. Planning of plants and design of equipment based on collected data for the same. Classroom and laboratory work. 2 cred. per qtr.; prereq., 104. Mr. Montillon.
- 117s—Chemical Engineering Equipment Design. Fundamental principles in the design of simple chemical engineering equipment. Laboratory work. 3 cred.; prereq. 104. Messrs. Montonna and McMillen.
Lect. IV T; 410C
Lab. (1) VI-IX TTh; 410C (2) VI-IX TTh; 443C
- 121w—Chemical Engineering Economics. The economic and business considerations controlling chemical engineering industries. Statistical analysis of

* For permissible substitute, see page 56.

† Each section is limited to fourteen students.

- these industries. Raw and finished products. Principles of plant location, layout, and design. Unit operation costs. Principles of management operation and control. 3 cred.; prereq., 132; III MWF; 111C. Mr. Montonna.
- 131w—Industrial Inorganic Chemistry. Applications of unit operations common to chemical industries, chemistry involved, equipment used, marketing of products, utilization of by-products, use of trade journals. Topics: Industrial water, acids and alkalies, salts, chlorine, ammonia, glass, pigments, etc. Lectures and recitations. 4 cred.; prereq., (for chem. engrs.) 101; (for chem.) Anal. Chem., 1, 2; I MTWFS; 325C. Mr. Mann.
- 132s—Industrial Organic Chemistry. Similar to 131 but covering organic field. Destructive distillation of coal and wood, petroleum oils, paper, unit organic operations, synthetic products, vegetable and animal oils, fats, waxes, soap, sugar, starch, etc. 4 cred.; prereq., (for chem. engrs.); 101; (for chem.) Org. Chem. 52 and Anal. Chem. 1, 2; I MTWThF; 325C. Mr. Mann.
- 133f—Chemistry of Explosives. History and technology of modern explosives, their manufacture and uses, war gases. Lectures, required reading, and reports. 3 cred.; prereq., 132; I MWF; 115C. Mr. Montonna.
- 134f—Intermediates and Dycstuffs. Their technical chemistry and manufacture. Processes, purification, uses, etc. Lectures and recitations. 3 cred.; prereq., 132 or equiv. (may be accompanied by laboratory work in 160); I TThS; 111C. Mr. Montonna.
- 136w—Chemistry and Technology of Cellulose. Processes and industries based on the use of cellulosic materials including the chemical and technological considerations. Pulp and paper, plastics, esters, rayon, etc. 3 cred.; prereq., Org. Chem. 52 or equiv.; I TThS; 111C. Mr. Montonna.
- 140s—Sanitary Chemistry. Discussion of the chemistry of sewage and potable waters. Purification of water supplies, and the treatment of municipal and industrial wastes. Lectures and recitations. 3 cred.; jr., sr.; ar. prereq., Bact. 41 or by permission. Mr. Stoppel.
- 141s—Gas Manufacture and Distribution. Fundamental principles of manufacture of coal gas, carbureted water gas, and other industrial fuel gases, and the equipment for manufacture and distribution. Open to chemists and chemical engineers. 3 cred.; prereq., Org. Chem. 52. Mr. Montillon.
- 150s—Unit Operations Laboratory. Operation and testing of chemical engineering equipment. Laboratory work and reports. 1 cred.; prereq., 101. Mr. Ruth.
 Lab. (1) VI-VIII M; 90C (3) II-IV S; 90C
 (2) VI-VIII W; 90C (4) Arranged
- 151f,su*—Chemical Manufacture (Inorganic). Manufacture of technical products on a scale large enough to afford data for the determination of operating conditions and costs of manufacture. Use of semi-plant scale equipment. Technical trade journals used. Laboratory. 3 or more cred.; prereq., 101. Messrs. Montonna and McMillen.
- 152w,su*—Chemical Manufacture (Organic). Similar to 151 but covering the unit organic processes. Laboratory. 3 or more cred.; prereq., 101. Messrs. Montonna and McMillen.
- 153f-154w-155s-156su—Special Laboratory Problems. Investigations on chemical engineering equipment and its use in the manufacture of special chemical products on a semi-works scale. 3 or more cred. per qtr. Messrs. Mann, Montillon, and Montonna.

* Required for chemical engineers during summer quarter.

- 160f—Intermediates and Dyestuffs Laboratory. Manufacture of intermediates and dyestuffs using semi-works equipment. Operations on sulphonation, hydroxylation, nitration, reduction, alkylation, diazotization, coupling etc. Laboratory. 3 or more cred.; prereq., 132, 152 and preceded or accompanied by 134. Mr. Montonna.
- 168w—Petroleum and Petroleum Products. (Miners.) Technology and testing of petroleum and petroleum products. 3 cred.; prereq., Anal. Chem. 9. Mr. Stoppel.
Lect. I M; 115C
Rec. I W; 115C
Lab. VI-IX W; 10C
- 176f-177w—Applied Electrochemistry. Application of the electric current to chemical processes. Laws and phenomena of electrochemistry, batteries, electroplating, electric furnace construction and operation, and electrochemical products. 4 cred. per qtr.; prereq., Phys. Chem. 103. Mr. Montillon.
Lect. III MWF; 115C (f), 111C (w) Lab. VI-VIII W or Th; 25C
- 179s—Applied Electro-Organic Chemistry. Theory and practice of the electrochemistry of organic compounds. Lect. and rec., lab. 1 or 2 cred. optional. 3 cred.; prereq., 176-177; III MWF; 115C. Mr. Mann.
- 187s—Inspection Trip. Various industrial plants in the middle west are visited by the class on a trip which lasts about ten days, during the spring vacation period. Written reports covering the plants must be submitted. Required of seniors in Chemical Engineering. 2 cred.; prereq., 131, 132. Mr. Mann.
- 201f-202w-203s—Seminar. Presentation and discussion of papers concerning the newer developments in chemical engineering. 1 cred. per qtr. Mr. Mann.
- 205f-206w-207s—Advanced Process Problems. A study of new developments in the unit operations including the theory and practical applications to equipment and plant process design problems. 2 cred. per qtr.; prereq., 104. Open to graduate students only. (Not offered in 1935-36.)
- 208f-209w-210s—Advanced Chemical Engineering. An extended study of the principles of chemical engineering and their applications to industrial problems, together with surveys of the literature. 2 cred. per qtr.; prereq., 104. Open to graduate students only. Mr. Montillon.
- 301f,su-302w-303s—Research in Chemical Engineering. Unit operations, applied electrochemistry and electric furnace work, and chemical manufacture. Cred. ar. Messrs. Mann, Montillon, Montonna, Stoppel, and Ruth.

INORGANIC CHEMISTRY

(A fee of \$2 per quarter is charged for Courses 1 to 17, inclusive.)

- 1f,su-2w-3s—General Inorganic Chemistry. 1. Study of general laws of chemistry and of the non-metals and their compounds. 2. Continuation of Course 1. 3. Metals and their compounds. Continuation of Course 2. 4 cred. per qtr.; no prereq. Messrs. Pervier and Stephens.
- (1) (Pre-med., pre-dent.)
Lect. VI MWF; 225C
Lab. VII-IX T; 290C
Quiz. VI T; ar C
- (2) (Agr., arch.)
(f,w) Lect. VII MWF; 225C Lab. VIII-IX MW; 210C
(s) Lect. VII MF, IV S; 100C Lab. VIII-IX MF; 210C

4f,su-5w—General Inorganic Chemistry. Study of the general laws of chemistry and of the non-metals and their compounds. More intensive than Course 1f-2w-3s. 4 cred. per qtr.; prereq., high school chemistry. Messrs. Heisig, Stephens, and Maynard.

- 4f (Engrs.)
 Lect. (1) I TThS; 100C
 (2 and 3) IV T; 225C; VI Th,
 IV S; 100C
 Quiz (1) VIII M; 100C
 (2) and (3) III M; 225C
 (Pre-med., pre-dent.)
 Lect. (4) VI MWF; 100C
 Lab. (1) VII-IX T; 210C
 Quiz (1) VI T; ar C or
 (2) VI Th; ar C

- Lab. (1) II-IV T; 110C
 (2) I-III F; 110C
 (3) II-IV W; 110C
 (2) VII-IX Th; 210C

- 5w (Engrs.)
 Lect. (1) I TThS; 100C
 (2 and 3) IV T; 225C; VI Th,
 IV S; 100C
 Quiz (1) VIII M; 100C
 (2) and (3) VI T; 100C
 (Pre-med., pre-dent.)
 Lect. (4) VI MWF; 100C
 Lab. (1) VII-IX T; 210C
 Quiz (1) VI T; ar C
 (2) VI Th; ar C

- Lab. (1) II-IV T; 110C
 (2) I-III F; 110C
 (3) II-IV W; 110C
 (2) VII-IX Th; 210C

6f,su-7w—General Inorganic Chemistry. Study of the general laws of chemistry and of non-metals and their compounds. 5 cred. per qtr.; no prereq. Miss Cohen and Mr. Barber.

- Sec. 1 (Not open to miners)
 Lect. II MWF; 225C

- Lab. I-III ThS; 210C
 or
 I-II TThS; 210C

- Sec. 2 (Miners)
 Lect. II TThS; 100C

- Lab. VII-IX T, VI-VIII Th; 110C

8s†—Qualitative Chemical Analysis. (S.L.A., miners, and pharm.) Laboratory work in systematic qualitative analysis with lectures on solutions, ionization, chemical and physical equilibria, oxidation, and reduction, etc. 5 cred.; prereq., 7. Miss Cohen and Mr. Barber.

- Sec. 1 (Not open to miners)
 Lect. II MWF; 225C

- Lab. I-II TThS; 210C
 or
 I-III ThS; 210C

- Sec. 2 (Miners only)
 Lect. II TThS; 100C

- Lab. VII-IX TTh; 110C

9f,w,su-10w,s—General Inorganic Chemistry. Course 9. A study of general laws of chemistry and of non-metals and their compounds. More intensive than Courses 6 and 7. Course 10. The metals and their compounds. 5 cred. per qtr.; prereq., one year of high school chemistry. Messrs. Sneed and Reyerson, Miss Cohen, and Mr. Maynard.

- 9f-10w Lect. (1) (Agr.) VII MWF 100C
 (2) (Chem., S.L.A.) II MWF; 100C

- Lab. (1) VIII-IX MWF; 110C
 (2) I-III ThS; 290C
 (3) (S.L.A.) I-II TThS; 290C

- 9w-10s Lect. (1) III MWF; 225C
 Lab. VI-VII MWF; 210C, 290C

- (2) III MWF; 325C

11f,s,su—Qualitative Chemical Analysis. Laboratory work in systematic qualitative analysis with lectures on solutions, ionization, chemical and physical

† To be followed by Course 13, not 12.

- equilibria, oxidation and reduction, etc. 4 cred.; prereq., 3 or 5. Miss Cohen, Mr. Stephens.
- 11f Lect. IV MWF; 225C Lab. VI-IX F; 210C
 11s Lect. VI MWF; 100C Lab. (1) VI-IX T; 210C
 (2) VI-IX Th; 210C
- 12f,s,su-13f,w*†—Qualitative Chemical Analysis. Laboratory work in systematic qualitative analysis with lectures on solutions, ionization, chemical and physical equilibria, oxidation, and reduction, etc. 5 cred. per qtr.; prereq., 8 or 10. Messrs. Sneed, Heisig, and Maynard.
- 12f Lect. I TThS; 225C Lab. I-III MW; 290C
 12s Lect. II MWF; 100C Lab. I-III ThS; 290C
 13f,w Lect. VI WF; 325C Lab. VII-IX WF, VI-VIII M; 290C
- 14f,su-15w—General Inorganic Chemistry. (Engrs.) General laws of chemistry; the non-metals, the metals, and their compounds. 5 cred. per qtr.; no prereq. Mr. Barber.
- Lect. II TThS; 100C
 Quiz VIII F; 100C
 14f Lab. (1) II-IV MW; 110C
 (2) VII-IX TTh; 110C
 15w Lab. (1) VII-IX T; VI-VIII Th; 110C
 (2) II-IV MW; 110C
- 16s—Qualitative Chemical Analysis. (Engrs.) Laboratory work in systematic qualitative analysis with lectures on solutions, ionization, chemical and physical equilibria, oxidation and reduction, and other subjects pertinent to qualitative analysis. 5 cred.; prereq., 5 or 15. Messrs. Barber, Heisig, and Maynard. (Engrs. who entered with h.s. chem.)
- Lect. (1) I TThS; 100C Lab. (1) VII-IX M, II-IV S; 110C
 (2) IV TS, VI Th; 225C (2) VI-VIII TF; 110C
 (3) I TThS; 100C (3) I-III W, II-IV F; 110C
- (Engrs. who entered without h.s. chem.)
 Lect. (4) II TThS; 100C Lab. (4) I-III W, II-IV F; 110C
 (5) VII-IX TTh; 110C
- 17s,su—Glassblowing. Exercises in the more important operations in building chemical apparatus. 1 cred.; no prereq. Mr. Stephens.
- 51s—Senior Qualifying Examination in General Inorganic Chemistry and Qualitative Analysis. Required of juniors in the School of Chemistry. Prereq., Anal. Chem. 1, 2. Mr. Sneed.
- 96f-97w-98s—Senior Thesis. 5 cred. per qtr.; sr.
- 101s—History of Chemistry. Historical development of the theories of chemistry from the period of the ancients to the present time is covered by this course, particular emphasis being given to modern theories and laws. 2 cred.; prereq., Org. Chem. 52 or permission of instructor. Miss Cohen.
- 102w,su—Advanced Qualitative Analysis. This course includes an analysis of minerals, alloys, paints, and the methods of detecting some of the rarer elements. 2 or 3 cred.; prereq., Anal. Chem. 1, 2; hrs. ar.; 290C. Mr. Sneed.
- 103f-104w-105s—Advanced Inorganic Chemistry. Discussion of the periodic system and the chemistry of the elements and their compounds and of special subjects of inorganic chemistry such as valency, oxidation and reduction, complex ions, etc. 3 cred. per qtr.; prereq., Anal. Chem. 1, 2, Org. Chem. 52; I TThS; 215C. Mr. Sneed.

* Course 12f may be taken by students registered in the College of Engineering and Architecture in place of 16s.

† Students who have completed Course 8 should omit Course 12 and take Course 13.

- 106f-107w-108s—Theories of Inorganic Chemistry. Theory of valency, electron conception and octet theory of G. N. Lewis, geometrical aspects, co-ordination theory, and modern theories of chemical combination. 3 cred. per qtr.; prereq., Phys. Chem. 103 or by permission. Mr. Glockler.
- 109w-110s—Synthetic Inorganic Chemistry. Methods of preparation and purification of inorganic compounds of special interest. Current literature. 3 to 5 cred. per qtr.; prereq., 13; 2 lect., with lab.; ar. Mr. Heisig.
- 115su—Commercial Products and Their Analysis. Study of current commercial products, their composition and methods of analysis. 5 cred.; prereq., Anal. Chem. 1 and 2; lect. and lab. Mr. Barber.
- 134f-135w-136s—Seminar: Modern Problems in Inorganic Chemistry. 1 cred.; prereq., Anal. Chem. 1 and 2 and Phys. Chem. 103. Mr. Sneed.
- 301f,su-302w-303s—Research in Inorganic Chemistry. Cred. ar. Messrs. Sneed, Reyerson, and Heisig.

ANALYTICAL CHEMISTRY

(A fee of \$2 per quarter is charged for Courses 1 to 9, inclusive.)

- 1w,su-2s,su—Quantitative Analysis. Introductory courses covering the general principles and methods of quantitative analysis. Typical problems are assigned and attention given to proper laboratory practice. Course 1, Gravimetric Analysis. Course 2, Volumetric Analysis. 5 cred. per qtr.; prereq., Inorg. Chem. 13. Mr. Geiger.
- Lect. VI M; 325C
 Quiz VI F; 410C
 Rec. (1) VI W; 111C (3) VIII W; 111C
 (2) VII W; 111C
 Lab. (1) VII-IX MF, VII-IX W; 310C (3) VII-IX MF, VI-VII, IX W; 310C
 (2) VII-IX MF, VI, VIII-IX W; 310C
- 7f,s,su—Quantitative Analysis. (Pre-med.) Introductory course covering the general principles and methods of quantitative analysis, both gravimetric and volumetric. Typical problems are assigned and attention is given to proper laboratory practice. 4 cred.; prereq., Inorg. Chem. 11 or 13. Messrs. Geiger and Sarver.
- 7f Lect. (1, 2) VI M; 325C (3) VI Th; 325C
 Rec. (1) VI W; 215C (Limit 35) (3) VII Th; 325C
 (2) VI F; 315C (Limit 35)
 Lab. (1) VII-IX MW, VI-VII F; 310C (3) VII-IX T, VIII-IX Th,
 (2) VII-IX MF, VI-VII W; 310C I-III or II-IV S; 310C
- 7s Lect. VI Th; 325C
 Rec. VII Th; 325C
 Lab. VII-IX T, VIII-IX Th, I-III or II-IV S; 310C
- 9w—Quantitative Analysis. (Dentists, engineers, miners.) Short introductory course covering general principles of quantitative analysis, both gravimetric and volumetric. Typical problems are assigned and attention given to proper laboratory practice. 3 cred.; prereq., Inorg. Chem. 8, 11, or 16. Mr. Sarver.
- Lect. VII Th; 325C Lab. VI-IX T, VIII-IX Th; 310C
- 52f—Fundamentals of Analytical Chemistry. Introductory lecture and recitation course covering the general principles of gravimetric and volumetric analysis for advanced standing students and graduate students who have inadequate knowledge of the subject. One lect.; one rec.; no cred.; ar. Mr. Geiger.
- 53s—Senior Qualifying Examination in Quantitative Analysis. Required of juniors in the School of Chemistry. Prereq., 1, 2. Mr. Kolthoff.

- 201f-202w-203s—Selected Topics in Analytical Chemistry. 3 cred. per qtr.; prereq., 1, 2, and 123. Mr. Kolthoff.
- 204s—Modern Theories of Acidity and Basicity. 2 cred.; prereq., Phys. Chem. 103; ar. Mr. Kolthoff.
- 301f,su-302w-303s—Research in Quantitative Analysis. Cred. ar. Messrs. Kolthoff, Geiger, Sarver, and Sandell.

ORGANIC CHEMISTRY

- 1f,w,su-2w,s,su†—Elementary Organic Chemistry. (Pre-med., pre-dent., pharm.) Discussion of important classes of organic compounds, both aliphatic and aromatic. Laboratory work includes the preparation of typical substances. 4 cred. per qtr.; prereq. Inorg. Chem. 11. Messrs. Koelsch and Thompson.
- 1f-2w Lect. I MWF; 100C
Lab. Conference II T; 225C
Quiz I T; ar
Lab. (1) VI-IX T; 390C
(2) VI-IX W; 390C
(3) I-IV S; 390C
- 1w-2s Lect. IV MWF; 100C
Lab. Conference IV T; 100C
Quiz V T; ar
Lab. (1) VI-IX W; 390C
(2) VI-IX Th; 390C
(3) I-IV S; 390C
- 51f-52w†-153s—Elementary Organic Chemistry. (All except pre-med., pre-dent., pharm.) Discussion of the important classes of organic compounds, both aliphatic and aromatic, together with some heterocyclic compounds. Laboratory work includes the preparation of typical substances. Course 153 is a prereq. to all other advanced courses in organic chemistry. 5 cred. per qtr.; prereq., 15 cred. of chemistry. Messrs. Smith and Lauer.
- Lect. III MWF; 100C. Mr. Smith
Lab. Conferences (f,w) III ThS; 100C
(s) III Th, I S; 100C. Mr. Lauer
Lab. (1) II-IV, VI-VIII T; 390C. Mr. Lauer
(2) VI-VIII T, VI-VIII Th; 390C
(3) VI-VIII W, VI-VIII F; 390C
- 54f-55w†-156s—Elementary Organic Chemistry (without laboratory). (All except pre-med., pre-dent., pharm., and chem. majors.) Discussion of the important classes of organic compounds, both aliphatic and aromatic, together with some heterocyclic compounds. General discussion of organic laboratory practice. 3 cred. per qtr.; prereq., 15 cred. of chemistry; III MWThF; 100C. Messrs. Smith and Lauer.
- 96f-97w-98s—Senior Thesis. 5 cred. per qtr.; sr. May be taken with any member of the Organic Chemistry Division staff.
- 105f-106w-107s—Advanced Organic Chemistry. Advanced, descriptive course covering the field of organic chemistry, together with an introduction to the literature of organic chemistry. Lectures and outside reading. Ability to read German is assumed. 3 cred. per qtr.; prereq., 153 or equiv. I MWF; 225C. Mr. Smith.

† To receive credit for any part of this course a student must complete the parts preceding the dagger.

- 110f*—Organic Qualitative Analysis. Reactions of typical functional groups, identification of pure organic compounds, separation and identification of constituents of mixtures. 5 cred.; prereq., 153 or equiv.; lect. IV T and 1 hr. ar.; 315C; 9 hrs. of lab. work ar. Mr. Koelsch.
- 130s—Organic Quantitative Analysis. Methods of proximate and ultimate analysis of organic compounds, with special attention to semi-micro methods. 2 or 3 cred.; prereq., 153 and Anal. Chem. 1 and 2; ar. One lecture and 3 or 6 hours lab. work per week. Mr. Lauer.
- 139f,w,s—Advanced Organic Chemistry Laboratory Work. Selected laboratory problems of an advanced nature, including some original work. Ability to read German is assumed. Students are advised to take this course during the winter quarter. Permission of instructor is required to take it at any other time. 2 to 5 cred.; prereq., 153. Mr. Thompson.
- 141f—Reagents in Organic Chemistry. Discussion of typical reagents used in organic reactions: their limits of applicability, methods of use, and types of substances with which they react. 3 cred.; prereq., 153; IV MWF; 315C. Mr. Koelsch.
- 142w-143s—The Chemistry of Natural Products. Discussion of the organic chemistry of important classes of natural products. 3 cred. per qtr.; prereq., 153; IV MWF; 315C. Messrs. Lauer and Thompson.
- 201f-202w-203s—Organic Chemistry Seminar. 1 hr. per week. 1 cred. per qtr. Required of all graduate students taking major work in organic chemistry. Messrs. Smith, Lauer, Koelsch, and Thompson.
- 205f-206w—Theoretical Organic Chemistry. Structure, reaction mechanisms, relation of physical properties to constitution, and other topics of a theoretical nature. 3 cred. per qtr.; prereq., 107. (Not offered in 1935-36.)
- 212s—Physico-Organic Chemistry. Contributions made to organic chemistry by kinetic and equilibrium studies of organic reactions, including mechanisms of catalytic and ionotropic reactions; and an introduction to the current electronic formulations of organic reactions. Lectures, outside reading, and a term paper are required. 4 cred.; prereq., 107, Phys. Chem. 103, and calc., or permission of the instructor. (Not offered in 1935-36.)
- 301f-302w-303s—Research in Organic Chemistry. Cred. ar.; prereq., 110. Messrs. Smith, Lauer, Koelsch, and Stephens.

PHYSICAL CHEMISTRY

- 96f-97w-98s—Senior Thesis. 5 cred. per qtr.; ar.
- 101f-102w-103s—Physical Chemistry. General survey of the subject. 3, 4, or 5 cred. per qtr., depending on the amount of lab. work; prereq., 2 yr. coll. chem., 1 yr. coll. phys. Knowledge of calculus is advisable. Messrs. MacDougall, Glockler, and Livingston.
Lect. IV MWF; 325C
Rec. IV S; 325C, 410C, (f,w) 225C
Lab. conf. (f) VI W; (w,s) VI M; 410C (for students registered for 5 cred.)
Lab. (1) (f) VI-VIII M, VII-VIII W; 190C (2) VI-VIII F; 190C
(1) (w,s) VII-VIII M, VI-VIII W;
190C
- 105w—Application of Higher Mathematics to Chemical Problems. 3 lect.; 3 cred.; prereq., integral calculus and permission of the instructor. Mr. MacDougall.

* A charge of \$10 is made to cover special chemicals in this course.

- 106su-107su—Physical-Chemistry. Courses 106 and 107su when completed in two summer quarters are equivalent to Phys. Chem. 101-102-103. (Given in alternate years. 106 given in 1936.) $4\frac{1}{2}$, 6, or $7\frac{1}{2}$ cred., depending on amount of lab.; prereq., 2 yr. coll. chem., 1 yr. coll. phys.; lect. and rec. I-II MTWThF; 115C; lab. VI-IX MTWTh; 190C. Mr. Livingston.
- 110f—Physical Chemistry. Short introductory course treating as non-mathematically as possible some of the principles of the subject. 3 cred.; prereq., 2 yr. coll. chem.; IV MWF; 215C. Mr. Glockler.
- 116f-117w-118s—Advanced Physical Chemistry. Certain topics are studied intensively and many problems are assigned in this course. 3 cred. per qtr.; prereq., 103 and calculus; hrs. ar. Mr. Glockler.
- 128f-129w-130s—Colloid Chemistry. 2 cred. per qtr.; prereq., 103. Mr. Reyerson.
- 131f-132w-133s—Colloid Chemistry Laboratory. Cred. and hrs. ar. Must be preceded or accompanied by 128, 129, or 130. Mr. Reyerson.
- 161f-162w—Radioactivity. Discovery; theory of atomic disintegration; properties, transformations, and preparation of radioactive elements; properties and effects of alpha, beta, and gamma rays; radioactive and non-radioactive isotopes. 2 cred. per qtr.; prereq., 103; II TTh; 111C. Mr. Lind.
- 171su. Elements of Radioactivity. 2 cred.; III TWThF; 115C. Mr. Lind.
- 175s—Photochemistry. History, development, and present status of photochemistry. 3 cred.; prereq., optics and 103; III MWF; 215C. Mr. Lind.
- 201f-202w-203s—Thermodynamics and Chemistry. A detailed study of the principles of thermodynamics and their application to physical and chemical phenomena. 4 cred. per qtr.; prereq., 103 and calculus; II TThS; 115C. Mr. MacDougall.
- 204f-205w-206s—Kinetic Theory and Atomistics. Kinetic theory of gases and liquids, crystal structure, structure of atom, quantum theory. 4 cred. per qtr.; prereq., 103 and calculus. (Not offered in 1935-36.)
- 211f-212w-213s—Advanced Physical Chemistry Laboratory. To accompany or follow any of the advanced courses in physical chemistry. Cred. ar.; prereq., 103. Mr. MacDougall.
- 221f-222w-223s—Colloid Seminar. 1 cred. per qtr. Mr. Reyerson.
- 251f-252w-253s—Physical Chemistry Seminar. For students taking advanced courses in physical chemistry. 1 cred. per qtr.; II M; 315C. Mr. MacDougall.
- 264f,w,s—Radioactivity Laboratory. Use and standardization of electroscopes, radioactive measurements, and quantitative determination of radium in ores, minerals, waters, and plant products. 1 or 2 cred. Must be preceded or accompanied by 161. Mr. Lind.
- 271f-272w-273s—Chemical Activation. (Seminar 1 hour per week for graduate students.) Current theories of chemical activation, including photochemical excitation, gaseous ionization, and the kinetics of cluster and of chain reactions. 1 cred. per qtr.; prereq., physics and physical chemistry. Mr. Lind.
- 301f,su-302w-303s—Research in Physical Chemistry, including work in electrochemistry, photo- and radio-chemistry, and colloids. Cred. ar. Messrs. Lind, MacDougall, Reyerson, Glockler, and Livingston.

CIVIL ENGINEERING

SURVEYING

- 11f—Surveying. Lectures and field problems; use of steel tape and transit. Computation and platting of field notes, determination of areas. 3 cred.; prereq., M.&M. 12, Dr. 2. Mr. Boon.
 Lect. (1) VII W; 21E (2) I Th; 21E
 Lab. (1) VII-IX M, VI-IX Th; 1E (3) I-III T, VI-IX T; 1E
 (2) VI-IX F, I-III S; 1E
- 12w—Surveying. Lectures and drafting room. Platting of profiles and mass diagrams, computation of earthwork volume and overhaul. Public land survey. Mapping and conventional signs. 3 cred.; prereq., 11. Messrs. Cutler, Zelner, and Boon.
 Lect. (1) VII M; 21E (2) III W; 21E
 Lab. (1) II-IV T, VI-IX Th; 217E (3) VI-IX T, I-III Th; 217E
 (2) VI-VIII M, VI-IX W; 217E
- 13s—Surveying. Lectures and field problems; differential and profile leveling; cross-sections, circular curves, and adjustment of instruments. 3 cred.; prereq. 12. Messrs. Cutler and Boon.
 Lect. (1) VI Th; 21E (2) III Th; 21E
 Lab. (1) II-IV T; 217E; I-IV S; 21E (3) I-IV T; 7E; I-III S; 217E
 (2) VI-IX W; 7E; VI-VIII Th; 229E
- 14f—Surveying. Complete topographical survey, stadia method, is made and plat-
 ted. 3 cred.; prereq., 13. Mr. Zelner.
 (1) VI-IX WF; 217E (3) VI-IX TTh; 217E
 (2) VI-IX M, I-IV S; 217E
- 15w—Surveying. Purpose and theory of triangulation, meridian determination, base line measurements, computations. Theory and use of the sextant. Hydrographic surveying. Aerial mapping. Applied problems. 2 cred.; prereq., 14. Mr. Zelner.
 (1) II-III T, I W, III F; 21E (2) II MWF, III S; 21E
- 16s—Surveying. Classroom and field. Field problems with the sextant. Triangulation reading and computations. Plane table theory. Various field solutions of the "three point" problem. Plane table survey based on triangulation control. Topographic map. 2 cred.; prereq., 15. Mr. Zelner.
 (1) I-II T; 22E; VI-IX M; 21E (2) II-III F; 22E; I-IV S; 7E
- 17f,s—Surveying. Short course including problems in chaining, transit and tape surveys; differential, trigonometric and profile leveling, computations and platting of notes, etc. Open to students other than Civil Engineers. 3 cred.; prereq., M.&M. 12. Messrs. Cutler, Zelner, and Boon.
 17f Lect. (1) III Th; 21E Lab. I-III M, I-IV W; 217E
 17s Lect. (1) VI F; 21E (3) I W; 21E
 (2) I F; 21E
 Lab. (1) VI-IX T, I-III Th; 5E (3) I-IV M, II-IV W; 21E
 (2) VI-IX Th; 21E; VI-VIII F; 7E
- 18w—Land Surveying. Classroom study of the theory and field methods necessary to determine the boundaries, descriptions, and areas of rural and urban lands. United States public land system. Resurveys, monuments, co-ordinates. 2 cred.; prereq., Agr.E. 20; ar. Mr. Boon.
- 23su—Summer Camp. Six weeks immediately preceding the beginning of the senior year. Extended railroad, topographic, hydrographic, and triangulation surveys. 9 cred.; prereq., 16, 22. Fee, \$25. Messrs. Cutler, Zelner, Boon.

- 109f,w,s—Cadastral Surveying. Study of the newer methods of accurate surveys of property with geodetic control and with co-ordinates of property monuments. 2 cred.; prereq., 16. Mr. Boon.
 109f IV MF; 4E
 109w I MF; 227E
 109s VI M, IV F; 206E
- 110f,w,s—Errors in Surveying. Studying of the sources, importance and reduction of errors in surveying. 2 cred.; prereq., 23. Mr. Boon.
 110f IV TS; 203E
 110w IV MF; 227E
 110s Ar.
- 111f,w,s—Methods of Computation. Study of the methods used in various problems in precise and geodetic surveys and distribution of errors. 2 cred.; prereq., 110; ar. Mr. Boon.

RAILWAY ENGINEERING

- 21w—Railway Engineering. General survey of the problems of railway location, including grades, curvature, rise and fall, etc. 2 cred.; prereq., 13. Mr. Boon.
 Lect. I Th; 227E
 Lab. (1) I-IV S; 229E (2) I-IV T; 229E
- 22s—Railway Engineering. Study of the construction and maintenance of railway track and structures. Simple, compound, and spiral curves, and turnouts. 2 cred.; prereq., 21. Messrs. Cutler and Boon.
 Lect. VI W; 227E
 Lab. (1) VI-IX F; 229E (2) VI-IX M; 229E
- 121f—Railway Engineering. Train resistance, ruling and momentum grades, curvature, distance, rise and fall as factors in location and operation of railroads. Train loading, acceleration, retardation; locomotives and equipment. Operating costs governing grade revision. 3 cred.; prereq., 22. Mr. Cutler.
 Lect. III F; 227E
 Lab. (1) I-III T, VII-IX Th; 229E (2) VII-IX T, I-III Th; 225E
- 122w—Railway Engineering. Lectures, office work, and field inspection. Design and operation of various types of yards and terminals, and terminal facilities, including the hump, engine house, coal and water station. Signaling and interlocking. 3 cred.; prereq., 22. Mr. Cutler.
- 123s—Railway Engineering. Design and construction of railroad buildings and structures; culverts, wooden trestles, switches, cross-overs, crossing frogs, etc. Earthwork computation, estimates and reports. Distribution of material by mass diagram. 3 cred.; prereq., 22. Mr. Cutler.
- 124w—Transportation. Development of railway and inland waterway transport, railway regulation and control with special reference to the 1920 Railway Transportation Act, geographical, financial, and rate grouping of railways, Interstate Commerce Commission method of accounting, cost and value of service, present systems, and organization. 3 cred.; prereq., 22; II MWF; 227E. Mr. Cutler.
- 125s—Transportation. Specific illustrative problems: Twin City and Mississippi Valley traffic situation, Mississippi River experiment, New York Barge Canal, Great Lakes traffic, Panama Canal status. 3 cred.; prereq., 121. Mr. Cutler.
- 221f-222w-223s—Railway Administration. Analysis of railway organization and methods of management and operation. Special problems. 3 cred. per qtr.; prereq., 122. Mr. Cutler.

224f—Railway Terminals and Yards. Continuation of Course 123. 3 cred.;
prereq., 122. Mr. Cutler.

STRUCTURAL ENGINEERING

31f—Stresses in Structures. Algebraic and graphic analysis of various types of
bridge trusses for fixed and moving loads. 2 cred.; prereq., M.&M. 26.
Mr. Parcel.

Lect. III MW; 21E

Lab. (1) I-II T; 217E

(2) III-IV T; 217E

32w—Stresses in Structures. Analysis of simple span bridge trusses. Standard
engine loadings and equivalent uniform loads. 3 cred.; prereq., 31, M.&M.
141. Mr. Parcel.

Lect. III M, VI F; 227E

Lab. II-III Th; 229E

33s—Elementary Structural Design. Designing principles and methods. Com-
plete designs and detail drawings of typical simple structures. 4 cred.;
prereq., 32, M.&M. 128, Dr. 23. Mr. Parcel.

Lect. II M, III Th; 227E

Lab. VI-VIII T, VII-IX W; 229E

37s—Structural Engineering. (Ag.E., M.E., E.E.) Analysis of stresses in simple
structural frames. Roof trusses, crane girders, mill building bent. 3 cred.;
prereq., M.&M. 26 or 84. Mr. Wise.

Lect. VI Th; 227E

Lab. VI-IX T, VII-IX Th; 229E

38f—Stresses in Structures. (Arch.) Application of laws of equilibrium to
simple structures. Special emphasis is placed on graphic methods. 3 cred.;
prereq., M.&M. 93; IV MWF; 227E. Mr. C. A. Hughes.

39w—Structural Design. (Arch.) General principles of structural design. Gird-
ers, columns, and roof trusses. 3 cred.; prereq., 38; IV MWF; 203E. Mr.
C. A. Hughes.

41s—Reinforced Concrete. (Arch.) Brief course in theory and designing methods
with special reference to building. 3 cred.; prereq., M.&M. 93; IV MWF;
227E. Mr. C. A. Hughes.

131w-132s—Bridge Analysis and Design. Stresses in cantilevers, arches, and
continuous bridges. Design and detail of typical bridge structure. 2 cred.
per qtr.; prereq., 134. Mr. Parcel.

131w VI Th; 227E; VII-IX Th; 225E

132s II W; 227E; VI-VIII Th; 225E

134f—Statically Indeterminate Structures. Theory of deflections and statically
indeterminate stresses and their application to continuous girder, frames,
swing bridges, and redundant members. 3 cred.; prereq., 33, M.&M. 128.
Mr. Parcel.

Lect. VI TF; 227E

Lab. VIII-IX M; 225E

135s.—Advanced Reinforced Concrete Design. Analysis of structures as rigid
frames. Application to reinforced concrete buildings. Effect of temperature
and shrinkage. Effect of settlement of foundations. Rigid frame bridges.
4 cred.; prereq., 142; VII-IX M, II-IV S; 225E. Mr. Wise.

137f,w,s—Structural Laboratory. Theoretical and experimental analysis of struc-
tural members and models. 2 cred.; prereq., 134, 141. Mr. C. A. Hughes.

137f I-III ThS; Ex

137w II-IV TS; Ex

137s VI-VIII M, II-IV S; Ex

141f—Reinforced Concrete. Principles of reinforced concrete. Theory of beams,
slabs, and columns and the application to ordinary structures. 3 cred.
prereq., M.&M. 128; VI-VII M; 225E; VI Th; 227E. Mr. Wise.

- 142w—Reinforced Concrete Design. Continuation of 141 with especial emphasis on the practical features of the design of buildings, bridges, retaining walls, etc. 3 cred.; prereq., 141; VI M; 227E; VI-VII T; 225E. Mr. Wise.
- 143s—Reinforced Concrete Arches. Analysis and design of reinforced concrete arches. 3 cred.; prereq., 134, 142. Mr. Wise.
- 146f,w,s—Plain Concrete. Theory of design and control of concrete mixtures. Practice in control tests of concrete and concrete materials. Lectures and laboratory work. 3 cred.; prereq., M.&M. 141. Mr. C. A. Hughes.
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| 146f | Lect. III MW; 206E | Lab. VI-IX W; Ex |
| 146w | Lect. III WF; 209Ex | Lab. VI-IX W; Ex |
| 146s | Lect. III MF; 209Ex | Lab. VI-IX F; Ex |
- 147w—Foundations. Design and construction of footings, cofferdams, and caissons for bridges and buildings. Piers and abutments. Underpinning of buildings. Exploration and testing of foundation sites. Excavation and removal of materials from foundation site. 2 cred.; prereq., 33, M.&M. 128; VIII-IX T; 206E. Mr. Wise.
- 148f-149w-150s—Advanced Concrete. Short research problems in concrete. 2 cred. per qtr.; prereq., 146; ar. Mr. C. A. Hughes.
- 234f-235w-236s—Advanced Theory of Structures. Application of the theory of indeterminate stresses to the more complex problems of structural analysis. Continuous and swing bridges, simple and multiple arch and suspension systems, wind stresses in tall building frames, secondary stresses. 3 to 5 cred. per qtr.; prereq., 132, 142. Mr. Wise.
- 237f-238w-239s—Advanced Structural Laboratory. Special problems. 3 to 5 cred. per qtr.; prereq., 137. Mr. C. A. Hughes.
- 245f-246w-247s—Seminar. Special topics in the higher theory of structures. 3 to 6 cred. per qtr.; prereq., 134, 142. Mr. Parcel.

HIGHWAY ENGINEERING

- 51f-52w—Highways and Pavements. Elementary course with field inspection, relating to the economies, location, construction, and maintenance of highways and pavements. 3 cred. per qtr.; prereq., 12. Mr. Lang.
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| 51f | Lect. (1) VI MTh; 215Ex | (3) VII W, VI F; 215Ex |
| | (2) VI T, VII F; 215Ex | |
| | Lab. (1) VII-IX Th; 210Ex | (3) VII-IX M; 210Ex |
| | (2) VII-IX T; 210Ex | |
| 52w | Lect. VII F; 110Ex | |
| | Lab. (1) VI-IX T, VI-VII Th; 210Ex | (3) VI-IX W, VIII-IX F; 210Ex |
| | (2) VI-IX M, VIII-IX Th; 210Ex | |
- 55f—Public Highways. Historical development, administration and legislation pertaining to highways, also general economic problems of highway improvements. 3 cred.; no prereq.; I MWF; 215Ex. Mr. Lang.
- 154w—Soils Laboratory. Laboratory study of properties of soils which pertain to their stability. 1 cred.; prereq., jr. or sr.; ar.; 210Ex. Mr. Lang.
- 156w—Highway Transport. Development, economic field, relation to other forms of transportation. Highway transport surveys, economics of location, economics of selection of type of surface, effect of vehicle on road and road on vehicle. 3 cred.; prereq., 52. Mr. Lang.
- 157s—Highway Transport. Motor vehicle as a common carrier, analysis of road legislation, taxation. Principles of successful operation. Selling motor transportation. 3 cred.; prereq., 156. Mr. Lang.
- 251s—Highway Laboratory. Investigations in co-operation with State Highway Department. 3 to 5 cred.; prereq., 52. Mr. Lang.

252s—Highway Design. Preparing of a plan and specification for short sections of highway and city streets, also making estimates of materials and cost. 3 to 5 cred.; prereq., 52. Mr. Lang.

HYDRAULIC ENGINEERING

161f—Hydrology. Rainfall, evaporation, transpiration, percolation, run-off. Flood and low water of streams. Storage for use in water supply, water power, irrigation and navigation. Mass curves and frequency curves. 3 cred.; open to sr. only. Mr. Bass.

Lect. II MF; 227E

Lab. (1) VII-IX T; 229E

(2) VII-IX Th; 227E

164f,s—Water Power. Types of low, medium, and high-head developments. Details of developments. Dams. Turbine settings and characteristics. 3 cred.; prereq., M.&M. 129. Mr. Bass.

164f Lect. IV T; 227E

Lab. II-III, VI-IX W; 225E

164s Lect. II M; 107E

Lab. III-IV W; VI-IX F; 225E

263s—Hydraulic Engineering Problems. Special hydraulic problems in laboratory, drafting room, and field. 3 to 5 cred.; prereq., 164.

MUNICIPAL AND SANITARY ENGINEERING

162w-163s—Water Supply and Sewerage. Sources of water supply; quality of water. Methods of testing, collection, distribution, and purification of water. Selection of pumping machinery and motive power. Sewer systems and sewage disposal works. 3 cred. per qtr.; prereq., M.&M. 129. Mr. Bass.

162w Lect. III M; 21E

Lab. II-III Th, VI-VII F; 225E

163s Lect. II TF; 136E

Lab. VI-VIII T, II-III Th; 225E

171w—Building Sanitation. Location and orientation of buildings; lighting, ventilation, water supply, plumbing, sewage, and refuse disposal. 2 cred.; prereq., sr. arch. only; II TF; 22E. Messrs. Bass and Martenis.

261f-262w—Water and Sewage Purification. Design of water purification and sewage disposal works. 3 to 5 cred. per qtr.; prereq., 163. Mr. Bass.

GENERAL

53s—Civil Engineering Practice. Greater problems of engineering. Interrelations of various branches of engineering in practice. Legal, financial, and business functions of the engineer. Relations of the engineer to government and public affairs. 3 cred.; open to jr. and sr. Mr. Bass.

(1) III T, II WS; 107E

(2) III M; 22E; III T, II W; 107E

172s—City Planning. Physical elements of the city; topography, drainage, geology. Public works and structures. Internal and external transportation. Zoning. Subsurface structures. Esthetic features of the city. 3 to 5 cred.; prereq., 52; I MWF; 7E. Messrs. Bass and Mann.

280f-281w-282s—Civil Engineering Research. Original work in concrete, structural steel, hydraulics, municipal or transportation problems. Investigations, reports, tests, designs. 5 cred. per qtr.; by permission. Messrs. Bass, Cutler, Lang, and Parcel.

DAIRY HUSBANDRY

7f,s—Elements of Dairying. Composition of milk. Causes of variation in composition; milk constituents and their uses in dairy manufacture and as food; Babcock test; sanitary handling of milk and cream on the farm. 3 cred.; no prereq.; III MWF; 100HH(UF). Mr. Combs. (For Agr. Eng. only). Students will meet with the lecture section of Dairy Husbandry 1.

DRAWING AND DESCRIPTIVE GEOMETRY

- 1f,w,su-2w,s,su—Engineering Drawing. Elements of drafting including an introductory course in methods of representation, and constructive geometry. Graphs and formulas. Sketching, lettering, working drawings, conventions, standards, tracing, and blueprinting. 3 cred. per qtr.; prereq., solid geometry. Messrs. Potter, Schuck, Williams, Cruzen, and Quaid.
- 1f (1) VI-VII MTWF; 417C (2) I-II MTThS; 417C (3) III-IV TS, VIII-IX T, VI-VII Th; 417C
- 1w (1) I-II MTThS; 455C (2) III-IV TS, VI-VII TTh; 455C
- 2w (1) VI-VII MWF, VIII-IX T; 417C (2) I-II MTThS; 417C (3) III-IV TS, VI-VII TTh; 417C
- 2s (1) VI-VII TWThF; 455C (2) VIII-IX MF, III-IV TS; 455C
- 3f,w,s,su—Descriptive Geometry. Elementary course in the methods of representation, correlated in part with analytical geometry. Graphical and algebraic solutions. Lectures, demonstrations, and drafting. 3 cred.; prereq., 2, M.&M.
11. Messrs. Eggers, Levens, and Shultz.
- 3f (1) VIII-IX MWF, III-IV S; 201E (2) VI-VII MWThF; 455C
- 3w VIII-IX MWThF; 201E
- 3s (1) VI-VII TWThF; 417E (2) I-II MWFS; 417C (3) VIII-IX MF, III-IV TS; 417C
- 4f,su-5w,su-6s,su*—Engineering Drawing and Descriptive Geometry. (Chem. and chem. engr.) 2 cred. per qtr.; prereq., solid geometry; III-IV MWF; 455C. Messrs. Schuck, Williams, and Cruzen.
- 7w,su-8s,su*—Engineering Drawing and Descriptive Geometry. (Chem. and chem. engr.) 3 cred. per qtr.; prereq., solid geometry. Messrs. Schuck and Cruzen.
- 7w III-IV MWF, VIII-IX F; 445C
- 8s III-IV MWF, VIII-IX Th; 445C
- 11f—Engineering Drawing (Mines). 4 cred.; no prereq.; III-IV MTWFS; 101E. Mr. Potter.
- 12w—Engineering Drawing (Mines). 2 cred.; prereq., 11; III-IV WF; 101E. Mr. Potter.
- 13s—Engineering Drawing (Mines). 3 cred.; prereq., 12; III-IV TWFS; 1E. Messrs. Levens and Potter.
- 14f—Descriptive Geometry (Mines). Not an engineering elective. 3 cred.; prereq., 13, Mine Math. 5. Messrs. Myers, Eggers, Levens, and Shultz.
- (1) I MWF; 3E (2) I MWF; 203E
- 15w—Drafting (Mines). 2 cred.; prereq., 14; III-IV WF; 417C. Messrs. Myers and Potter.
- 21f,w,s,su—Drafting (C.E.) The application of descriptive geometry to drafting room problems including working drawings. 2 cred.; prereq., 3. Messrs. French, Myers, and Levens.
- 21f (1) III-IV MWF; 201E (2) VI-VII MWTh; 201E
- 21w III-IV MWF; 217E
- 21s I-II MWF; 1E
- 22w,s,su—Drafting (C.E.). Detail, assembly, and construction drawings of steel members and simple structures. Standards, conventions, and graphical methods. 2 cred.; prereq., 21. Messrs. French, Myers, and Levens.
- 22w (1) III-IV MWF; 201E (2) VI-VII TThF; 201E
- 22s III-IV MWF; 101E
- 23f,s,su—Drafting (C.E.). Drafting problems in general construction work including earth work, wood, steel, and concrete. 2 cred.; prereq., 21. Messrs. French, Myers, and Levens.
- 23f I-II MWF; 201E
- 23s (1) III-IV MWF; 201E (2) VI-VII MTF; 201E

- 26w,s,su*—Drafting (E.E.). Applications of descriptive geometry to drafting room problems. Working drawings and tracing. 2 cred.; prereq., 3. Messrs. Eggers, Quaid, and Shultz.
 26w (1) VIII-IX MWF; 101E (2) II-III M, I-II ThS; 101E
 26s I-II MWF; 201E
- 28f,w,su*—Drafting (Aero.E.). Application of descriptive geometry to drafting room problems. Working drawings and tracing. 2 cred.; prereq., 3. Messrs. Potter, Williams, and Shultz.
 28f (1) VI-VII T, VIII-IX WF; 101E (2) VI-VII WThF; 101E
 28w I-II T, VI-VII ThF; 101E
- 29w,s,su—Drafting (Aero.E.). Application of elementary formulas in the proportioning of simple machine parts. Detail and assembly drawings. Machine and structural drafting and graphical methods. 2 cred.; prereq., 28. Messrs. Potter, Williams, and Shultz.
 29w I-II T, VI-VII ThF; 1E
 29s (1) VI-VII MW, VII-VIII T; 101E (2) III-IV TS, II-III Th; 101E
- 34f,w,s—Lettering. Study and analysis of single stroke lettering with particular emphasis on the application to engineering drawing. 1 cred.; prereq., 1. Messrs. Cruzen and Quaid.
 (1) IV T; 107E (2) II Th; 227E
- 37f,w,s—Lettering for Engineers. Analysis of the alphabets. Exercises in roman and gothic lettering. Design and composition of the paragraph and the title. 2 cred.; prereq., 2; I WF; 101E. Mr. Schuck.
- 41f,w,s-42f,w,s-43f,w,s—Technical Drawing. (a) General course in the theory and practice of drawing. Sketching, lettering, tracing, conventions, renderings, and mechanical drawings. (b) Modification of the above course of particular interest to dental and medical students. 2 cred. per qtr.; no prereq. Mr. Brainard.
 (1) I-II MWF; 411C (3) VIII-IX MWF; 411C
 (2) III-IV MWF; 411C
- 44f,w,s—Lettering. Practical course in plain lettering. Not an engineering and architecture elective. 1 cred.; no prereq. Messrs. Levens and Schuck.
 (1) IV T; 104E(f); 203E(w); 215E(s) (2) II Th; 104E(f); 106E(w); 215E(s)
- 45f,w,s—Alphabets. Construction and analysis of various types of letters and their arrangement. Exercises, and reference work. Not an engineering and architecture elective. 2 cred. per qtr.; soph., jr., sr.; no prereq.; II TTh; 205E. Mr. Kirchner.
- 50w,s—Diagrams and Charts. Elementary course dealing with the construction of simple diagrams and charts. 2 cred.; no prereq.; I TTh; 5E. Messrs. Eggers and Cruzen.
- 51f,w—Graphic Representation and Computation. Types of charts and applications to the solution of problems and equations. 3 cred.; prereq., 2, M.&M. 12; III MWF; 7E. Messrs. Eggers and Levens.
- 52w,s—Alignment Charts. Straight and curved scales, and diagrams with adjustment. 3 cred.; prereq., 2, M.&M. 12; ar. Messrs. Eggers and Levens.
 52w I MWF; 104E
 52s IV MWF; 215E
- 53s—Design of Diagrams for Formulas and Experimental Data. Empirical equations. 3 cred.; prereq., 3, M.&M. 13; ar. Messrs. Eggers, Levens, and Shultz.
- 64f—Graphic Arts. Introduction. Field, development, and application in art and industry. Elementary principles of design. Discussion of materials, style,

- and technique. Exercises including the construction of simple graphs. 2 cred.; jr., sr. in the School of Business Administration; prereq., 15 cred. in econ.; IV MW; 206E. Mr. Kirchner.
- 65w—Graphic Arts—Format and Layout. Analysis of the standard type faces. Study of specimens of fine printing. Exercises: simple layouts, including lettering associated with type. Open to students in the School of Business Administration. 2 cred.; prereq., 15 cred. in econ.; IV MW; 206E. Mr. Kirchner.
- 66s—Graphic Arts—Processes. Design and composition including the use of illustrations in black and white, line, and color. Discussion of the various processes of printing, lithography, and engraving. Exercises in planning for text and display work. Open to students in the School of Business Administration. 2 cred.; prereq., 15 cred. in econ.; IV MW; 206E. Mr. Kirchner.
- 81f,w,s-82f,w,s-83f,w,s—Advanced Drawing. 3 cred. per qtr.; prereq., 43 or equivalent. Messrs. Kirchner and Brainard.
- 86f,w,s-87f,w,s—Anatomical Drawing. 3 cred. per qtr.; prereq., 43 or equivalent. Messrs. Kirchner and Brainard.
- 111f,w,s-112f,w,s-113f,w,s—Advanced Descriptive Geometry. Methods of representation; parallel and central projection. Curves and surfaces, geometrography, axonometry, and photogrammetry. 3 cred. per qtr.; prereq., 3, calculus. Messrs. Kirchner, Eggers, and Levens.
- 114f,w,s—Perspective. Principles and practice of perspective, including shadows, reflections, distortions, corrections, systems, methods, the practical problem, and inverse construction. 3 cred.; prereq., 3 or Arch. 63. Mr. Kirchner.
- 157f-158w-159s—Graphical Methods. Theory and construction of graphic charts and diagrams. Course can be entered at any quarter. 2 cred. per qtr.; prereq., soph. draw., M.&M. 26. Messrs. Kirchner, Eggers, and Levens.
157f IV MW; 203E
158w IV MF; 139EE
159s I MF; 203E
- 215f-216w-217s—Geometry. Pure and applied. Transformations, kinematics, stereotomy, graphic statics, graphic calculus. 3 cred. per qtr.; prereq., calculus. Mr. Kirchner.
- 218f,w,s-219w-220s—Nomography. Technique and theory of computing charts. Equations of three and more variables. Determination of constants of empirical equations. 3 cred. per qtr.; prereq., 3, M.&M. 128. Messrs. Kirchner, Eggers, and Levens.

ECONOMICS

- 3f,w,s—The Mechanism of Exchange. Elementary course in money and banking. Financial institutions and their relations. Relation of financial organization to economic organization. 5 cred.; no prereq. Mr. Stehman and others.
- 3f III MTWThF; 3B
3w Lect. III TTh; BuAud
Rec. (1) I TThS; 211Bu (4) IV MWF; 9F
(2) II MWF; 102F (5) V MWF; 202B
(3) III MWF; 3B (6) VI MWF; 211Bu
- 3s Lect. III TTh; BuAud
Rec. (1) I MWF; 25F (7) IV MWF; 109F
(2) I TThS; 6B (8) V MWF; 3B
(3) II MWF; 3B (9) V MWF; 6B
(4) II TThS; 6B (10) VI MWF; 5F
(5) II TThS; 202B (11) VI MWF; 3B
(6) III MWF; 3B (12) VII MWF; 202B

8f-9w—General Economics. (Eng., Arch., Chem.) Principles of economics with special emphasis upon their application to current problems such as money, banking, conservation, insurance, international commerce, monopolies, transportation, labor, socialism, public ownership, and finance. 3 cred. per qtr.; no prereq. Mr. Filipetti and others.

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| (1) I MWF; 136E(f), 135E(w) | (3) III MWF; 135E |
| (2) II MWF; 135E | (4) IV MWF; 135E |

14f,w,s†—Elements of Statistics. Elementary concepts in statistical method; averages, ratios, errors, sampling, index numbers, graphic representation, collection of material. 5 cred.; prereq., 8, 9. Messrs. Mudgett, Kozelka, and others.

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| 14f (1) I MTWThF; 303F | (3) IV MTWFS; 11F |
| (2) III MTWThF; 6F | (4) VI MTWThF; 112Bu |
| 14w (1) III MTWThF; 206P | (3) VI MTWThF; 112Bu |
| (2) IV MTWFS; 11F | (4) VII MTWThF; 3B |
| 14s (1) I MTWThF; 3B | (4) IV MTWFS; 6B |
| (2) II MTWThF; 15F | (5) VI MTWThF; 102B |
| (3) III MTWThF; 200Pt | |

20f,w,s—Elements of Accounting. Fundamental principles underlying bookkeeping and accounting. Sufficient practice in technical processes will be given to serve as a background for more advanced work. Preparation and analysis of statements. Open only to Engineering Pre-Business students. Other engineering students register in 29. 3 cred.; no prereq. Mr. Heilman and others.

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| 20f* (1) I MWF; 3B | (5) III TThS; 301B |
| (2) I TThS; 3B | (6) V MWF; 302B |
| (3) II TThS; 209B | (7) VI MWF; 302B |
| (4) III MWF; 301B | (8) VII MWF; 302B |
| 20w* (1) I TThS; 3B | (4) V MWF; 302B |
| (2) III TThS; 302B | (5) VI MWF; 102B |
| (3) III MWF; 302B | |
| 20s* (1) I MWF; 6B | (4) IV MWF; 302B |
| (2) I TThS; 301B | (5) VI MWF; 301B |
| (3) III TThS; 3B | |

25w,s-26f,s—Principles of Accounting. Course following Econ. 20 presenting the principles underlying the accounting statements, the accounts, principles of valuation, depreciation, preparation and analysis of statements. 3 cred. per qtr.; prereq., 20. Mr. Heilman and others.

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| 25f-26w(1) I TThS; 301B | (2) VI MWF; 302B |
| 25w-26s(1) I MWF; 302B | (4) III MWF; 301B |
| (2) II MWF; 301B | (5) VI MWF; 302B |
| (3) II TThS; 301B | |
| 25s (1) II MWF; 302B | (3) V MWF; 302B |
| (2) III TThS; 301B | |
| 26f (1) III TThS; 302B | (2) IV MWF; 302B |

28f,s—Business Law. Business law arranged for engineers, including the law of contracts, suretyship, agency, partnership, corporations, negotiable instruments, conveyance patents, and riparian rights. 3 cred.; soph., jr., sr. with 6 cred. in econ. or sr. without econ. cred.; I MWF; 135E. Mr. Palmer.

29f,s—Principles of Accounting. (Eng., Arch., Chem.) Purpose and principles of account classification; capital and revenue; accruals; valuation; deprecia-

* Students who have had high school training or other experience in bookkeeping and who pass the placement test may be exempt from this course and be admitted to Econ. 25.

† Credit may not be received for both Econ. 14 and B.A. 70.

tion; preparation and interpretation of balance sheets, income accounts, and other statement. 3 hrs. of lect. a week. 3 cred.; no prereq. Mr. Lund.

29f IV MWF; 3E
29s I MWF; 205E

149f,w,s—Business Cycles. Analysis of factors involved in business fluctuations. Comparison of theories of the cause of prosperity and depression. Introduction to the statistical data and methods of business forecasting. 3 cred.; sr., grad.; prereq. 141 or B.A. 142. Mr. Marget.

149f III TThS; 209B
149w I MWF; 209B
149s III MWF; 102B

161f,w,s—Labor Problems and Trade Unionism. Discussion of employment; hours; wages; extent and strongholds of unionism; open and closed shops; collective bargaining; industrial unrest; government regulation of labor disputes. 3 cred.; prereq., 8, 9.

161f IV MWF; 202B
161w III TThS; 209B
161s III TThS; 102B

BUSINESS ADMINISTRATION

51f-52w-53s—Business Law.* 51. Contracts. 52. Agency, Partnership, Corporations. 53. Negotiable Instruments. 3 cred. per qtr.; jr., sr.; prereq., for 51, Econ. 8 and 9, for 52 and 53, B.A. 51. Mr. Dalzell.

Lect. IV T; JAud
Rec. (1) I ThS; 301F
(2) II ThS; 202B
(3) III ThS; 301F

58f,w,s§—Elements of Public Finance. Public expenditures, revenues, and debts. Special attention is given to tax principles, practices, and burdens. Condensed course given especially for business administration students. 3 cred.; jr., sr.; prereq. Econ. 8, 9. Mr. Blakey.

58f IV MWF; 209B
58w IV MWF; 102B
58s IV MWF; 202B

70f†—Statistics Survey Course. Tools and devices which facilitated the use of business data. Statistical information is collected by questionnaires, consolidated into tables, summarized in averages, and illustrated by graphic devices. Current index numbers are compared in form and application. Interpretation and limitations of statistical data. 4 cred.; prereq., Econ. 8, 9; I MWThF; 6B. Mr. Gaumnitz.

71f,w,s—Transportation: Services and Charges I. Survey of rail, highway, and water transportation facilities, services, and rates. Current transportation problems. 3 cred.; prereq., Econ. 8, 9. Mr. Crawford.

71f I MWF; 209B
71w,s VI MWF; 202B

72f—Transportation: Services and Charges II. Principles, construction, interpretation, and use of rail, highway, and water classifications, rates, and tariffs for handling freight, express, and mail shipments. Audit of transportation charges. Adjustment of rates, rules, and regulations. 3 cred.; prereq., B.A. 71; VII MWF; 6B. Mr. Crawford.

* No credit will be given for 51, 52, or 53 until all three are completed.

† Students may not receive credit for both Econ. 14 and B.A. 70.

§ Credit may not be received for both Econ. 191-192 and B.A. 58.

77f,s—Survey in Marketing. (An introductory course.) The principles of production economics and of price as illustrated in marketing. Commodity classifications, market functions, description of market organizations. 3 cred.; jr., sr.; not open to students who have credit for Econ. 2. Mr. Cassady.

77f I TThS; 209B

77s I TThS; 202B

89f,w,s—Production Management. Analysis of the procedure and methods of production in industrial plants, the factors involved in production management, the means of effecting control. 3 cred.; prereq., Econ. 8, 9. Mr. Filipetti.

89f II MWF; 202B

89w II MWF; 202B

89s I MWF; 209B

100f,w,s—Report Writing. 1 cred.; jr., sr. Mr. Heilman.

100f VI T; 202B

100w IV S; 202B

100s VI T; 202B

101f,w-102w,s†§—Advanced General Economics. A study of some of the more important theoretical problems of economics; competitive and monopoly prices; equilibrium prices and costs; theories of valuation of producers' goods; capital earnings and interest rates; profits. 3 cred. per qtr.; sr.; prereq., Econ. 8, 9. Messrs. Garver, Vaile, and Schmidt.

101f-102w (1) I TThS; 102B

(3) III MWF; 102B

(2) II TThS; 102B

101w-102s I TThS; 209B

112f,w,s—Business Statistics. Survey and criticism of methods used in analyzing time series, with special applications to the study of cyclical fluctuations of economic phenomena. 3 cred.; jr., sr., grad.; prereq., Econ. 14 or B.A. 70. Mr. Kozelka.

112f (1) III TThS; 209B

(2) VI MWF; 209B

112w (1) I TThS; 302B

(2) II MWF; 209B

112s (1) II MWF; 6B

(2) III TThS; 6B

130f,s—Cost Accounting. (General survey.) 3 cred.; prereq., Econ. 26 or 29; I TThS; 302B. Mr. Ostlund.

139f,w,s—Advanced General Accounting. A course intended particularly for the general student of business. Interpretation of accounts and statements, statement preparation, and analysis. Utilization of the statements by the executive. The use of budgets in business. Accounting methods and statements in a number of business fields. 3 cred.; jr., sr., grad.; prereq., Econ. 25, 26. Mr. Heilman.

139f IV MWF; 6B

139w VI MWF; 209B

139s IV MWF; 209B

142f,w,s—Money and Banking. Advanced Course. 3 cred.; jr., sr., grad.; prereq., Econ. 8, 9. Messrs. Marget and Meyers.

142f (1) II MWF; 209B

(2) VI MWF; 202B

142w (1) II TThS; 209B

(2) IV MWF; 209B

142s II TThS; 209B

155f,w,s—Corporation Finance. 3 cred.; prereq., Econ. 8, 9; III MWF; 202B. Mr. Stehman.

165f,w,s—Economics of Public Utilities. Economic and legal bases of classification. Relative advantages of public ownership and regulation. Central and

† Credit may not be received for both B.A. 101-102 and B.A. 107.

§ The entire course must be completed before credit is received for any quarter.

municipal regulation. Basis of rates; relative rates; rates and service. Theories of valuation. 3 cred.; prereq., 8, 9; III TThS; 202B. Messrs. Garver and Schmidt.

167w—Personnel Administration. Managerial policy for various types of organization of labor. Job analysis, employment, incentives, and regulation of employment. 3 cred.; prereq., Econ. 161; I TThS; 202B.

180-181-182G—Senior Topics Course—Production Management. Selected problems in management; technique of executive control in manufacturing enterprises; field research and surveys in organization and management of Northwest industrial concerns. 9 cred.; prereq., B.A. 89, 130; VI MWF (f,w); VII MWF (s); 6B. Mr. Filippetti.

184s†—Scientific Management in Industry. 3 cred.; prereq., 8, 9; VI MWF; 303B. Mr. Filippetti.

(For other courses see Combined Class Schedule bulletin for 1935-36 School of Business Administration section.)

ELECTRICAL ENGINEERING†

11f-13w-15s—Elements of Electrical Engineering. Introduction to the development, principles, materials, safety, and general applications of electrical engineering. 3 cred. per qtr.; prereq., reg. in Phys., and M.&M. 24 for 11; reg. in M.&M. 25 for 13. Messrs. Ryan and Todd.

11f Lect. (1) III TThS; 138EE (3) I TThS; 138EE
(2) I TThS; 238EE

13w Lect. (1) I TThS; 238EE (3) III TThS; 138EE
(2) I TThS; 339EE

Lab. (1) VI-VII M; 21EE (4) VIII-IX Th; 21EE
(2) VI-VII T; 21EE (5) VIII-IX M; 21EE
(3) VIII-IX T; 21EE (6) VI-VII Th; 21EE

15s Lect. (1) III TThS; 237EE (3) I TThS; 36EE
(2) I TThS; 238EE

Lab. (1) VIII-IX M; 21EE (4) VIII-IX Th; 21EE
(2) VI-VII Th; 21EE (5) VI-VII M; 21EE
(3) VIII-IX T; 21EE (6) VI-VII W; 21EE

111f-113w-115s—Junior Electrical Engineering. Alternating-current circuits and machinery. 5 cred. per qtr.; prereq., 11, 13, 15.

111f (1) I MTWFS; 237EE (2) II MTWFS; 237EE

113w (1) I MWThFS; 237EE (2) II M'WThFS; 237EE

115s (1) I MTWThF; 237EE (2) II MTWThF; 237EE

112f-114w-116s—Junior Electrical Engineering Laboratory. Taken with Courses 111, 113, 115. Experimental study of alternating-current circuits and machinery. 2 cred. per qtr.; prereq., reg. in 111, 113, 115.

(1) VI-IX M; 107EE (3) VI-IX Th; 107EE

(2) VI-IX W; 107EE (4) VI-IX F; 107EE

121f-123w-125s—Senior Electrical Engineering. Theory of alternating and direct current machinery. 3 cred. per qtr.; prereq., 115, 116.

(1) III MWF; 237EE (2) IV MWF; 237EE

122f-124w-126s—Senior Electrical Engineering Laboratory. Operating characteristics of alternating and direct current machinery. 2 cred. per qtr.; prereq., 116 and reg. in 121, 123, 125.

(1) VI-IX T; 107EE (3) VI-IX Th; 107EE

(2) VI-IX W; 107EE (4) VI-IX F; 107EE

† In courses continuing through three quarters, the work of each quarter is prerequisite for following quarters.

‡ Credit may not be received for both B.A. 181G and B.A. 184.

- 127f-128w-129s—Transient Electrical Phenomena. Mathematical study of electric circuits during sudden changes of conditions. Classical and operational methods of analysis applied to electric circuits and machines, and use of the oscillograph in the analysis of these problems. 3 cred. per qtr.; prereq., reg. in 121, 123, 125; I TTh; 139EE; VI-VIII W; 129EE. Messrs. Bryant and Johnson.
- 138f-139w-140s—Slow Transients. Short-circuit currents in power networks, unbalanced loads in polyphase circuits, transformers and motors, harmonics, stability of power systems under steady state conditions. Application of relay, oil circuit breakers, and lightning arresters to power systems for protection of apparatus and service. 3 cred. per qtr.; prereq., reg. in 121, 123, or 125; II MWF; 339EE. Messrs. Bryant, Caverley, and Johnson.
- 227f-228w-229s—Transients in Electrical Machinery and Transmission Lines. Theoretical and laboratory study of transients in electrical power machinery and of lightning surges and lightning protection. 3 cred. per qtr.; prereq., 127, 128, and 129. Mr. Bryant.

DESIGN

- 132f-134w-136s—Electrical Design. The design of direct current generators and motors, alternating current transformers, generators and synchronous motors. 2 cred. per qtr.; prereq., for 132, 125; for 134 and 136, 121; II TS; 335EE. Mr. Kuhlmann.
- 232f-234w-236s—Electrical Design. Special problems. 2 cred. per qtr.; prereq., 132, 134, 136. Mr. Kuhlmann.
- 237s—Power Transmission Line Design. Preparation of detailed plans and specifications for construction of high voltage transmission lines and distributing systems. 3 cred.; prereq., 134, 142. Mr. W. T. Ryan.

ELECTRIC POWER

- 36f-37w-38s—Electric Power. Similar to 43-44-45. 3 cred. per qtr.; sr. M.E.; prereq., Phys. 43, 44.
Lect. III MF; 238EE
Lab. (1) III-IV W; 107EE(f) (2) III-IV S; 107EE
II-III W; 107EE(w,s)
- 40f—Electric Wiring and Equipment. Elements of direct and alternating current circuits. Interior wiring and electrical equipment of buildings. Elements of illumination. 2 cred.; sr. arch.; prereq., Phys. 43; IV MW; 139EE.
- 41f—Electric Power. Elementary principles of continuous and alternating currents, generators, and motors, transmission and distribution. Measurement of power. 3 cred.; sr. mines; prereq., Phys. 43.
Lect. II TTh; 138EE Lab. I-III F; 107EE
- 42w,s—Electric Power. Similar to 41. Sr. C.E. 4 cred.; prereq., Phys. 43, 44.
Lect. I TThS; 138EE Lab. III-IV T; 107EE
- 43f-44w-45s—Electric Power. Elementary study of the generation, distribution, measurement, and utilization of electric power. 3 cred. per qtr.; sr. Ch.E.; prereq., Phys. 43, 44.
Lect. III TTh; 238EE
Lab. (1) I-II T; 107EE (2) I-II S; 107EE
- 46f-47w-48s—Electric Power. Similar to 43-44-45. 3 cred. per qtr.; sr. Aero.E.; prereq., Phys. 43, 44.
Lect. VI MF(f); TF(w); VII M, VI F(s); 237EE
46f-47w Lab. (1) II-III M; 107EE (2) I-II Th; 107EE
48s VIII-IX M; 335EE

- 141f—Central Stations. Electric power generating stations and distributing systems. Load diagrams. Selection of prime movers and units. Cost of electrical energy. Methods of charging. Maintenance of plants. 3 cred.; prereq., reg. in 121; III TThS; 237EE. Mr. W. T. Ryan.
- 142w—Electrical Transmission. Consideration involved in the designing and building of transmission lines. Kelvin's law and its limitations. Transmission line as a mechanical structure. Lightning arresters. 3 cred.; prereq., reg. in 123; III TThS; 237EE. Mr. W. T. Ryan.
- 144w—Railway Electrical Engineering. Principles of mechanics applied to electric train movements. 2 cred.; prereq., 42 or 45 or 48 or 115; IV TS; 237EE. Mr. Johnson.
- 145s—Railroad Electrification. Reasons for electrification. Study of European and American systems. Results of electrification. 2 cred.; prereq., 144; IV TS; 339EE. Mr. Johnson.

ILLUMINATING ENGINEERING

- 151f—Illuminating Engineering. Nature of light. Laws of vision. Principles of illumination. Photometry. Sources of light and their characteristics. Lighting equipment. Illumination requirements and calculation for various fields of use. 2 cred.; prereq., Phys. 43; IV TS; 237EE. Mr. Johnson.
- 152f—Photometric Laboratory. Photometer practice. Distribution curves of lamps and reflectors. Measurement of lighting installations. 1 cred.; prereq., reg. in 151; VI-VII Th; ar. Mr. Johnson.
- 153w-154s—Illumination Problems. Illumination design and specifications applied to problems in street, residence, industrial, commercial, and other kinds of lighting. 2 cred. per qtr.; prereq., 151. (Not offered in 1935-36.)
- 251w-253s—Illuminating Engineering. Lectures and laboratory work. Methods of determining locations, kind, and quality of lights for obtaining desired illumination. 2 cred. per qtr.; prereq., 151. Mr. Johnson.

TELEPHONE AND TELEGRAPH ENGINEERING

- 64f-65w-66s—Elements of Communication. Theoretical and laboratory study of communication circuits and apparatus. Simplex, duplex, multiplex telegraph systems. Speed of transmission. Magneto, common battery, manual, automatic telephone systems. 2 cred. per qtr.; prereq., reg. in 111, 113, 115. Mr. Hartig.
Lect. III M; 335EE
Lab. (1) VI-VII T; 307EE (3) VI-VII W; 307EE
(2) VIII-IX T; 307EE (4) VIII-IX W; 307EE
- 164f-165w-166s—Electric Communication. Telephone circuits at audio and carrier frequencies. Theoretical and laboratory study of circuits having distributed constants. Use of hyperbolic functions. Wave filters, balancing networks, equalizers, repeaters. 3 cred. per qtr.; prereq., 66. Mr. Hartig.
Lect. I MW; 138EE
Lab. (1) VI-VIII Th; 307EE (2) VI-VIII F; 307EE
- 267f-268w-269s—Telephone Transmission. Advanced transmission theory at communication frequencies. Class and laboratory. 2 or 3 cred.; reg. by permission. Mr. Hartig.
- 272f-273w-274s—Electromechanical Vibrating Systems and Engineering Acoustics. Theoretical discussion of the production of sound by electrically driven vibrating systems, sound transmission, reflection, absorption. Laboratory study of vibrating systems, pipes, horns, absorbing materials, sound pressure, articu-

lation, reverberation, resonance, sound filters. 2 cred.; open to grad. and sr. by permission; prereq., M.&M. 151. Mr. Hartig.

287f-288w-289s—Advanced Communication Laboratory and Seminar. Special problems in communication. Study and discussion of current articles on communication. 2 or 3 cred.; reg. by permission. Mr. Hartig.

RADIO ENGINEERING

161f-162w-163s—Radio Communication. Theoretical and laboratory study of radio transmitting and receiving circuits and apparatus. Amplifiers, detectors, oscillators. Electromagnetic waves in free space and on antenna systems. 3 cred. per qtr.; prereq., reg. in 121, 123, 125. Mr. Webb.

Lect. II MW; 335EE

Lab. (1) VI-VII M; 308EE

(4) VIII-IX T; 308EE

(2) VIII-IX M; 308EE

(5) VI-VII W; 308EE

(3) VI-VII T; 308EE

215f-216w-217s—Electronics. Theoretical and laboratory study of the following subjects with aspects of their engineering applications. Electron emission from hot bodies, Richardson's equation, Langmuir-Childs equation, secondary electron emission, ionization and resonance potentials, external and internal photoelectric effect, positive ion emission, shot effect, discharge of electricity through gases, "getter" action, Barkhausen-Kurtz effect, ionization due to radioactivities, etc., Heavyside layer as a reflecting and a refracting medium, long period echo effect, electron waves, vacuum gauges, vacuum technic, etc. 2 cred. per qtr.; graduate course, open to seniors by permission of instructor. Mr. Webb.

261f-263w-265s—Advanced Radio Communication. Theoretical study of the transmission of electromagnetic waves. Design and testing of radio transmitting and receiving apparatus. Theory of electron tubes and their use in radio circuits. High frequency measurements. Taken with 262-264-266. 2 cred. per qtr.; reg. by permission. II TTh; 339EE. Mr. Webb.

262f-264w-266s—Advanced Radio Laboratory. Special problems in radio laboratory and station, usually taken in connection with Course 261-263-265. For students specializing in electrical communication. 1 or more cred. per qtr.; reg. by permission. Mr. Webb.

270f—Radio Transmission. Design and operation of modern transmitting equipment, with special emphasis on broadcast transmission. Graduate course, open to sr. by permission of instructor. 2 cred. Mr. Webb.

271w—Radio Receiver Design. Detailed study of the problems arising in broadcast receiver design. Graduate course, open to sr. by permission of instructor. 2 cred. Mr. Webb.

RESEARCH

171w-172s—Undergraduate Thesis. Investigation of some approved problem in electrical engineering. 3 to 6 cred. per qtr.; prereq., 121.

275f-276w-277s—Electrical Engineering Research. Investigation of special problems in laboratory or library. 2 to 6 cred. per qtr.; grad.

MEASUREMENT

81w—Electrical Engineering Measurements. Principles of electrical measuring instruments, construction, limitations, sources of error, methods of calibra-

- 4f (1) II MWF; 107E (7) VI MWF; 107E
 (2) II MWF; 5E (8) VI MWF; 104E
 (3) II MWF; 215E (9) VII MWF; 107E
 (4) IV MWF; 107E (10) VII MWF; 104E
 (5) IV MWF; 104E (11) VII MWF; 215E
 (6) IV MWF; 205E
- 4w V MWF; 107E
- 5w (1) III MWF; 107E (6) VI MWF; 203E
 (2) III MWF; 203E (7) VI MWF; 206E
 (3) III TThF; 107E (8) IV MWF; 215E
 (4) III TThF; 203E (9) IV MWF; 4E
 (5) VI MWF; 107E
- 5s V MWF; 107E
- 6f I MWF; 107E
- 6s (1) III MWF; 107E (5) I TThS; 107E
 (2) III MWF; 203E (6) I TThS; 215E
 (3) VI MWF; 107E (7) VII MWTh; 107E
 (4) VI MWF; 215E (8) VII MWTh; 215E

7w-8s—Explorations in Literature. An attempt to introduce world literature to the student through a study of books and their authors. 3 cred. per qtr.; credit given for either qtr.; prereq., 6; I MWF; 107E. Mr. Richardson.

36s—Technical Writing. Training in the various types of reports, technical articles, and news stories written by engineers in the practice of their profession. 3 cred.; prereq., 6; IV MWF; 107E. Mr. Haga.

37w,s—Technical Discussions. (M.E.) Oral presentation of technical papers for the purpose of developing speaking ability. Class criticism. Extemporaneous discussion. Limited to thirty students. 3 cred.; prereq., 6; III MWF; 4E(w), 135E(s). Mr. Richardson.

FORESTRY

1f—General Forestry. A brief history of the development of forestry in Europe and America; its bearing on the forestry problems of the United States; description of the United States forests. Lectures and collateral reading. 3 cred.; no prereq.; III TThS; 102Hr(UF). Mr. Cheyney.

27w—Farm Woodlots and Windbreaks. Trees and their relation to the farm. Planning and planting farm windbreaks and shelter belts. Utilization and marketing of farm grove, or woodlot products. 3 cred.; no prereq.; IV MWF; 301Hr(UF). Mr. Cheyney.

FRENCH

1f,w,s-2f,w,s—Beginning French. 5 cred. per qtr.; no prereq.

- 1f-2w (1) I MTWThF; 227F (3) VI MTWThF; 226F
 (2) IV MTWFS; 202F

1w-2s IV MTWFS; 227F

1s IV MTWFS; 212F

- 2f (1) I MTWThF; 202F (2) VI MTWThF; 202F

3f,w,s-4f,w,s—Intermediate French. 5 cred. per qtr.; prereq., 1-2 or 2 years high school French.

- 3f-4w (1) I MTWThF; 201F (3) VII MTWThF; 202F
 (2) III MTWThF; 226F

3w-4s (1) I MTWThF; 202F (2) VI MTWThF; 202F

- 3s (1) I MTWThF; 227F (3) VI MTWThF; 226F
 (2) IV MTWFS; 202F

- 4f (1) II MTWThF; 113F (3) VI MTWThF; 209½F
 (2) IV MTWFS; 227F

GENERAL ENGINEERING

- 11f-12w-13s—Orientation. General lectures by members of the university staff covering the various branches of engineering and allied professions. Illustrated by lantern slides and motion pictures. No cred.; no prereq.; required of freshmen in Engineering and Architecture. 13s is required of freshmen in Chemistry. Mr. Zelner.
 11f IX Th; 100C
 12w IX Th; 100C
 13s VIII W; 100C
- 70f,w,s—The Slide Rule. Theory, construction, and use. Computation practice. Design of special rules. 1 cred.; prereq., M.&M. 12 or reg. in M.&M. 12. Mr. French.
 70f,w IV F; 206E
 70s I F; 138EE
- 81w—Estimating. Plan reading and quantity surveying. Study of costs of concrete, brick, timber, and steel construction. Analysis of material and labor costs. 3 cred.; jr., sr., only. IV MW; 2 hrs. ar.; 138EE. Mr. French.
- 101w—Contracts and Specifications. Engineering specifications. Classes of specifications; essential features; clauses, details. Bids and bidders, engineering contracts. 3 cred.; jr. and sr. only; IV MWF; 238EE. Mr. Fixen.
- 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, 3 cred.; sr. and grad. only; III TThS; 339EE. Mr. W. T. Ryan.
- 112f-113w-114s—Rates for Public Utility Properties. Determination of the rate base and depreciation amount for transportation, gas, water, electric power and telephone utilities operating expenses, the rate structure for particular utilities, service and discrimination. 3 cred. per qtr.; sr. and grad. in engineering, economics and business administration. Mr. Bryant.
- 193s—Engineering Practice. Engineering relations, personal and ethical; business relations, letters and employment; legal relations, and interpretation; patents, rights of invention; engineering specifications and salesmanship. Engineering reports and discussions. 2 cred.; sr. only. Mr. Martenis.
 (1) II M, III Th; 254ME (2) III TTh; 254ME

GEOLOGY AND MINERALOGY

- 1f,w,s,su-3w,s—General Geology (Dynamic and Economic). A synoptical treatment of the materials of the earth and the origin, distribution, and occurrence of metals, non-metals, coal, and petroleum. 6 cred.; no prereq. Mr. Emmons.
 1f Lect. III TThS; 110P Rec. III F; 110P
 1w Lect. II MWF; 110P Rec. II S; 110P
 1s Lect. III MWF; 110P Rec. III Th; 110P
 3w Lect. III TThS; 110P Rec. III F; 110P
 3s Lect. II MWF; 110P Rec. II S; 110P
- Af,w,s-Cw,s—General Geology Laboratory (General and Economic). 4 cred.; no prereq.
 Af (1) III-IV MW; 220P (2) VI-VII TTh; 220P
 Aw I-II TTh; 220P
 As III-IV TS; 220P
 Cw (1) III-IV MW; 220P (2) VI-VII TTh; 220P
 Cs I-II TTh; 220P
- 5f—Engineering Geology. Materials of the earth and geologic processes. Application of geology to engineering problems. Lectures, rock study, and reference work. 3 cred.; no prereq.; I MWF; 110P. Mr. Schwartz.

- 6w—Applied Geology for Engineers. Occurrence, properties, production, and uses of building stones, cements, clay, fuels, and road materials. Lectures and reference work. 3 cred.; prereq., 5; I MWF; 110P. Mr. Schwartz.
- 7s—Applied Geology for Engineers. Includes a brief survey of the occurrence of the important metals. Lecture and reference work; 3 cred.; prereq., 6; I MWF; 110P. Mr. Schwartz.
- 23w-24s—Elements of Mineralogy. The crystal systems; morphological, physical, and chemical characters of minerals; occurrence, genesis, and use of minerals; classification and description of common minerals, rock minerals, and common rocks. Determinative work in laboratory, blowpipe analysis, sight identification. 8 cred.; prereq., Inorg. Chem. 10. Mr. Gruner.
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| 23w | Lect. II WF; 206P | Lab. (1) VII-VIII WF; 100P |
| | Rec. ar Th; 210P | (2) III-IV TS; 100P |
| 24s | Lect. II MWF; 206P | |
| | Rec. VII F | |
| | Lab. (1) VIII-IX MF; 100P | (2) III-IV M; VII-VIII W; 100P |
- 67f—Mineralogy of Chemical Materials. Lectures on special laboratory methods of mineralogy, nature and identification of the chief commercial minerals, and the world's supply and market for the same. Laboratory work in identification and tests of the value of minerals. 3 cred.; prereq., 6 qtr. cred. of chemistry at University. Mr. Gruner.
- 121f—Crystallography. Study of crystal models and space groups. Crystal drawings and measurements. Projections and mathematical calculations. 3 cred.; prereq., M.&M. 11, and Inorg. Chem. 10. Mr. Gruner.

For other electives in the Department of Geology see the Combined Class Schedule bulletin for 1935-36, College of Science, Literature, and the Arts section.

GERMAN

- 24f-25w-26s—Chemical German. Pronunciation, reading, sentence analysis, and translation. 4 cred. per qtr.; no prereq.
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| (1) IV MTWF; 113F | (2) V MTWF; 207F |
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- 27f-28w-29s*—Chemical German. Chemical prose. 3 cred. per qtr.; prereq., two years high school German or one year college German; IV MWF; 209F.

HISTORY

- 1f-2w—The Modern World. 5 cred. per qtr.; no prereq. Mr. Ford.
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| Lect. II TThS; BuAud | |
| Rec. (1) I MW; 2F | (7) IV MW; 112Bu |
| (2) I MW; 5F | (8) V MW; 112Bu |
| (3) II MW; 301F | (9) V TF; 112Bu |
| (4) II MW; 211Bu | (10) VI TTh; 2F |
| (5) III MW; 9F | (11) VII MW; 2F |
| (6) III TTh; 2F | |
- 3s—Social and Economic History of Modern Europe. 5 cred.; prereq., 10 cred. if taken by fr. Mr. Heaton.
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| Lect. II TThS; BuAud | |
| Rec. (1) I MW; 2F | (4) IV MW; 211Bu |
| (2) II MW; 2F | (5) VII TTh; 2F |
| (3) III MW; 211Bu | |

* Membership in the class is determined by a placement test at the beginning of the fall quarter.

98f-99w-100s—Problems of Contemporary Civilization. 3 cred. per qtr.; prereq., sr.; IX TTh. History staff.

HORTICULTURE

- 6f—Fruit Growing. Fundamental principles of fruit growing. Sites, soils, nursery stock, planting and planting plans, tillage, fertilization, cover crops, pollination, frost avoidance, pruning and thinning. Lectures, recitations, references, and laboratory. 3 cred.; no prereq.; II MWF; 102Hr(UF). Mr. Angelo.
- 51s—Garden Flowers. A study of the common annuals, biennials and perennial flowers, with special emphasis on plants for the perennial border and rock garden. Lectures, reference reading and laboratory. 2 cred.; I T, I-II Th; 8Hr(UF). (Not given in 1935-36.) Mr. Longley.
- 70su*—Plant Materials. Garden flowers, identification, classification, and landscape uses. Lectures and field trips. 3 cred.; prereq., 10 cred. Bot.; 3Hr(UF).
- 71f—Plant Materials Used in Landscape Design. A study of the plants used in landscape design; the identification of evergreen and deciduous trees and shrubs and vines, with special emphasis on their fall and winter characters and their uses in landscape design. Lectures, outdoor and indoor laboratories, special field trips. 3 cred.; prereq., Bot. 10 cred.; VI-VIII TTh; 8aHr(UF). Mr. Longley.
- 72s—Woody Plants. Deciduous and evergreen trees, shrubs and vines from their winter and spring characters, with special emphasis on their flower characters. Lectures, indoor and outdoor laboratories, with special field trips. 2 cred.; prereq., Bot. 10 cred.; II T, I-II S; 8aHr(UF). Mr. Longley.
- 74w—Principles of Landscape Design. The composition of the various elements used in landscape gardening, methods of presentation. Lectures and problems. 3 cred.; prereq., Arch. 21 or Ag.E. 3 and Hort. 71; VIII T, VI-VII TTh; 107Hr(UF). Mr. Longley.
- 75w—Landscape Problems. Continuation of Course 74. 3 cred.; ar.; 107Hr(UF). Mr. Longley.
- 76s—Landscape Construction. Construction and maintenance of turf for lawns, golf courses, and other play areas; garden architecture, grading, planting and care, costs of construction. Lectures, field trips and reports. 3 cred.; prereq., 71; VI-VIII T, VI-VII Th; 107Hr(UF). Mr. Longley.

MATHEMATICS AND MECHANICS

MATHEMATICS

11f,w,su—College Algebra. Theory of quadratic equations, interpretation of complex results, graphical representation, indeterminate equations, ratio, proportion, variation, progressions, series, undetermined coefficients, binomial theorem, logarithms, theory of equations, Horner's method. 5 cred.; prereq., higher algebra.

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| 11f (1) III MWThFS; 3E | (7) I MTWThS; 4E |
| (2) III MWThFS; 4E | (8) I MTWThS; 104E |
| (3) III MWThFS; 5E | (9) I MTWThS; 227E |
| (4) VII MTWThF; 227E | (10) VI MTWF, IV S; 3E |
| (5) VII MTWThF; 4E | (11) VI MTWF, IV S; 4E |
| (6) VII MTWThF; 136E | (12) VI MTWF; 106E; IV S; 107E |
| 11w (1) II MWThFS; 3E | (2) VIII MTWTh, VII F; 227E |

* Given by special arrangement.

12f,w,s,su—Trigonometry. Graphical representation of functions, computation by logarithms and slide rule. Trigonometric functions, plane right triangles, reduction formulas, fundamental relations, addition formulas, double angles, half angles, identities and equations, inverse functions, oblique triangles, De Moivre's theorem, spherical right triangles. 5 cred.; prereq., 11.

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| 12w | (1) II MWThFS; 4E | (5) I MTWThS; 3E |
| | (2) II MWThFS; 7E | (6) I MTWThS; 4E |
| | (3) VIII MTWThF; 205E | (7) VII MTWF, IV S; 4E |
| | (4) VIII MTWThF; 106E | (8) VII MTWF; 205E; IV S; 203E |

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| 12s | (1) II MTWThF; 4E | (2) VI MTWThF; 106E |
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13f,w,s,su—Analytical Geometry. Co-ordinate systems, locus and equation, straight line, circle, parabola, ellipse, hyperbola. Transformation of co-ordinates and simplification of equations. Polar co-ordinates, higher plane curves, tangents, normals. Empirical equations, solid analytic geometry. 5 cred.; prereq., 11 and 12.

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| 13f | (1) V MTWFS; 136E | (2) III MTWThF; 205E |
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13w IV MTWFS; 21E

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| 13s | (1) II MTWThF; 3E | (5) VII MTWThF; 227E |
| | (2) II MTWThF; 104E | (6) VII MTWThF; 136E |
| | (3) III MTWThS; 3E | (7) VI MTWTh, IV S; 4E |
| | (4) III MTWThS; 4E | (8) VI MTWTh, IV S; 203E |

24f,w,s,su—Differential Calculus. Limit, derivative, simple applications of derivative, maxima and minima, differentials, rates, change of variables, radius of curvature, mean value, indeterminate forms, partial differentiation, series. 5 cred.; prereq., 13. Mr. Siler.

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| 24f | (1) VI MTWF, III S; 205E | (4) VII MTWThF; 106E |
| | (2) IV MTWFS; 106E | (5) III MTWThF; 106E |
| | (3) II MWThFS; 106E | (6) I MTWThF; 106E |

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| 24w | (1) VI MTWF, IV S; 104E | (3) II MTWFS; 107E |
| | (2) IV MTWF, II S; 104E | (4) III MTWThF; 104E |

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| 24s | (1) I MTWThF; 104E | (2) V MTWFS; 136E |
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25f,w,s,su—Integral Calculus. Expansion of functions, Taylor's theorem. Standard elementary forms, definite integral, rational fractions, integration by substitution, by parts, reduction formulas, integration a process of summation, successive and partial integration, elementary ordinary differential equations. 5 cred.; prereq., 24. Mr. Dalaker.

25f V MTWFS; 205E

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| 25w | (1) VI MTWF, IV S; 106E | (4) VII MTWThF; 106E |
| | (2) IV MTWF, 106E; II S; 136E | (5) III MTWThF; 106E |
| | (3) II MTWFS; 106E | |

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| 25s | (1) VII MTWThF; 106E | (3) IV MTWFS; 104E |
| | (2) II MTWThF; 203E | (4) III MTWThF; 104E |

91f*—Calculus (Arch., Pre-bus.). Short course, derivatives, maxima and minima, integration of simple forms, definite integrals, areas. 4 cred.; prereq., 13; III MTWF; 203E. Mr. Peebles.

151f—Differential Equations. Differential equations and their solutions. First order and first degree, first order and higher degree, singular solutions; total differential equations, linear differential equations, miscellaneous methods, system of simultaneous equations, integration in series. 3 cred.; prereq., 25; I MWF; 215E. Mr. Dalaker.

152w-153s—Advanced Calculus with Applications. 3 cred. per qtr.; prereq., 151; I MWF; 215E. Mr. Dalaker.

* For permissible substitute, see page 56.

- 154f-155w-156s—Vector Analysis and Applications. 3 cred. per qtr.; prereq., 26; IV MWF; 7E. Mr. Brooke.
- 157f-158w-159s—Determinants and Solid Analytical Geometry. An advanced course. 3 cred. per qtr.; prereq., 150. (Not offered in 1935-36.)
- 164f-165w-166s—Operational Methods and the Operational Calculus. 3 cred. per qtr.; prereq., 151 or by permission; ar. Mr. Scherberg.
- 254f-255w-256s—Modern Analysis. Based on Whittaker and Watson's text. 3 cred. per qtr.; prereq., 153. (Not offered in 1935-36.)
- 261f-262w-263s—Functions of a Complex Variable. Elliptic functions and integrals with applications. 3 cred. per qtr.; prereq., 153. (Not offered in 1935-36.)
- 264f-265w-266s—Advanced Topics in Functions of Complex Variable. 3 cred. per qtr.; prereq., 263. (Not offered in 1935-36.)

MECHANICS

- 26f,w,s,su—Technical Mechanics: Statics. Characteristics of a force, parallelogram law, moments, couples, resultant of a force system, equilibrium of a force system, frictions, centroids, moments of inertia, catenary. 5 cred.; prereq., 25. Messrs. Herrick and Doeringsfeld.
- 26f (1) V MTWFS; 106E (2) II MTWThF; 136E
- 26w III MTWThF; 3E
- 26s (1) VII MTWThF; 104E (3) IV MTWFS; 106E
(2) II MTWThF; 106E (4) III MTWThF; 136E
- 84f,s*—Technical Mechanics. (Chem., Ch.E., Ag.E., and Pre-bus.) Statics, resolution of forces, conditions of equilibrium, center of gravity, moment of inertia, stresses in framed structures, and machines, kinematics, dynamics of a particle. Newton's laws of motion, work, energy, power, impulse, and momentum. 5 cred.; prereq., 25 or 91. Mr. Doeringsfeld.
- 84f II MTWThF; 21E
- 84s III MWThFS; 215E
- 92w*—Mechanics for Architects. Statics, resolution of forces, conditions of equilibrium, center of gravity, moment of inertia of plane sections, stresses in framed structures. 4 cred.; prereq., 91; III MTWF; 5E. Mr. Peebles.
- 127f,w,s—Technical Mechanics: Dynamics. Force, mass, acceleration, translation and rotation, gyroscope, governors, work, energy, power, conservation of energy, impulse, momentum, loss of kinetic energy, conservation of momentum. 5 cred.; prereq., 26. Messrs. Wilcox and Doeringsfeld.
- 127f (1) II MTThFS; 203E (2) I MTWFS; 205E
- 127w (1) VI MTWF, IV S; 205E (3) II MTWThF; 203E
(2) III TWThFS; 205E
- 127s (1) IV MTWFS; 136E (3) VI MTWThF; 205E
(2) I MTWThF; 106E
- 161f-162w-163s—Advanced Technical Mechanics. Moving axes, Eulerian angles, Lagrange's equations, generalized co-ordinates, dynamical problems soluable in terms of circular and elliptic functions, dynamical specifications of bodies, motion of a top, theory of vibrations, Hamilton's principle. Special problems. 3 cred. per qtr.; prereq., 127. Mr. Wilcox.
- 161f IV MWF; 138EE
- 162w I MWF; 139EE
- 163s IV MWF; 203E
- 267f-268w-269s—Advanced Dynamics. Text, Routh's *Rigid Dynamics*, Vol. I. 3 cred. per qtr.; prereq., 153. Mr. Brooke.

* For permissible substitute, see page 56.

- 274f-275w-276s—Advanced Dynamics of a Particle. 3 cred. per qtr.; prereq., 127. Mr. Brooke.
- 277f-278w-279s—Advanced Statics. Text, Routh's *Analytical Statics*. 3 cred. per qtr.; prereq., 127. (Not offered in 1935-36.)
- 297w-298s—Vibration—Problems. 3 cred. per qtr.; prereq., 127. (Not offered in 1935-36.)

MATERIALS

- 85f*—Strength of Materials with Laboratory. (Ch.E. and Pre-bus.) Mechanical and elastic properties of materials of construction, beams, shafts, columns, combined stresses, dynamic stresses. 4 cred.; prereq., 84. Mr. Miller.
Lect. II MWF; 205E
Lab. (1) VIII-IX M; Ex (2) VI-VII M; Ex
- 93s*—Strength of Materials. (Arch.) Mechanical and elastic properties of materials of construction, design of riveted joints, beam theory, columns, arches. 4 cred.; prereq., 91 and 92; III MTWF; 206E. Mr. Peebles.
- 128f,w,s—Strength of Materials. Mechanical and elastic properties of materials of construction, beams, shafts, columns, combined stresses, hollow cylinder rollers, plates, curved bars, springs, dynamic stresses, true stresses. 5 cred.; prereq., 26. Messrs. Priester and Miller.
128f (1) IV MTWFS; 136E (2) II MTWThF; 4E
128w (1) I MTWFS; 106E (3) III MTWThF; 136E
(2) II MTWThF; 136E
128s (1) II MTWThF; 110Ex (3) III MTWThF; 205E
(2) IV MTWFS; 205E
- 141f,w,s—Materials Testing Laboratory. Investigation of the physical properties of various metals and engineering materials (wood, cement, ropes, etc.). Standard methods of testing. 2 cred.; prereq., 128 or reg. in 128. Messrs. Priester and Miller.
141f Lect. (1) VI T; 110Ex (2) VI W; 110Ex
Lab. (1) I-III S; Ex (3) VII-IX Th; Ex
(2) VII-IX F; Ex
141w Lect. (1) VI W; 110Ex (2) VI F; 110Ex
Lab. (1) II-IV S; Ex (3) VII-IX T; Ex
(2) VII-IX F; Ex (4) VII-IX W; Ex
141s Lect. (1) VI Th; 110Ex (2) VI W; 110Ex
Lab. (1) VII-IX T; Ex (3) VII-IX F; Ex
(2) VII-IX Th; Ex (4) VII-IX W; Ex
- 144w—Materials Testing Laboratory. (Mines.) Four laboratory hours accompanying Mine Mech. 110. VI-IX Th; Ex. Mr. Priester.
- 180f-181w-182s—Advanced Strength of Materials. Special problems in applied elasticity. 3 cred. per qtr.; prereq., 128; IV MWF; 5E. Mr. Priester.
- 184f-185w-186s—Advanced Testing Materials Laboratory. Special problems relating to the physical properties of engineering materials. 2 cred. per qtr.; prereq., 141. Mr. Priester.
- 294f-295w-296s—Mathematical Theory of Elasticity. 3 cred. per qtr.; prereq., 128, 153. Mr. Priester.

HYDRAULICS

- 86w*—Hydraulics. (Ch.E. and Ag.E.) Hydrostatics, Bernoulli's theorem, flow through orifices, pipes, and over weirs, dynamic action of jets and streams, flow of gases through pipes. 2 cred.; prereq., 84. II MF; 205E. Mr. Doeringsfeld.

* For permissible substitute, see page 56.

- 129f,w,s—Hydraulics. Laws of equilibrium of fluids, flow through orifices and over weirs, pressure and flow through tubes and pipes, flow in conduits and rivers, dynamic pressure of water, elementary principles of turbines and pumps. 4 cred.; prereq., 26. Messrs. Straub, Doeringsfeld, and Barker.
- 129f Lect. (all sections) II Th; 335EE
 Rec. (1) VI MWF; 215E (3) IV TS, VI Th; 215E
 (2) IV MWF; 215E (4) II MWF; 110Ex
- 129w Lect. (all sections) III W; 335EE
 Rec. (1) I MTF; 205E (2) IV MFS; 136E
- 129s Lect. (all sections) VI Th; 335EE
 Rec. (1) I MWF; 136E (2) I TThS; 205E
- 130f—Open Channel Flow. Theory of uniform and varied flow in open channels, with practical applications to the design of hydraulic structures; computations for drawdown curves, backwater curves, hydraulic jump, measuring flumes, submerged weirs, etc. 3 cred.; prereq., 129 and 143; I MWF; 206E. Mr. Straub.
- 132f-133w-134s—Advanced Hydraulic Problems. Special problems in hydraulic design. 2 cred. per qtr.; prereq., 130 or reg. in 130. Mr. Straub.
- 143f,w,s—Hydraulics Laboratory. Experimental and demonstrational work. Pressure head, Piezometer tubes, gages, stability of flotation, Bernoulli's theorem. Venturi meter, flow through orifices, over weirs, and through pipes. Open channels, gaging, impact on vanes, pumps, and hydraulic machines. 1 cred.; prereq., 86 or 129 or reg. in 86 or 129. Mr. Straub.
- 143f (1) VIII-IX T; Ex (4) VI-VII T; Ex
 (2) VI-VII W; Ex (5) VIII-IX Th; Ex
 (3) III-IV M; Ex
- 143w (1) VI-VII M; Ex (4) VIII-IX Th; Ex
 (2) I-II S; Ex (5) VI-VII F; Ex
 (3) VIII-IX M; Ex
- 143s (1) VI-VII M; Ex (3) III-IV T; Ex
 (2) VIII-IX Th; Ex
- 190w—Mechanics of Similitude and Dimensional Analysis. Theory of the use of models in design; conditions for similarity in the case of hydraulic structures, elastic structures, aircraft, ships, waves, etc. 3 cred.; prereq., 127, 128, and 129; ar. Mr. Straub.
- 191w—Hydraulic Motors and Pumps. Study of the hydraulic theory of the ram, impulse wheel, reaction turbine, and centrifugal pump. 3 cred.; prereq., 129; III TThS; 227E. Mr. Straub.
- 192s—Natural and Artificial Waterways. Wave motion, tides, ship resistance, transportation of sediment. Control and regulation of rivers, design of ship canals, locks, dry docks, movable dams, harbors. 3 cred.; prereq., 129 and preferably 130; I MWF; 206E. Mr. Straub.
- 193w—Hydraulic Measurements. Hydraulic similitude. Detailed study of the current meter. Venturi meter, weir, orifice, Parshall flume, traveling screen, chemical method of gaging, etc. 3 cred.; prereq., 129; I MWF; 206E. Mr. Straub.
- 194f-195w-196s—Advanced Hydraulics Laboratory. Special experimental studies concerning the characteristic of turbines, pumps, etc. Hydraulic models. 2 cred. per qtr.; prereq., 129 and 143; ar. Mr. Straub.
- 281f-282w-283s—Hydrodynamics. 3 cred. per qtr.; prereq., 129, 153. Mr. Brooke.
- 284f-285w-286s—Advanced Hydrodynamics. 3 cred. per qtr.; prereq., 283. Mr. Brooke.

MECHANICAL ENGINEERING

MACHINE CONSTRUCTION

- 1su—Machine Woodworking. Operation and setting up of woodworking machinery; care and manipulation of adjustable parts. Layout and plan of course and equipment for high school or junior college, including problems in cabinet making and wood construction. 2 to 4 cred.; no prereq.; I-IX MT, I-IV WF, I-II Th; ME. Mr. Richards.
- 2su—Bench Work. Bench and vise work in metal chipping, filing, scraping, fitting, polishing, and layout practice; planning of courses of study for school work. 2 cred.; no prereq.; I-IX MT, I-IV WF, I-II Th; ME. Mr. Cowie.
- 3su—Elementary Machine Shop Practice. Lathe, shaper, planer, and drill press manipulation; the grinding, care, and kinds of cutting tools. Layout of courses and exercises for high school courses. This course can be arranged to include part of 2su. 2 to 4 cred.; no prereq.; I-IX MT, I-IV WF, I-II Th; ME. Mr. Cowie.
- 4su—Wood Turning. Operation and adjustment of the lathe; care and manipulation of wood turning hand tools. Turning between centers, face plate, and chuck work. Plan and arrangement of projects suitable for a high school course. 2 to 4 cred.; no prereq.; I-IX MT, I-IV WF, I-II Th; ME. Mr. Richards.
- 5f,w,s,su-6f,w,s,su. Woodworking and Wood Finishing. Preparatory treatment of wood surfaces, color mixing, application of oil and acid stains, shellacking, varnishing, enameling, rubbing, and finishing. Polychrome projects, layout, building up of design, application and blending of colors. 2 to 4 cred.; no prereq. Mr. Richards.
- 5f,s ar
5w II-III MWF
6f,w ar
6s I-III WF
- 7su—Advanced Machine Shop. Advanced lathe work, milling machine operation. Production work. Gear calculation and cutting. Precision grinding. Layout of typical course. 2 to 4 cred.; prereq., 3; I-IX MT, I-IV WF, I-II Th; ME. Mr. Cowie.
- 9f,w,s,su—General Metal Work. Special arrangements for individual needs. Care and use of metal working tools. Precision grinding, gear cutting, tool making, heat treating, and gas and electric welding. Planning equipment and projects for a high school course. 2 to 4 cred.; no prereq.; ar. Messrs. Cowie and Hughes.
- 10su—Furniture Making. Details of designs and construction. Doweling, mortise, and tenon work. Bending and setting of shapers. Value and materials used in built-up work. Laying of veneers. Layout of a course in high school furniture making. 2 to 4 cred.; no prereq.; I-IX MT, I-IV WF, I-II Th; ME. Mr. Richards.
- 11f,w,s,su—Pattern Practice. Study and application of methods and principles used in constructing and using patterns and core boxes in the production of castings. Shop drawings and materials used. Manipulation and care of wood-working tools and machinery. Inspection trips and reports. 2 cred.; no prereq. Mr. Richards.
- 11f Lect. III Th; 202ME Lab. I-IV F
11w Lect. I Th; 202ME Lab. VIII-IX MF
11s Lect. III Th; 202ME Lab. (1) I-IV M (2) VI-IX Th

- 12f,w,s—Foundry Practice. Theory and practice in mixing, molding, and casting of ferrous and non-ferrous metals. Preparation of materials used in making cores and molds. Bench, floor, and machine molding. Inspection trips and reports. 2 cred.; no prereq. Mr. Holtby.
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| 12f | Lect. VIII W; 153ME | |
| | Lab. (1) VI-IX Th | (2) I-IV T |
| 12w | Lect. (1) IX T; 153ME | (2) VI T; 153ME |
| | Lab. (1) VIII-IX MF | (3) I-IV T |
| | (2) I-IV F | |
| 12s | Lect. (1) IV W; 153ME | (2) VII T; 153ME |
| | Lab. (1) I-IV M | (3) I-IV T |
| | (2) VI-IX Th | (4) VI-IX F |
- 13f,w,s,su—Forge Practice. Lectures and discussions on modern forge and drop forge practices, industrial welding methods, steels and their treatment. Practice in welding, hardening, tempering, and die forging. Plant inspection and reports. 2 cred.; no prereq. Mr. Hughes.
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| 13f | Lect. I W; 153ME | |
| | Lab. (1) VI-IX Th | (2) I-IV T |
| 13w | Lect. (1) VII M; 153ME | (2) VIII F; 153ME |
| | Lab. (1) I-IV F | (3) I-IV T |
| | (2) VI-IX Th | |
| 13s | Lect. (1) I F; 153ME | (2) III T; 153ME |
| | Lab. (1) I-IV M | (3) VI-IX F |
| | (2) VI-IX Th | |
- 14f,w,s,su—Pattern Practice. Care and use of wood working tools and machinery; practice in making patterns, sweeps, and core boxes for various types of work; planning from blue prints the construction of patterns and core boxes for complex castings; study of paints, oils, varnishes, lacquers, and stains for finishing. 2 cred.; prereq., Chem. 5, Dr. 2. Mr. Richards.
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| 14f | Lect. VIII Th; 202ME | |
| | Lab. (1) I-IV T | (2) VI-IX T |
| 14w | Lect. (1) IV T; 202ME | (2) VII F; 202ME |
| | Lab. (1) I-IV S | (3) VI-IX Th |
| | (2) VI-IX T | |
| 14s | Lect. VIII F; 202ME | Lab. VI-IX T |
- 15f,w,s—Foundry Practice. Laboratory practice in green and dry sand molding; core making; casting in iron, brass, and aluminum; testing sand for permeability, strength of bond, moisture, and hardness; cupola practice and operation of brass furnace; chemistry of melting, purifying, and alloying of metals. 2 cred.; prereq., Chem. 5, Dr. 2. Mr. Holtby.
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| 15f | Lect. (1) I Th; 153ME | (2) III Th; 153ME |
| | Lab. (1) I-IV S | (3) I-IV W |
| | (2) VI-IX T | |
| 15w | Lect. II S; 153ME | Lab. VI-IX Th |
| 15s | Lect. VIII M; 153ME | Lab. VI-IX W |
- 16f,w,s,su—Forging, Heat Treating, and Welding. Forging and heat treatment of metals; operation of gas, oil and electric furnaces; thermit welding, electric arc, gas and spot welding theory and operation; brazing and soldering of ferrous and non-ferrous metals. 2 cred.; prereq., Chem. 5, Dr. 2. Mr. Hughes.

- 16f Lect. (1) VII M; 153ME (2) III W; 153ME
 Lab. (1) VI-IX F (3) II-V S
 (2) VI-IX T
- 16w Lect. III W; 153ME (2) VI-IX W
 Lab. (1) I-IV M
- 16s Lect. (1) III F; 153ME (2) VIII T; 153ME
 Lab. (1) I-IV W (3) I-IV S
 (2) VI-IX W
- 17f,w,s,su*—Machine Shop Practice. (Chem., Ch.E., and Pre-bus.). 2 cred.; no
 prereq. Mr. Cowie.
 17f Lect. I F; 153ME Lab. VI-IX Th
 17w Lect. I W; 153ME (3) VIII-IX MT
 Lab. (1) VI-IX Th
 (2) I-IV T
- 17s Lect. I W; 153ME (2) VI-IX F
 Lab. (1) I-IV T
- 18f,w,s,su—General Woodworking. For teachers desiring elementary or advanced
 practice in manual training, wood turning, and pattern making. Planning and
 layout of projects, materials used, care and operation of woodworking tools
 and machinery; selection and installation of equipment. 3 cred.; no prereq.;
 VI-IX MW. Mr. Richards.
- 19s,su*—Machine Shop Practice. Elementary course in machine work arranged
 especially for students in electrical engineering. 2 cred.; prereq., 16. Mr.
 Cowie.
 Lect. (1) III W; 202ME (2) III M; 202ME
 Lab. (1) VI-IX T (3) VI-IX Th
 (2) II-V S
- 71f,su—Machine Shop Practice. Care and operation of machine tools; screw
 cutting, taper turning, and gear cutting, including spur, helical, worm, and
 bevel gears. 3 cred.; prereq., 14, 15, 16. Messrs. Koepke and Cowie.
 Lect. (1) VI F; 202ME (2) II S; 202ME
 Lab. (1) VI-IX T, II-IV W (3) VI-IX W, VII-IX F
 (2) II-V T, I-III Th (4) II-IV, VI-IX M
- 72w,su—Advanced Machine Practice. Manufacturing methods, quantity produc-
 tion; also carbonizing and heat treatment of steel, autogenous welding and
 brazing. 3 cred.; prereq., 71. Messrs. Koepke and Cowie.
 Lect. VI T; 202ME (2) VI-IX W, II-IV S
 Lab. (1) II-IV M, VI-IX F
- 76f—Survey of Shop Practice (Miners). Technique of pattern making, mold-
 ing, forging, and machining. Lectures and demonstrations. 3 cred.; no pre-
 req.; VI MWF; 153ME. Mr. Koepke.

MACHINE DESIGN

- 20f—Elementary Machine Design. Technique and knowledge necessary to convey
 information from engineering department to shop. Drawing room and shop
 standards; fits, limits, and tolerances; heat treating; welding; material speci-
 fications; records and changes. 2 cred.; prereq., Dr. 2. Messrs. Martenis and
 Palmer.
 (1) I-II T, VIII-IX TTh; 151ME (3) III-IV TS, I-II F; 151ME
 (2) VIII-IX MWF; 151ME

* For permissible substitute, see page 56.

- 21s—Kinematics. Instant centers, centroids, point paths, gear tooth profiles, cam construction, velocity diagrams. Lectures and drafting. 2 cred.; prereq., 20. Messrs. Martenis and Palmer.
 (1) VIII-IX MWF; 151ME (2) II-III TS, VI-VII Th; 151ME
- 22f—Mechanism. Motion studies. Revolving and oscillating bodies, linkages, chains, flexible connectors, gearing, wheels in trains, epicyclic gear trains, worm and wheel, screws, straight line motions, hoists, pulley blocks, ratchets, intermittent motions. Recitations and problems. 3 cred.; prereq., 21 and M.&M. 24. Mr. Martenis.
 (1) I TThS; 252ME (3) VII MWF; 252ME
 (2) III MWF; 252ME
- 23w—Dynamics of Machine Design. Valve mechanisms; governors; static, dynamic, and reciprocating balance; crank effect diagrams; gyroscopic action; critical speeds. 3 cred.; prereq., M.&M. 127. Messrs. J. J. Ryan and Palmer.
 Lect. (1) II WF; 254ME (3) II TTh; 254ME
 (2) I TTh; 254ME
 Lab. (1) II-IV T, VII-IX W; 151ME (3) VII-IX MF; 151ME
 (2) VI-VIII T, I-III S; 151ME
- 24s—Elements of Machine Design. Design of beams, shafting, columns, screw fastenings, springs, friction clutches, and brakes. Factor of safety. Stresses due to sudden applied, repeated, and reversed loads. 3 cred.; prereq., M.&M. 128. Mr. J. J. Ryan.
 (1) II MWF; 252ME (3) IV MWF; 252ME
 (2) III MWF; 252ME
- 26w—Mechanism and Kinematics. (E.E., Aero.E., and Ag. E.) Kinematics of machines. Levers, linkwork, flexible connections, gearing, screws, cams, epicyclic trains. Graphical studies of velocities. Motion; intermittent, parallel, quick return, and escapements. 3 cred.; prereq., M.&M. 24. Messrs. Martenis and Palmer.
 (1) II MWS; 252ME (4) III WFS; 252ME
 (2) I TThS; 252ME (5) I MWF; 252ME
 (3) IV TS, VI Th; 252ME
- 27s—Machine Design. (Aero.E. and Ag.E.) Fundamental principles of design of machine elements; lubrication, theory and application; friction drives, shafts, screws, gears, belt connectors, springs, flywheels, machine frames, shrink fits. 3 cred.; prereq., M.&M. 128. Messrs. J. J. Ryan and Palmer.
 Lect. (1) VII T; 252ME (2) III Th; 252ME
 Lab. (1) II-IV TS; 255ME (2) VII-IX MF; 255ME
- 28f,s—Machine Design. (Ch.E.) Kinematic analysis of machine parts. Screw fastenings, riveted and welded joints, piping, shafting, belting, gearing, cams, bearings, pressure vessels, and stresses in machine parts. 3 cred.; prereq., M.&M. 85. Mr. Martenis.
 28f Lect. VI F; 252ME Lab. VII-IX TF; 251ME
 28s Lect. IV W; 254ME
 Lab. (1) VI-VIII WF; 251ME (2) VI-VIII T, II-IV S; 251ME
- 121f—Machine Design. Spur, bevel, and worm gears; flywheels and pulleys; rotating discs; belt and rope transmission; force and shrink fits; critical speeds; lubrication. 2 cred.; prereq., 24. Mr. J. J. Ryan.
 121f (1) VII-IX WF; 255ME (3) VII-IX M, I-III Th; 255ME
 (2) I-III T, VII-IX Th; 255ME
- 122w-123s—Mechanical Engineering Design. Machine elements as applied to complete machines. Mathematical theory of lubrication; vibration analysis;

stress analysis by photo-elastic methods. Study of materials for special purposes, high temperatures, etc. 2 cred. per qtr.; prereq., 121. Mr. J. J. Ryan.

122w VII-IX MTh; 255ME

123s I-II, VI-IX Th; 255ME

221f-222w-223s—Advanced Mechanical Engineering Design. 3 cred. per qtr.; prereq., 121 and grad. Messrs. DuPriest, Martenis, and J. J. Ryan.

STEAM ENGINEERING

.30f—Steam Engineering. Elementary study of the steam power plant, including boilers, stokers, furnaces, fuels, combustion, steam generation, and prime movers. 3 cred.; prereq., Phys. 23. Messrs. DuPriest and Easton.

(1) IV MFS; 154ME

(4) III MWF; 154ME

(2) II MWF; 154ME

(5) III TThS; 154ME

(3) VI MWTh; 154ME

.31w-32s—Thermodynamics. Heat and mechanical energy and the laws governing the operation of machines used to convert heat energy into mechanical energy. Steam, gas, and oil engines, air compressors, refrigeration machines, and turbines. 3 cred. per qtr.; prereq., 30. Messrs. DuPriest and Easton.

31w Lect. (1) VI Th; 254ME

(2) VI M; 254ME

Rec. (1) III WF; 154ME

(4) III TTh; 154ME

(2) II WF; 154ME

(5) II T, III S; 154ME

(3) IV TS; 154ME

Lab. (1) I-II Th; 154ME

(4) VII-VIII F; 154ME

(2) VII-VIII Th; 154ME

(5) VII-VIII M; 154ME

(3) II-III M; 154ME

32s Lect. VII Th; 254ME

Rec. (1) III MW; 154ME

(3) IV TS; 254ME

(2) II TTh; 154ME

Lab. (1) VIII-IX Th; 154ME

(3) VII-VIII W; 154ME

(2) VI-VII M; 154ME

.33f—Elementary Mechanical Laboratory. Calibration of pressure gages, anemometers, indicator springs. Use of steam calorimeters, planimeters, indicators. Calculations from indicator cards. Tests of mechanical appliances, lubricating oils. 2 cred.; prereq., reg. in 30. Messrs. Gibbs and Campbell.

(1) VI-IX W; Ex

(4) VI-IX M; Ex

(2) VI-IX Th; Ex

(5) VI-IX F; Ex

(3) II-V S; Ex

(6) VI-IX T; Ex

.34w—Mechanical Laboratory. Calibration of tachometers, pyrometers, steam flow meters. Valve setting. Flow of steam through orifices. Test of steam trap, surface condenser, simple steam engines. Inspection trips. 2 cred.; prereq., 33. Messrs. Gibbs and Campbell.

(1) VI-IX M; Ex

(2) VI-IX W; Ex

.35s—Elementary Steam and Power Laboratory. Friction test of oils. Test of hot air engine, centrifugal fan, injector, steam pump, steam boiler. Calibration of transmission dynamometer. Power study of industrial machines. Approximate analysis of fuels. Use of Mahler, Bomb, and Junkers calorimeters. 2 cred.; prereq., 34, and reg. in 32. Messrs. Gibbs and Campbell.

(1) I-IV S; Ex

(2) VI-IX T; Ex

.36f—Elementary General Laboratory. (Mines.) Calibration of pressure gages, anemometers. Use of steam calorimeters, planimeters. Steam indicator practice, card calculation, valve setting. Tests of oils, simple steam engine and steam pump. 4 hours; prereq., accompanying Mine Mech. 112; VI-IX Th. Mr. Gibbs.

- 38w-39s—Heat Engines. (Ch.E.) Study of steam properties, steam calorimetry, elementary thermodynamics, fuels, and combustion; calibration and use of instruments; valve setting; operation and testing of steam engines, boilers, compressors, water heaters and purifiers, gas engines, etc. Selection of equipment for power plants. 3 cred. per qtr.; prereq., Phys. 23. Mr. Gibbs.
- 38w Rec. IV MWF; 110Ex
 39s Rec. (1) IV MF; 110Ex (2) II TTh; 215Ex
 Lab. (1) VI-IX M; Ex (2) VI-IX F; Ex
- 40f-41w—Heat Engines. (E.E.) Properties of steam; principle of operation of steam machinery; fuels, combustion, and smoke prevention; construction, operation, and testing of engines, turbines, boilers, condensers, pumps, and power plant equipment. Selection of equipment for different types of plants. 3 cred. per qtr.; prereq., Phys. 23. Mr. Gibbs.
- Rec. (1) IV TS; 110Ex (2) III WF; 110Ex
 40f Lab. (1) VI-VIII F; Ex (3) I-III Th; Ex
 (2) VI-VIII Th; Ex (4) VI-VIII M; Ex
 41w Lab. (1) VI-VIII Th; Ex (3) I-III Th; Ex
 (2) VI-VIII T; Ex (4) VI-VIII F; Ex
- 42f,w,s—Heat Engines. (C.E.) Steam generation and properties. Fuels and combustion. Construction and operation of boilers and auxiliaries. Elementary thermodynamics. Use and calibration of engine-room instruments. Types, details, and tests of steam engines, steam turbines, gas engines, and air compressors. Performance and adaptability of power equipment. 4 cred.; prereq., Phys. 23. Mr. Gibbs.
- 42f Rec. IV MWF; 209Ex Lab. I-IV S; Ex
 42w Rec. I TThS; 209Ex Lab. VI-IX W; Ex
 42s Rec. I TThS; 209Ex
 Lab. (1) VI-IX W; Ex (2) II-V S; Ex
- 138w—Advanced General Laboratory. (Mines.) (a) Tests of air compressor, steam turbine, compound steam engine, centrifugal fan, gas engines. (b) The use of hydraulic measuring devices, weirs, differential gages, etc., in tests of centrifugal pumps, hydraulic turbines and rams. 4 hours; prereq., 36; VI-IX Th; Ex. Messrs. Shoop and Straub.
- 141f,w—Power Plant Engineering. Theory, practice, and economics relating to prime movers and steam generating equipment of the modern power plant, including auxiliary units such as condensers, heaters, purifiers, pumps, fans, piping, etc. 3 cred.; prereq., 32. Mr. Shoop.
- 141f II MWF; 254ME
 141w II MF, I S; 110Ex
- 144w—Steam Turbines. Theory and practice applied to various types. Thermodynamics and mechanical analysis of problems involved in the design of nozzles, blades, rotors, etc. Condition of operation; systems of transmission; lubrication; economy; field of service. Laboratory investigation. 3 cred.; prereq., 32; I MWF; 209Ex. Mr. Shoop.
- 145w—Applied Thermodynamics. Laws of heat transmission, mean temperature difference, in condensers, boilers, brine coils, feed water heaters. Treatment of cooling towers, accumulators, multiple stills, stage evaporators, vapor refrigeration; air compressors, multi staging, intercooling, etc. 3 cred.; prereq., 32, 35; II TThS; 209Ex. Mr. Shoop.
- 146s—Fuels and Combustion. Fuels: classification and analyses. Hand and stoker treatment; regulation. Pulverized and liquid fuels. Types of burners, controls. Combustion: generation of heat; furnace gases; stratification; flame

- way; smoke prevention. Furnaces. Lectures and recitations. 3 cred.; prereq., 141; I MWF; 215Ex. Mr. Shoop.
- 147w—Design of Steam Machinery. Piping systems, furnace and gas passage dimensions, stokers, oil, gas, and pulverized fuel burners, superheaters, feed water heaters, and pumps, air pre-heaters, automatic controls, chimneys, etc. 2 cred.; prereq., 141 or reg. in 141; VII-IX MTh; 251ME. Mr. Shoop.
- 148s—Design of Power Plant Units. Treatment of condensers, air pumps, cooling towers, stage evaporators, reheaters, etc. 2 cred.; prereq., 147; VI-VIII TW; 255ME. Mr. Shoop.
- 149f,w,s—Advanced Steam Laboratory. Tests of steam turbines, uniflow and compound steam engines, condensers, evaporators, and vacuum pumps. Tests of compound steam pump. Air compressor, boiler, superheater, and power plant. Studies of fluid flow meters and air-conditioning apparatus. 2 cred.; prereq., 32 and 35, 141 or reg. in 141. Mr. Shoop.
 (1) I-IV T; Ex
 (2) (w) VI-IX T; Ex
 (2) (s) VI-IX Th; Ex
- 241s—Advanced Thermodynamics. Reversible changes of state and efflux of wet and superheated vapors. Flow of compressible fluids in mains, moving channels, into receivers, and communicating vessels. Gas mixtures, critical points, liquefaction. Power plant cycles: regenerative, reheating, and bleeding. 3 cred.; prereq., 145. Mr. Shoop.
- 242f-243w—Power Plant Design. Problems, designs, and estimates for power plants and central stations. Selection of motive powers, relative advantages of steam, producers, and gas plants. Choice of engines and boilers; pumps, piping, and accessories. 2 cred. per qtr.; prereq., 148. Mr. Shoop.
- 244s—Power Plant Management. Operation and maintenance of boilers, engines, steam turbines, and accessory apparatus. Smoke prevention, lubricants and lubrication. Power plant finance. Daily logs and power costs. Study of recent power researches. 3 cred.; prereq., 141. Mr. Shoop.

INTERNAL COMBUSTION ENGINES

- 50f,w,s—Auto and Airplane Engines. Principles and types. Electrical systems. Lubrication and cooling. Carburetors. Accessories. 3 cred.; soph. Messrs. Robertson and Ford.
 50f (1) I TThS; 110Ex (2) I MWF; 110Ex
 50w,s I MWF; 110Ex
- 55s—Internal Combustion Engines. (E.E.) Brief course in theory and laboratory, including real gas cycles, combustion, fuels and lubrication; construction and performance of gasoline, Diesel, and compression-ignition engines. 3 cred.; prereq., 41. Messrs. Robertson and Ford.
 Rec. (1) I TS; 110Ex (2) III WF; 110Ex
 Lab. (1) VI-VIII M; Ex (3) VI-VIII W; Ex
 (2) I-III Th; Ex
- 150f,w—Internal Combustion Engines. Study of real gas cycles, combustion, fuels. Construction and performance. Characteristics of Otto, Diesel, and compression-ignition engines. Carburetion, fuel injection, cooling, lubrication. Auxiliary systems. 3 cred.; prereq., 31. Mr. Robertson.
 150f (1) II MWF; 252ME (3) I MWF; 252ME
 (2) II TThS; 252ME
 150w II MF, I S; 215Ex

- 151w—Advanced Internal Combustion Engines. Special reference to automobile, truck, and airplane engines. Theoretical consideration of fuels, combustion, detonation, lubrication, etc. 3 cred.; prereq., 150; VI MWTh; 135E. Mr. Robertson.
- 152s—High Speed Engine Testing. Use of modern research instruments and methods for testing. Experiments showing effect of fuel mixture, distribution, spark timing, etc., upon general engine performance. 2 cred.; prereq., 159; VII-IX TF; Ex. Mr. Robertson.
- 153s—Automobile Fleet Maintenance. Study of available types of motor coaches and trucks, their design features from a maintenance viewpoint, a survey of service depot requirements with a study of fleet service methods and maintenance practice. 3 cred.; seniors only; prereq., 150; I MWF; 209Ex. Mr. Robertson.
- 154w—Design of Airplane Engines. Study of the designs of radial and in-line aircraft engines. Drawing room problems, including graphical and analytical calculations of stresses in moving parts. Combined polar diagrams of bearing loads, etc. 2 cred.; prereq., 27, 150. Messrs. Robertson and Ford.
 (1) I-III T, VII-IX W; 251ME (2) VII-IX TF; 251ME
- 156w,s 157s—Design of Internal Combustion Engines. Detailed study of design of automotive and stationary engines. Problems, including calculation of cylinders, bearing loads, stresses in moving parts, and valve mechanisms. 2 cred.; prereq., 121, 150 for 156, 154 or 156 for 157. Messrs. Robertson and Ford.
 156w II-IV W, I-III Th; 251ME
 156s-157s VI-VIII M, II-IV W; 251ME
- 158f,s—Aero Engine Testing. The use of modern instruments for testing gasoline, Diesel, and aircraft engines. The use of dynamometers and torque stands in determining engine performance. 2 cred.; prereq., 150 or reg. in 150. Mr. Robertson.
 158f VII-VIII M, 209Ex; VI-IX Th; Ex
 158s (1) VI-IX T, Ex; I-II S, 209Ex (3) VI-IX Th, Ex; II-III T, 209Ex
 (2) VI-IX W, Ex; VII-VIII F,
 209Ex
- 159f,w,s—Internal Combustion Engine Laboratory. Tests of gasoline, semi-Diesel, and Diesel engines. Power plant units and automotive engines. 2 cred.; prereq., 150 or reg. in 150. Messrs. Robertson and Ford.
 (1) (f) VI-IX W; Ex (2) (f) VI-IX T; Ex
 (1) (w,s) I-IV T; Ex
- 250f,w,s—Dynamics of High Speed Engines. Advanced study of inertia forces; balancing high speed multi-cylinder engines; engine torque analysis; torsional vibration, etc. Conferences, assigned readings, and problems. 3 cred.; prereq., 121, 150. Mr. Ford.
- 251f-252w-253s—Automobile and Motor Truck Design. Theory and design of the automobile, motor truck engine and chassis, complete design of engine, transmission, and chassis. 2 cred. per qtr.; grad. Mr. Robertson.
- 254w,s—Engine Service Management. Instruments and methods used in servicing or reconditioning automobile and airplane engines. Causes of mechanical failure and wear. Permissible tolerance in worn parts. Lubrication and ignition service. 3 cred.; prereq., 151. Messrs. Robertson and Ford.
- 255f-256w-257s—Automobile Testing and Research. Dynamometer and road tests including over-all efficiency of cars at various speeds, fuel consumption, effect of road surface on traction, efficiencies, and general performances. Special research problems. 2 cred. per qtr.; prereq., 55 or 159. Mr. Robertson.

- 258s—Motor Truck and Bus Transportation. Problems involving motor truck transportation, capacity of trucks, trailers, drawbar pull. Efficiencies. Effect of road surface. Freight handling. Analysis of costs of truck operation and maintenance. Relative costs of transportation. 3 cred.; prereq., 152. Mr. Robertson.
- 259w,s—Diesel Engines. An advanced course in the theory, design, operation, and economics of the Diesel engine. Lectures and assigned readings. 3 cred.; prereq., 150. Mr. Robertson.
- 259w I MWF; 7E
259s ar

HEATING, VENTILATION, AND REFRIGERATION

- 160f—Heating and Ventilation. Principles of heating, ventilation, and air conditioning. Warm air, steam, hot water, vapor, vacuum, and fan systems of heating; pipe systems; heat regulation. Ventilation and air conditioning, central station heating. 3 cred.; prereq., 31, M.&M. 127, 129. Mr. Rowley.
- Lect. VI MTh; 209Ex
Rec. (1) III Th; 209Ex (3) VI F; 209Ex
(2) II S; 209Ex
- 164s—Heating and Ventilation. (Arch.) Principles of heating, ventilation, and air conditioning. Heating systems; furnaces, steam, hot water, vapor, vacuum and fan blast. Piping systems. Ventilation, air conditioning, and methods of control. 2 cred.; prereq., M.&M. 92; I TTh; 215Ex. Mr. Rowley.
- 165w—Advanced Heating, Ventilation, and Air Conditioning. Requirements for comfort, health and industrial processes. Thermodynamics of air vapor mixtures. Heating, cooling, humidification, dehumidification. Atmospheric impurities, sources, classifications, methods of elimination. Air supply and distribution. Methods of control and application. 3 cred.; prereq., 160. IV MWF; 209Ex. Mr. Rowley.
- 166s—Refrigeration. Principles of refrigeration. Various types of refrigerating machines, refrigerants, applications to ice making, cold storage, and air conditioning. 3 cred.; prereq., 32; IV MWF; 209Ex. Messrs. Rowley and Algren.
- 167s—Advanced Heating, Ventilation, and Air Conditioning. Special problems including air conditioning, heat transfer, heating and cooling loads, solar radiation, etc. Equipment and test methods. 3 cred.; prereq., 160. I MWF; 3E. Mr. Rowley.
- 168w—Heating and Ventilation Design. Design, selection, and arrangement of equipment for various types of heating and ventilating systems. 2 cred.; prereq., 160; I-III TTh; 255ME. Mr. Algren.
- 169f,w,s—Heating and Ventilation Laboratory. Tests of heating, ventilating, and air conditioning equipment. The determination of air qualities as required for comfort and for specific industries. Tests and studies of complete installation. 2 cred.; prereq., 35, 160 or reg. in 160. Mr. Algren.
- (1) (f,s) I-IV T; Ex (2) (w) VI-IX T; Ex
(2) (s) VI-IX Th; Ex
- 265f,w,s—Advanced Heating, Ventilation, and Air Conditioning. Taken in connection with research work in the laboratory. Cred. ar.; grad. only; prereq., 160. Mr. Rowley.
- 267w—Mechanical Equipment of Buildings. Selection of heating, ventilating, cooling, and plumbing systems for various types of buildings. Piping layouts,

- 175w—Materials Handling. Equipment and facilities necessary for economical transportation and storage of materials and parts during the process of manufacture; factors affecting capital invested in inventory, hand and power trucks, conveyors, elevators, hoists, cranes, arrangement of stores, checking and issuing materials. 2 cred.; prereq., 172 or reg. in 172. Mr. Koepke.
- 179s—Industrial Relations. Labor administration. Foreman training. Training the worker; job analysis. Employment and turnover; the human element, service departments. Stabilization of labor. Lectures, reading, shop visits and reports. 3 cred.; prereq., 171; IV MWF; 202ME. Mr. Koepke.
- 277f-278w-279s—Industrial Engineering Problems. Special investigations of practical problems and suggested methods of procedure. Lectures, assigned reading, shop visits, and reports. 3 cred. per qtr.; grad.; prereq., 173, 174. Mr. Koepke.

GENERAL

- 189s—Hydraulic Machinery. Theory of operation, design, construction, and regulation of water turbines. Turbine testing; characteristics, selection of type. Cost of turbines and water power. 3 cred.; sr.; prereq., M.&M. 129.
- 190f-191w-192s—Seminar. Reading of assigned articles in current technical press. Classroom presentation of principal features of assigned articles. 1 cred. per qtr.; sr. Mr. DuPriest.
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| 190f | (1) I S; 154ME | (2) IV T; 154ME |
| 191w | (1) II Th; 252ME | (2) VII W; 154ME |
| 192s | (1) IV S; 154ME | (2) II S; 154ME |
- 194w,s—Advanced Engineering Problems. Opportunity will be offered for carrying on special investigations in the various fields of Mechanical Engineering. 2 cred.; registration by permission of the division chief in charge of work. Open only to sr. M.E.
- 281f—Railway Technology. Systematic course of visits to the various railroad shops in the vicinity to study locomotive details and classifications. Locomotive practice. 1 cred.; prereq., M.&M. 127, 128, 129. Mr. Martenis.
- 282f-283w-284s—Locomotive Design and Construction. Locomotive details. Design of boiler, cylinders, frame, springs, trucks, axles, wheels, running gear, equalizing arrangements, valve gears, lubrication. Lectures, assigned reading, and drafting. 3 cred. per qtr.; prereq., 281. Mr. Martenis.
- 290f-291w-292s—Mechanical Engineering Research. Investigations in connection with lubrication, fuels, furnaces, boilers, steam engines, turbines, gas engines, heating and ventilation, industrial and other engineering problems. Cred. as ar. per qtr.; grad. Messrs. DuPriest, Rowley, Shoop, Koepke, Martenis, and Robertson.

METALLOGRAPHY

- 150f—Metallography for Electrical Engineers. Principles of metallography, including pyrometry, thermal analysis, constitution diagrams, microscopic and photomicrographic technique; study of typical alloys with special reference to electrical resistance, conductivity, magnets, etc. Laboratory work and demonstrations. 3 cred.; jr., sr. E.E. Mr. Forsyth.
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| Lect. I MW; 304M | Lab. VI-VIII M; 17M |
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- 151w—Advanced Metallography for Electrical Engineers. Study of iron and steel, alloy steels, metals and alloys used in electrical engineering practice. Special problems for outside reading and for research. Laboratory work. 3 cred.; prereq., 150. Mr. Forsyth.
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| Lect. I MW; 304M | Lab. VI-VIII M; 307M |
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- 152f—Metallography for Aeronautical Engineers. Principles; metallography of iron and steel with special references to alloy steels, and light alloys used in airplane construction. Laboratory work and demonstrations. 3 cred.; prereq., sr. Aero.E. Messrs. Dowdell and Jerabek.
Lect. I TS; 109M
Lab. (1) VII-IX M; 17M (2) VII-IX W; 17M
- 156w—Metallography for Mechanical Engineers. Principles of metallography, including pyrometry, thermal analysis, constitution diagrams, microscopic and photomicrographic technique; metallography and heat treatment of iron and steel. Laboratory work. 3 cred.; prereq., jr., sr. M.E. Mr. Dowdell.
Lect. III ThS; 315M
Lab. (1) VII-IX W; 307M (2) VII-IX F; 307M
- 157s—Advanced Metallography for Mechanical Engineers. Metallography of alloy steels, tool steels, high speed tool steels, and important non-ferrous alloys; metallography applied to engineering practice and specifications. Outside reading and special reports. Laboratory work. 3 cred.; prereq., 156. Mr. Dowdell.
Lect. I MW; 305M
Lab. (1) VII-IX W; 307M (2) VII-IX F; 307M
- 160f—Metallography. (Chem.) Principles of metallography, including constitution diagrams, preparation and standardization of thermocouples, preparation and thermal analysis of alloys, their microscopic examination and photomicrographs; typical alloy systems such as iron carbon (steel, cast iron), and some non-ferrous alloys. Lab. work; 3 cred.; prereq., Anal. Chem. 1, 2. Mr. Jerabek.
Lect. III MF; 111M
Lab. (1) VI-VIII Th; 17M (2) VI-VIII F; 17M
- 161w—Advanced Metallography. (Chem.) Metallography and heat treatment of iron and steel, including alloy steels, commercial uses of various steels, and engineering specifications. Lab. work; 3 cred.; prereq., 160. Mr. Jerabek.
Lect. I MF
Lab. (1) VI-VIII Th; 307M (2) Ar
- 162s—Advanced Metallography. (Chem.) Metallography of the non-ferrous metals with a study of the constitution diagrams, properties, and uses of important commercial alloys. Lab. work; 3 cred.; prereq., 160. Mr. Jerabek.
Lect. III MF
Lab. (1) VI-VIII Th; 307M (2) Ar
- 163f—Advanced Metallography. Seminar work on recent advances in metallography. Lectures and recitations, with outside reading and special reports. May be accompanied by laboratory work. 3 cred.; prereq., 6 cred. in metallography. Mr. Dowdell.
- 164w—Advanced Metallography. Advanced consideration of the structures, properties, and uses of metals and alloys. May be accompanied by laboratory work. 3 cred.; prereq., 6 cred. in metallography. Mr. Dowdell.
- 165s—Advanced Metallography. Technical metallography as applied to the automotive industry. Lectures and special reports. May be accompanied by laboratory work. 3 cred.; prereq., 6 cred. in metallography. Mr. Dowdell.
- 201f-202w-203s—Advanced Metallography for Graduate Students. Intended primarily for research work. Mr. Dowdell.

METALLURGY

- 3f—General Metallurgy. Combustion, fuels, refractory materials, furnaces, and fluxes. Lectures and recitations. 3 cred.; prereq., Inorg. Chem. 8 or equiv.; I TThS; 108M. Mr. ———.
- 4w—Metallurgy of Pig Iron. General principles of iron blast furnace practice. Construction of furnace, handling of stock and products, principles of regulations. Lect. and rec.; 3 cred.; prereq., 3; I TThS; 108M. Mr. ———.
- 5s—Metallurgy of Wrought Iron and Steel. General principles involved in the production of wrought iron and steel. Lect. and rec.; 3 cred.; prereq., 4; I TThS; 108M. Mr. ———.
- 106f—Metallurgy of the Base Metals. Lead, copper, zinc, and mercury. Consideration of smelting methods and principles involved in refining. Lect. and rec.; 4 cred.; prereq., 3; I F, III TThS; 108M. Mr. Pease.
- 107w—Metallurgy of the Base Metals. 4 cred.; prereq., 106; I F, III TThS; 108M. Mr. Pease.
- 108s—Metallurgy of the Precious Metals. Principles involved and methods used in the extraction of gold, silver, and other precious metals. Lect. and rec.; 4 cred.; prereq., 107; I F, III TThS; 108M. Mr. Pease.
- 109f—Metallurgy of Base Metals. (Ch.E., M.E.) Special consideration is given to mechanical appliances. Lect. and rec.; 3 cred.; prereq., Inorg. Chem. 8, 16 or equivalent; IV MWF; 108M. Mr. Pease.
- 109w—Metallurgy of Base Metals. (Chem. and E.E.) Special consideration is given to electrical appliances. Lect. and rec.; 3 cred.; prereq., Inorg. Chem. 8, 16 or equiv.; IV MWF; 108M. Mr. Pease.

MILITARY SCIENCE AND TACTICS

All physically fit male students in the College of Engineering and Architecture and the School of Chemistry (except foreigners) may take instruction in military science for three hours each week during the first two undergraduate years of their course. All students taking this course are given the instruction prescribed for the Basic Course, Senior Division, R.O.T.C. Students registered in Electrical Engineering are assigned to the Signal Corps, all others in Engineering, Architecture, and Chemistry are assigned to the Coast Artillery.

The University allows six credits for the two years' Basic Course, R.O.T.C. These credits may be applied as elective credits in qualifying for a degree.

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 pay. Students pursuing the Advanced Course are also furnished a special uniform and receive a fixed allowance per day. The total government compensation for the two years' advanced work amounts to something over \$200. Students who satisfactorily complete the Advanced Course will be commissioned in the Officer's Reserve Corps of the United States Army.

The University allows 18 credits for the two years' Advanced Course, R.O.T.C., in all units. These credits may be applied towards graduation.

The Advanced Course for the students of this college normally embraces two departments: Coast (Anti-aircraft) Artillery, and Signal Corps. The Signal Corps is open to electrical engineers only.

1f-2w-3s—First Year Basic Course, R.O.T.C.

Coast Artillery. Duties of the coast artillery soldier, with special reference to anti-aircraft equipment and methods; organization; leadership; military history; current international situations; obligations of citizenship; courtesies and customs of the service; marksmanship; relationship of the citizen to his government. 1 cred. per qtr.; no prereq. Master Sergeant Dunkum.

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| 1f | (1) VI MWF; A | (3) VIII MWTh; A |
| | (2) III MWF; A | |
| 2w | (1) VI MWF; A | (3) IX MWF; A |
| | (2) III MWF; A | |
| 3s | I M, V, IX T; A | |

Signal Corps. Duties of the signal corps soldier; relationship of the citizen to his government; important world events of economic, political, and military nature and their effect on our national policies; discipline and courtesies; sanitation and first aid; army organization; map and aerial photograph reading; leadership. 1 cred. per qtr.; no prereq.

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| 1f | VIII MWTh; A |
| 2w | IX MWF; A |
| 3s | I M, V, IX T; A |

4f-5w-6s—Second Year Basic Course, R.O.T.C.

Coast Artillery. Duties of non-commissioned officer of Coast Artillery; defense against chemical warfare; map sketching; signal communication; aircraft identification and characteristics; position finding and fire control for anti-aircraft artillery. 1 cred. per qtr.; prereq., 1-2-3. Lieutenant Zimmer.

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| 4f | (1) II TThS; A | (3) VIII MWTh; A |
| | (2) IV MWF; A | |
| 5w | (1) II TThS; A | (3) IX MWF; A |
| | (2) IV MWF; A | |
| 6s | (1) I M, V, IX T; A | (2) I, V, IX T; A |

Signal Corps. Duties of the signal corps non-commissioned officer; radio telegraph and telephone operating; code practices and procedure in handling messages; leadership. 1 cred. per qtr.; prereq., 1-2-3.

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| 4f-5w | III MWF; A |
| 6s | I M, V, IX T; A |

151f-152w-153s—First Year Advanced Course, R.O.T.C.

Coast Artillery. Duties of the coast artillery officer; aerial photographic reading; combat orders; instructional methods; leadership; basic gunnery, methods of adjusting fire principles of probability; position finding, gunnery and fire control for anti-aircraft artillery. 3 cred. per qtr.; prereq., 4-5-6. Captain Ericson.

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| 151f-152w | (1) II MWF, VI-VII M; A | (2) IV MWF, VI-VII W; A |
| 153s | (1) II MWF; V, IX T; A | (2) IV MWF; V, IX T; A |

Signal Corps. Duties of the signal corps officer; means and methods of transmitting messages; theory and laboratory instruction in military wire communication; use of codes and ciphers; installation and operation of radio sets; tactics and transmission of decisions in form of orders to subordinates; leadership. 2 cred. per qtr.; prereq., 4-5-6 and reg. in E.E. 64-65-66. Lieutenant Brown.

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| 151f-152w | IV MWF, III-IV T; 321EE |
| 153s | I M, V, VII-IX T; A |

154f-155w-156s—Second Year Advanced Course R.O.T.C.

Coast Artillery. Duties of coast artillery officer; command and leadership; military history and policy; military law, surveying and orientation, field engineering; motor transport; instructional methods; artillery tactics.

3 cred. per qtr.; prereq., 51-52-53. Major Potts.

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| 154f | (1) I MWF, VIII-IX W; A | (2) IV MWF, VIII-IX F; A |
| 155w | (1) IV MWF, VIII-IX W; A | (2) IV T, I Th, II S, VIII-IX F; A |
| 156s | I MWF, V, IX T; A | (2) IV MWF, V, IX T; A |

Signal Corps. Duties of the signal corps officer; military law, training management; defense against chemical warfare; military history and policy; leadership; staff duties of a signal corps officer. 4 class and lab. hrs. per week. 2 cred. per qtr.; prereq., 51-52-53, EE. 64-65-66. Lieutenant Brown.

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| 154f-155w | VI-VII MW; 32IEE |
| 156s | I-II M, V, IX T; A |

PHYSICAL EDUCATION FOR MEN

The courses in sports education are offered by the Department of Physical Education to men students of the University for the purpose of providing instruction and practice in sports of a recreational nature in which men may participate in future years as a means of obtaining recreation, regular exercise, and social intercourse.

The University furnishes uniforms to students for class work or recreational play for \$1 per quarter.

SPORTS EDUCATION

1f-2w-3s.†† Sports education courses. Include instruction and participation in the following activities:

Fall Quarter

1. Tennis, handball, and squash rackets (beginning and advanced)
2. Golf (beginning and advanced)
3. Touch football
4. Boxing
5. Swimming (beginning, advanced, and life saving)
6. Freshman team practice in football, gymnastics, wrestling, and swimming as substitution for class instruction.

Winter Quarter

1. Handball and squash rackets
2. Basket-ball and volley ball
3. Boxing
4. Gymnastics
5. Swimming (beginning, intermediate, advanced, and life saving)
6. Freshman team practice in basket-ball, gymnastics, hockey, indoor track, swimming, and wrestling as substitution for class instruction.

† Course 1-2-3 may be offered as a substitute for G.E. 13.

Course 1-2-3 carries a total of three credits. The entire course must be completed before credit is received for any quarter.

†† A fee of \$1 per quarter is charged students registering for one or more of these courses.

Spring Quarter

1. Tennis (beginning and advanced)
2. Golf (beginning and advanced)
3. Diamond ball
4. Swimming (beginning, intermediate, advanced, diving, and life saving)
5. Freshman team practice in baseball, basket-ball, football, golf, track, and tennis as substitution for class instruction.

Courses will be offered during the following periods. Definite scheduling of each activity will not be made until after a meeting at the beginning of the quarter to determine the hours which best fit the schedules of a majority of students wishing to elect each activity.

MWF II, III, IV, VI, VII
TThS II, III

NOTE.—A student may elect the same activity for only two quarters. Freshman team practices may be substituted two quarters only, except that students who can pass proficiency examinations in a sufficient number of recreational games will be allowed to substitute a third quarter.

4w—Freshman Hygiene. No cred.; no prereq.; IV S; 202S.

13f,14w,15s‡—Individual Activities. 3 cred.; prereq., 1, 2, 3. Mr. Osell.

(1) II MWF; 264S

(4) VIII MWF; 264S(f,w)

(2) III MWF; 264S

(4) VII MWF; 264S(s)

(3) IV MWF; 264S

PHYSICAL EDUCATION FOR WOMEN

This department aims to promote the physical efficiency of the women students. It gives physical examination and advice to all on entrance; plans systematically to keep in close touch with them during their first two years of residence; gives a course in hygiene; organizes neuro-muscular activity leading toward organic strength, nervous stability, conscious motor control, correct bodily mechanics, skill in handling the body in physical recreation, and the development of that valuable social quality known as good sportsmanship; co-operates closely with the Women's Athletic Association in encouraging and organizing athletic sports, holds regular office hours for the purpose of consultation with all students who desire its advice.

Work in this department must be taken for six consecutive quarters in the freshman and sophomore years. Every student must complete Courses 1, 2, 3, 4, 5, 6, and 7. All students are allowed as free choice as their physical condition permits.

Physical examinations or consultations are required annually of all students.

Women students in the College of Engineering and Architecture and the School of Chemistry take physical education instead of military science and tactics in the freshman and sophomore years and without numerical credit.

Statement of fees.—There is a fee of \$1.75 a quarter for all exercise courses, including swimming, for which registration is required. Maximum fee paid by a student in physical education, \$3.50 a quarter.

1f,2w,3s,4f,5w,6s—General Course in Physical Education. Students must register for the 1-2-3 sequence in their first year and for the 4-5-6 sequence in their second year. No cred.; no prereq.

‡ A fee of \$1 per quarter is charged students registering for one or more of these courses.

| | | |
|--|---------------------|--------------------------------|
| Archery | | |
| 1f,2w,4f,5w | II MW; 153WGm | |
| 3s,6s | (1) II TTh; 153WGm | (4) VI MW; 153WGm |
| | (2) III TTh; 153WGm | (5) VII WF; 153WGm |
| | (3) IV MW; 153WGm | |
| Baseball | | |
| 3s,6s | (1) III TTh; 151WGm | (3) VI MW; 151WGm |
| | (2) IV WF; 151WGm | |
| Basket-ball, Beginning | | |
| 2w,5w | (1) III TTh; 151WGm | (3) VI MW; 151WGm |
| | (2) IV MF; 151WGm | |
| Basket-ball, Intermediate | | |
| 2w,5w | II MW; 151WGm | |
| * Dancing, Interpretive | | |
| 1f,4f,2w,5w | | |
| 3s,6s | VII TTh; 151WGm | |
| Dancing, Tap, Elementary | | |
| 1f,4f,2w,5w | III MW; 151WGm | |
| Dancing Tap, Intermediate | | |
| 1f,4f,2w,5s | VIII TTh; 151WGm | |
| Field Hockey | | |
| 1f,4f | VI MW; 151WGm | |
| Fundamentals | | |
| 1f,4f,2w,5w | (1) III TTh; 153WGm | (3) VI MW; 153WGm |
| | (2) IV MW; 153WGm | |
| †Golf, Elementary | | |
| 2w,5w | II WF; 151WGm | |
| 3s,6s | (1) I TTh; 151WGm | (3) VII TTh; 151WGm |
| | (2) III MW; 151WGm | |
| Golf, Intermediate | | |
| 1f,4f | VII WF; 151WGm | |
| 3s,6s | (1) VI MW; 151WGm | (2) II TTh; 151WGm |
| ‡Horseback Riding | | |
| 1f,4f,3s,6s | IX TTh; 151WGm | |
| Orthopedics | | |
| 1f,2w,3s, | (1) II MW; 3WGm | (3) IV MW; 3WGm (f and w only) |
| 4f,5w,6s | (2) III TTh; 3WGm | (4) VI MW; 3WGm |
| Posture | | |
| 1f,4f | (1) I TTh; 151WGm | (3) VI MW; 151WGm |
| | (2) III TTh; 151WGm | |
| Recreational Games, Folk Dancing, and Gymnastics | | |
| 1f,4f,2w,5w | I WF; 151WGm | |
| Skating | | |
| 2w,5w | VII WF; 151WGm | |
| Soccer | | |
| 1f,4f | IV MW; 151WGm | |
| §Swimming, Elementary | | |
| 1f,2w,3s, | (1) II TTh; 51WGm | (3) VII WF; 51WGm |
| 4f,5w,6s | (2) IV MF; 51WGm | (4) VIII TTh; 51WGm |
| Swimming, Intermediate | | |
| 1f,2w,3s, | | |
| 4f,5w,6s | (1) III TTh; 51WGm | (2) VIII MW; 51WGm |
| Swimming, Advanced | | |
| 1f,2w,3s, | | |
| 4f,5w,6s | VI MW; 51WGm | |
| Swimming, Life Saving | | |
| 3s,6s | (1) II MW, 51WGm | (2) IX MW; 51WGm |

* The winter course in Interpretive Dancing is not open to students who have not taken Rhythmic Dancing fall or spring quarters.

† Students must supply their own golf equipment.

‡ For horseback riding students will pay at about \$1 per lesson, but not the regular gymnasium fee. Attendance at class hour is required for credit. Class meetings will be one hour in length. Groups will be arranged according to riding ability.

§ Students may not enter the winter quarter of elementary swimming unless they have taken elementary swimming in the fall or spring in Sec. 3, VII WF.

| | | | |
|---|---|----------------------|--|
| Swimming, Diving | | | |
| 2s,5s | III MW; 51WGm | | |
| ‡Tennis, Elementary | | | |
| 3s,6s | (1) I TTh; 151WGm | (3) IV MW; 151WGm | |
| | (2) III TTh; 151WGm | (4) VI MW; 151WGm | |
| ‡Tennis, Intermediate | | | |
| 3s,6s | (1) II TTh; 151WGm | (3) VIII TTh; 151WGm | |
| | (2) VII WF; 151WGm | | |
| Volley Ball | | | |
| 1f,4f | II TTh; 151WGm | | |
| 3s,6s | IV WF; 151WGm | | |
| 7f,w,s† | Lectures in Physical Education and Health. No cred.; no prereq. | | |
| 1f,4f | (1) I MW; 201WGm | (3) VI MW; 201WGm | |
| | (2) II TTh; 201WGm | | |
| 2w,5w | (1) II TTh; 201WGm | (2) VI MW; 201WGm | |
| 3s,6s | VI MW; 201WGm | | |
| Activities for which no registration is required. | | | |
| § Elective Sports (fall)—field hockey, volley-ball, swimming. | | | |
| (winter)—basket-ball, ice hockey. | | | |
| (spring)—track, baseball, swimming, tennis. | | | |
| IX MTWTh; 151WGm | | | |
| General Swimming IX MTWF; 151WGm | | | |
| Tap Dancing IX TTh; 153WGm | | | |

PHYSICS

| | | | |
|---|-------------------------|------------------------|--|
| 3f,w,s,su—Elements of Mechanics. Mechanics of solids and fluids. Study of the simpler fundamental principles. First part of a general course 3, 13, 23, 33, 43. Course 4 should be taken in conjunction with this course. 3 cred.; prereq., M.&M. 12 or equiv. Mr. Erikson. | | | |
| 3f | Lect. (1) II MWF; 150Ph | (2) VI MWF; 150Ph | |
| | Quiz (1) II Th; 150Ph | (2) IX Th; 150Ph | |
| 3w,s | Lect. VIII MWF; 150Ph | Quiz IX F or ar; 150Ph | |
| 4f,w,s,su*—Elements of Mechanics Laboratory. The laboratory part supplementing Course 3. 1 cred.; prereq., 3 or reg. in 3. Mr. Erikson. | | | |
| 4f | (1) III-IV T; 153Ph | (7) I-II F; 153Ph | |
| | (2) VI-VII W; 153Ph | (8) III-IV S; 153Ph | |
| | (3) VIII-IX M; 153Ph | (9) I-II M; 153Ph | |
| | (4) I-II T; 153Ph | (10) VI-VII Th; 153Ph | |
| | (5) I-II W; 153Ph | (11) VI-VII M; 153Ph | |
| | (6) VIII-IX F; 153Ph | (12) I-II S; 153Ph | |
| 4w,s | (1) VI-VII M; 153Ph | (3) I-II T; 153Ph | |
| | (2) VIII-IX T; 153Ph | (4) VIII-IX Th; 153Ph | |
| 13f,s—Acoustics. Study of the principles and applications of sound. 3 cred.; prereq., 3. Mr. Buchta. | | | |
| 13f | Lect. I TThS; 133Ph | Quiz IX M; 150Ph | |
| 13s | Lect. III MWF; 133Ph | Quiz IX M; 150Ph | |
| 23f,w—Heat. Study of principles underlying heat phenomena. Course 24 should be taken in conjunction with 23. 3 cred.; prereq., 3. Mr. Miller. | | | |
| 23f | Lect. III TThS; 150Ph | Quiz IX T; 150Ph | |
| 23w | Lect. (1) II MWF; 150Ph | (3) IV MWF; 150Ph | |
| | (2) VI MWF; 150Ph | | |
| | Quiz (1) II Th; 150Ph | (2) IX Th; 150Ph | |

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

† 7f,w,s must be taken during the first year in residence, preferably during the fall quarter. This course should be taken at the same time as an activity course. Required of women students in Engineering, Architecture, and Chemistry in place of G.E. 13.

‡ Students taking tennis must pay \$1 for a tennis permit.

§ With permission of the director.

24f,w*—Heat Laboratory. Laboratory part supplementing Course 23. 1 cred.; prereq., 4, 23, or reg. in 23. Mr. Miller.

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|-----|----------------------|-----------------------|
| 24f | (1) VI-VII M; 244Ph | (3) VI-VII T; 244Ph |
| | (2) VIII-IX M; 244Ph | (4) VIII-IX T; 244Ph |
| 24w | (1) VIII-IX F; 244Ph | (7) VI-VII F; 244Ph |
| | (2) II-III Th; 244Ph | (8) VI-VII W; 244Ph |
| | (3) III-IV T; 244Ph | (9) I-II W; 244Ph |
| | (4) I-II M; 244Ph | (10) VI-VII M; 244Ph |
| | (5) I-II T; 244Ph | (11) III-IV S; 244Ph |
| | (6) VIII-IX M; 244Ph | (12) VIII-IX T; 244Ph |

33f,w,s—Optics. Experimental demonstrations of optical phenomena and a study of the fundamental optical principles. Course 34 should be taken in conjunction with this course. 3 cred.; prereq., 3.

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|-------|---------------------|--|
| 33f | Lect. IV MWF; 133Ph | Quiz IX F; 133Ph |
| 33w,s | Lect. I TThS; 133Ph | Quiz IX F or ar; 133Ph(f,w), 166Ph(s) |

34f,w,s*—Optics Laboratory. Laboratory part supplementing Course 33. 1 cred.; prereq., 33 or reg. in 33. Mr. Valasek and others.

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|---------|----------------------|----------------------|
| 34f,w,s | (1) VI-VII M; 352Ph | (3) VI-VII Th; 352Ph |
| | (2) VIII-IX M; 352Ph | |

43w,s—Electricity. Study of the principles underlying electric phenomena. Course 44 should be taken in conjunction with 43. 3 cred.; prereq., 3. Mr. Zeleny.

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|-----|-------------------------|-------------------|
| 43w | Lect. III TThS; 150Ph | Quiz IX T; 150Ph |
| 43s | Lect. (1) II MWF; 150Ph | (3) VI MWF; 150Ph |
| | (2) IV MWF; 150Ph | |
| | Quiz (1) II Th; 150Ph | (2) IX Th; 150Ph |

44w,s*—Electricity Laboratory. Laboratory part supplementing Course 43. 1 cred.; prereq., 4, 43, or reg. in 43. Mr. Zeleny.

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|-----|----------------------|-----------------------|
| 44w | (1) VI-VII T; 231Ph | (3) I-II Th; 231Ph |
| | (2) VI-VII W; 231Ph | (4) III-IV F; 231Ph |
| 44s | (1) III-IV M; 231Ph | (8) VIII-IX Th; 231Ph |
| | (2) VIII-IX M; 231Ph | (9) I-II F; 231Ph |
| | (3) III-IV T; 231Ph | (10) VI-VII F; 231Ph |
| | (4) I-II W; 231Ph | (11) VIII-IX F; 231Ph |
| | (5) VI-VII W; 231Ph | (12) I-II S; 231Ph |
| | (6) II-III Th; 231Ph | (13) III-IV S; 231Ph |
| | (7) VI-VII Th; 231Ph | |

101f-102w-103s—Theoretical Physics. An analytical survey of fundamental principles of mechanics, sound, heat, light, electricity, and magnetism, designed to supplement the general course and to prepare students for more specialized graduate courses. 5 cred. per qtr.; jr., sr., grad.; prereq., 12 cred. in phys., M.&M. 25; IV MTWFS; 145Ph. Mr. Tate.

124s*—Pyrometry. Experimental study of the principles underlying temperature. One lecture, two three-hour sessions in the laboratory a week. 3 cred.; prereq., 23, 24; VI-IX MW, or ar.; 245Ph. Mr. Miller.

126f,s*—Advanced Heat. Temperature standards, expansion, calorimetry. Kinetic theory of matter. Change of state and heat transfer. Lecture and laboratory. 3 cred.; prereq., 23, 24; VI-IX MW, or ar.; 245Ph. Mr. Miller.

144f*—Electricity Measurements. Devoted mainly to the study of potentiometer methods, capacitance, inductance, magnetic flux. One lecture, one quiz hour and two two-hour laboratory periods a week. 3 cred.; prereq., 43, 44. Mr. Zeleny.

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|-----------|-------------------|------------------------|
| Lect. III | Th; 166Ph | Quiz III S; 166Ph |
| Lab. (1) | VIII-IX MF; 231Ph | (3) VIII-IX TTh; 231Ph |
| (2) | VI-VII TTh; 231Ph | (4) VI-VII MF; 231Ph |

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

For other electives in the Department of Physics see the Combined Class Schedule bulletin for 1935-36, Science, Literature, and the Arts section.

PHYSIOLOGIC CHEMISTRY

100f,su—Physiologic Chemistry. Application of physical and inorganic chemistry to physiology. 7 cred.; prereq., phys. and Org. Chem. 153. Messrs. McClendon, Hemingway, and Cavett.

Lect. IV MTWF; MeS Aud

Quiz I F

Lab. (1) I-III MW; 310MH

(3) I-III ThS; 310MH

(2) I-III MW; 310MH

(4) I-III ThS; 310MH

101w,su—Physiologic Chemistry. Chiefly in organic aspects. Metabolism of proteins, fats, carbohydrates in health and disease. 6 cred.; prereq., Physiol. 100. Messrs. McClendon, Hemingway, and Cavett.

Lect. IV TS, VI F; MeS Aud

Quiz VI T

Lab. (1) I-III MW; 310MH

(3) I-III ThS; 310MH

(2) I-III MW; 310MH

(4) I-III ThS; 310MH

POLITICAL SCIENCE

63s—Functions of Government. Services of modern government: law enforcement, regulation of business and agriculture, government and the professions, education, public welfare, highways, public works, health, conservation of natural resources, problems of personnel and finance, the place of the expert in government. 3 cred.; no prereq., soph., jr., sr.; I MWF; BuAud. Mr. Field.

RHETORIC

(College of Agriculture)

22f,w,s—Public Speaking. Practical course in fundamentals of speech making. 3 cred.; prereq., Engl. 6. Mr. Routledge.

22f,s III MWF; 311En(UF)

22w (1) I MWF; 311En(UF)

(2) II MWF; 311En(UF)

23f,w,s—Public Speaking. 5 cred.; prereq., Engl. 6; IV MTWFS; 311En(UF).

SOILS

6w—Soils. Origin, formation, physical properties, moisture relations, principles of soil fertility, use of lime, commercial fertilizers, and stable manure; soil organisms and green manures; tillage. 5 cred.; no prereq.; II MTWThF; 204So(UF). Mr. Rost.

108w—Physical Properties of Soils. The determination of physical constants of soils, including mechanical composition. 3 cred.; jr., sr.; prereq., 6. Mr. McMiller.

Lect. VI W; 204So(UF)

Lab. VII-IX W, VI-VIII F;

201So(UF)

ZOOLOGY

14f-15w†-16s*—General Zoology. Structure, physiology, embryology, classification, and evolution of animals. Textbook, lectures, laboratory, and quizzes. 3 cred. per qtr.; no prereq.; V-VII TTh; 101Z, 15MeS. Mr. Dawson.

* A fee of \$1 is charged each quarter.

† Courses 14 and 15 must be completed before credit is received for any quarter.

Bulletin of
University of Minnesota



Freshman Week

September 23 to 28, 1935

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No. 36

July 20, 1935

Entered at the post-office in Minneapolis as second-class matter, Minneapolis, Minn. Accepted for mailing at special rate of postage provided for in section 1103, Act of October 3, 1917, authorized July 12, 1918.

Freshmen, Welcome to the University!

This booklet has been prepared for you. It contains information which you will find helpful during Freshman Week and throughout the year. Read it carefully. Then reread it and study the sections that concern you particularly.

Carry this booklet with you throughout Freshman Week and preserve it for future reference.

For statements concerning courses of study, requirements, and regulations you must consult the Bulletin of General Information and the bulletins of the various colleges.

You will find the

PROGRAM OF FRESHMAN WEEK

on page 3. Definite assignments for the various exercises will be given you on a program card.

The *Registration* procedure is outlined on pages 7 to 9.

If you wish to *rent a room* consult the Housing Bureau in Shevlin Hall.

Meals will be served to men in the cafeteria of the Minnesota Union and to women in Shevlin Hall.

See the map of the Main campus, page 40, and of the University Farm campus, page 41.

When in doubt, do not hesitate to ask questions. The members of the administration, the faculty, and the upper classmen are all interested in you and always ready to help you.

Freshman Week Committee

OSCAR C. BURKHARD, Director

ROBERT CRAWFORD, Student Chairman

**NOTICE THAT ALL FRESHMEN MUST REGISTER FOR
FRESHMAN WEEK ON MONDAY, SEPTEMBER 23,
OR TUESDAY, SEPTEMBER 24**

It is recommended that as many as possible present themselves for registration on Monday, September 23, in order to avoid the inconvenience and delay incident to the congestion on the last day.

To the Class of 1939:

Admission to a university is to every student a privilege, an obligation, and a test. It is a privilege, because even today, despite the large numbers who now continue education beyond the high school, so many are denied this opportunity; and because important sacrifices are made to maintain a university.



President Coffman

You have an obligation when you attend a university, because society and your parents are making it possible for you to obtain a training, a knowledge of the world, and an insight into its affairs under expert guidance and in specially suitable surroundings. In your lives and achievements you will have an opportunity to repay this debt and to reflect credit on the judgment of those who let you contract it.

More than most entering students realize, university life is a test. Your achievements here will be the guides by which those with whom you seek business or professional affiliations will be certain to judge you. More than you know now, your future will depend upon the use you make of opportunities opened to you here, and more laurels will go to the small number who do best than to very large numbers of the others. This is true; but at the same time no one of you who faces university life seriously will fail to benefit tremendously.

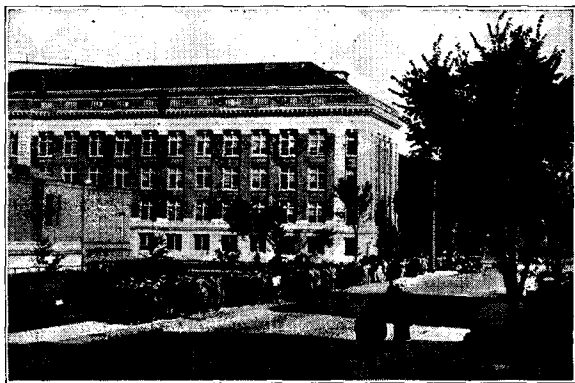
At this important point in your careers you have my heartfelt good wishes for success.

L. D. COFFMAN, President

LECTURES ON PROFESSIONS

Your attention is called to the following lectures which will give information and advice on the training for the various professions. They are intended primarily for the students who will register for the respective courses, but all freshmen who are interested, as well as advanced students coming from other institutions, are urged to attend.

| | | | |
|--|---|-------------|-----------------------------|
| Law | Dean Fraser | Wed. 10:30 | Music Aud. |
| Dentistry | Dean Lasby | Wed. 10:30 | 111 Medical Sci. Bldg. |
| Medicine | Dean Lyon | Wed. 11:30 | Music Aud. |
| Business | Dean Stevenson | Wed. 11:30 | Burton Hall Aud. |
| Engineering, Architecture, and Chemistry | Dean Leland | Thurs. 1:30 | Chemistry Aud. |
| Education | Dean Benjamin | Fri. 1:30 | Pattee Hall Aud. |
| Pharmacy | Dean Wulling | Wed. 1:30 | Lect. Room, Pharm. Bldg. |
| Mines | Prof. E. H. Comstock | Thurs. 1:30 | Lect. Room, Mines Bldg. |
| Agriculture, Forestry, and Home Economics | For information and advice on Agriculture, Forestry, and Home Economics students are advised to apply at the office of Dean Freeman, 200 Plant Pathology Building, University Farm. | | |



Students Return to the University

LIBRARY INSPECTION

The tours through the library are made under the direction of the librarian, Mr. Walter, or one of his assistants, who gives the freshmen instruction on the facilities of the library and the opportunities and privileges it offers. The students are shown the location of the reading, reference, and periodical rooms, and are told something of library procedure, how to use the card catalog, how to obtain books, etc.

PROGRAM OF STUDY

The Program of Study is made out by the student in conference with a faculty adviser from the college which he desires to enter. If there is a question about the subjects you should take or the arrangement of hours for your study program the faculty adviser will give careful consideration to your wishes. If you are in doubt about your Vocation consult the Committee on Vocational Information in Room 310 Northrop Auditorium. The members of this committee will help you in choosing a profession.

CAMPUS TOURS

For the purpose of acquainting new students with the campus, its buildings, its landscape, its athletic as well as academic facilities, tours have been arranged which will cover the grounds of the University. Student guides will conduct the parties and will endeavor to make the tours not only interesting but profitable. If you are interested in making a tour of the Main campus or the Farm campus register in the Freshman Week office in Room 104 Minnesota Union.

The tours will start from the Minnesota Union every morning at 9:30 and every afternoon at 1:30 from Wednesday, September 25, to Friday, September 27.

The education program is supplemented by a number of entertainments given by the student committee. These give the freshman an impression of campus activities and social life, and fill what might otherwise be lonely moments. Something is provided for each evening.

Wednesday, 7:00 p.m.—Reception, Northrop Memorial Auditorium. A play and other entertainment.

Thursday, 3:30 p.m.—Campus Sisters' Tea. Minnesota Union.

8:00 p.m.—Church Night. At the church table in the Post Office students are given tickets for this event.

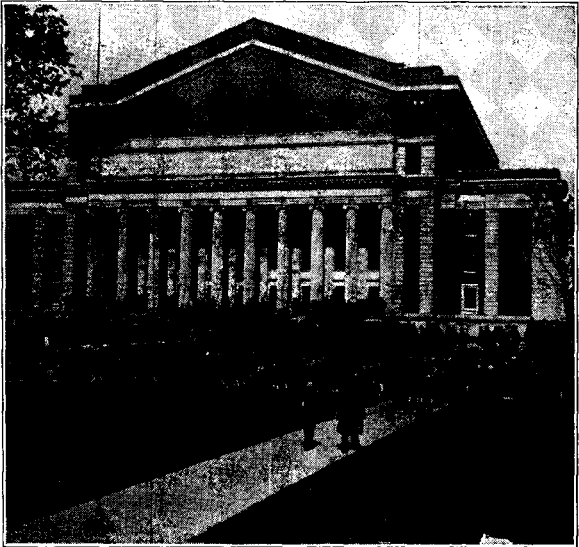
Friday, 8:00 p.m.—Mixer for men in the Minnesota Union.

Entertainment for women in the Women's Gymnasium.

Saturday, 8:00 p.m.—Carnival. Minnesota Union.

FRESHMAN CONVOCATION

On Thursday, October 3, at 11:30 a.m., all freshmen will assemble in the Northrop Memorial Auditorium to hear the address of welcome by President Coffman. Representatives of the Board of Regents, the faculty, and upper classmen will be there to greet the new students.



Freshman Convocation

Registration

1. If you have received your Admission Certificate:

Report for Freshman Week Assignment:

Time: Monday-Tuesday, September 23-24, 8:30 a.m. to 12:00 m., 1:00 to 5:00 p.m.

Place: Armory, University Avenue at 17th Avenue S.E.

Required to present: Admission Certificate (form A138 previously mailed to student)

Receive: Freshman Week Assignment (listing the time and place of all Freshman Week activities, including lectures, physical examination, study program, and payment of fees)

As assignments for exercises of Freshman Week and programs for the fall quarter where there is a choice of sections are made in the order in which students report, it will be advantageous to report early Monday, September 23.

2. If you have not received your Admission Certificate but have taken the tests required (see paragraph 3 below):

Report to the Board of Admissions, Windows 18-20, Registrar's Office at 8:30 a.m., Monday, September 23.

3. If you have not taken the Aptitude and English Tests or if you are entering the College of Science, Literature, and the Arts, College of Education, or College of Pharmacy and have not written the English Theme:

Report for College Aptitude Test, English Placement Test, and English Theme:

150 Physics Bldg., Monday, September 23, 9:30 a.m., 1:00 or 3:00 p.m. (if either the first two tests or all three have to be taken. The College Aptitude and English Placement Tests are required of all freshmen. The English Theme is required only of freshmen entering the College of Science, Literature, and the Arts, College of Education, or College of Pharmacy. In reporting for tests, present the Certificate for Testing, form A263, issued to you by the Board of Admissions)

Report for English Theme:

133 or 136 Physics Bldg., Monday, September 23, 9:00, 10:00, 11:00 a.m., 1:00, 2:00, 3:00, or 4:00 p.m. (For students entering the College of Science, Literature, and the Arts, College of Education, or Col-

lege of Pharmacy who have had the College Aptitude and English Placement Tests. When you report for the English Theme, present the Certificate for Testing, form A263, issued to you by the Board of Admissions.)

Required tests may be taken prior to Freshman Week by reporting any day before 9:00 a.m. to the University Testing Bureau, Room 310 Northrop Memorial Auditorium. In reporting for tests, present the Certificate for Testing, form A263, issued to you by the Board of Admissions. Freshmen are urged to take the tests early, if possible, to enable them to obtain their Admission Certificates before Freshman Week begins.

In indicating your choice of college the following should be kept in mind:

(a) The General College is a new unit entirely distinct from the other colleges. It is intended to meet the needs of those students who either have only a limited time to give to college or who have not as yet decided upon the field in which they wish to do their life work. Read the section on the General College on page 58.

(b) The first two years in preparation for medicine, dentistry, law, and business are in the College of Science, Literature, and the Arts.

(c) The first two years in preparation for the general course in teaching are in the College of Science, Literature, and the Arts. Students desiring Art Education, Physical Education, Public School Music, or Industrial Education will register for their first year's work in the College of Education.

(d) Chemical Engineering is offered in the School of Chemistry. Mining, Petroleum and Geological Engineering, Metallurgy and Metallography are offered in the School of Mines and Metallurgy. All other engineering courses including Agricultural Engineering are in the College of Engineering and Architecture.

Freshman Week Assignments. As you leave the Armory, you will receive your program of Freshman Week assignments and will have completed your preliminary registration for the week. Read the instructions on the cover of the program and follow them explicitly. Be sure to report for the various events promptly at the hour indicated in each case.

Registration for the Fall Quarter. This registration

will be conducted as a part of Freshman Week and is covered by two of the items on your program card of assignments. At the time scheduled for "Matriculation and Payment of Fees" report at the window labeled "Matriculation" in the post-office lobby east entrance. You should bring with you your certificate of admission and be prepared to pay your fall quarter fees at that time. Further instructions for the completion of your registration will be given you at the time of matriculation.

Fall Quarter Programs. Advice in the selection of studies is a function of the faculty. Faculty advisers will assist you in making out your study program when you report at the place indicated on the program for the item "Study Program."



Entrance to Armory
Registration Begins Here

The Purpose of Freshman Week

To the Freshmen of 1935:

During Freshman Week new students will learn something of the many lines of work conducted by the University and of the organization through which they are carried on. How many colleges and departments are there and where are they located? In what college is a given subject of study to be found, where does one register for it, and to whom does one go for information about it? Where do I find a class that is scheduled IV M,T,W,F,S 209F, and why does it not meet on Thursday instead of Saturday? Where do I pay my fees, and why do I have to take my physical examination and psychological tests first?

These and a thousand other questions are to be answered during Freshman Week (1) by a large group of faculty members especially chosen for this purpose; (2) by the information clerk at the registrar's office; or (3) by students known as Campus Sisters and Senior Advisers.

The freshman is advised to ask questions about anything that he needs to know. Any faculty member or student will be glad to tell you or direct you where to go to find what you want. Do not hesitate to ask. Everyone on the campus is the freshman's friend.

The purposes of the University have to do primarily with intellectual achievement and moral character. These are to be attained through studies and personal experience. Relations with one's fellows inside and outside of college are important factors in the development of the whole man. Every student may find among the student activities at the University some opportunities for worth-while personal experience. However, he needs to choose wisely among these in order not to waste his time or to submit himself to harmful influences. Students who come to college solely to have a good time or to spend most of their energies in college politics or in any other activities to the neglect of their studies are throwing aside the chief opportunities which the University offers them. Such persons tend to spoil the activities in which they take part and to mislead and poison the minds of others who enter these activities. Beware of what you go into. Student activities are not good just because they are praised by many upper classmen or other persons either during Freshman Week or at

other times. Neither are the same activities suitable for everyone. Choose your activities for the help they will give you in your main purpose or merely as recreation. Your main job at the University is in scholarship, in learning, and in mastering the ways of acquiring knowledge. These are the things you will use in your profession or other work throughout life. Activities are good if they support and strengthen you in your main job and help you to apply your knowledge to the general welfare—your neighbor's and yours.

We wish to give the new student information and advice about the vocation or profession which he plans to undertake or the college which he should enter, and to bring the undecided student into contact with those who can help him to study his own interests and abilities and find out for what kind of work he is best fitted. Many students cannot decide their questions in the first week or the first year. During Freshman Week the Committee on Vocational Information, 310 Northrop Memorial Auditorium, will be glad to give help on these general questions. The registration advisers in the various colleges and the members of departments in which you may be interested will be glad to discuss your questions with you.

We shall try to give you some help about how to study and how to plan the best use of your time. As you get into the university life you will find many things to do and many things to attract your attention. Everything that is worth while can be done if you plan your time and put each thing into its proper place. Otherwise, every *attractive* thing will *distract* you from the main purpose for which you come here. A time budget adviser will be found in the Armory during Freshman Week. He will gladly help you plan your time for study and recreation in relation to your classes. It will pay you to visit him or a faculty adviser in your own college after your study program has been arranged.

We wish you to learn promptly and from competent persons the use of the University Library. You will have a lecture on the library, and you will visit it as one of a small group to whom the members of the staff will explain the catalog, the reading rooms for assigned work, for general reference readings, for periodical literature, etc.

Those in charge of Freshman Week wish the new student to catch something of the spirit of the University—what it

does and what it stands for. All the lectures and exercises are intended to contribute to this end.

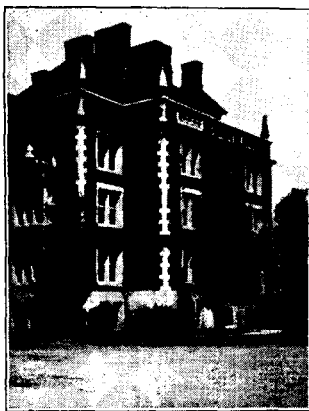
Finally, we wish to put you actually in touch with those persons who will help you in adjusting yourself to the complex life of the University. During Freshman Week every new student may talk with the dean of his college or with an experienced and responsible faculty adviser. The dean of student affairs, the dean of women, the Student Council, the Women's Self-Government Association, the Campus Sisters, the pastors of churches, and student religious organizations, all are active in looking after new students. The Student Council is represented by a special Student Committee which co-operates with the Freshman Week Committee.

Professor Oscar C. Burkhard is director of Freshman Week and is the representative of this committee in charge of all the exercises.

We shall cordially welcome you and help you in every possible way.

FRESHMAN WEEK COMMITTEE

J. B. JOHNSTON, Chairman



Folwell Hall

*Principal Recitation Building of the
Arts College*

Helping You Solve Your Vocational and Other Personal Problems

*Donald G. Paterson, Professor of Psychology
and*

E. G. Williamson, Director of University Testing Bureau

SUCCESS or failure in college frequently hinges upon the kind of adjustments made early in the freshman year. New problems may arise during this year, the most important of which are:

- Developing new study habits
- Learning how to use the library facilities
- Keeping physically and mentally fit
- Securing adequate financial resources
- Choosing one's friends wisely
- Discovering that scholarship is basic to professional success
- Selecting proper courses of study
- Making a vocational decision.

Altho the problem of choosing one's life work and planning a course of study preliminary to, or in accordance with, such decision is only one of the many problems facing the young man or young woman on the threshold of college life, the wisdom of carefully selecting studies in conformity with some definite purpose (either cultural or vocational or both) can scarcely be denied.

It is clearly recognized that it is better for some students to postpone definite choice of vocation until they have had an opportunity to explore and test themselves out in a variety of courses. Such students may enroll in the University General College or in the general course in the College of Science, Literature, and the Arts. If the student enrolls in the latter college, it is well to keep in mind the necessity of choosing *by the end of the sophomore year* a suitable major subject in which to concentrate during the junior and senior years.

This choice of vocation and college courses should be based upon abilities for that vocation as well as the opportunities for promotion and happiness. You should not be unduly influenced in your choice by the desires of your friends, the outstanding success of someone you know, or by other irrelevant factors. Some people probably can be successful in several vocations, while others do their

best work in one particular vocation. The important thing is to understand your own assets and to find the kind of job which demands these assets.

This process cannot be made by self-analysis and many times it cannot be made by talking with your friends. A better method is, first, talk with someone who knows what abilities are required for the work in which you are interested and second, compare your own aptitudes with those possessed by successful persons in a given vocation by means of objective tests. To aid you in taking these two steps, the University provides the *Committee on Vocational Information* and the *University Testing Bureau*.

COMMITTEE ON VOCATIONAL INFORMATION

During Freshman Week the Committee on Vocational Information is available for your use in choosing a vocation. Members of the committee may be consulted in Room 310 Northrop Auditorium, between the hours of 9:00 to 12:00 and 1:00 to 4:00 each day.

If you are unable to decide or need additional information to enable you to choose a vocation, the Committee on Vocational Information will help you select college subjects which will give you firsthand information and will help you test your interests and aptitudes for these vocations. Even tho you may have chosen your vocation, it is advisable to consult the committee in order to be more certain that you have chosen wisely. This consultation will take only a few minutes, and it may prevent worries and needless changing of courses at a later time in your college life.

You are urged to do the following during Freshman Week:

1. Consult the Committee on Vocational Information in Room 310 Northrop Auditorium.
2. Select two or three vocations which have the most intense appeal for you. In consultation with the committee, consider the advisability of preparing for these vocations.
3. If you are still unable to decide, then arrange for a tryout of such college courses as will help you choose your vocation.

4. Attend the Freshman Week lectures on the professions given by the deans of the various colleges. These lectures give information about the nature of the work, the training required, and the available opportunities in the various professions.

UNIVERSITY TESTING BUREAU

The University Testing Bureau, Room 310 Northrop Auditorium, is also designed to assist you, during your first year in college, in selecting the vocational or professional fields for which you have adequate aptitudes and genuine interests. The bureau's method of helping you requires considerable time for the testing of aptitudes and interests and for interpretation in terms of your family background, education, and work experience. In some cases the bureau can assist you in making a tentative choice within a short time; usually, however, this process must be carried on throughout the freshman year or longer. It is advisable, therefore, that you seek the assistance of the University Testing Bureau during the summer or during Freshman Week *prior* to your enrolment in the University of Minnesota. A nominal fee is charged for this service. During the summer you may come directly to the Testing Bureau; if possible, your parents should come with you in order that they, too, may understand all the factors involved in making a vocational decision. During Freshman Week you may secure the assistance of the Testing Bureau through the Committee on Vocational Information as described above. Any student desiring this assistance *after* Freshman Week may come directly to the offices of the University Testing Bureau.

It is well at all times to keep in mind that vocational decisions should not be based entirely upon subjective judgment, advice of friends, or systems of character analysis. An extensive study of each individual by means of aptitude tests, psychological tests, interest tests, and personal interviews together with firsthand experience in various courses and curricula is advisable before making final choice. Each freshman should begin this process as early as possible.

Even tho a student has already made a vocational choice, he is advised to seek the assistance of the University Testing Bureau in order that the choice may be evaluated.

In these days of economic and professional uncertainty, it is unwise to base a choice solely upon such factors as desire to make money or the wish of one's parents, without regard to one's aptitude for a particular type of work or available opportunities for employment.

FACULTY ADVISERS

Each college of the University provides faculty advisers who assist in arranging study schedules and may be consulted on all matters pertaining to registration. A thoro study by you of the bulletins containing course announcements will facilitate your registration, but you should take advantage of the opportunity to consult a faculty adviser, obtaining from him any and all information necessary to insure that your course selections are in harmony with your educational plans and purposes. In the following paragraphs are listed the names and offices of staff members in the various colleges who may be consulted during Freshman Week or at any other time during the year.

GENERAL COLLEGE OF THE UNIVERSITY

Students interested in the general program provided by this college should consult Director Malcolm S. MacLean, Room 200 Wesbrook Hall. This college provides a new type of course in the form of general surveys of fields of knowledge. These courses are intended to give students a vivid and realistic picture of themselves and the present world in which they live; they offer cultural education for intelligent citizenship and for the fullest enjoyment of home life and leisure in an immediate future wherein present trends indicate that a drastic reduction in our working hours will be made. Those individuals who desire general orientation in the various fields of knowledge before beginning a restricted professional training program should consider enrolling in this college. A more complete description of this college's program is contained in the General Information Bulletin and the Bulletin for the General College of the University. These bulletins may be obtained from the registrar's office.

COLLEGE OF SCIENCE, LITERATURE, AND THE ARTS

Students seeking registration and curriculum advice may consult Mr. W. H. Bussey, assistant dean for the Junior College, Room 106 Folwell Hall, or Mr. R. R. Shumway, assistant dean for Students' Work, Room 219 Administration Building. In addition, a Committee of Faculty Counselors functions throughout the year. The committee aims to assist the individual student to make the best possible adjustment to the opportunities available within and without the University and to foster a friendly relationship between the individual members of the faculty and students desiring such contact. Students should feel free to consult members of the committee in regard to curriculum matters, methods of study, living conditions, associations and habits, interests, extra-curricular activities, health, and any and all matters which affect the student's work. Appointments for conferences with members of this committee may be made by calling at *Room 114 Psychology Building* after Freshman Week. The following faculty members serve on this committee, some devoting as much as half time to this work:

- Mr. Bryng Bryngelson, Room 410 Folwell Hall
- Mr. Oscar Burkhard, Room 210 Folwell Hall
- Mr. Alburey Castell, Room 300 Folwell Hall
- Mr. Reed O. Christenson, Room 14 Zoology Building
- Mr. James Edmunds, Room 111 Folwell Hall
- Mrs. Anne Fenlason, Room 8 Jones Hall
- Mr. Clifford Kirkpatrick, Room 111 Jones Hall
- Mr. Franklin H. Knower, Room 309b Folwell Hall
- Mr. Howard P. Longstaff, Room 108 Psychology Building
- Mrs. Jesse M. McFadyen, Room 316½ Folwell Hall
- Mr. Duncan Mallam, Room 313 Folwell Hall
- Mr. Kenneth E. Olson, Room 9 Pillsbury Hall
- Mr. Donald G. Paterson, Room 114 Psychology Building
- Mr. Alvin E. Prottengeier, Room 210 Folwell Hall
- Miss Margaret Scallon, Room 316½ Folwell Hall
- Mr. George M. Schwartz, Room 207a Pillsbury Hall
- Mrs. Mary S. Shaw, Room 26 Folwell Hall
- Mr. Edgar W. Weaver, Room 317½ Folwell Hall
- Mr. E. G. Williamson, Room 310 Northrop Auditorium

COLLEGE OF ENGINEERING AND ARCHITECTURE AND SCHOOL OF CHEMISTRY

Dean O. M. Leland may be consulted in Room 133 Main Engineering Building. The following members of the staff may be consulted regarding specific curricula, requirements, opportunities, etc.:

Aeronautical Engineering, Mr. J. D. Akerman, 201 Mechanical Engineering Building

Agricultural Engineering, Mr. H. B. Roe, 208 Engineering Building, University Farm

Architecture, Architectural Engineering, Interior Architecture, Landscape Architecture, Mr. F. M. Mann, 315 Engineering Building

Chemical Engineering, Mr. C. A. Mann, 35 Chemistry Building

Chemistry, Mr. S. C. Lind, 127 Chemistry Building

Civil Engineering, Mr. F. Bass, 123 Engineering Building

Electrical Engineering, Mr. J. M. Bryant, 137 Electrical Engineering Building

Engineering Prebusiness, Mr. G. Filipetti, 205 Westbrook Hall

Mechanical Engineering, Mr. J. R. DuPriest, 150 Mechanical Engineering Building

COLLEGE OF AGRICULTURE, FORESTRY, AND HOME ECONOMICS

Students in this college select their advisers preferably from the faculty staff of their major interest. For special counsel on personal or study problems, students are urged to consult any member of the Students' Work Committee, as follows:

Dean E. M. Freeman, 200 Plant Pathology Building

Mr. R. C. Lansing, 309 Engineering Building

Mr. H. Schmitz, 205 Horticultural Building

Mr. E. G. Cheyney, 310 Horticultural Building

Miss Wylle B. McNeal, 215 Home Economics Building

Miss Kathryn B. Niles, 101 Home Economics Building

Mr. C. H. Bailey, 111 Biochemistry Building

Mr. E. F. Ferrin, 1 Stock Pavilion

COLLEGE OF EDUCATION

Pre-education and education students may consult Dean M. E. Haggerty or Assistant Dean Harold Benjamin, Room 204 Burton Hall, regarding curricula, requirements, opportunities, etc. The following members of the staff may be consulted in regard to specific curricula open to freshmen:

- Art Education, Miss Ruth Raymond, 209 Jones Hall
- Physical Education for Men, Mr. R. A. Piper, 208 Athletic Building
- Physical Education for Women, Dr. J. Anna Norris, 101 Women's Gymnasium
- Industrial Education, Mr. H. J. Smith, 222 Burton Hall
- Public School Music, Mr. Archie Jones, 213 Music Building

SCHOOL OF MINES AND METALLURGY

Dean W. R. Appleby, 103 School of Mines Building, Mr. E. H. Comstock, 102 School of Mines Building, or Mr. Levi B. Pease, 106 School of Mines Building, will be glad to meet anyone desiring information regarding curricular requirements, opportunities, etc.

VOCATIONAL WORK FOR WOMEN

Recognizing the special need of women for assistance in preparing for a life's work, the University employs the part-time services of a specialist in the vocational advisement of women. Conferences are held in the Housing Bureau office, Shevlin Hall. This arrangement brings to the campus a vocational worker who is constantly in touch with the problems of college-trained women seeking employment in Minneapolis and the Northwest. In addition to discussing opportunities and providing available information, the vocational adviser for women strives to place the student in contact with experienced workers in a given field and may advise part-time or summer employment to give the student actual experience. Students desiring to consult this adviser should call at Dean Anne D. Blitz' office in Shevlin Hall for a definite appointment.

Vocational information round-table conferences are held from time to time in Shevlin Hall. The Vocational Committee of the W.S.G.A. is responsible for these conferences and urges all women students directly or indirectly interested in any of the conference subjects announced to attend and to participate actively in the discussions.

OPPORTUNITIES FOR EMPLOYMENT

Students seeking part-time employment should report at the earliest opportunity to the University Employment Bureau, Room 11 Administration Building.

The attention of students is also directed to facilities provided by the reorganized Minnesota Public Employment offices maintained in Duluth, St. Paul, and Minneapolis. The service covers all types of occupations including clerical work and the professions.

OTHER GUIDANCE AGENCIES

Should you find yourself emotionally upset, worrying excessively, or laboring under some mental or nervous strain, you are advised to seek help along the lines of mental hygiene from experts in the Students' Health Service. It is as much the duty of every citizen to keep himself mentally fit as it is to keep physically fit. Mental hygiene is as important as physical hygiene.

The Department of Speech maintains a Speech Clinic for the benefit of students needing speech correction work. Should you happen to possess a speech defect, a stutter or stammer, you should seek help from those in charge of this clinic. Report to Room 410 Folwell Hall.

Many freshmen feel somewhat "lost in the crowd" during their first quarter or so of residence here. If this feeling should come upon you, it would be well to visit:

Minnesota Union for men

Shevlin Hall for women

University Y.M.C.A.

University Y.W.C.A.

Campus Sisters of the Freshman Advisory Commission

Dean of Women

Dean of Student Affairs

Deans of the several colleges

Members of the faculty.

The University of Minnesota is a large organization but it is far from being a huge, impersonal machine as some uninformed persons might have led you to believe. You will find countless individuals eager and ready to lend a sympathetic ear. *Seize every opportunity for getting acquainted with your classmates, your instructors, and other members of the faculty and administration. You will find that college life is rich in worth-while friendly contacts.*

Principles of Effective Study

Professor Charles Bird, Department of Psychology

SUCCESS in college, like success in sports, may be made more certain by instruction. Some people may, and do, learn to play games skilfully without special training, but the majority never become experts merely by unaided effort. In most branches of human endeavor you learn to profit from the successes and failures of other people and often you derive principles, which, when put into effect, enable you to achieve success more readily than you can without guidance. You may increase your knowledge without training in methods of study, but examination of the scholastic records of many students reveals frequent failure to accomplish as much as their ability would permit, while those who have received training more closely approximate academic attainments equal to their capacity. An understanding of study principles is not, however, a substitute for actual performance. Many students, convinced that there are more economical methods of study than those they pursue, have not tried to change their study habits to conform to the principles. *Success in mastering knowledge requires the practice of right principles in your study periods.* This will not be easy if you have formed unprofitable habits. Your first efforts to eliminate them may be discouraging, but persistent endeavor will yield the reward of greater self-development.

DEFINITE MOTIVE IS NECESSARY

Successful people in all walks of life are often characterized by an interest in, and an enthusiasm for, their work. They usually have an attainable goal and a strong desire or motive to reach it. A first essential for effective study is a "will to learn," an intense desire to broaden and deepen knowledge, to become expert in one or more fields of endeavor. Your presence in the University represents the investment of valuable years and of a considerable amount of money, but whether it is a profitable investment is determined chiefly by the use you make of the opportunities around you. Perhaps you will meet people on the campus whose boast is "to just get by" and in ignorance you may agree with their own self-estimate that they are superior

people. Is it not more likely that their boast is a sign of failure, or misdirected effort, or perhaps of intellectual blindness? Indifference to the cultural, scientific, and professional opportunities within the University suggests a lack of a vigorous, intellectual curiosity. To be intellectually curious, to seek problems and their solutions, to appreciate the beauty of art and literature, and to work faithfully and diligently to master both the details and meanings of your university courses are the best ways of developing permanent interests. *The faithful pursuit of knowledge yields many immediate satisfactions, while a rapidly increasing body of evidence shows it is closely related to success in later life.* I do not believe we can measure the values of a university education in financial terms, yet contrary to popular belief, students who receive the highest grades in college more often gain positions of eminence and honor following graduation than those who do only average academic work. Some business and professional men have shown that the best students continue their successes beyond the college level and are being sought in preference to others who have earned average grades. These and other incentives, when realized, may enable you to rank your studies as of primary importance.¹

PLAN THE WORK OF EACH DAY

It is very unfortunate that the phrase "plan your day" suggests slavery to routine, whereas the experience of busy people indicates that planning not only favors better work, but permits the enjoyment of more leisure time. In high school various forms of supervised study may have made it unnecessary for you to prepare a daily program, and the curriculum may not have taxed your intellectual ability to the maximum. The difference between high school and university requirements will be so great that unless you plan your daily activities much of your time and energy will be wasted on useless details, to the neglect of important matters, such as your studies. During the first two weeks in the University keep a record of the time spent in each activity, such as sleep, meals, classroom attendance, study, recreation, and especially note how much time you waste. This preliminary record should be analyzed to discover if

¹ See W. S. Gifford, "Does Business Want Scholars?" *Harper's Magazine*, May, 1928.

your studies are receiving sufficient attention and whether the time of studying them can be changed so that more effective work will result.

Our contacts in "How To Study" classes at the University of Minnesota often show that many freshmen sincerely believe they study twenty or thirty hours each week, but imagine their surprise on discovering from time-budget sheets that trivialities have taken the place of a large amount of study activities. It is common for university students to spend many hours each week in ways which not only contribute nothing to their advancement but leave them dissatisfied and unfitted for serious work. Unless you try to use your time wisely the success you covet may be unattainable. Perhaps freshmen have wasted much time in the past because they have not known how many hours others study. We realize that the amount of time expended is not a certain index of mastery; that habits of study differ from student to student. The brightest students, as a general rule, devote fewer hours to study than their less capable classmates, but they often receive average grades. How many hours are expended, on the average, by university students?

Surveys, conducted in several colleges, indicate an average of twenty hours of study each week for a normal load of fifteen credit hours, whereas most colleges set a standard of two hours of preparation for each credit hour. In classes at Minnesota, organized to aid the improvement of habits of study, we have found, during the first or second week of the fall quarter, that the average number of hours spent in study agreed with other surveys, while several weeks later an increase to an average of twenty-seven and even thirty-two hours occurred, largely because waste time had been eliminated. Students in these classes have usually declared that a better use of time led to more wholesome attitudes toward recreation and study. Our analyses of their grades show that they do better work than other students of equal ability who have not learned to organize daily schedules. Efficient study is unhurried, thoughtful effort, rather than the nervous, hasty behavior which many young people hope will yield miraculous success. Undoubtedly some people excel in spite of poor methods of work and misused time, but the majority encounter inevitable failure. During your first quarter, particularly, you will be obliged to select from a multitude of demands upon your time those

deserving attention. Intelligent choice is aided by planning your activities, and success in study is facilitated by dispatching your work as planned.

SKILFUL READING HABITS ARE ESSENTIAL

Recent investigations have demonstrated that inefficient habits of reading are related to low scholarship. Frequently we find university students who read no faster and no more accurately than sixth grade pupils. If slow readers always, or most often, understood better than fast readers, nothing would be gained by reading rapidly, but experiments prove that slow reading is frequently associated with poor comprehension, with an inability to grasp facts and to understand the meaning of paragraphs. To read quickly and well is a big asset in scholastic work since a considerable proportion of knowledge is gained through the printed page. Experiments also show, almost without exception, that improvement in speed and comprehension occurs with practice. Recently we discovered that one group of students made an average score, on a standardized comprehension test, which was equal to the level of the highest twenty-five per cent of high school juniors. After practicing fifteen minutes each day for eight weeks the group advanced to the average score of the upper twenty-five per cent of high school seniors. Practically all groups investigated at Minnesota have shown as much or more improvement in comprehension following a period of intensive effort. The same group also improved in speed of reading. At the beginning of the practice period the group averaged nineteen paragraphs, of thirty words each, in one and three-quarters minutes, whereas at the end the average was twenty-four paragraphs. Very few adults realize that reading skill may be improved; yet the need for reaching a high level of proficiency, if you are to succeed in course requirements, is urgent.

I cannot now enumerate all of the steps necessary for the improvement of reading skills. One hopeful procedure is to devote some time each day to practicing reading against time. If you keep a record of the number of words read, provided you do not sacrifice understanding to speed, you will find a marked improvement taking place. The amount of time devoted to increasing your reading skill will undoubtedly be saved during other periods when you are engaged in reading for pleasure or study. When practicing

reading, guard against too much activity of the vocal organs, of the lips, tongue, and throat. Speaking words consumes too much time and contributes to failure to grasp logical relationships. Cultivate during your study periods the habit of silent reading.

DEVELOP PROBLEM SOLVING ATTITUDES IN STUDY

To read both rapidly and accurately does not guarantee that you will retain what you read. To master assignments requires more than one experience with them. Shall we, therefore, read the assignment repeatedly? Undoubtedly two repetitions are better than one, but does rereading constitute study? Does it yield the greatest value for the time and effort put forth, or is it likely to result in rote learning, in an uncritical acceptance of the information imparted? I believe the reading method neither favors critical attitudes nor the comparison of ideas and facts, and that it is less valuable than the method of recitation. *The method of recitation, requiring us to ask questions, favors active attitudes and a critical examination of the subject.* A brief description of this method and a discussion of its advantages may convince you of its superiority over the method of rereading.

When preparing a textbook assignment, form the habit of using the table of contents to obtain, in the shortest time, a general idea of the subject. Following this, if problems or questions are given at the end of chapters, study them to cultivate a critical attitude and to anticipate some of the important points in the assignment. You need not be able to answer these questions immediately, but a knowledge of them should indicate the field to be explored. As a further step in the discovery of the author's plan, read the assignment as rapidly as possible without attempting to stress any particular topics. During this first reading do not underline your book since, the contents being new to you, it is not likely that you can select the most important phrases. These three steps do not constitute study. They are preliminary explorations designed to yield a meaningful view of the subject, and as such they should not consume much time. They should be followed by an intensive reading of the chapter when an outline of the significant facts and ideas can be made with profit. Do not copy the striking

phrases of the author. It is usually more helpful to study the chapter sections, one at a time, and to formulate questions, the answers to which briefly summarize their contents. Your outline, therefore, will be a series of questions, with their answers, rather than a succession of appealing phrases which probably do not represent your understanding. The formulation of good questions requires active, critical attitudes; also the discovery of the right answers involves a careful analysis of the author's treatment and the grasping of facts and ideas in their relationships. Frequently it is helpful to turn topical headings into questions and to study the section to discover the answers. The fifth step involves a careful study of your outlines and the memorizing of important points. In this process, from time to time, cover up your answers, think upon the topical question and seek to answer it. *Always check your answers since it is easy to confuse an erroneous feeling of correctness with actual knowledge.* Unless you do check your answers you will share the experience of many who, during examinations, regret that they knew the answers yesterday, but try as they will today the answers escape recall. When you have completed your systematic questioning, another rapid reading of the assignment will often make lively the relationship of part to part and will give added meaning to details.

The advantages of the method of recitation over the typical reading method are striking. Mastery of the subject requires less time, while retention is more permanent than when you read your assignments. The latter fact is due to the greater effectiveness of the original learning, for, in the last analysis, the goodness of memory depends upon the goodness of learning. Since the method requires you to formulate questions and to discover their answers, it prepares you to meet directly the conditions of classroom recitations and examinations, but, of still greater significance, it lays the basis for intelligent discussion of problems in everyday conversation. The necessity of answering questions during the study period reveals weaknesses, thereby enabling you to concentrate your effort intelligently, and it also yields a measure of progress, thus supplying an important incentive to efficient work. Certainly the question and answer method, occupying, as it should, about one half of your total study time, is far less fatiguing than the process of reading over and over again the same subject-matter. Another advantage of this method comes from

making outlines which can be studied before examinations intended to measure retention over a longer period of time than the shorter weekly tests. Finally, the recitation method, demanding, as it does, very active attitudes, serves as a check upon the ease of daydreaming which is a very pleasant yet futile and expensive form of behavior. I would urge you to study carefully the discussion of this method since the experience of many students shows that its faithful application promotes academic success to a greater degree than the practice of any other single principle of study.

GOOD NOTES AN AID IN LEARNING

Just as the method of recitation requires you to make notes in outline form, so your lectures, if they are to be mastered, require a record of the main points in your notebook. In high school the frequent classroom recitations, and the relative absence of lectures, may not have required you to make notes, but in university courses lectures are an important means of developing and making clear the subject-matter. It is practically impossible to retain even important points stressed in lectures without adequate means of recording them for future use. Make good notes from the start, subject your notes to the same analysis as you would an assignment in a text, and seek to discover the differences and similarities between lecture and assigned material.

FORM THE HABIT OF DISTRIBUTED STUDY

Students would never leave the preparation of lessons until immediately before examinations, nor would they study one subject for a whole evening, if they could compare the results of distributed study with cramming. The attempt to master an assignment at a single sitting is often disastrous. You are likely to get lost in details, to suffer from fatigue, and to form the uneconomical attitude of studying merely to pass examinations. Experiments show that the study of each subject every day not only saves time but results in better retention of what is learned. Apart from experimental support for distributed effort our common experiences, when reflected upon, are its best recommendation. In spite of the most careful planning, the complexity of our social life necessitates many readjustments. There are occasions when friends desire our company with very

little advance notice. If the preparation of course work has been left until the night before an examination, are you not in a dilemma when invited to accompany a friend? To accept the invitation or not is a serious question, for your wishes make both for going and not going. If you leave your studies, are you not disturbed by intruding thoughts of unpreparedness, and if you regrettably, almost stoically, remain, do not thoughts of pleasures missed interfere with concentrated effort? A little reflection shows that distributed study yields social as well as academic advantages, and that the two are not incompatible. Learn, also, to review your course work systematically every week and thus avoid the period of strain which now seems to be the lot of many people during the week of mid-quarter or final examinations. The presentation of the few principles of study, in this short article, is offered to you in order that, by their application, you may become both an efficient scholar and a well-balanced personality.

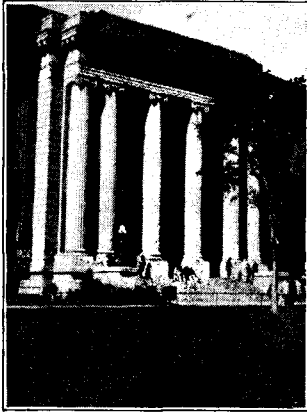


Students Ready for the Tour through the Library

The University Library

Frank K. Walter, Librarian

IN any good modern college or university, the library is the center of much of the work of the institution. The University of Minnesota Library ranks well among those of institutions of its class. It includes the General Library



The University Library
*Center of Intellectual Life
on the Campus*

in the main Library Building with branches in the College of Engineering, the School of Chemistry, and the School of Mines and Metallurgy. Smaller departmental collections are provided in the Department of Geology and in many other departmental quarters. There are large libraries in the Law School and the Department of Agriculture. In all there are more than 780,000 volumes in the library collections of the University. More than 625,000 of these are in the main Library Building.

Most of the undergraduate courses have their assigned reading. Books for this are provided in the Reserve Reading Room on the first floor of the main Library Building and in the reading rooms attached to the school and college libraries noted above. Just before and just after classes, and in the two or three weeks immediately preceding final examinations these reading rooms are crowded a large part of the day. At such times it is hardest to get books promptly. New students can save time by planning to use the library at the less crowded hours. In the evenings and on holidays there is relatively little use of the books and the reading rooms, and much better personal service is possible.

In addition to assigned reading there will be term papers and discussions to be prepared and, it is hoped, considerable independent reading by the student. In the

General Reading Room on the second floor of the main library are more than 7,000 volumes of reference works. The Periodical Room, with more than 2,500 current periodicals; and the Biological-Medical Room with many books and periodicals on botany, dentistry, medicine, zoology and other biological sources are on the same floor. All these are open to all registered students. In each there are trained assistants to help the student obtain the books or other printed materials he needs. The Circulation Department in the main hall on the second floor, lends books for use either in the building or outside, subject to library rules. A book card, permitting the student to borrow books, may be obtained by any registered student of the University.

The rooms on the top floor and in the basement of the main building are open only to the faculty, graduate and advanced students, and to research workers.



The Arthur Upson Room

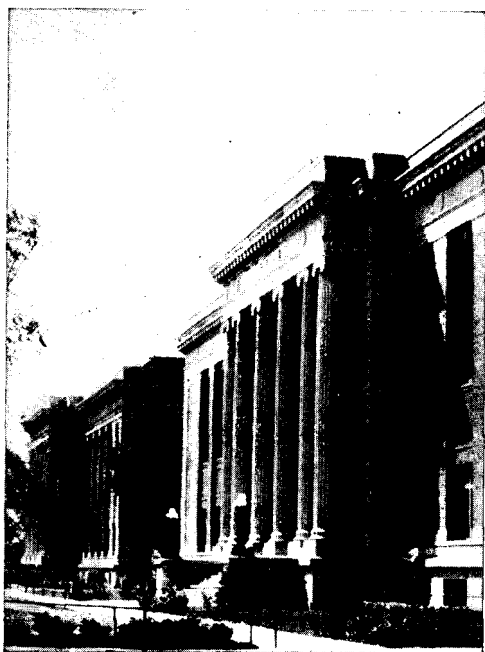
A Unique Opportunity To Become Acquainted with the Greatest Books

Arthur Upson Room with about 4,500 books especially selected for their interest and the variety of subjects they cover. This room (a gift to the University), is not a study room nor intended for the reading of class assignments, but is maintained solely for the use of those who like to read good, interesting books. It is one of the most beautiful rooms of its kind anywhere and every new student should get the habit of using it in his leisure time.

The library collections outside the main library, altho smaller, serve the same general purposes in much the same way as those in the main library. Students in special fields should use both these special collections and the main library.

The rules and regulations of the library and more information about its collections may be found in the small pamphlet given each new student who takes the library tour during Freshman Week and in the more detailed *Library Handbook* which is available on application at the reference and circulation desks.

Familiarity with library regulations and systematic use of the library over the entire year are very important.



Buildings on the Mall

The Students' Health Service

Harold S. Diehl, M.D., Director

THE Students' Health Service is an institution maintained in the interest of the health of the university students. During the entire day, physicians, dentists, and nurses are in attendance at the Health Service dispensary; at other times emergency service is available upon request. All students are urged to report early when they are ill, for the prevention of serious conditions is much easier than their cure.

In the matter of health, every student has an obligation not only to himself but also to his university. A university student who is physically defective or in ill health is a liability to himself, to his family, and to the state; and everyone with a communicable disease is a danger to the whole university community, and particularly to his closest friends and associates.

On the Main campus the Health Service occupies a new wing of the University of Minnesota Hospitals where adequate facilities are provided for dispensary service, laboratory and X-ray examination, periodic health examinations, dentistry, and hospital care, including a modern unit for the isolation and treatment of infectious diseases. On the University Farm campus the hospital and dispensary are located in the Health Service Building. The normal capacity of the two hospitals is one hundred beds.

The facilities of the dispensary, medical and dental, are such that four hundred students can be given attention daily. Physicians are on duty daily from 8:00 a.m. to 5:00 p.m., except Sunday, but for emergencies a physician may be called at any hour of the day or night. In the dispensary, students may consult physicians regarding health matters and may receive treatment for illness. In addition to physicians in general medicine, the services of specialists in the various fields, such as eye, ear, nose and throat, skin, heart, lungs, orthopedic surgery, surgery, and internal medicine are available to students in the dispensary and in the hospital.

The Health Service has been established for the purpose of safeguarding the health of the students. Its aims are (1) to help each student entering the University of Minnesota to possess a healthy, vigorous, and active body,

thereby contributing much to his success in college and in later life; (2) to reduce to the minimum the prodigious academic loss due to indisposition and illness of students. Positive health is its goal.

The following are some of the more important phases of student health work:

1. *Treatment and professional care.*—Students are urged to seek treatment even for milder disabilities, for proper treatment and care instituted early may prevent more serious illness and loss of time from classes. Students may enter the students' hospital upon the recommendation of a staff physician. Medical and nursing care are rendered without charge.

2. *Provision for the prevention and care of communicable diseases.*—Early detection and isolation of all cases of communicable diseases, such as tuberculosis, diphtheria, scarlet fever, measles, smallpox, etc., can only be accomplished through the co-operation of the student body. Immunization against smallpox, diphtheria, typhoid fever, etc., is offered to students without charge. Provision is made for the care and treatment of cases of communicable diseases in the isolation wards of the hospital.

3. *Dental hygiene.*—As a part of the entrance physical examination each student is given a complete dental examination by a member of the dental staff, and advised regarding the condition of the teeth. During the school year students may receive dental consultation at any time and obtain dental treatment on a cost basis.

4. *Entrance physical examination.*—During Freshman Week each new student is given the first portion of a physical examination. Appointments for this examination are obtained by freshmen at the registrar's office, and by students with advanced standing at the Health Service.

After freshman week *every student must complete his physical examination by keeping the following appointments:*

A—Report at the main entrance to the Health Service *one week* after the physical examination for a reading of the Schick test.

B—During the fall quarter all new students must report by appointment to the Health Service for the second part or completion of the physical examination. A notice will be sent to your post-office box designating the day and hour for this appointment. All students must report promptly.

Result of Physical Examination. At the time of the second part of the physical examination the physician with whom you are given an appointment will explain the results of the examination and answer any questions which you may have in regard to your health or physical condition. If you or your parents wish a written report of the findings of the examination, advise the physician of this fact.

5. *Excuses for illness.*—The dean of your college is the only person authorized by the University Senate to issue excuses from classes. If a student has been unable to attend classes on account of illness and has been under the care of the Health Service, or presents a physician's statement giving details as to duration and nature of such illness, the Health Service will mail to the dean of the college a statement containing this information. Students must report to the Health Service within twenty-four hours of their return to classes in order to obtain such statements.

6. *Special fees.*—For ordinary medical and nursing care no charge is made, but for services that are specialized or largely individual in character certain fees calculated on a cost basis are charged. Some of these are as follows: for board and laundry while in the hospital after two days; for use of the operating room; for diathermia and ultra-violet light treatments; for drugs, glasses, and X rays, and for calls upon students at their rooms. A special provision that any or all of these fees may be remitted by the dean of student affairs will prevent these charges from working a hardship on the student who cannot afford to pay.

7. *Dental Service.*—The Students' Dental Service has been established to give students the highest grade of treatment at the lowest possible cost. Fees are set at a rate which will pay just the expenses of the department. Students have found that this department makes possible a saving of both time and money.

8. *Students' hospitals and dispensaries.*—The infirmaries exclusively for the care of students are located in the Health Service wing of the University of Minnesota Hospitals on the Main campus and in the Health Service Building on the Farm campus. Dispensary hours, 8:00 a.m. to 5:00 p.m. In case of emergency call Main 8551 and ask for the Health Service.

*How with
speech will help
2/10/21*

The University Speech Clinic

Bryng Bryngelson, Director

MANY students entering the University find it difficult to make good adjustments in classroom recitations and in social situations because of a speech defect. The defects most commonly known to be a handicap to a student's success are stuttering, lisping, infantile speech, oral inaccuracy, cleft-palate, dialect, abnormal pitch range, monotone, nasality, and husky voice. The Speech Clinic is maintained for the purpose of rendering services to students desiring help with their speech. Many of the speech disorders found among freshmen are of such serious character that a cure cannot be attained in a few months' time. It is essential, therefore, that students avail themselves of the opportunity for clinical aid in speech upon entrance to the University. Speech defects are often a handicap to successful vocational work after graduation.

The Speech Clinic also offers aid to students who have disabilities in reading, writing, and spelling. These disabilities are sometimes closely linked with defects in speech.

Very often we find students who are in need of speech hygiene. Because of some outstanding physical differences, such as clubfoot, strabismus, short stature, red hair, protruding teeth, receding chin, obesity, etc., these students have developed hypersensitiveness, extreme social morbidity, and a deep-seated feeling of inadequacy. Students suffering with any of these problems may receive psychological treatment in the clinic. Whatever your speech problem or handicap may be, if you desire help, it would be advisable for you to get in touch with the clinic during the first two weeks of the college year. It is possible for you to carry a reduced program of studies while you are receiving treatment in the clinic.

The Speech Clinic services are free to students registered in the University. If a student wishes full-time treatment in the clinic before he registers in a college course, he may arrange for it by paying a fee of \$33 per quarter. Registration for work in the Speech Clinic should be made in the office of the director, 411 Folwell Hall.

College of Science, Literature, and the Arts

J. B. Johnston, Dean

THIS college in its four-year course provides for a general liberal education and prepares those who wish to enter the Graduate School for training for scientific research or a career in scholarship. The college gives the preprofessional courses required of those who wish to enter the Law School, the Medical School, the School of Dentistry, the College of Education, the School of Business Administration, the College of Pharmacy, or the School of Nursing. All students intending to enter any of these courses, except those in Art Education, Industrial Education, Physical Education, or Public School Music register as freshmen in the College of Science, Literature, and the Arts.

In this college are given also many courses which form part of the professional training of students in Education, Agriculture, Engineering, and most of the professional schools.

Within the college itself students find many lines of study leading to different fields of work. Among the vocations for which training is given are Social Work, Journalism, Music, Municipal Administration, Library Service, expert work in Geology and other sciences, while in their graduate work the departments of this college prepare students for college teaching in their various fields and for scientific research.

The purpose of the college in Freshman Week is (1) to help new students to understand the complex organization by which all these things are carried on, so that they will not make mistakes or lose time; (2) to start freshmen on the study of their own talents and aptitudes so that they may find the line of work best suited to them; (3) to tell them something of the most efficient methods of study, the use of the library and other equipment, the economic use of their time, and the many social and cultural opportunities to be found here. Every part of the Freshman Week program contributes something to these purposes. Parts of the program particularly intended for students of this college are the talks on professional opportunities, the faculty advising during registration, the dean's talk to freshmen, his personal conferences with individuals, and the assignment to faculty counselors of those who have any special problems.

Through its officers and faculty counselors the college

gives special attention to individual students. Advice about the choice of studies is given before entrance to those who send in their admission blanks in the summer. Every freshman should avail himself of this service.

One of the most important things throughout your whole course is the careful planning of your choice of studies. You should begin this with your very first registration. Whatever you intend to do, you should study carefully what is the best way to prepare yourself for it. In several ways the studies which you have already taken in high school will have a bearing on the studies to be selected in college. If you are going into a professional school, your studies in preparation are more or less fully prescribed. Usually, you have the chance to elect one or several courses. You should consider very carefully what subjects will be of the greatest value to you.

If you expect to complete the course in this college, there are three regulations to which you should give careful attention. (1) You cannot complete a college course by taking four years of freshman and sophomore studies. In your junior and senior years you will be expected to devote your time to work in Senior College courses. (2) In order to be ready to do this, you will be required (during your freshman and sophomore years) to prepare yourself for Senior College work in five subjects. (3) When you enter the Senior College you will have two options: to take the usual course with a major and a minor study, or to take the curriculum in liberal arts. The purpose of the latter is to encourage greater breadth of culture and to offer each individual student the opportunity to plan a curriculum to suit his own interests and needs. These new regulations are explained in detail in the college bulletin. In order to get full satisfaction from your college course, you must plan your studies each year so that you will be ready for the subjects you desire in later years. For help in planning you should talk with members of the faculty in the fields in which you are interested, and you should seek a regular adviser early. Apply at 114 Psychology Building for assignment to a faculty counselor. Take your college course seriously and you will get proportionate satisfaction from it.

College of Engineering and Architecture and the School of Chemistry

O. M. Leland, Dean

STUDENTS who plan to enter courses in engineering, architecture, or chemistry should be well prepared in mathematics and science, as well as in the general studies included in the usual high school course. No student who is weak in mathematics should undertake these technical courses. An average of 17 or 18 credits of work per quarter is required, and a large part of it is technical and scientific in character. (A credit represents about three hours of class time and preparation per week.) It is not necessary, on the other hand, that a student be prepared in mechanical drawing, shop work, and other vocational subjects in order to be able to pursue an engineering course with prospects of success, altho these are useful.

The courses offered may be divided into four groups, within each of which the requirements of the freshman year are similar. These groups are: (in the College of Engineering and Architecture) (a) aeronautical, civil, electrical, and mechanical engineering; (b) agricultural engineering and engineering prebusiness; (c) architecture, and (d) (in the School of Chemistry) chemical engineering and chemistry. For the course in interior architecture, the student enters the College of Science, Literature, and the Arts for the first two years, transferring to the College of Engineering and Architecture for the third and fourth years. All of these courses are four years in length except architecture which is five. Five-year combined courses in engineering and business administration are available.

Thus it is not necessary that the student determine definitely when he enters the University which course he will take, altho he has generally decided this, but he must decide upon the *group* in which he wishes to register, as the freshman year is different among the four groups. Within his group, he may transfer from one course to another without difficulty up to the beginning of his second year, and also from group (b) to group (a) or (d).

To inform students about the various branches of engineering, an orientation course is provided which all students in engineering and architecture are required to attend during the freshman year. This consists of lectures by

various members of the university staff, and especially professors from the departments in the technical colleges, who explain the nature of the work involved in each of the fields of engineering and architecture. In this way, students are given an opportunity to become acquainted with the various lines of work in these professions and are therefore in a position to verify their choice of a course.

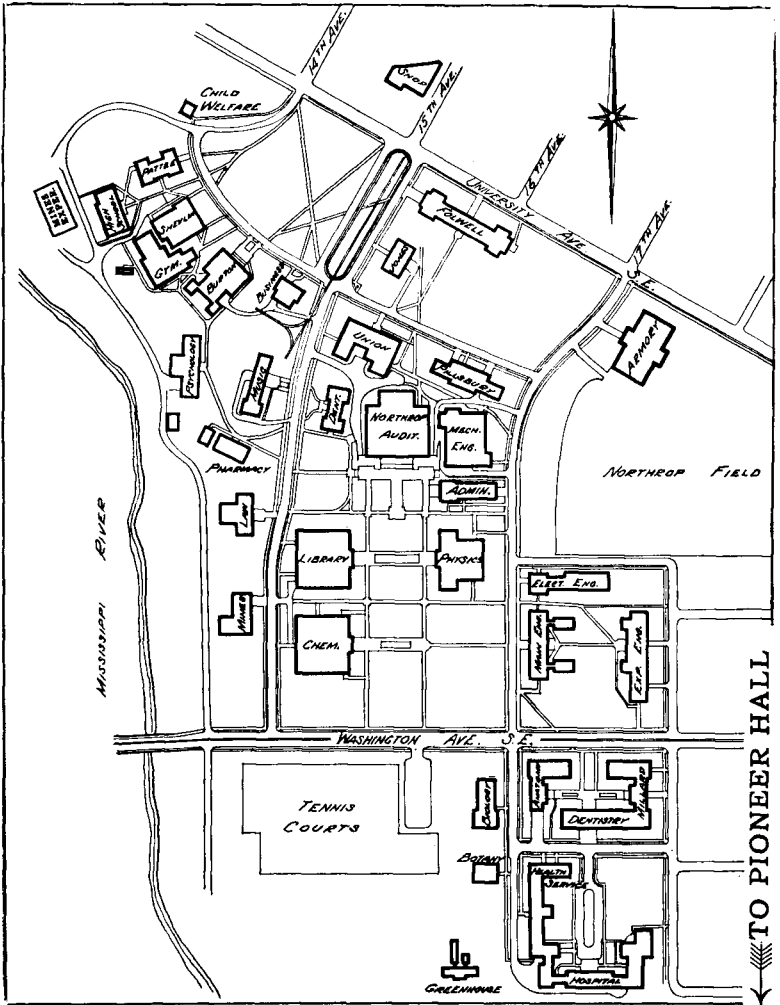
Altho the courses in engineering, architecture, and chemistry are known as technical courses, they are broadly scientific and practical, so that students who complete them are not confined to a single field of work but are qualified to enter many different lines of professional activity for their life occupations. In addition to the practice of their profession, many graduates enter the fields of college and university teaching in the lines of their specialization. The extensive training in mathematics, chemistry, physics, mechanics, and the professional courses received by the graduates of these colleges affords excellent preparation for teaching in these departments.

In general, the objects of these professional courses are three: first, to provide adequate training so that the young graduate can earn his living at his profession; second, that a thoro foundation of scientific and professional studies will be provided upon which future development may be based and which will enable the graduate to advance into positions of greater responsibility and importance; and third, to provide a broad, cultural education and college experience as a basis for a life of usefulness and service.

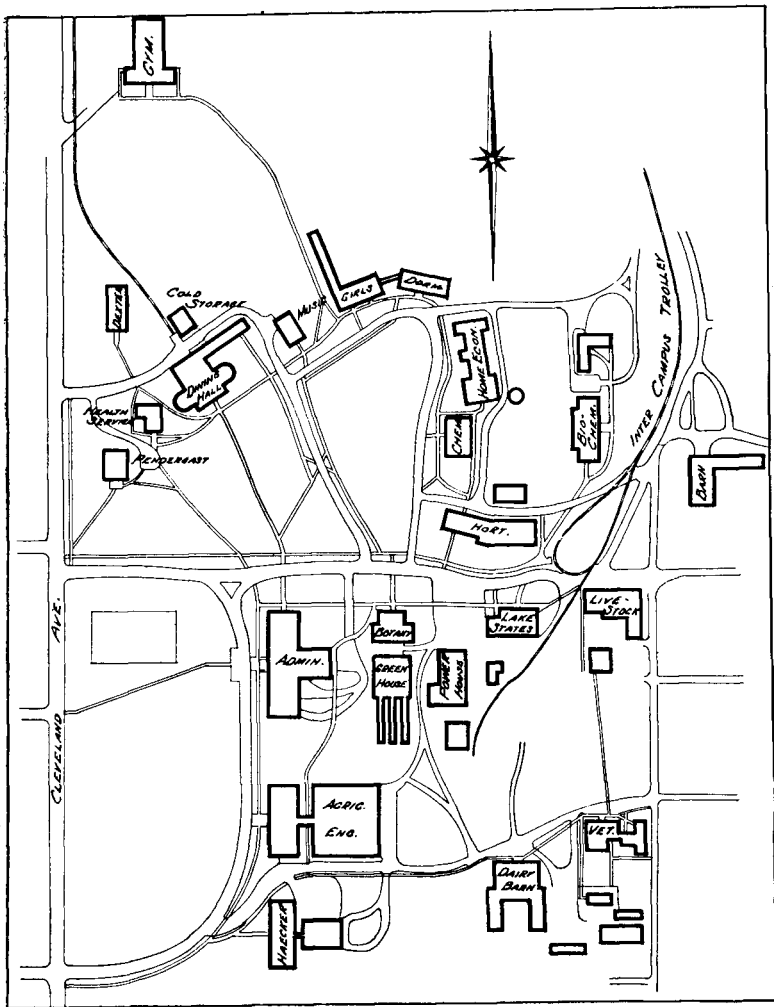


Testing Concrete

← TO SANFORD HALL



Map of Main Campus



Map of University Farm Campus

College of Agriculture, Forestry, and Home Economics

E. M. Freeman, Dean

EACH of these fields opens up wide possibilities of vocations and professions and, in addition, offers a broad university education.

Agriculture offers, but is not merely, a training for farming. Everybody knows that agriculture is the foundation of our national prosperity. We cannot exist without it. It furnishes employment for at least one half of our population. It needs men actually to produce our foodstuffs and raw material. It needs chemists, botanists, engineers, livestock experts, bacteriologists, and many other kinds of specialists to solve its scientific problems. It needs business men in lands and banking, marketing and transportation, and manufacture and sale of machinery. It needs journalists and newspaper men. It needs teachers in high schools and colleges, and research specialists for state and government educational institutions and inspection bureaus. It needs statesmen and leaders in public life who understand the relation of the large economic problems of agriculture to our national prosperity.

Forestry is not merely the science of cutting down trees; neither is it a profession of camping, hunting, and fishing. It is a field of wide opportunities in vocations and professions. It needs men to operate and manage the national forests with over 159 million acres of land. It needs managers for private and institutional forests. It needs men for the industries and commerce that depend on the forest for their products, such as lumber companies, pulp and paper mills, and wood-using industries, of which there are more than one hundred kinds. It needs timber engineers, consulting foresters, journalists, and technical experts in many scientific and commercial lines. It needs educators and investigators in colleges, government bureaus, and technical institutions. Forestry, like agriculture, is basic to our national welfare. It is a permanent, not a temporary, field of professions and vocations.

Home Economics has two great possibilities for every young woman. She learns the science and art of home-making and she may prepare herself for an increasing number of professions and vocations in this great field which

touches the home on every hand. Every woman is potentially a homemaker, and present day conditions demand scientific and sound preparation. A home economics training leads also to numerous independent professions such as teachers of home economics in high schools, colleges, and other institutions, extension specialists, club leaders, social workers, dietitians in hospitals and other institutions, managers of institutions and homes, special opportunities in commercial fields in textiles, decorating, food manufacture, and other commercial lines, and in journalism. We especially need women leaders in public life who have a modern knowledge of home economics.

If you are at all interested in any of these three fields, ask the registrar for a copy of the bulletin on *Before and After College—Vocations and Professions in Agriculture, Forestry, and Home Economics*.



Livestock Judging

The Medical School¹

E. P. Lyon, Dean

A DOCTOR must mingle with all classes of people. He should be a broadly useful citizen. He should take an active part in civic and social affairs. Especially he should be a leader in public health and education in his community.

The first thing a doctor needs is above-average intelligence; the second is a good general education.

High school graduates are urged to spend three or four years in their premedical college studies and not to make up their minds in regard to the medical course until at least a year of college residence has passed. This will give time for orientation in the University, for a broader choice of courses, and for ample consideration of the many important questions which should be gone into before a decision to study medicine is arrived at. A three- or four-year course will also permit a student to distribute his science courses to better advantage. The minimum legal time for pre-medical study, namely, two years, involves a concentration of biology, chemistry, and physics which many students find impossible to handle.

Our advice, therefore, is to plan for at least three years in the Arts College, take either chemistry or zoology in the first year but not both, and fill in with English, German, and perhaps the excellent orientation courses of the General College. Pay particular attention to English. Many medical men are handicapped by inability to handle their own language well. Stick to English until you can write, speak, and spell with reasonable accuracy and facility.

As to general ability and class marks it is to be noted that two thirds of the failures in the Medical School are among those who make a lower average than 1.25, one fourth above a "C" average, on their premedic work. It is, therefore, sound advice, that a student who finds he cannot make that average should not plan to enter the Medical School. In general students in the lower half of their high school classes stand a great chance of being disappointed if they try for a medical degree. The medical course is long, difficult, and expensive. Students should not attempt it unless they are reasonably well assured of success on the basis of

¹ The Medical School administers three curricula: the Medical Course, the Nursing Course (School of Nursing), and the Course in Medical Technology.

their previous school work. You don't sign up for the marathon unless you are already a pretty good runner.

It is to be noted, further, that the medical profession is overcrowded. Young doctors are finding it more and more difficult to get established and make a living. It appears that increasing numbers will have to turn to something else eventually, in spite of having an M.D. degree. The medical course is not readily usable in other lines of endeavor. These ideas should be considered before a student decides upon a career in medicine.

The "premedical course" is an American device in education. The prospective doctor in European universities gets his physics, chemistry, and biology in the medical school. In other words, these are medical studies. The moral is that the wise premedical student should look upon himself as really started in medicine and as really a "medical student" from the beginning. Otherwise he may fail to realize the importance of preliminary work and find himself fatally handicapped later on.

The medical course proper according to American standards is an extension of premedical studies. Anatomy, physiology, etc., are extensions of biology, physics, and chemistry, and the practical branches such as internal medicine and surgery are extensions and applications of these sciences. Therefore no student should go into medicine unless he has good powers of observation and an interest in scientific matters. No one should choose medicine as a profession unless he is in sound health and has the intelligence and power of application to carry the severe course of study involved.

Medicine offers numerous fields of usefulness. Not only is there the broad field of general practice but also opportunities in public health work, the various specialties, salaried positions in institutions, teaching, laboratory work, and investigation. Women find several lines of work for which they are well adapted.

Contrary to the belief of some the average income of doctors is not large. Students should choose the profession from desire for service or scientific inclination rather than from financial considerations.

Dean Lyon and other members of the medical faculty will be glad to consult with any student who desires advice concerning medicine as a career.

School of Nursing

Katharine J. Densford, Director

THE art of nursing is the oldest occupation of women, dating from the first mother who gave care to her little ones.

Its traditions are found in the pre-Christian era, in the annals of the early churches, and in the rise of secular orders of medieval days.

The end of the nineteenth century saw the emancipation of nursing from a struggling, dark period of degradation, to a high professional plane due to the dominating influence of Florence Nightingale who established a new system of educating nurses in 1860 and encouraged women of education and refinement to enter the field. From that day to this the profession has steadily improved, until now we have one of the largest organized groups of women in the world, giving service, not of the hand only, but of the heart and of the mind in one of the widest fields open to women. Not only does nursing make an almost irresistible appeal in periods of stress, such as times of epidemic, disaster, and war, but it is increasingly attracting women because of the emphasis now laid on prevention of sickness in the home and in whole communities.

The variety of demands made upon nurses requires at least high school education as a foundation; college work equips a nurse more adequately for future usefulness.

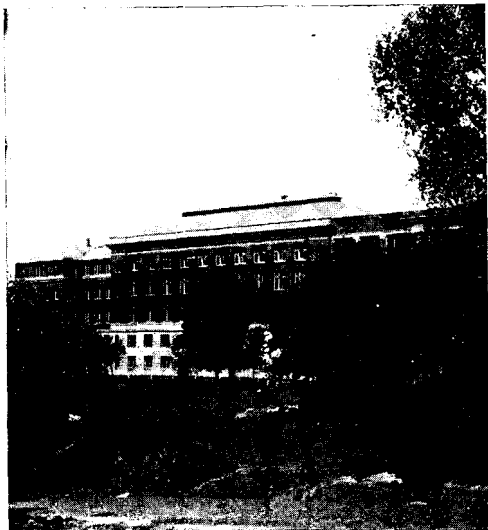
Nurses are being looked upon more and more as students, and their life is becoming characterized by the same pleasures and activities as is the life of other student groups. Student government has developed to give students the opportunity for self-expression and self-development. Many warm friendships are made, and there is a splendid sense of group consciousness and loyalty. Above all, there is the real interest in a scientific work combined with the "Joy of Service." To see suffering and to do nothing about it is depressing. To see suffering and to alleviate it is a deep satisfaction. The hospital is, on the whole, a happy place. There are, of course, many tragedies and many times the greatest heroism is demanded of the nurses. On the other hand, most of the patients recover and to the nurse who assists in that recovery there come happiness and hope and satisfaction.

The profession of nursing, like other professions, is at present overcrowded. To a greater extent than in other professions the overcrowding is mostly in the lower level positions, whereas in fields requiring advanced preparation it is extremely difficult to find well-qualified personnel. To the good student who is willing to prepare herself rightly, many satisfying opportunities are open in the various fields.

Medical Technicians' Course

Dr. W. A. O'Brien, Director

A MEDICAL TECHNICIAN does work in chemistry, microscopy, X ray, and other subjects for a doctor, clinic, or research laboratory. The course is much like the premedical course in the first two years. The third year is spent in the Medical School and the fourth in a practical rotating laboratory service in the University of Minnesota Hospitals. It is a four-year course and leads to a B.S. degree.



Elliot Memorial Hospital

The Law School

Everett Fraser, Dean

LAW offers opportunities for the use of intellectual powers, independence, and public service. Lawyers draw wills, contracts, and other legal papers, settle estates, advise on the organization of corporations, and other business affairs. Court work is the more spectacular, but the smaller, part of the work of most lawyers. Law is not a money-making profession. Few large fortunes are made in practice, but some lawyers become wealthy in business. Many law graduates go at once or ultimately into business, such as insurance, real estate, and finance. Many presidents of corporations were lawyers. Law study is an excellent training for business. Law is also an avenue to political life.

Indispensable qualities for success in law are character, mental ability, health, and industry. Competition is keener than in other occupations, consequently the lawyer must be abler and work harder for success. The prize is great, but the race is only for the strong. The student who does not maintain a high rank in college should not enter a law school. Nearly a third of those who get an Arts degree fail in the better law schools. They are generally the low ranking students in arts. Good mathematical students are good law students. Ability in public speaking is useful but a poor reason for studying law. Helpful qualities are an interest in people, ability to make friends and to inspire confidence, poise and self-confidence, patience and perseverance.

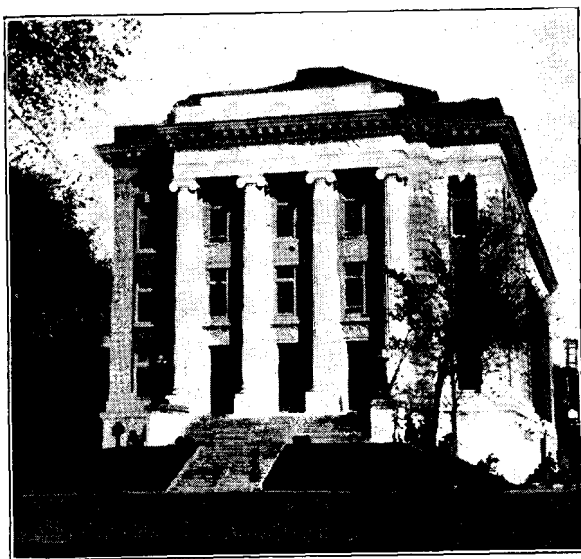
The Law School requires six years of college and law school study for the degree of bachelor of laws. A student may take two years of college work and four years of law school work, and receive the degree of bachelor of science in law on completing four years of the course, and bachelor of laws at the end of the course. This is known as the "two-four" course. Or a student may take three years of college work and three years of law school work and receive the degree of bachelor of arts on completing four years of the course, and bachelor of laws at the end of the course. This is known as the "three-three" course. See bulletins for specific subjects required for the bachelor of science and bachelor of arts degrees.

The college work is done in the College of Science, Literature, and the Arts of the University. It may also be taken

in any accredited college, but in the "three-three" course the third year of college work must be taken at the University in order to qualify for the degree of bachelor of arts.

The two courses will be explained by the dean of the Law School in a Freshman Week talk, at which every student interested in law should be present. There will also be a member of the law faculty present during Freshman Week registration to advise prelaw students, and every prelaw student should ask for this prelaw adviser.

The Council of Legal Education of the American Bar Association prepares a list of approved law schools which may be obtained from Mr. Robert L. Stearns, First National Bank Building, Denver, Colorado. The University of Minnesota Law School is the only approved law school in Minnesota.



The Administration Building

School of Mines and Metallurgy

W. R. Appleby, Dean

THE School of Mines and Metallurgy has for its object the training of young men in five professional lines:
Mining (General engineering applied to mining ores and operating companies.)

Geology (Location and study of ore formations and development and operation of mines.)

Metallurgy (Chemistry applied to the treatment of ores and production of all kinds of metals.)

Metallography (The scientific study of metals and alloys and their uses in industries.)

Petroleum Engineering (General engineering applied to oil and gas production.)

The idea that a mining engineer spends most of his life underground subjected to innumerable physical risks is common but erroneous. The mining engineer must apply the fundamental principles of civil, electrical, and mechanical engineering to mining operations, and eventually superintend and direct all operations.

OPPORTUNITIES AT THE UNIVERSITY

The course of study in the School of Mines and Metallurgy includes required work in other schools and departments of the University such as Physics, Engineering, Geology, and Chemistry. Subjects may be elected in business, cost accounting, economics, etc. Graduate courses are offered leading to the degree of master of science and doctor of philosophy.

EQUIPMENT

The laboratories of the School of Mines and Metallurgy are well designed and equipped with the latest apparatus and machinery. The Mines Experiment Station is considered by experts to be the best equipped and most unique building for that special line of work in the world. Each general division of work is administered by specialists who keep abreast of the times by visiting with their classes the important mining, metallurgical, geological, and oil fields of the United States.

OPPORTUNITIES FOR GRADUATES

During normal times the calls for graduates to fill responsible positions are far in excess of the supply. The

man who says we have already too many school of mines graduates is the man who is not informed or is a man who on account of too little training fears, and desires less, competition. A survey made by a leading technical society is responsible for the statement that the number of students enrolled in mining and metallurgical schools throughout the country is not sufficient to take care of the demand for technically trained men. The Department of Metallography in one year received calls for thirty men which was more than three times the number of graduates in that department. There is also a great demand for men trained in other departments. Records show that 92 per cent of all graduates of the School of Mines and Metallurgy are still in engineering and technical work.

Our school has a most enviable reputation for graduating able, capable men, many of whom have become distinguished. By comparison with other departments, the work in the School of Mines and Metallurgy may appear more difficult, but any man entering the school can graduate in four years with an Engineer's degree if he comes with a firm determination to succeed, if he will budget his time, and if he has interest and enthusiasm to apply himself largely to the subjects in the curriculum with a keen realization that careful and thoro preparation is the key to his professional success.



The Mines Experiment Station

The College of Education

M. E. Haggerty, Dean

ALMOST three quarters of a million people—possibly one fourth of the state's entire population—are going to school in Minnesota this year. Beginning in kindergarten, and in some places in nursery schools, they continue through grades, high school, college, professional schools, and in some cases through the Graduate School.

An individual who takes the entire program of education provided by the state can spend twenty or more years in going to school. Many drop out at the end of the elementary school or at other levels beyond. These, however, continue their education through extension classes, evening schools, and special training institutions. Education is thus the chief public concern of the state. It employs approximately twenty-three thousand persons and spends annually upon its public educational institutions fifty-five million dollars. Supplementing the state's public school system are many other educational institutions supported by churches, semi-public foundations, and private agencies.

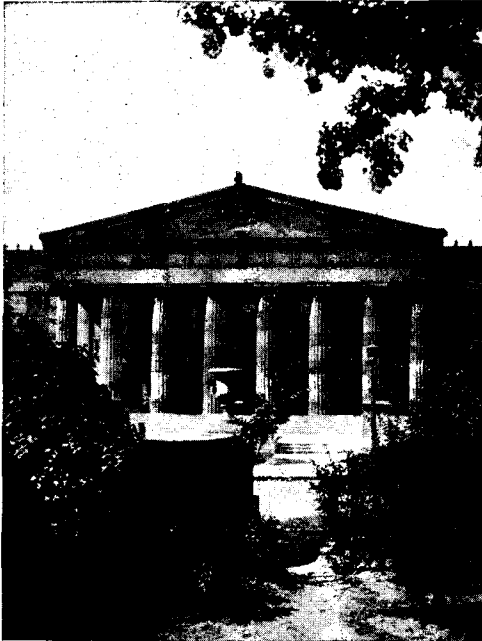
It is the function of the College of Education to provide teachers and other trained educational workers, to promote research in the increasingly difficult problems of instruction and school administration, and to render direct and immediate service to the public schools. You who are entering the University may well be interested in this program of education and in the work of this college since some of you will find here an opportunity for a future occupation that is reasonably remunerative, fosters the development of an intellectual career, and, at the same time, offers large possibilities for public service.

A Junior College student or transfer student contemplating work in the College of Education should consult the bulletin of the college at his earliest convenience, because it sets forth certain specific requirements that must be met by those desiring to enter the college later, and also because it describes the detailed requirements of more than forty specialized curricula leading to educational positions in the public schools. The greater number of these positions are in teaching, ranging from the nursery school and kindergarten to high school and college work. In addition to the curricula for teachers of the academic subjects there are others for teachers of home economics, agriculture,

commercial work, physical education, art, music, industrial arts, library service, and teachers of subnormal children. Certain curricula are designed to prepare students to become principals of high schools, superintendents of town and city schools, school psychologists, educational counselors, visiting teachers, etc.

In addition to a study of the bulletin, students desiring to enter the College of Education should seek advice from one of the faculty counselors of this college, and should make their choice to enter educational work only after satisfactory consultation. The college provides a number of such counselors in the special departments, and also in connection with the central college administration.

In general, the student should choose that special field in which he has a real interest and also one in which he has some reason to believe his special abilities qualify him for success. The college does not desire to prescribe the particular line of specialization for any of its students. This is a choice which the student himself must finally make.



Burton Hall

The School of Dentistry

W. F. Lasby, Dean

THE Medical Sciences Building is one which you are cordially invited to visit. Its modern lecture rooms, laboratories, and the large dental clinic where many patients, including students, come for dental service are equipped completely for the teaching of dentistry and dental hygiene.

Two courses of study are offered:

1. The three-year course in dentistry, leading to the degree doctor of dental surgery, is open to both men and women and aims to prepare them to enter the general practice of dentistry.
2. The two-year course in dental hygiene, leading to the degree graduate dental hygienist, is open to young women who are graduates of an accredited high school or who have already had work in college, and who wish to prepare to do dental hygiene work in dental offices, health institutions, or in public schools.

Admission to the three-year course in dentistry is based upon the completion of two years or more of college work, including the sciences of biology, chemistry, and physics which are fundamental to the practice of dentistry. These, together with English and elective subjects in social sciences and languages, form a background which is essential for every professional man.

By arrangement with the College of Science, Literature, and the Arts, a student who completes satisfactorily three years of college work and the course in dentistry may earn both the degrees bachelor of arts and doctor of dental surgery in six years.

The curriculum of the dental course is based upon what a dentist is expected to know in order to engage in the general practice of dentistry. The combination of knowledge, judgment, and skill required for the diagnosis and treatment of the diseases and disorders of the oral cavity requires a training in the medical sciences and also the development of a highly specialized form of manual dexterity. This is best acquired by those who have a natural ability for doing mechanical work with their hands. Sound health and good eyesight are important requirements.

Dentistry is a branch of the healing art concerned with

the health and well-being of the individual. In recent years health service, rather than mechanical procedures, has become the dominant note in practice. Rapid advances are being made both in professional attainments and in the esteem and confidence which is accorded to the dentists by the public. Dentistry offers one of the few individual and independent fields for the professional man. It offers an ever increasing and broadening field for service, worthy of the best and fullest efforts to all those who successfully qualify for practice. Its financial returns during the productive period of life compare favorably with other lines of endeavor and, in addition, it offers a full share of those rewards and satisfactions which come to those who serve their fellow men in matters of health service.



Main Clinic in the School of Dentistry

The College of Pharmacy

F. J. Wulling, Dean

PHARMACY has been in a state of transition and improvement for a number of years now. Not long ago pharmacists were wholly professional in their activities. The insinuation of trade into drug store practice is a story too long to relate here. Suffice it to say that commerce has now so thoroly exploited pharmacy that the commercialized drug store no longer represents pharmacy. The low entrance requirements to all professions of only a comparatively few years ago attracted to pharmacy in a small degree recruits who were more commercially than professionally minded. They were a type of pharmacists who found it more difficult to uphold and maintain high professional standards than to engage in trade and so they neglected pharmacy and gave most of their time and energy to trade. They became more successful financially than the wholly professional pharmacists, and on that account the number of drug stores gradually increased until at the present time there are about two and one-half times as many drug stores as are needed. Some of the old-time pharmacists were not able to meet the commercial competition and were crowded out, while concurrently more and more persons who were not pharmacists at all opened drug stores solely to carry on commerce. The reaction was bound to come. Indeed there are already in this country a respectable number of purely professional pharmaceutical laboratories where commerce is entirely absent. They are of recent origin. There are also still many pharmacists who, altho engaging in trade, are giving a very high standard of specialized pharmaceutical service.

The student thinking of entering pharmacy should decide whether he wants to become a professional practitioner or a merchant. Commerce is as respectable as professional practice, but to prepare himself for business a student need not—indeed should not—enter a college of pharmacy. Should he decide to become a pharmacist, he cannot afford to complete less than four years of college work required for the first degree in pharmacy. Opportunities for the well-trained pharmacist are good and for the reasons already stated, will continually grow better and better.

School of Business Administration

Russell A. Stevenson, Dean

IT is the aim of the School of Business Administration to afford a thoro training to those who are preparing to enter business in positions of responsibility. Emphasis is placed upon the basic principles of management. It is expected that students will secure an acquaintance with the various factors affecting the production and marketing of commodities and services, the financing of modern business concerns, and the problems of personnel administration. These subjects form a background from which to view the various aspects of management. After a student has completed the general courses in the basic principles of management, he should have a fair knowledge of the problems involved in all phases of business.

In addition to the general background, the school affords an opportunity for more intensive training in certain specialized fields of administration such as accounting, advertising, banking, foreign trade, personnel management, merchandising, traffic management, and statistics. Each field offers opportunities for a high type of professional work.

The demand for college-trained men and women in business has shown a tendency to expand during recent years along two lines. First, business itself has found that an adequately trained personnel is essential in meeting the competition in modern industry. Most of the large corporations have set up special training programs open only to graduates of collegiate schools of business. Each year the personnel representatives of these companies visit the school for the purpose of soliciting the most promising candidates. Those students chosen are given an intensive training in company methods. At the termination of their training program, they are given permanent positions. The smaller companies which do not have facilities for such training courses have shown a tendency to prefer graduates when seeking additional personnel.

The government service furnishes a second attractive field for graduates of this school. Not only have the government agencies concerned with the control and regulation of business increased in number and scope, but there are numerous cases in which the government has entered the field of business. Recently the demand for trained men in these government agencies has increased materially.

The General College of the University

Malcolm S. MacLean, Director

THIS college has been established to offer a two-year rounded education in the University. Its courses are synthetic, not specific. They are designed to give students a concrete, vivid, and realistic picture of themselves and the modern world in which they live. They are intended to survey the various fields of man's life and activity. In this age, vocations and training processes are so highly specialized and the development so rapid that broad understanding of them is hard to achieve and yet such an understanding is necessary to intelligent, successful, and happy living. The course serves as a vital background in family, social, business, and professional relationships.

Since nearly half of the students who enter the University drop out before graduation we feel that these students may be better served by the courses in the General College than by the specialized courses offered in other branches of the University. The *Bulletin of the General College* is a complete and readable description of the courses offered, and prospective students should get this bulletin at the office of the registrar and read it through. Overview courses may also serve to orient students in the choice of a vocation. By glimpsing in broad outline the fields of agricultural, business, engineering, law, and other professions, they may more readily determine the one for which they are fitted and to which they would be willing to give a lifetime of work. Hence, on the basis of the courses taken here, an enlightened plan of life may be formed. Curiosity may be satisfied and stimulated. Habits of intelligent reading and directed thinking may be formed.

A student may take one or two years in the General College. If he satisfactorily completes two years of work he will receive a degree of associate in arts from this college. He may, however, if his studies are fully satisfactory, and if he has chosen his special field, transfer to another unit of the University, provided, of course, that he fully meets its requirements.

To Our New Students

MEN and women of the freshman class, we all, faculty and students, join in welcoming you to the campus of our University—yours also, from now on, if you have the desire and the will to make it so.

You probably have read and will hear much of college spirit. To you and to many others this may picture masses of students leading a carnival life of cheering, singing, and conflicts with others. This is not "The Minnesota Spirit." "The Minnesota Spirit" is one of service and friendship. You have an opportunity to glimpse this in the service and friendship which is offered you in this, your first week here. It is here for you throughout your college years, if you desire it and are willing to work for it, giving as well as receiving.

A hint as to how this spirit is to be found and taken to yourself: First, prove that you are capable of carrying the work for which you are here—the scholastic. Until you prove this, you cannot be recognized as a contributing member of the community. If you are sincere in your wish to enter into the full spirit of Minnesota, you will, after your mastery of the scholastic responsibility, look for opportunities to take part in, and give to, the student life outside of the classroom.

This consists of the publications, dramatics, athletics, student government, and many others, Remember that no one is acceptable or can continue in these activities who does not maintain a clear passing standard in the scholastic work.

Do not rush into activities, be slow in entering, select first the one to which you can bring the most and from which you can receive the most.

Be willing to seek advice and suggestions from your friends, and upper classmen, your instructors, your deans.

The Dean of Student Affairs and the Dean of Women will be glad to have you come to them with any and all of your problems. Men and women are equally welcomed by both.

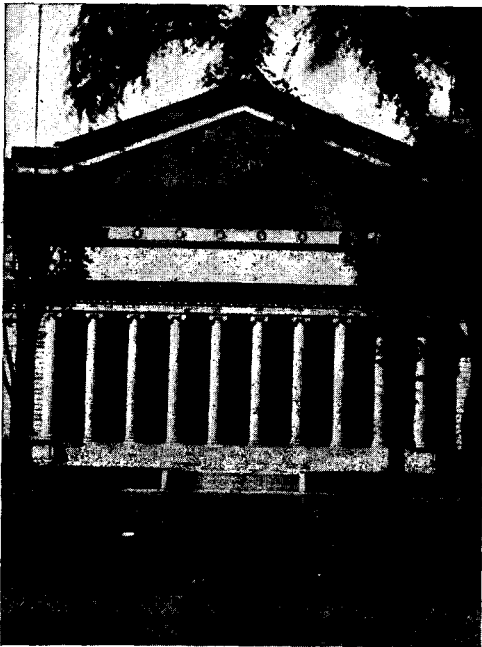
A reasonable observance of these points will bring to you "The Spirit of Minnesota."

E. E. NICHOLSON, Dean of Student Affairs

WE welcome the freshman class to the University of Minnesota, and we hope you will let us be your friend. My office is open to you at all times, whatever your need. Please get into the habit of dropping in when you are in Shevlin Hall, so that we may become acquainted.

If you are perplexed over any problem, bring it to us and let us help you solve it. We act as a clearing house, too, to put you in touch with the expert help that exists elsewhere on the campus. Many times just talking out your problem with a more experienced person will help you to see its solution. Often, however, you may need more than that. If you have to earn your way, we can help you to find some kind of employment. If you have difficulty in deciding on a vocation, or if you think an earlier decision was a mistake, come in and talk it over. If you are homesick, or ill, or lonesome, come to us. We offer you help and friendship.

ANNE DUDLEY BLITZ, Dean of Women



Northrop Memorial Auditorium

Student Section

WELCOME

By Edward Harding

HELLO, you poor, friendless, bewildered, puzzled, and awed freshmen! If I've insulted you, I apologize, but I know that's how I felt when I was a freshman. Being a freshman is like cutting your teeth—it's painful, but everybody has to do it.

There is only one rule which you should carry in your mind during Freshman Week and the first few weeks after it, and that is, "ask questions!" When I came to Minnesota I didn't understand anything about this huge institution, and it took months for me to orient myself. You can avoid this mistake by asking questions of everybody you see about anything of which you are the least bit doubtful. We upper classmen have only one function for the first few weeks of school, and that is to try to make you acquainted with all the ins and outs of the University of Minnesota.

Bashfulness is the cardinal sin of all freshmen. Avoid it as you would the plague! If you're interested in some activity discussed here, go to the head of that organization or some upper classman who is active in its affairs and ask questions of him. He will be glad to help you. If you don't know just where to go for information, ask the members of the Freshman Week Committee. That's the only use we have.

In this handbook you will find information about religious organizations, about athletics, about the hundreds of different societies and activities which attempt to make of the University of Minnesota something more than a knowledge factory, which attempts to give you a little niche in which to fit yourself, to make you feel that you are a part of this institution.

You are homeless if you are from out of town. In this book you will find complete information about where to live.

You are bewildered, and a little bit homesick and very lonesome. In this book you will find information about different campus activities which you can throw yourself into in order to eliminate that empty feeling.

You feel, and rightly, that at a university there should be something more than mere formal education. In this

book you will find the answers to your questions about how you can develop yourself in ways other than those covered by formal schooling.

STUDENT ACTIVITIES

Student activities form a necessary and vital part of college life—they aid in transforming a rather shy and somewhat awkward freshman into a poised and assured college graduate. Many of the dozens of different groups will give training which will prove helpful in later life—training that may aid in hunting down and trapping that elusive job when—and if—graduation comes. And speak-



To Convocation

ing about graduation brings up the age-old question of how much outside activities interfere with studies. The answer is that a good student can handle both his studies and his extra-curricular activities. The answer has to be modified somewhat tho—depending on the college and the course a student is taking. Engineering, medicine, and mines students would be using a lot of horse sense if they stayed out of activities for a quarter to see how they could carry the scholastic load before getting involved in too

many student affairs. This rule is a good one for all students to follow, tho a freshman's chances of landing a really big job in his junior or senior year depend to a large extent on getting the jump on his fellow frosh by turning out for an activity before the others do. As to how to get in—just drop around to the meeting place of your chosen activity, and you will find that the upper classmen will be glad to give you a chance to show your stuff.

PUBLICATIONS

The *Minnesota Daily* is the campus newspaper. It's put in each post-office box every morning except days after holidays and on holidays. The *Daily* "covers" the campus completely—sports, news, and editorials. Freshmen interested in either the business side or the writing side of a modern newspaper can get a lot of fun as well as a lot of valuable training from the *Daily*. The higher positions pay salaries—not very much, of course, but often enough partly to pay tuition or to buy textbooks.

The *Ski-U-Mah* is the humor publication of the campus—or so its editors claim. Sometimes what they consider a



Ski-U-Mah Office

joke really is funny, but seriously, the *Ski-U-Mah* will give a lot of valuable experience to students interested in magazine writing or advertising.

The *Gopher* is the yearbook of the University of Minnesota and, while there is not quite as much room for freshmen on its staff, any interested who have the ability will be given a chance.

In addition there are a few minor publications, not of an all-university nature, in some of the various colleges. The *Techno-Log* in Engineering, for instance, and the *Law Review* and one or two others are examples. Jobs on these publications are open only to students in these colleges.

BOARD IN CONTROL OF STUDENT PUBLICATIONS

The Board in Control of Student Publications is composed of seven students elected as representatives from the various colleges and three faculty members, ex officio.

Dean E. E. Nicholson, dean of student affairs, T. E. Steward, all-university representative, and R. D. Casey, head of the Department of Journalism, are the faculty members.

The board has complete control over the three major publications: the *Minnesota Daily*, the *Gopher*, and the *Ski-U-Mah*. In the spring of each year the outgoing board selects managing editors and business managers of each publication for the following year. The officers named choose their own organizations.

BOOKSTORES

There are several co-operative bookstores on the campus for the convenience of the students in different schools. The bookstores that are for the use of freshmen are: the W.S.G.A. second-hand bookstore in the basement of Folwell Hall, the School of Business Administration bookstore in the Business Building, and the Engineers' bookstore in the basement of the Main Engineering Building. The Engineers' bookstore is only equipped to sell new books and equipment. Any of these stores will be glad to answer any of your questions on how they run, what they handle, and what arrangements they can make to serve you.

ATHLETICS

Minnesota is a member of the Big Ten Athletic Conference—recognized as one of the toughest leagues in the country in practically every major sport. Last year the Gophers won the mythical national football championship, finished rather low in basketball, won both singles and doubles tennis championships, placed third in golf, and won the baseball title.

Freshmen aren't eligible for play on varsity teams, but unless you come out for the team during your first year, you will have but little chance of making the varsity later on. Watch the *Daily* for calls for candidates in sports in which you are interested.

Students may buy season tickets for all athletic contests except swimming and out of town games for \$7.50. If you have the money, it's a good investment.

1935 FOOTBALL GAMES

- September 28—North Dakota Aggies
- October 5—Rest date
- October 12—Nebraska (at Lincoln)
- October 19—Tulane
- October 26—Northwestern (Homecoming)
- November 2—Purdue (Dad's Day)
- November 9—Iowa (at Iowa City)
- November 16—Michigan (at Ann Arbor)
- November 23—Wisconsin



The Little Brown Jug

INTRAMURAL ATHLETICS

The University conducts an extensive intramural sports program. Among the sports offered are: touch football, basketball, tennis, golf, track, squash racquets, handball, swimming, and diamondball. Students play against their fellow students in different colleges or in different fraternities. Players who have made a varsity team in some sport are ineligible for play in that intramural sport. Splendid trophies are awarded by the intramural department, and the *Daily* has a special staff in the sports office devoted exclusively to intramural athletics. The entire program is put on free for the students.

WOMEN'S ATHLETIC ASSOCIATION

The Women's Athletic Association attempts to promote a program of activities that will reach all students. Results are measured by enjoyment, development of good health, physical efficiency, sportsmanship, and leadership. The ideal of the organization shows in its motto, "Play for play's sake and not for point's sake."

During the fall quarter the major sports sponsored by the association are field hockey, volleyball, rifle marksmanship, swimming, and tap dancing, while in the winter quarter basketball, ice hockey, and fencing are the major sports. Track, archery, baseball, golf, and tennis are offered in the spring. Women may also earn participation credit in unorganized sports such as riding, hiking, skating, and skiing.

Membership is open to any undergraduate woman who has participated in one season of athletic activity or one season of service to W. A. A. and has complied with the requirements of W. A. A.

Orchesis (dancing club), the Aquatic League (swimming club), the Home Economics branch for women on the University Farm campus, and the riding club are subdivisions of the W. A. A. These clubs merely require certain preparatory tests for entrance, and work during the year on various interesting projects.

During the spring vacation the Minnesota W. A. A. will be hostess to the National Athletic Federation of College Women.

WOMEN'S SELF-GOVERNMENT ASSOCIATION

Every freshman woman in the University is automatically a member of the W. S. G. A. which sponsors four class organizations to develop a closer friendship and class spirit among the members of the different classes. Bib and Tucker is the freshman organization, Pinafore the sophomore, Tam O'Shanter the junior group, and Cap and Gown the senior group.

The W. S. G. A. maintains a vocational bureau to provide advisory service for any woman in doubt as to the occupation she intends to pursue. The organization also supplies tutors for both men and women students at minimum rates.

The group sponsors a social hour in Shevlin ballroom or the Minnesota Union Friday noons and usually gives a "sunlite" dance every other week. During Freshman Week a free sunlite will be offered. The exact date wasn't decided when this book went to press.

SCHOLARSHIPS AND AWARDS

There are many scholarships and prizes awarded to university students who have a fine scholastic record or have excelled in some particular activity. Some of these prizes are awarded at the end of the freshman year, but whether they are or not, it behooves every entering student to make a good record during the first year. It would be too bad to let some small carelessness or indifference in the freshman year ruin any chances for an award which you would really like to win. A good start is half the race!

MINNESOTA UNION

When a fellow enters the University he has a clubhouse waiting for him—the Minnesota Union. It is his, and he should make good use of it. He can use it as a place for study, recreation, or as a place to eat. He may attend or hold meetings in its many rooms or go to any of its many parties and dances. There are billiard tables, ping pong tables, a card room, cafeteria, and soda fountain in the building.

SHEVLIN HALL

For women, Shevlin Hall serves the same purpose that the Minnesota Union serves for men—that of a clubhouse in which all women's activities center. It is open for social affairs, study, rest, and meals. In the basement are the Shevlin cafeteria and small dining rooms available for luncheon and dinner meetings. The main floor contains a large lounge room, furnished with easy chairs and davenports where students can spend their leisure time either studying or chatting with friends. Also on this floor are the ballroom, the office of the dean of women, and the Y.W.C.A. office. On the second floor there is a study room and a quiet room provided with cots.

PIONEER HALL

Pioneer Hall, the men's dormitory, is located four blocks from the campus in pleasantly situated surroundings just above the river. The original dormitory was built four

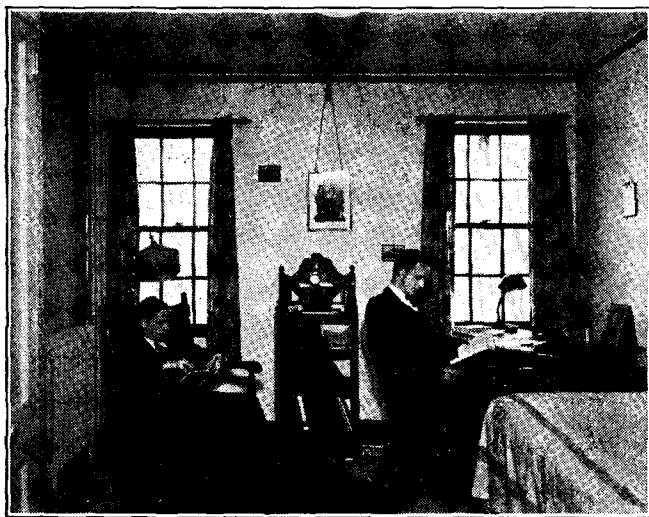


Pioneer Hall—Men's Dormitory

years ago and redecorated last year. The second building was constructed last year, and this is the first year that it will be occupied.

Rates for both buildings follow:

| | |
|--|----------------------|
| Double rooms with board, per student.... | (\$34.00 per month) |
| | \$102.00 per quarter |
| Fourth floor three-room suites (three men) with board, per student..... | (\$38.33 per month) |
| | \$115.00 per quarter |
| Double rooms (large) with board, per student | (\$38.33 per month) |
| | \$115.00 per quarter |
| Single rooms with board..... | (\$41.67 per month) |
| | \$125.00 per quarter |
| Three-room suites for two men (two bedrooms and a common study) with board, per student..... | (\$41.67 per month) |
| | \$125.00 per quarter |
| Bay window three-room suites with board, per student..... | (43.35 per month) |
| | \$130.00 per quarter |



Room in Pioneer Hall

SANFORD HALL

The women's dormitory, Sanford Hall, is located on University Avenue and Eleventh Street, two blocks from the main gate of the campus. It offers living accommodations for the women students at moderate rates. It supplies food in generous quantities, has laundry facilities and running hot and cold water in each room. The hall also sponsors a full social program. A library and reading room has been added this past year.

Rates are as follows:

| | |
|---|---|
| Basement rooms (doubles) with board, per student | (\$26.65 per month) \$80.00 per quarter |
| Basement rooms (singles) with board, per student | (\$30.00 per month) \$90.00 per quarter |
| Double rooms with board, per student.... | (\$35.00 per month) \$105.00 per quarter |
| Single rooms with board..... | (\$38.35 per month) \$115.00 per quarter |
| Large single rooms with board..... | \$117.50 per quarter |
| Fourth floor rooms are \$10 less per quarter. | |



Parlor, Sanford Hall—Women's Dormitory

FRATERNITIES AND SORORITIES

For the out of town student who will feel especially the lack of companionship and fellowship that he has been accustomed to in high school, joining a fraternity or sorority, as the case may be, will prove an investment which will pay large dividends. Much unfavorable publicity has been circulated in the past about the Greek letter organizations, and while some of it was true in the past, at present fraternities and sororities are most emphatically *not* draggers-down of scholarship or tearers-down of morals. President Roosevelt and ex-President Hoover were both fraternity men, and countless other public figures in both business and society belong to Greek letter organizations.

In a school as large as Minnesota a fraternity or sorority forms a well-nigh indispensable integrating factor in adjusting students to college life. Belonging to such an organization aids in forming closer and better friendships and in adjusting students to the larger aspects of collegiate growth, both mentally and morally.

Those students who feel that they have enough money to consider joining a Greek letter organization should talk to their respective deans. The fraternity or sorority will make the first step. Rushing for women will begin the first week of school and for men the second week with pledging delayed until mid-quarter for the men. Women may pledge immediately after rush week. Those going through rushing are charged a small fee and complete information regarding the rules is given them.

INTERFRATERNITY COUNCIL

The Interfraternity Council is composed of one representative of each academic fraternity on the campus. It has jurisdiction over rushing, initiations, and other similar matters concerning academic fraternities.

PANHELLENIC COUNCIL

This is the law-making and governing body of the Greek letter sororities, and it will try during Freshman Week to contact every girl who is interested in sororities. There will be open house teas for out of town girls on Monday, September 30, and for Twin City girls on Sunday, Sep-

tember 29. The rushees may attend as many houses as they wish on these days. The rushees should go to Shevlin Hall, starting Tuesday of that week, to call for their invitations. These invitations must be answered by one o'clock each day. All freshman girls are cordially invited to these teas.

HOUSING BUREAU

Maintained by the University to aid students in finding suitable rooms, the Housing Bureau which is located on the second floor of Shevlin Hall, can furnish you with information concerning rooms of any type. A list of available rooms will be supplied upon request.

UNION BOARD OF GOVERNORS

The Union Board of Governors, composed of one popularly elected representative from each college or school, two faculty members, and one alumnus directs the Minnesota Union, plans its social functions, and executes its policies. The board selects a manager each year.

CO-OPERATIVE COTTAGES

Six co-operative cottages offer homes for approximately 75 women. In order to keep expenses under \$22 per month, those who reside in the houses assist with the work.

One of these cottages is exclusively for graduate women and one cottage is devoted only to girls who wish to do light housekeeping.

For further information, communicate with Catharine McBeath, manager of the University Cottages, Shevlin Hall.

MUSIC

Appointments for entrance examinations on practical music and placement tests in ear training must be made in the Music Building, Room 107, before registering.

The University Symphony Orchestra has for its object the study of standard symphonic literature. Tryouts are held during Freshman Week and at the first rehearsal. Students must register for orchestra as a regular credit class during registration periods.

The Collegium Musicum consists of a group of students and faculty who possess unusual technical equipment and evidence a desire to study a literature composed for a vehicle of expression smaller than that of the Symphony Orchestra.

The University of Minnesota bands, under the direction of Gerald R. Prescott, are open to men and women of all colleges of the University. The Concert Band, playing standard American and European arrangements of concert band material, plays for convocations, spring commencement, broadcasts, fall and winter quarter concerts, twilight concerts in the spring, and goes on a tour during spring vacation. The tour next spring will be through southeastern Minnesota and parts of Wisconsin, Illinois, and Iowa. The Marching Band plays for athletic functions, parades, etc., and goes on the student football trip each fall—this year to Ann Arbor, Michigan, on November 16. The Freshman Band prepares new players for service in either the Marching Band or the Concert Band, and augments the Marching Band on special occasions. Students interested in the university bands are invited to visit the band offices in Northrop Memorial Auditorium, and to arrange with Mr. Prescott, in Room 14, for a tryout.

There are several other musical organizations on the campus and you can get all information about them by applying at the Music Building.

STUDENT FORUM

The Student Forum is an independent discussion group meeting each Tuesday at 12:30 p.m. in the Minnesota Union. It sponsors speakers on topics in practically every field. There is no definite membership, and the luncheon meetings are open to everyone. A speaker is required to answer questions from the floor after his formal speech is ended. "Fritz" Rarig is chairman this year.

ARTS COLLEGE INTERMEDIARY BOARD

This board is one of the newer of the activities on the campus. It was originated in 1932 by Dean J. B. Johnston. It is open only to honor students of the Arts College, and only honor students can vote for its members. Its purpose is to act as an advisory board on administrative and curricular policies.

LITERARY AND FORENSIC SOCIETIES

Freshmen and sophomores interested in debating try out for places on their class team, and these teams compete for the Frank H. Peavey prize of \$100 which is divided

equally among members of the winning team. Upper classmen and graduate students compete for places on the varsity team which meets teams from the Western Conference Debate League and other college teams in the Middle West.

The main interest of the freshmen is in the annual contest for the Ludden prizes of \$50, \$30, and \$20 open to the under classmen only. The main oratorical contest of the year is the competition for the John S. Pillsbury prizes of \$100, \$50, and \$25. The winner is entered in the Northern Oratorical League contest in which orators from six colleges and universities in the Middle West compete. First prize is \$100.

The Minnesota chapter of Delta Sigma Rho, forensic society, sponsors an extemporaneous speaking contest for prizes of \$15 and \$10 and the Pi chapter of Zeta Phi Eta sponsors an annual verse-reading contest in which books are given as prizes.

The University Theatre is the all-university dramatic organization. It produces several plays each year. PUNCHINELLO is the Farm campus, and MINNESOTA MASQUERS is the Main campus, dramatic group. The University has local chapters of National Collegiate Players, Delta Sigma Rho, and Zeta Phi Eta. MINERVA and THALIAN are women's writing societies.



The University Theatre's Major Barbara

ALL-UNIVERSITY COUNCIL

The All-University Council is the organization at the University which compares with the Student Council of the high school. It is composed of a representative from each college in the University and is the students' governing body. Its members are elected for one- or two-year terms at the semiannual elections. As the council represents the student body and co-operates with the faculty in regulating student affairs it is important that even the "unactivity" minded freshman should make himself acquainted with parties and policies so that he can vote intelligently.

CAMPUS DAYS

Minnesota, like most universities, has its days of festivity. The most important of these are Homecoming Day, Cap and Gown Day, Mother's Day, Dad's Day, and Engineers' Day.

Mother's Day is celebrated on the Saturday preceding the national Mother's Day. Dad's Day is a day during the fall quarter reserved for the entertainment of university dads. It is held on the date of one of the more important football games.

RELIGIOUS ORGANIZATIONS

No one will deny that the University is a large school and for this reason it is undoubtedly hard for the entering freshman to find exactly the right group into which he will fit. The easiest way for him to find a group of his own type of people is to go to the campus representative of his own church. Here he will find students, like himself, all seeking after companionship and truth. The tendency of most students is to forget the church as soon as they get away from home for the first time, but it does not take long for them to realize that they need what the church can offer. Why not accept your church's open invitation and get in on some of the fun and education that is offered by it?

The campus churches with the Y.W. and Y.M.C.A. have organized what is known as the Students' Religious Council. Members of the council are as follows:

Y.M.C.A.—Benjamin Schmoker, secretary
Y.W.C.A.—Miss Jan Bradley, secretary
Newman Club (Catholic)—Father Murphy
Temple Israel (Jewish)—Rabbi Minda
Temple Adath Jeshurun (Jewish)—Rabbi Gordon
Temple Bethel (Jewish)—Rabbi Aaronson
Baptist—Rev. George I. Fetter
Congregational—Rev. P. E. Gregory
Episcopal—Rev. E. H. Lofstrom
Grace Church (Lutheran)—Rev. C. E. Wendell
Hope Church (Lutheran)—Rev. C. S. Thorpe
Lutheran Student Center
Wesley Foundation (Methodist)—Rev. J. G. Lewis
Andrew Presbyterian—Rev. R. G. Riemann
Christian Science Church

The chairman of this council will be elected sometime during the summer and will be formally announced next fall.

Thursday of Freshman Week is designated as *Church Night*, and the churches listed above will have some event of special interest to all new students. Usually this takes the form of a welcome banquet for which tickets must be secured in the post-office lobby. The calendar of the University is kept clear on Thursday evening and every new student is urged to attend the function planned at one of the churches.

Each year the University sponsors three religious convocations. A well-known Catholic priest, Jewish rabbi, and Protestant minister are asked in turn to speak at these convocations.

Several of the large churches have special facilities for students, and always welcome any additions to their numbers. Some of these are:

Andrew Presbyterian: 4th and 8th Avenue S.E.
University Baptist: 13th and University Avenue S.E.
Beth El Synagogue: 1349 Penn Avenue N.
Temple Israel Synagogue: 24th and Emerson Avenue S.
Fifth Church of Christ: 12th and University Avenue S.E.
First Congregational: 5th and 8th Avenue S.E.
First Methodist Episcopal: 4th and 12th Avenue S.E.
Holy Trinity Episcopal: 4th and 4th Avenue S.E.

Grace Lutheran: Harvard and Delaware S.E.

University Lutheran Church of Hope: 6th and 13th Avenue S.E.

St. Lawrence Catholic: 1215 5th Street S.E.

Unitarian Society: Unitarian Center, 1526 Harmon Place

Mount Olive Lutheran: Chicago at 31st Street S.

Y.M.C.A.

The University Y.M.C.A. is one of the largest men's campus organizations and is well-organized to cater to the student's moral, spiritual, and social needs. It is on the campus for the sole purpose of promoting Christian ideals among the students and to aid them in any way possible. Any religiously minded student is eligible for membership at the Y.

The Y.M.C.A. maintains a beautiful building on the corner of Fifteenth and University Avenues, and a branch home on the Farm campus. There are rooms in either for study or recreation. It also offers town boys a place to eat their lunch.

FRESHMAN CAMP

If you want to get started right at the University you will attend Freshman Camp, September 20-22, the week-end before Freshman Week. You will have a chance to meet your future classmates as well as prominent athletes in all sports, leaders in extra-curricular activities, and deans of many colleges. Be a step ahead of the next fellow by having your program gone over at camp. Further information concerning the Y.M.C.A. Freshman Camp will be mailed to you on request.

Registration \$1, camp fee \$4. Total, \$5.

For information write to:

WILLIAM BREDESEN,
Care Y.M.C.A., 1425 University Ave.,
Minneapolis, Minnesota

Y.W.C.A.

The University Y.W.C.A. is a fellowship of women students sponsoring a varied program of social and religious activities such as freshman friendship groups, teas, office hostessing, parties and dances, social service, and religious education.

Freshman friendship groups are informal gatherings of all freshman girls who are interested in music, charm and personality, arts and crafts, camping, contract bridge, poetry, public affairs, or knitting.

Shortly after school begins the organization conducts a house party at Lyman Lodge, Lake Minnetonka, to which all university women are invited.

Fortnightly dances, costing 35 cents, are held regularly in the Minnesota Union ballroom to which both men and women are invited to attend stag.

Girls may do volunteer work in settlements, Girl Reserve clubs, Girl Scouts, Campfire groups, or recreational centers through the social service department of the organization.

Freshman women and new students are invited to participate in the activities of the Y.W.C.A. and to use its office in Shevlin Hall.



Student Committee of Freshman Week

SENIOR ADVISERS

The organization at the University called Campus Sisters will act this year as advisers to all freshman women or transfer women. It will pay you to become acquainted with your adviser for she can do a lot to help you become adjusted to your place in the University.

Altho men cannot have a Campus Sister, still they have not been forgotten. A group called the Senior Advisory Council, supervised by the Freshman Week Committee, endeavors to aid each freshman in any way possible. Even

tho each of you will be assigned an adviser, always feel at liberty to ask any question of any upper classman.

EMPLOYMENT BUREAU

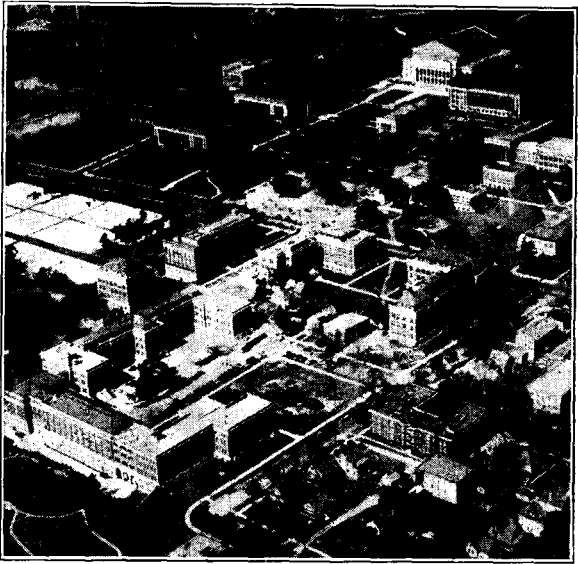
A free employment bureau devoted to finding part-time work for students is operated by the University. It is located on the ground floor of the Administration Building. Altho a large percentage of university students work part of their way through school, it does take time to find suitable employment. All freshmen are advised to have funds sufficient to pay expenses during the first quarter at the very least—preferably the first year.

SOCIAL EVENTS

Social events include such annual functions as the Military Ball in the fall quarter, the Junior Ball in the winter quarter, the Senior Prom in the spring, the Sophomore Ball, and the Freshman Frolic. These parties are planned by student committees under university supervision. Attendance is open to anyone in the University.

FRESHMAN WEEK

The transition from high school to the University is eased slightly by the administration's Freshman Week program. It consists of a series of lectures and tours which give the incoming freshman a good idea of the general workings of the school. All the arrangements for the week are in charge of a committee of which Dean Johnston is chairman. Mr. Burkhard is director of Freshman Week and Mr. Crawford, chairman of the Student Committee.



The Main Campus

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

The School of Mines and Metallurgy
Announcement for the Years
1935-1937



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FACULTY

ADMINISTRATION

Lotus Delta Coffman, Ph.D., LL.D., President
William R. Appleby, M.A., Dean of the School of Mines and Metallurgy
Elting H. Comstock, M.S., Chairman of Students' Work and Advanced Standing Committees

CHEMISTRY

Professors Lee I. Smith, Ph.D., Frank H. MacDougall, Ph.D., M. Cannon Sneed, Ph.D.; Associate Professor I. William Geiger, Ph.D.; Assistant Professors Hervey H. Barber, Ph.D., Landon A. Sarver, Ph.D., Arthur E. Stoppel, Ph.D.; Instructor J. Lewis Maynard, B.A.

DRAWING AND DESCRIPTIVE GEOMETRY

Professor William H. Kirchner, B.S.; Associate Professor Howard D. Myers, B.S.(C.E.); Assistant Professors Henry C. T. Eggers, Ph.D., Orrin W. Potter, E.M., M.S., Robert F. Schuck, B.S.(E.E.), William S. Williams, B.S.(E.E.)

ELECTRICAL ENGINEERING

Professor John M. Bryant, M.S., E.E.; Assistant Professor Milo E. Todd, B.A.(E.E.)

EXPERIMENTAL ENGINEERING

Mathematics and Mechanics

Professor William E. Brooke, B.C.E., M.A.; Assistant Professor Forrest E. Miller, M.S.(Agr.E.)

Mechanical Engineering

Professors Frank B. Rowley, B.S., M.E., Charles F. Shoop, B.S., B.S.(M.E.)

GEOLOGY AND MINERALOGY

Professors William H. Emmons, Ph.D., Frank F. Grout, Ph.D., Clinton R. Stauffer, Ph.D.; Associate Professors John W. Gruner, Ph.D., George M. Schwartz, Ph.D., George A. Thiel, Ph.D.; Instructor Carl E. Dutton, Ph.D.

MECHANICAL ENGINEERING

Professor John R. DuPriest, B.S.(E.E.), M.E., M.M.E.; Associate Professor Charles A. Koepke, M.S.(M.E.)

METALLURGY

Professors William R. Appleby, M.A., Peter Christianson, B.S., E.M., Ralph L. Dowdell, Met.E., Ph.D., Levi B. Pease, M.S.; Assistant Professors Henry S. Jerabek, M.S., John N. Searles, E.M., M.S.; In-

structors Arthur C. Forsyth, Met.E., M.S., Myron W. Griswold, E.M.; Assistant Bernard R. Queneau, Met.E., M.S.

MILITARY SCIENCE AND TACTICS

Professor Adam E. Potts, Major, Coast Artillery Corps; Assistant Professors Richard A. Ericson, Captain, Coast Artillery Corps, Layton A. Zimmer, First Lieutenant, Coast Artillery Corps, Charles B. Brown, First Lieutenant, Signal Corps; Instructors Aubrey R. Dunkum, Master Sergeant, Coast Artillery Corps, Roy Cunningham, Staff Sergeant, Infantry, John E. Seay, Staff Sergeant, Infantry, Ernest R. Mylke, Staff Sergeant, Coast Artillery Corps.

MINE PLANT AND MECHANICS

Professor Elting H. Comstock, M.S.; Associate Professor Louis S. Heilig, E.M.; Assistant Professor James C. Sanderson, Ph.D.

MINING

Professor Walter H. Parker, E.M.; Instructor Stanley A. Trengove, Ph.D.

MINING ENGINEERING

Professor Edwin M. Lambert, M.E.

PETROLEUM ENGINEERING

Professors Walter H. Parker, E.M., Peter Christianson, B.S., E.M., Elting H. Comstock, M.S.; Instructor Stanley A. Trengove, Ph.D.

PHYSICS

Professors Henry A. Erikson, Ph.D., Louallen F. Miller, Ph.D., Anthony Zeleny, Ph.D.

GENERAL INFORMATION

The School of Mines and Metallurgy was established by the Board of Regents in 1888, upon recommendation of the general faculty of the University. The buildings and laboratories of the school are located on the Main campus of the University. The mining districts of Minnesota are within a few hours, by rail, of Minneapolis. The heartiest co-operation exists between the various mine managements and the school, so that the mining properties are at all times open to parties from the school for observation and study trips. Practical surveying, geological field work, and underground work are carried on in one or more of the districts. Students in the School of Mines and Metallurgy have, therefore, all the advantages afforded by a large university combined with ample opportunity for field observation and experience.

The School of Mines and Metallurgy occupies the building provided by the Legislature of 1913. In the basement are the assay and electro-metallurgical laboratories, together with machinery room, instrument room, balance room, furnace rooms, and necessary storerooms. On the first floor are the administrative offices, the offices and lecture rooms of the Departments of Metallurgy and Mine Plant and Mechanics. On the second floor are the lecture rooms and drafting rooms of the Department of Mining, the ore dressing laboratory, and the library of the school. On the third floor are the offices, laboratories, and lecture rooms of the Department of Metallography, Department of Mining Engineering, senior drafting room, dark rooms, blueprinting room, and offices and computing rooms for the branch of the experiment station serving the Tax Commission.

DEGREES

In the School of Mines and Metallurgy there are four regular courses of study, viz., Mining Engineering, Mining Engineering specializing in Geology, Mining Engineering specializing in Petroleum, and Metallurgy, leading to the degrees of engineer of mines (E.M.), engineer of mines in geology (E.M.[Geology]), engineer of mines in petroleum (E.M.[Petroleum]), and metallurgical engineer (Met.E.), respectively.

The School of Mines and Metallurgy also offers work in the Graduate School leading to the Master's or Doctor's degree in mining, metallurgy, metallography, or petroleum engineering. For details, the Bulletin of the Graduate School should be consulted.

CLASSIFICATION OF SUBJECTS

The work falls under the following subdivisions, supplemented by thoro courses in mathematics, mechanics, surveying, physics, chemistry, and the necessary theory and practice of structural, mechanical, and electrical engineering.

(a) *Geology*—to determine the location of the ore. (b) *Mineralogy*—to determine its nature. (c) *Assaying*—to determine whether or not it has

value for treatment. (d) *Mining engineering*—to furnish material for treatment. (e) *Mine plant*—to provide the physical equipment for mining and treating the ore. (f) *Ore testing*—to determine best methods of treatment. (g) *Ore dressing*—to furnish products for metallurgical treatment. (h) *Metallurgy*—to smelt and refine ores and ore dressing products; reduction to metals. (i) *Metallography*—to study metals and their alloys.

EXPERIMENT STATION

The School of Mines and Metallurgy Experiment Station was established in 1911 and is maintained to promote the development of the mining and mineral resources of the state; to assay specimens of ores, rocks, clays, and minerals; to make such assays free of charge for private parties subject to such regulations as the Board of Regents may deem necessary; to make mining and metallurgical experiments in the treatment of such substances and in the utilization of mining and metallurgical by-products; to investigate methods of mining and the use of explosives; to undertake such other mining and metallurgical problems as may seem desirable; to make all ore estimates for the Tax Commission, and to do such other work along the lines above outlined as may be requested by other state departments. Co-operation has been effected with the United States Bureau of Mines, the United States Geological Survey, the Minnesota Geological Survey, and the School of Chemistry.

The experiment station is prepared to assist citizens interested in these lines of work and to assay specimens of ore, rocks, clays, and minerals found within the state, free of charge.

In submitting samples the sender must state the exact location in which each sample was found, giving all possible additional information. This information, together with results of any test or analysis, will be on file and available to the public at the office of the station. Citizens desiring free assay privileges must agree to give accredited representatives of the School of Mines and Metallurgy Experiment Station and of the Geological Survey access to the property should they desire to visit the same for purposes of examination and geological study.

Correspondence will receive prompt attention, but consultations generally prove more satisfactory.

Each sample should be numbered for identification and bear the name and address of the sender. All shipments must be delivered to the Minnesota School of Mines and Metallurgy, charges prepaid. Shipping tags will be furnished upon request.

Address all communications to William R. Appleby, Director, Minnesota School of Mines and Metallurgy Experiment Station, the University of Minnesota, Minneapolis, Minnesota.

ADMISSION

The course leading to the degrees of engineer of mines, engineer of mines (in geology), engineer of mines (in petroleum), and metallurgical engineer may be completed in four years.

Freshmen will be divided into two sections as follows:

- a. Those entering with credits in higher algebra and solid geometry.
 - b. Those entering without credits in higher algebra and solid geometry.
- Students in section b will carry a special course in mathematics during their freshman year.

Details as to admission and entrance requirements, description of subjects accepted for admission, and list of fees and expenses will be found in the Bulletin of General Information, which will be sent to any address upon application to the registrar, University of Minnesota, Minneapolis.

UNCLASSED STUDENTS

No unclassified students will be admitted to the School of Mines and Metallurgy.

ADMISSION TO ADVANCED STANDING

Students who desire to obtain advanced standing must present their applications and certificates to the department concerned, obtain a written statement from the department, showing the exact credit allowed, and present this to the Advanced Standing Committee of the School of Mines and Metallurgy.

CREDIT FOR OUTSIDE WORK

Credit for certain courses, as a result of work done outside of the regular classes, may be obtained by satisfactorily passing comprehensive examinations.

Work done outside of class includes work done by correspondence, by the aid of a private tutor, by individual study, through practical experience, or otherwise.

The comprehensive examination will be conducted by a committee appointed by the head of the department in which the course is given.

Permission to take the examination must be obtained from the Students' Work Committee, and the usual fee of \$5 for a special examination must be paid unless it be taken within six weeks after first entering the University.

FEEES

| | |
|---|---------|
| Tuition fee (per quarter) | |
| Residents of Minnesota..... | \$30.00 |
| Nonresidents | 40.00 |
| Incidental fee (per quarter)..... | 6.00 |
| Matriculation deposit* (first quarter only) men..... | 15.00 |
| Special fees | |
| Examination for removal of condition..... | 1.00 |
| Examination for credit (after the first six weeks in residence) | 5.00 |
| Special examination | 5.00 |
| Chemistry deposit | 5.00 |
| Graduation fee | 7.50 |

Certain courses have laboratory fees. Such fees are indicated in the Description of Courses later in this bulletin.

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

Penalty Fees

A penalty fee for late registration, late change of registration, or late payment of fees shall be \$2 prior to the day classes begin, on and after which the penalty increases at the rate of \$1 per day, provided that no student shall pay more than \$10 of penalty in any given quarter.

COST OF FIELD TRIPS

The approximate cost of the field trips is \$90 for the northern trip taken at the end of the sophomore year and \$150 for the western trip taken at the end of the junior year.

FIELD WORK

MINE SURVEYING

The work in surveying is given in the sophomore year and is designed primarily for mining engineers. The work begins with the elements of plane surveying, with special reference to the computations necessary, followed by the higher theoretical work in plane surveying and its application to the problems met in underground surveying. Beginning about May 1, the class devotes seven weeks to field work at some convenient point in the Mesabi, Cuyuna, or Vermilion Range. The exact location will be announced in March of each year. The expenses for this trip are estimated at \$90.

The students will be divided into squads of two to four. Each student will be required to complete satisfactorily a practical course in plane and underground surveying including exercises in chaining and taping; adjustment and use of surveying instruments, solar and stellar observations; laying out railroad tangents and curves; making earthwork estimates; solving three-point problem by use of a plane table; and other problems. In addition each squad will be required to make a yardage estimate of the stripping of an open-pit mine; to transfer a meridian, from the surface, underground and make a complete survey of an underground mine.

The data obtained will be used in the course in mine mapping during the winter quarter of the junior year, and credit for field work is withheld until maps of the underground survey are satisfactorily completed.

A full equipment of surveying instruments of the latest and best types is furnished each squad for this work.

SOPHOMORE GEOLOGY

At the end of the sophomore year mining students are required to devote about two weeks to geologic mapping. This course usually comes after a seven-week course in surveying and the fields chosen are the Vermilion and Mesabi iron ranges of Minnesota. This work is intended to train the students in the interpretation of field relations and the preparation of geologic maps and cross sections.

JUNIOR MINING, METALLURGY, AND PETROLEUM ENGINEERING .

At the end of the junior year students are required to study plants and operations in one or more districts under the direction of members of the faculty. This work begins about May 15, and not over three weeks will be devoted to it. The work in mining and metallurgy is carried on in the leading western metal mining districts, that in petroleum engineering in the leading oil fields. The exact location will be announced in March of each year. The expenses for the trip are estimated at \$150. A deposit of \$50 must be made before starting on the trip to cover board and lodging and necessary side trips. Any balance will be returned at the close of the work in the field.

All notes, data, and sketches, necessary for a complete report on the field work, must be fully and neatly recorded in notebooks. These notebooks will be collected at the close of the trip and returned to the student at the reopening of field work at the school. In judging the character of the student's field work, equal importance will be attached to the completed report and to the original field notes. The departments reserve the right to reject notebooks considered below the standard that should be demanded of candidates for senior work. During the months of June, July, and August, the student is urged to spend at least six weeks in actual work in some district for which he may receive wages. The department will render all possible assistance in locating students in districts of their choice.

Field work will reopen at the School of Mines and Metallurgy on Monday of Freshman Week for a period of three weeks. No senior will be registered after that date. A limited program will be carried in addition to field work after the regular university class work starts.

The final reports covering field work must be prepared at the School of Mines and Metallurgy under the direct supervision of the department concerned. These reports must be typewritten and contain drawings, to scale, made from the field sketches, covering operations, and details of plants and equipment. These reports shall become the property of the school. Class work in the remaining subjects of the first quarter, senior year, will begin when the final field work reports are accepted.

JUNIOR GEOLOGY

The second field course in geology is required only of those students who are candidates for the engineer of mines (in geology) degree. The course begins early in May and is completed in June. The course requires altogether about six weeks' work, and the field chosen is the Black Hills region of South Dakota or some other western region. The expenses of the trip are estimated at \$150. The student is trained in interpretation of field data; in detailed mapping, underground and on the surface; in the preparation of geologic cross sections through mines; and he may gather material which will serve as a basis for future study in advanced courses the following year. The work conforms to the standards of official surveys as nearly as practicable. In preparation for the trip a lecture of one hour

per week will be scheduled for part of the third quarter preceding the trip. At the close of the field season the students are expected to obtain positions with mining companies either as miners or as engineers, or if openings are available, they may enter geologic surveys for the season's work.

The completion of sophomore and junior field work is a requisite for graduation, and satisfactory evidence thereof must be submitted to the department. Should a student, for sufficient reason, fail to complete this work in regular course, he may, with the consent of the department, be permitted to pursue his regular studies. In all such cases, however, the degree will be withheld until all field work is completed.

THESIS

The thesis work is intended to bring in review and connect the work of the fundamental sciences and the allied technical subjects which have formed the undergraduate curriculum.

It has been found that this purpose is most satisfactorily accomplished by assigning to each student a project, embracing the prospecting, development, and equipment of a group of mining claims, for candidates for the degree of engineer of mines; the investigation of a problem in mining geology, for candidates for the degree of engineer of mines (in geology); the investigation of an oil field problem, for candidates for the degree of engineer of mines (in petroleum); and the investigation of a metallurgical or metallographic problem, for candidates for the degree of metallurgical engineer.

As much latitude as possible will be allowed the student in the choice of his problem. He must select a suitable problem during the summer preceding the senior year. Outlines are furnished setting forth the lines of investigation necessary to obtain the required data. The junior field work affords opportunity therefor.

Prior to October 25 each student is required to submit to the department concerned an outline embodying the principal features of the problem. Unless this outline is submitted when due and is accepted by the department, registration for the first semester, senior year, may be cancelled.

All preliminary work must be done and final work on the project must be under way by December 1. On April 7 the text of the thesis must be completed and submitted for final approval. Completed work (typewritten and bound) together with all tracings and one set of clear blueprints therefrom must be in and accepted not later than April 27. Theses will not be accepted or examined after these dates. Unless the above conditions are complied with no student can expect to graduate with his class.

These theses shall become the property of the school.

GRADUATION

Students completing courses of study to the satisfaction of the faculty are entitled to receive the appropriate degrees. Any person may undergo, at suitable times, examinations in any subject. If such person pass in all

the studies and exercises of a course, he is entitled to the appropriate degree, provided that at least a full year be spent at the University before such degree shall be granted, and provided the examination in every case be held before a committee of the faculty appointed for that purpose.

Seniors must be in regular attendance at all classes until after the final examination for the third quarter. Irregular attendance will debar a student from entering all final examinations.

SPECIAL NOTES

Students failing to receive a quarter mark of 75 per cent in any subject shall have the privilege of a supplementary examination before the opening of the following year.

Each student must obtain from the registrar his average in all subjects and present himself for supplementary examinations, according to the program to be found in a booklet on examinations issued during the summer.

Failure of the registrar to notify a student of deficiencies will not be accepted as a reason for neglecting to report for necessary supplementary examinations. Students failing to report for supplementary examinations will be compelled to take work over in class as in case of failures.

Students having deficiencies in any subject will become members of the class in which such subject is a part of the program for the year and must register for all deficiencies. They may take in addition certain other subjects not more than one year in advance of their class. Students having deficiencies can be registered for mining, mining engineering, petroleum engineering, and metallurgical courses only by special vote of the faculty.

Students failing to receive a quarter mark of 65 per cent in any subject shall not be allowed to pursue any dependent subject except by permission of the faculty. A student may be permitted to take the dependent subject conditionally for six weeks, at the end of which time he must have a passing grade in the subject if he is to continue it for the remainder of the quarter.

The faculty may exclude students from attending classes in any subject upon recommendation of the department concerned.

All students must report in time to make suitable arrangements with departments concerned in case of conflicts in program.

Students failing to present themselves for final examination for any quarter will be given zero on the examinations, unless satisfactory excuse is presented.

Students whose absences in any quarter exceed 20 per cent of the scheduled class hours will not be permitted to take examinations without special permission of the faculty.

Sophomores and juniors who, at the end of the winter quarter, are deficient in 15 hours or more of any subject, or who, at the end of the spring quarter examination period for sophomores and juniors, are deficient in any subject of the preceding year will not be eligible to take the spring field trip unless declared eligible by a special vote of the faculty. Sopho-

mores who are deficient in one or more quarters of surveying will not be eligible for the sophomore field trip unless recommended for the trip by the Department of Mining Engineering and declared eligible by the faculty.

During the academic year students will be held responsible for the receipt of official communications sent to them through the university post-office. During the summer vacation they will be held responsible for the receipt of such communications sent to the home address given on registration blank for the preceding academic year, unless formal notification of their correct address is filed with the registrar and the dean.

COURSES OF STUDY

UNIFORM CURRICULUM TO END OF SOPHOMORE YEAR

The courses leading to the degrees of engineer of mines, engineer of mines (in petroleum), engineer of mines (in geology), and metallurgical engineer are uniform for the first two years.

Freshmen will be divided into two sections as follows:

- a. Those entering with credits in advanced algebra and solid geometry.
- b. Those entering without credits in advanced algebra and solid geometry.

Subjects with the prefix a are to be taken by freshmen in section a; those with the prefix b are to be taken by freshmen in section b; and those without prefix are to be taken by students of both sections.

FRESHMAN YEAR

First Quarter

| Dept. | No. | Title | Lect. | Lab. | Prereq. |
|----------------|-----|-------------------|-------|------|---------|
| Chemistry | 6f* | General Inorganic | 3† | 6† | ..... |
| Drawing | 11f | Eng. Drawing | .. | 10 | ..... |
| Geology | 1f | General Geology | 3 | 2 | ..... |
| a. Mathematics | 2f | Algebra | 6 | .. | ..... |
| b. Mathematics | 1f | Introduction | 6 | .. | ..... |

Second Quarter

| | | | | | |
|-------------|-----|------------------------|----|----|---------------------|
| Chemistry | 7w | General Inorganic | 3 | 6 | Chem. 6f |
| Drawing | 12w | Eng. Drawing | .. | 4 | Draw. 11f |
| Geology | 23w | Elements of Mineralogy | 3 | 4 | Geol. 1f |
| Mathematics | 4w | Trigonometry | 6 | .. | Math. 1f or 2f |
| Metallurgy | 1w | Assaying | 4 | .. | Chem. 14f, Geol. 1f |
| Metallurgy | 2w | Assaying Laboratory | .. | 8 | Chem. 14f, Geol. 1f |

Third Quarter

| | | | | | |
|----------------|-----|------------------------|----|----|-----------|
| Chemistry | 8s | Qualitative Analysis | 3 | 6 | Chem. 7w |
| Drawing | 13s | Eng. Drawing | .. | 8 | Draw. 12w |
| Geology | 24s | Elements of Mineralogy | 3 | 4 | Geol. 23w |
| Mathematics | 5s | Analytical Geometry | 6 | .. | Math. 4w |
| b. Mathematics | 3s | Algebra | 4 | .. | Math. 1f |

* The suffixes f, w, or s, after the course number indicate the quarter in which a course is offered—fall, winter, or spring quarter, respectively. Two or three suffixes indicate that a course is offered in each of the corresponding quarters.

† Figures following the descriptive name of a course indicate number of hours per week. Course names following indicate prerequisite courses.

COURSES OF STUDY

13

SOPHOMORE YEAR

First Quarter

| Dept. | No. | Title | Lect. | Lab. | Prereq. |
|--------------------|------|------------------------|-------|------|------------------------|
| Drawing | 14f | Descriptive Geometry | 3 | .. | Draw. 13s |
| Geology | 105f | Rock Study | .. | 4 | Geol. 24s |
| Mathematics | 6f | Calculus | 4 | .. | Math. 5s |
| Metallurgy | 3f | General | 3 | .. | Met. 1w, 2w, Chem. 16s |
| Mining Engineering | 1f | Mine Surveying | 3 | .. | Math. 4w |
| Physics | 3f | Elements of Mechanics | 3 | .. | Math. 5s |
| Physics | 4f | Mechanics Laboratory | .. | 2 | Math. 5s |
| or Mechanics | 51f | Elementary Tech. Mech. | 4 | .. | Math. 5s |

Second Quarter

| | | | | | |
|--------------------|------|------------------------|----|----|--------------|
| Anal. Chemistry | 9w | Quantitative Analysis | 1 | 7 | Chem. 8s |
| Drawing | 15w | Drafting | .. | 4 | Draw. 14f |
| Geology | 2w | Historical Geology | 3 | .. | Geol. 1f |
| Geology | 106w | Petrography | .. | 4 | Geol. 105f |
| Mathematics | 7w | Calculus | 4 | .. | Math. 6f |
| Metallurgy | 4w | Met. of Pig Iron | 3 | .. | Met. 3f |
| Mining Engineering | 2w | Mine Surveying | 3 | .. | Min. Eng. 1f |
| Physics | 23w | Heat | 3 | .. | Phys. 3f |
| Physics | 24w | Heat Laboratory | .. | 2 | Phys. 4f |
| or Mechanics | 52w | Elementary Tech. Mech. | 3 | .. | Mech. 51f |

Third Quarter

| | | | | | |
|--------------------|-----|---------------------------------------|---------|----|----------------|
| Geology | 84s | Field Methods | .. | 4 | Geol. 2w, 105f |
| Mathematics | 8s | Calculus | 6 | .. | Math. 7w |
| Metallurgy | 5s | Wrought Iron and Steel | 3 | .. | Met. 4w. |
| Mining | 21s | Introductory Mining | 3 | .. | ..... |
| Mining Engineering | 3s | Mine Surveying | 3 | 4 | Min. Eng. 2w |
| Physics | 43s | Magnetism & Electricity | 3 | .. | Phys. 3f |
| Physics | 44s | Magnetism & Elec. Lab. | .. | 2 | Phys. 4f |
| or Mechanics | 53s | Elementary Tech. Mech. | 4 | .. | Mech. 52w |
| Mining Engineering | 4s | Field Work beginning about May 1 | 7 weeks | | Soph. year |
| Geology | 85s | Field Work beginning about June 20 | 2 weeks | | Soph. year |

DEPARTMENT OF MINING

The department is well supplied with samples of the smaller mine equipment, models, drawings, photographs, lantern slides, and mine maps. The lectures treat of prospecting, development, support of excavations, mining methods, mine administration, mining law, and the necessary allied subjects. The courses in mining extend through the sophomore, junior, and senior years.

COURSES LEADING TO THE DEGREE OF ENGINEER OF MINES

JUNIOR YEAR

First Quarter

| Dept. | No. | Title | Lect. | Lab. | Prereq. |
|-----------------|------|------------------|-------|------|-----------------|
| Exp. Eng., M.E. | 36f | Elementary Lab. | .. | 4 | With Mech. 112f |
| Geology | 110f | Economic Geology | 3 | .. | Geol. 24s |
| Mechanics | 109f | Mechanics | 5 | .. | Math. 8s |
| Mechanics | 112f | Mine Plant | 6 | .. | Math. 8s |
| Metallurgy | 106f | Base Metals | 4 | .. | Met. 3f |
| Metallurgy | 110f | Ore Dressing | 3 | .. | Geol. 24s |
| Mining | 131f | Exploration | 5 | .. | Mining 21s |

Second Quarter

| | | | | | |
|-----------------|------|------------------------|----|----|-----------------|
| Exp. Eng. M.&M. | 144w | Materials Testing Lab. | .. | 4 | With Mech. 110w |
| Mechanics | 110w | Mechanics of Materials | 5 | .. | Mech. 109f |
| Mechanics | 113w | Mine Plant | 6 | .. | Mech. 112f |
| Metallurgy | 107w | Base Metals | 4 | .. | Met. 106f |
| Metallurgy | 111w | Ore Dressing | 3 | .. | Met. 110f |
| Mining | 132w | Development | 5 | .. | Min. 131f |
| Mining Eng. | 105w | Mine Mapping | .. | 6 | Min. Eng. 4s |

Third Quarter

| | | | | | |
|-------------|------|---|---------|----|----------------|
| Mechanics | 111s | Mechanics | 5 | .. | Mech. 110w |
| Mechanics | 114s | Mine Plant | 6 | .. | Mech. 113w |
| Metallurgy | 108s | Precious Metals | 4 | .. | Met. 107w |
| Metallurgy | 115s | Ore Dressing Lab. | .. | 6 | Met. 111w |
| Mining | 130s | First Aid | 1 week |  | ..... |
| Mining | 140s | Mine Rescue | 1 week |  | ..... |
| Mining | 134s | Mining Methods | 5 | .. | Min. 132w |
| Mining Eng. | 107s | Mine Mapping | .. | 6 | Min. Eng. 105w |
| Metallurgy | 129s | Field Work in Metallurgy beginning about May 1 | 10 days | | Junior year |
| Mining | 135s | Field Work in Mine Plant and Mining beginning about May 1 | 2 weeks | | Junior year |

SENIOR YEAR

First Quarter

| Dept. | No. | Title | Lect. | Lab. | Prereq. |
|-----------------|------|---------------------------------|-------|------|------------------------|
| Electrical Eng. | 41f | Electric Power | 2 | 3 | Phys. 43, or Mech. 53s |
| Geology | 111f | Ore Deposits | 3 | .. | Geol. 110f |
| Mechanics | 120f | Water Power | 5 | 2 | Mech. 111s |
| Mechanics | 121f | Eng. Construction | .. | 8 | Mech. 111s |
| Metallurgy | 119f | Ore Testing | 2 | .. | Met. 108s |
| Metallurgy | 120f | Ore Testing Lab. | .. | 8 | Met. 108s |
| Mining | 141f | Mine Examinations and Contracts | 5 | .. | Min. 134s |
| Mining | 146f | Thesis | .. | 2 | Min. 134s |

Second Quarter

| Dept. | No. | Title | Lect. | Lab. | Prereq. |
|-----------------|------|-------------------------------|-------|------|---------------|
| Exp. Eng., M.E. | 138w | Advanced Lab. | . | 4 | Exp. Eng. 36f |
| Geology | 112w | Petroleum | 3 | .. | Geol. 111f |
| Geology | 115w | Applied Geology | 3 | .. | Geol. 111f |
| Mechanics | 122w | Mine Plant Design | .. | 9 | Mech. 121f |
| Metallurgy | 121w | Special Problems | . | 4 | Met. 119f |
| Mining | 143w | Coal Mining and Mining Law | 5 | .. | Min. 141f |
| Mining | 147w | Thesis | .. | 12 | Min. 146f |

Third Quarter

| | | | | | |
|-----------|------|-----------------------|----|----|------------|
| Geology | 113s | Problems in Ore Dep's | .. | 4 | Geol. 112w |
| Mechanics | 123s | Mine Plant Design | .. | 12 | Mech. 122w |
| Mechanics | 122s | Special Problems | .. | 8 | Met. 121w |
| Mining | 145s | Placers and Quarries | 5 | .. | Min. 143w |
| Mining | 148s | Thesis | .. | 12 | Min. 147w |

DEPARTMENT OF GEOLOGY

The department is well supplied with working collections of minerals, crystal models, rocks, thin sections, ores and economic minerals, fossils, and other illustrative material used in connection with the courses in paleontology, stratigraphy, and historical geology. The department has large, well-lighted laboratories and classrooms located on the first, second, and basement floors of Pillsbury Hall.

COURSES LEADING TO THE DEGREE OF ENGINEER OF MINES IN GEOLOGY

JUNIOR YEAR

First Quarter

| Dept. | No. | Title | Lect. | Lab. | Prereq. |
|-----------|---------|--------------------|-------|------|------------|
| Geology | 61f | Blowpipe Analysis | 2 | 4 | Geol. 24s |
| Geology | or 121f | or Crystallography | 2 | 4 | Geol. 24s |
| Geology | 110f | Economic | 3 | .. | Geol. 24s |
| Geology | 131f | Advanced Petrology | 3 | 3 | Geol. 106w |
| Geology | 151f | Advanced General | 3 | .. | Geol. 2w |
| Mechanics | 109f | Mechanics | 5 | .. | Math. 8s |
| Mining | 131f | Exploration | 5 | .. | Min. 21s |
| Elective | .... | ..... | 3 | .. | ..... |

Second Quarter

| | | | | | |
|-------------|------|------------------------|----|----|--------------|
| Geology | 124w | Struct. & Metamorphic | 3 | .. | Geol. 110f |
| Geology | 132w | Advanced Petrology | 3 | 3 | Geol. 131f |
| Geology | 144w | Geologic Maps | .. | 6 | Geol. 110f |
| Geology | 152w | Advanced General | 3 | .. | Geol. 151f |
| Mechanics | 110w | Mechanics of Materials | 5 | .. | Mech. 109f |
| Mining | 132w | Development | 5 | .. | Min. 131f |
| Mining Eng. | 105w | Mine Mapping | .. | 6 | Min. Eng. 4s |
| Elective | .... | ..... | 3 | .. | ..... |

Third Quarter

| Dept. | No. | Title | Lect. | Lab. | Prereq. |
|-----------|------|-------------------------------------|---------|------|------------|
| Geology | 125s | Struct. & Metamorphic | 6 | .. | Geol. 124w |
| Geology | 133s | Advanced Petrology | 3 | 3 | Geol. 132w |
| Geology | 145s | Geologic Maps | .. | 12 | Geol. 144w |
| Geology | 153s | Advanced General | 3 | .. | Geol. 152w |
| Mechanics | 111s | Mechanics | 5 | .. | Mech. 110w |
| Mining | 134s | Mining Methods | 5 | .. | Min. 132w |
| Geology | 150s | Field Work beginning about May 1 | 6 weeks | | Geol. 125s |

SENIOR YEAR

First Quarter

| Dept. | No. | Title | Lect. | Lab. | Prereq. |
|------------|------|------------------------------------|-------|------|----------------------|
| Geology | 91f | Paleontology | 3 | .. | Geol. 2w |
| Geology | 111f | Ore Deposits | 3 | .. | Geol. 110f |
| Geology | 137f | Testing Econ. Materials | 1 | 4 | Geol. 110f |
| Metallurgy | 110f | Ore Dressing | 3 | .. | Phys. 43s, Geol. 24s |
| Mining | 141f | Mine Examinations and Contracts | 5 | .. | Min. 134s |
| Thesis | .... | ..... | .. | 8 | ..... |
| Electives | .... | ..... | 6 | .. | ..... |

Second Quarter

| | | | | | |
|------------|------|-----------------------------------|------|----|------------------|
| Geology | 92w | Paleontology | 3 | .. | Geol. 91f |
| Geology | 112w | Petroleum | 3 | .. | Geol. 111f |
| Geology | 140w | Applied Petrography | 1 | 4 | Geol. 111f, 133s |
| Geology | 166w | Mineralography | .. | 6 | Geol. 111f |
| Metallurgy | 111w | Ore Dressing | 3 | .. | Met. 110f |
| Mining | 143w | Coal Mining and and Mining Law | 5 | .. | Min. 141f |
| Thesis | .... | ..... | .... | 8 | ..... |

Third Quarter

| | | | | | |
|------------|------|-----------------------|----|----|------------|
| Geology | 93s | Paleontology | 3 | .. | Geol. 92w |
| Geology | 113s | Prob. in Ore Deposits | .. | 4 | Geol. 112w |
| Geology | 141s | Applied Petrography | 1 | 4 | Geol. 140w |
| Geology | 167s | Mineralography | .. | 6 | Geol. 166w |
| Metallurgy | 115s | Ore Dressing Lab. | .. | 6 | Met. 111w |
| Thesis | .... | ..... | .. | 8 | ..... |

DEPARTMENT OF PETROLEUM ENGINEERING

The department is well supplied with samples of the smaller oil field equipment, well logs, drill cores, models, maps, photographs, lantern slides, and samples of petroleum products. The lectures treat of location, prospecting, development, production, distribution, administration, leasing, mineral law, and allied subjects affecting oil and gas production. The courses in petroleum production extend through the junior and senior years.

COURSES OF STUDY

COURSES LEADING TO THE DEGREE OF ENGINEER OF MINES IN PETROLEUM

JUNIOR YEAR

First Quarter

| Dept. | No. | Title | Lect. | Lab. | Prereq. |
|-----------|------|------------------------|-------|------|-----------------|
| Exp. Eng. | 36f | Elementary Laboratory | .. | 4 | With Mech. 112f |
| Geology | 110f | Economic Geology | 3 | .. | Geol. 24s |
| Geology | 131f | Petrology of Sediments | 3 | 3 | Geol. 106w |
| Geology | 151f | Advanced General | 3 | .. | Geol. 2w |
| Mechanics | 109f | Mechanics | 5 | .. | Math. 8s |
| Mechanics | 112f | Mine Plant | 6 | .. | Math. 8s |
| Pet. Eng. | 131f | Exploration | 5 | .. | Min. 21s |

Second Quarter

| | | | | | |
|-----------|------|------------------------|----|----|----------------|
| Geology | 124w | Struct. & Metamorphic | 3 | .. | Geol. 110f |
| Geology | 144w | Geologic Maps | .. | 6 | Geol. 110f |
| Geology | 152w | Advanced General | 3 | .. | Geol. 151f |
| Mechanics | 110w | Mechanics of Materials | 5 | .. | Mech. 109f |
| Mechanics | 113w | Mine Plant | 6 | .. | Mech. 112f |
| Min. Eng. | 106w | Mine Mapping | .. | 3 | M.E. 4s |
| Pet. Eng. | 132w | Oil Field Development | 5 | .. | Pet. Eng. 131f |
| Pet. Eng. | 134w | Oil Field Equip. | 2 | .. | Pet. Eng. 131f |

Third Quarter

| | | | | | |
|-----------|------|-----------------------|----|---------|-------------|
| Geology | 125s | Struct. & Metamorphic | 6 | .. | Geol. 124w |
| Geology | 153s | Advanced General | 3 | .. | Geol. 152w |
| Mechanics | 111s | Mechanics | 5 | .. | Mech. 110w |
| Mechanics | 117s | Petroleum Plant | 3 | .. | Mech. 113w |
| Pet. Eng. | 138s | Oil Field Mapping | .. | 12 | Geol. 144w |
| Pet. Eng. | 151s | Petroleum Refining | 5 | .. | ..... |
| Mining | 130s | First Aid | | 1 week | ..... |
| Mining | 140s | Mine Rescue | | 1 week | ..... |
| Pet. Eng. | 135s | Field Work | | 3 weeks | Junior year |

SENIOR YEAR

First Quarter

| Dept. | No. | Title | Lect. | Lab. | Prereq. |
|---------------|------|--------------------|-------|------|----------------|
| Geology | 91f | Paleontology | 3 | .. | Geol. 2w |
| Geology | 111f | Ore Deposits | 3 | .. | Geol. 110f |
| Mechanics | 120f | Hydraulics | 5 | 2 | Mech. 111s |
| Mechanics | 121f | Engineering Const. | .. | 8 | Mech. 111s |
| Metallography | 156f | Metallography | 2 | 3 | Met. 5 |
| Pet. Eng. | 141f | Administration | 5 | .. | Pet. Eng. 132w |
| Pet. Eng. | 144f | Thesis | .. | 6 | Pet. Eng. 132w |

Second Quarter

| | | | | | |
|------------|------|------------------------|----|----|----------------|
| Chemistry | 168w | Petroleum & Pet. Prod. | 2 | 4 | ..... |
| Geology | 92w | Paleontology | 3 | .. | Geol. 91f |
| or Geology | 102w | Micro-paleontology | .. | 6 | Geol. 91f |
| Geology | 112w | Petroleum | 3 | .. | Geol. 111f |
| Mechanics | 122w | Engineering Const. | .. | 9 | Mech. 121f |
| Pet. Eng. | 142w | Administration | 5 | .. | Pet. Eng. 141f |
| Pet. Eng. | 145w | Thesis | .. | 6 | Pet. Eng. 144f |
| Elective | .... | ..... | 2 | .. | ..... |

Third Quarter

| | | | | | |
|------------|------|-----------------------|----|----|----------------|
| Geology | 93s | Paleontology | 3 | .. | Geol. 92w |
| or Geology | 103s | Micropaleontology | .. | 6 | Geol. 102w |
| Mechanics | 124s | Plant Design | .. | 12 | Mech. 122f |
| Pet. Eng. | 137s | Pipe Lines | 3 | .. | Mech. 117f |
| Pet. Eng. | 143s | Production Technology | 5 | .. | Pet. Eng. 142w |
| Pet. Eng. | 146s | Thesis | .. | 12 | Pet. Eng. 145w |

DEPARTMENT OF METALLURGY

This department is well supplied with representative ores of all the most important metals, models and drawings of furnaces, and samples of all the different furnace products. The lectures treat of all the principal methods now in use. The practical work consists in visits to smelting and refining works which are accessible. The work in metallurgy extends through four years.

COURSES LEADING TO THE DEGREE OF METALLURGICAL ENGINEER

JUNIOR YEAR

First Quarter

| Dept. | No. | Title | Lect. | Lab. | Prereq. |
|---------------|------|-------------------------|-------|------|-----------|
| Mech. Eng. | 76f | Survey of Shop Practice | 3 | .. | ..... |
| Mechanics | 109f | Mechanics | 5 | .. | Math. 8s |
| Mechanics | 112f | Mine Plant | 6 | .. | Math. 8s |
| Metallurgy | 106f | Base Metals | 4 | .. | Met. 3f |
| Metallurgy | 110f | Ore Dressing | 3 | .. | Geol. 24s |
| Metallurgy | 112f | Ore Dressing Lab. | .. | 4 | Geol. 24s |
| Metallography | 153f | Metallography | 3 | 4 | ..... |

Second Quarter

| | | | | | |
|---------------|------|------------------------|----|----|-----------------|
| Mechanics | 110w | Mechanics of Materials | 5 | .. | Mech. 109f |
| Mechanics | 115w | Metallurgical Plant | 3 | .. | Mech. 112f |
| Metallurgy | 107w | Base Metals | 4 | .. | Met. 106f |
| Metallurgy | 111w | Ore Dressing | 3 | .. | Met. 110f, 112f |
| Metallurgy | 113w | Ore Dressing Lab | .. | 4 | Met. 110f, 112f |
| Metallurgy | 123w | Electrometallurgy | 5 | .. | Met. 5s |
| Metallography | 154w | Metallography | 3 | 4 | Met. 153f |
| Mining Eng. | 106w | Mine Mapping | .. | 3 | Min. Eng. 4s |

Third Quarter

| | | | | | |
|---------------|------|---|----|-------|-----------------|
| Mechanics | 111s | Mechanics | 5 | .. | Mech. 110w |
| Mechanics | 116s | Metallurgical Plant | 3 | .. | Mech. 115w |
| Metallurgy | 108s | Precious Metals | 4 | .. | Met. 107w |
| Metallurgy | 114s | Ore Dressing Lab. | .. | 6 | Met. 111w, 113w |
| Metallography | 155s | Metallography | 3 | 4 | Met. 154w |
| Mining | 133s | Elementary Mining | 5 | .. | Min. 21s |
| Mining Eng. | 107s | Mine Mapping | .. | 3 | Min. Eng. 4s |
| Mining | 130s | First Aid | 1 | week | ..... |
| Mining | 140s | Mine Rescue | 1 | week | ..... |
| Metallurgy | 116s | Field Work in Metallurgy beginning about May 1 | 2 | weeks | Junior year |
| Mining | 139s | Field Work in Mine Plant and Mining beginning about May 1 | 10 | days | Junior year |

COURSES OF STUDY

19

SENIOR YEAR

First Quarter

| Dept. | No. | Title | Lect. | Lab. | Prereq. |
|-----------------|------|------------------|-------|------|------------------------|
| Electrical Eng. | 41f | Electric Power | 2 | 3 | Phys. 43s or Mech. 53s |
| Mechanics | 120f | Water Power | 5 | 2 | Mech. 111s |
| Metallurgy | 119f | Ore Testing | 2 | .. | Met. 108s |
| Metallurgy | 120f | Ore Testing Lab. | .. | 8 | Met. 108s |
| Metallurgy | 124f | Thesis | .. | 8 | ..... |
| *Electives | .... | ..... | 9 | .. | ..... |

Second Quarter

| | | | | | |
|------------|------|---------------------|----|----|-----------|
| Metallurgy | 117w | Advanced Metallurgy | 4 | 6 | Met. 108s |
| Metallurgy | 121w | Special Problems | .. | 4 | Met. 119f |
| Metallurgy | 125w | Thesis | .. | 18 | Met. 124f |
| *Electives | .... | ..... | 9 | .. | ..... |

Third Quarter

| | | | | | |
|------------|------|---------------------|----|----|-----------|
| Metallurgy | 118s | Advanced Metallurgy | 4 | 6 | Met. 117w |
| Metallurgy | 122s | Special Problems | .. | 8 | Met. 121w |
| Metallurgy | 126s | Thesis | .. | 18 | Met. 125w |
| *Electives | .... | ..... | 6 | .. | ..... |

ASSAYING

The lectures treat of, and describe, apparatus, reagents, assay furnaces, fuels, etc., in connection with this subject. The principles of assaying and sampling are fully explained. A collection of representative ores of various metals with a collection of corresponding slags is shown, and instruction is given as to nature and quality of fluxes. Special and rapid methods of testing slags and metallurgical products as employed in western smelting works are emphasized.

The laboratory course includes preparing and testing reagents, making cupels, etc., and assaying samples of ores, furnace and mill products, and bullion; different charges are tried and practical conclusions drawn.

Great importance is attached to the work of the laboratory. A large, well-ventilated furnace room in which are located muffle and crucible furnaces, and another room of similar dimensions equipped with desks, pulp and bead balances, afford accommodations to a large number of students. Ores of various metals of known value are given the students who are required to make up the necessary charges and submit their report in detail. This work is offered to students completing the necessary course in mineralogy and chemistry.

ORE DRESSING

The lectures and recitations in ore dressing extend through the junior year, and comprise a detail study of ore dressing and concentrating machinery, together with a study of typical combinations of dressing machines as found in the various mining districts of the United States. In connection

* It is recommended that electives be taken from the following courses: Chem. 101f, 102w, 103s, Physical Chemistry; Met. 130f, 131w, 132s, Special Problems; Met. 163f, 164w, 165s, Advanced Metallography; Mech. 121f, 122w, 124s, Engineering Construction.

with the theoretical work, the ore dressing laboratory and testing plant of the school are utilized for illustration, and practical use of ore dressing machinery.

ORE TESTING

The lectures treat of the problems in ore testing such as extraction and losses in roasting, concentration, and other milling operations. Both the ore dressing laboratory and the Mines and Metallurgy Experiment Station laboratory are available for working out practical problems. The Mines and Metallurgy Experiment Station laboratory is maintained to aid the mining interests of the state of Minnesota in solving problems connected with concentration and conservation of the iron and manganese ores in the state.

The School of Mines and Metallurgy laboratories therefore serve both educational and commercial needs.

Educational.—The student becomes familiar with the use of the various types of machines such as crushers, rolls, classifiers, concentration and flotation machinery.

Commercial.—The laboratories are used by the Mines and Metallurgy Experiment Station to determine the best methods of treatment to produce a commercial product at the lowest cost. Recently additional commercial machinery has been obtained and new appliances are constantly being developed. Commercial samples varying from 500 pounds to carload lots can be treated by various methods.

METALLOGRAPHY

Courses in metallography are offered to candidates for the degree of metallurgical engineer in the School of Mines and Metallurgy, to students in the School of Dentistry, the College of Engineering and Architecture, the College of Science, Literature, and the Arts, the School of Chemistry, and the Graduate School.

These courses deal with the study of metals and alloys. The lectures treat of, and describe, the apparatus used in connection with this subject, the method of preparing specimens, physical and metallographic principles involved, and the interpretation of the results of microscopic examination and thermal analysis. There is an elaborate file of references and abstracts relating to the whole field of metallography, furnishing up-to-date information on the various phases of the work. A collection of specimens, photomicrographs, and lantern slides covering wrought iron, low carbon, structural, rail, and tool steels, brasses, bronzes, and other industrial alloys is available for study and comparison. The laboratory course includes the microscopic and pyrometric study of metals and alloys as related to their mechanical and physical properties. The laboratories are equipped with grinding and polishing apparatus, microscopes, photomicrographic apparatus, vacuum electric furnace, carbon resistance furnaces, nichrome and platinum resistance furnaces of various designs, gas furnaces, heat treating furnaces, pyrometers, and testing apparatus of the latest improved type. This department has a special dark room for the preparation of photomicrographs.

DESCRIPTION OF COURSES

EXPLANATION OF COURSE NUMBERS

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

CHEMISTRY

6. General Inorganic Chemistry. A study of the general laws of chemistry and of the nonmetals, the metals, and their compounds. \$2 laboratory fee.
7. General Inorganic Chemistry. A continuation of Course 6. \$2 laboratory fee.
8. Qualitative Analysis. Laboratory work in systematic qualitative analysis with lectures on solutions, ionization, chemical and physical equilibrium, oxidation and reduction, etc. \$2 laboratory fee.
9. Quantitative Analysis. A short 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. \$2 laboratory fee.
- 51-52†-153. Elementary Organic Chemistry. Discussion of the important classes of organic compounds, both aliphatic and aromatic, together with some heterocyclic compounds. Laboratory work includes the preparation of typical substances.
- 101-102-103. Physical Chemistry. A general survey of the subject. \$2 laboratory fee per quarter.
168. Petroleum and Petroleum Products. Examination and testing of petroleum products. \$2 laboratory fee.

DRAWING

11. Engineering Drawing. Sketching, lettering, representation, elements of drafting, details of machines and structures, interpretation of working drawings.
12. Engineering Drawing. Continuation of Course 11. The elements of general drafting, mechanical drawing as a language. Lines, views, dimensions, standards, signs, abbreviations, and explanatory notes.
13. Engineering Drawing. Continuation of Course 12. The elements of general drafting. Maps and sketches. Brush and pen conventions.
14. Descriptive Geometry. Projection; central and special cases, principles and application, representation of lines, planes, and solids, and of their relations; tangencies, intersections, and developments. Recitations, lectures, and solution of problems.

† To receive credit for any part of this course a student must complete the parts preceding the dagger.

15. Drafting. Graphics, machine drafting, and structural drafting. Instruction in drafting room methods.

ELECTRICAL ENGINEERING

41. Electric Power. Elementary principles of continuous currents. Continuous current generators and motors. Elementary principles of alternating currents. Alternating current generators, transformers, and motors. Measurement of power. Elementary principles of transmission and distribution. Lectures, recitation, laboratory work.

EXPERIMENTAL ENGINEERING

MATHEMATICS AND MECHANICS

144. Materials Testing Laboratory. Investigation of physical properties of metals and engineering materials; wood, cement, ropes, etc., supplemented by lectures and materials of construction and methods of testing.

MECHANICAL ENGINEERING

36. Elementary General Laboratory. Calibration of gages, anemometers, and gas meters. Physical tests of lubricating oils. Calibration of transmission dynamometer. Properties of steam; separating and throttling calorimeters; indicator and planimeter practice; valve setting. Tests of simple steam engine and steam pump.
138. Advanced General Laboratory. Tests of steam engines, steam turbines, gas engines, air compressors, fans, and blowers. Steam boiler trial, Calibration of V-notch weir. Tests of centrifugal pump, Pelton wheel, and hydraulic reaction turbine.

GEOLOGY AND MINERALOGY

1. General Geology. A synoptical treatment of materials of the earth and of geological processes. Physiographic, dynamic, and structural geology.
2. Historical Geology. The sequence of events in geologic history, with special reference to North America.
- 23-24. Elements of Mineralogy. Morphological, physical, chemical characters of minerals; occurrence, genesis, and uses of minerals; classification and description of common minerals, rock minerals, and common rocks. Determinative work in the laboratory, blowpipe analysis, sight identification.
61. Blowpipe Analysis. The determination of minerals by systematic blowpipe analysis.
84. Field Methods. General methods of field work necessary for Course 85.
85. Field Work. About two weeks in June are spent in geologic mapping of selected areas in the iron district of Minnesota. Involves preparation of geologic maps and written reports.

- 91-92-93. Index Fossils of North America. A study of fossil forms with special reference to those of geologic importance; faunas and their correlation.
101. Sedimentation. Origin and structure of sedimentary deposits; the interpretation of these in relation to paleogeography. Lectures and assigned readings.
- 102-103. Micropaleontology. A study and classification of Foraminifera, diatoms, and other small fossil organisms, and their use for purposes of correlation.
105. Rock Study. The occurrence and genesis of igneous, sedimentary, and metamorphic rocks; their mineral and chemical composition; their structure, texture, and alteration. The classification and methods of identification and description of rocks.
106. Petrography. The identification and study of minerals and rocks by optical methods; the study of igneous rocks, crystalline schists, and metamorphic rocks. The origin and classification of rocks.
110. Economic Geology. Study of nonmetallic minerals of economic value, and discussions of geologic guides to prospecting for these deposits.
111. Ore Deposits. The nature, distribution, and genesis of ore deposits of the United States; relations of ore deposits to geologic structure; the deformation and superficial alteration of ore deposits.
112. Geology of Petroleum. The nature, origin, and accumulation of petroleum, discussion of the various oil fields of the world.
113. Problems in Ore Deposits. Field excursions, map work, lectures on field and laboratory methods.
115. Applied Geology. The application of methods to laboratory, library, and field problems in geology.
121. Crystallography. Study of crystal models and space groups. Crystal drawing and measurements. Projections and mathematical calculations.
- 124-125. Structural and Metamorphic Geology. A study of the principles and applications of structural geology. The conditions, processes, and results of metamorphism.
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.
- 131-132-133. Advanced Petrology. Advanced optical methods. Criteria for rapid identification of minerals and rocks. The uses of schedules and tables. Standard rock types. Regional and genetic studies. Petrographic reports.
137. Testing Economic Minerals. Methods of determining quality of mineral deposits, described and illustrated by laboratory tests of coal, clay, oil, building stone, and metallic ores.
- 140-141. Applied Petrography. Determination of ores and gangue minerals. Microscopic studies of paragenesis of ores and other mineral associations. Practical problems in mining and geology settled by microscopic and optical examinations.

- 144-145. Interpretation of Geologic Maps. Study and problems in construction and interpretation of geologic maps; recognition of structural and stratigraphic relations. Geology 124 should precede or accompany this course.
150. Field Geology. Detailed, systematic work conforming with standards of official surveys. Preparation of geologic maps, structure sections, reports; paragenesis of ores and their relations to geologic structures. Field, Black Hills, South Dakota. Reports to be written week before college opens in fall.
- 151-152-153. Advanced General Geology. Geologic processes and their results; development of the North American continent.
- 166-167. Mineralography. Methods of studying opaque minerals and the application of the methods of problems in ore genesis and history.
246. Pre-Cambrian Geology. The problems of pre-Cambrian correlation and structure; the pre-Cambrian stratigraphy of North America. (Given in alternate years.)

GERMAN

- 24-25-26. Beginning German for Miners. Pronunciation, grammar, conversation, selected reading in easy prose.
27. Narrative Prose for Chemists. Reading, grammar review.
- 28-29. Chemical German. Selections from more difficult works on chemistry.

MECHANICAL ENGINEERING

76. Survey of Shop Practice. Technique of pattern making, molding, forging, and machining.

METALLOGRAPHY

150. 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.
151. Advanced Metallography for Electrical Engineers. Continuation of 150. Study of iron and steel, alloy steels, metals and alloys used in electrical engineering practice. Special problems for outside reading and for research. Laboratory work.
152. Metallography for Senior Aeronautical Engineers. Principles of metallography; metallography of iron and steel with special reference to alloy steels, and light alloys used in airplane construction. Laboratory work and demonstrations.
- 153-154-155. 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. Laboratory work.
156. Metallography for Mechanical Engineers. Principles of metallography, including pyrometry, thermal analysis, constitution diagrams, microscopic and photomicrographic technique; metallography and heat treatment of iron and steel. Laboratory work.

157. Advanced Metallography for Mechanical Engineers. Continuation of 156. Metallography of alloy steels, tool steels, high speed tool steels, and important nonferrous alloys; metallography applied to engineering practice and specifications. Outside reading and special reports. Laboratory work.
159. Dental Metallography. Study of the dental alloys from the standpoint of metallography. Lectures, recitations, and demonstrations, taking up the most important metals and alloys, with special reference to those used in dentistry.
160. Metallography for Chemical Students. Metallography, including constitution diagrams, preparation and standardization of thermocouples, preparation and thermal analysis of alloys, their microscopic examination and photomicroscopy; typical alloy systems such as iron-carbon (steel and cast iron); some nonferrous alloys. Laboratory work.
161. Advanced Metallography for Chemical Students. Metallography and heat treatment of iron and steel, including alloy steels, commercial uses of various steels, and engineering specifications. Laboratory work.
162. Advanced Metallography for Chemical Students. Metallography of the nonferrous metals with a study of the constitution diagrams, properties, and uses of important commercial alloys. Laboratory work.
163. Advanced Metallography. Seminar work on recent advances in metallography. Lectures and recitations, with outside reading and special reports. May be accompanied by laboratory work.
164. Advanced Metallography. Advanced consideration of the structures, properties, and uses of metals and alloys. May be accompanied by laboratory work.
165. Advanced Metallography. Technical metallography as applied to the automotive industry. Lectures and special reports. May be accompanied by laboratory work.
- 166-167-168. Laboratory. Laboratory work on special problems in ferrous, nonferrous, and X-ray metallography.
- 201-202-203. Advanced Metallography for Graduate Students. Intended primarily for research work.
- 210-211-212. Thesis courses for graduate students. Intended primarily for research work. Credits and hours to be arranged.

METALLURGY

1. Assaying. The determination of values of ores, metallurgical products by the fire method. Lectures and recitations.
2. Assay Laboratory. Practical determination of gold, silver, lead, and tin by the fire method.
3. General Metallurgy. Combustion, fuels, refractory materials, furnaces and fluxes. Lectures and recitations.
4. Metallurgy of Pig Iron. General principles of iron blast furnace practice. Construction of furnace, handling of stock, and products; principles of regulation. Lectures and recitations.
5. Metallurgy of Wrought Iron and Steel. General principles involved in the production of wrought iron and steel. Lectures and recitations.

9. Introductory Metallurgy. General principles of furnace practice.
106. Metallurgy of Base Metals. Lead, copper, zinc, and mercury. Consideration of smelting methods and principles involved in refining. Lectures and recitations.
107. Metallurgy of Base Metals. Continuation of Course 106.
108. Metallurgy of the Precious Metals. Principles involved in methods used in the extraction of gold, silver, and other precious metals. Lectures and recitations.
109. Metallurgy of Base Metals. Short course for mechanical and electrical engineers. Special consideration is given to the mechanical and electrical appliances. Lectures and recitations.
110. Ore Dressing. Crushing, sizing, classification, and concentration of ores. Lectures and recitations.
111. Ore Dressing. Continuation of Course 110.
112. Ore Dressing Laboratory. Practical examination of ores and the use of ore dressing machinery.
113. Ore Dressing Laboratory. Practical problems in ore dressing.
114. Ore Dressing Laboratory. Continuation of Course 113.
115. Ore Dressing Laboratory. Short course in the laboratory use of ore dressing machinery.
116. Field Work in Metallurgy. Study of metallurgical operations at smelters and mills. Detail reports are required covering plants visited.
117. Advanced Metallurgy. Metallurgical calculations to determine heat balance and heat distribution. Lectures and laboratory work.
118. Advanced Metallurgy. Design of furnaces. Conferences and laboratory work.
119. Ore Testing. General principles involved in determining the best method of extraction, including amalgamation, concentration, cyanidation, roasting, etc. Lectures and recitations.
120. Ore Testing Laboratory. Practical determination of extraction and distribution of values in mill and metallurgical products. Methods of calculation.
121. Special Problems in Ore Testing. Continuation of Course 120. Practical determinations for regulating metallurgical operations.
122. Special Problems in Ore Testing. Continuation of Course 121.
123. Electrometallurgy. Application of electricity to production of heat for smelting ores and refining metals. Costs of fuel and electricity for heating, relative efficiencies of electric and fuel furnaces. Construction of high temperature furnaces and commercial plants.
124. Thesis in Metallurgy. Conferences to select suitable problem together with preliminary laboratory work on problem selected.
125. Thesis in Metallurgy. Continuation of Course 124.
126. Thesis in Metallurgy. Continuation of Course 125.
129. Field Work in Metallurgy for Miners.
- 130-131-132. Special Problems in Metallurgy. Seminar work on metallurgical problems. Credits and hours to be arranged.
- 204-205-206. Special Problems in Advanced Metallurgy. Intended primarily for research work. Credits and hours to be arranged.

MILITARY SCIENCE AND TACTICS

1. First Year Basic Course, R.O.T.C.
- 2a,2b. Second Year Basic Course, R.O.T.C., Coast Artillery and Signal Corps.*
- 3a,3b. First Year Advanced Course, R.O.T.C., Coast Artillery and Signal Corps.
- 4a,4b. Second Year Advanced Course, R.O.T.C., Coast Artillery and Signal Corps.

All courses are elective and may be taken in addition to the prescribed curriculum in which no electives are provided.

Credits.—Basic Course: 1 credit per quarter; total 6 credits.

Advanced Course: 3 credits per quarter; total 18 credits.

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.

MINE PLANT AND MECHANICS

1. Introduction to Engineering Mathematics. Review of fundamentals from the engineering viewpoint.
2. Algebra. Functions, functional notation, factor and remainder theorems, factors and values of functions, development of functions, progressions, series, theory of equations, permutations and combinations, theory of logarithms, determinants.
3. Algebra. Continuation of Course 1. Functions, functional notation, factor and remainder theorems, factors and values of functions, development of functions, progressions, series, theory of equations, permutations and combinations.
4. Trigonometry. Trigonometric functions, right triangles, computation by logarithms and slide rule, analytic relations, oblique triangles, trigonometric equations, etc., solution of spherical triangles.
5. Analytical Geometry. Systems of co-ordinates, loci, equations, properties of straight lines, transformation of co-ordinates, equations and properties of conics, equations of second degree, higher plane curves, space co-ordinates, point, plane, quadric, surfaces, etc., empirical equations, graphic algebra.

* Signal Corps restricted to students enrolled in Electrical Engineering only.

- 6-7-8. Calculus. Differentiation, elementary forms, geometric applications, rates, successive differentiation, maxima and minima, expansion of functions, intermediate forms, partial derivatives, change of variable, elementary integration, undetermined coefficients, rationalization, formulas of reduction, some differential equation of mechanics.
- 51,52,53. Elementary Technical Mechanics. Elementary principles of mechanics and their application to technical problems of mining.
- 109,111. Mechanics. Composition and resolution of forces, laws of equilibrium, practical applications, rectilinear motion, circular motion, curvilinear motion in general, dynamics of rigid bodies, impact, work, and energy.
110. Mechanics of Materials. Mechanical and elastic properties of materials of construction; beams, columns, shafts, hollow cylinders and spheres, rollers, plates; theory of internal stress; reinforced concrete.
- 112-113-114. Mine Plant. Discussion of the machinery and appurtenances employed in the equipment of mines. Air compression, rock drills, mechanical features of hoisting, pumping, ventilation, underground transportation. Electricity applied to mining.
- 115-116. Metallurgical Plant. Power, air, and water supply for metallurgical plants.
117. Petroleum Plant. Plants for oil fields.
120. Hydraulics and Water Power. Laws of the equilibrium, pressure, and flow of liquids, hydrographs and mass diagrams, estimate of power to be developed at a power site, design of dams and hydroelectric plants, theory of water wheels and turbines, speed control, power house equipment, transmission.
121. Engineering Construction. Theory of structures, loading, analytic and graphic resolution of stresses in framed structures, stresses in ore bins, headframes, etc.
122. Engineering Construction. Design of structures for mining and metallurgical plant.
123. Mine Plant Design. A study of power possibilities, costs, etc., and design of a power plant, surface equipment, and structures for a mine.
124. Plant Design. A study of power possibilities, costs, etc., and design of a power plant, and structures for a metallurgical or oil field plant.

MINING

21. Introductory Mining. Introductory mining course, preparatory to sophomore field trip.
130. First Aid. Course in first aid to the injured given by the staff of the United States Bureau of Mines.
140. Mine Rescue. Course in mine rescue given by the staff of the United States Bureau of Mines.
131. Exploration. Location of mineral lands, prospecting, exploration, boring, explosives, drilling, blasting, and timber treating.
132. Tunneling. Tunneling, drifting, shaft sinking, raising, and mining methods.

133. Elementary Mining. Short course in mining for metallurgists.
134. Mining Methods. Underground mining methods and support of underground excavations.
135. Practical Mining. Study of mining operations. Mine plant and mining work in one or more mining camps.
139. Practical Mining. Study of mining operations, mine plant and mining work in one or more mining camps for metallurgists.
141. Mine Examinations and Contracts. Mine examinations, sampling, and mining reports. Amortization. Contracts and specifications. Corporations, capitalization, stocks, and bonds.
143. Coal Mining and Mining Law. Coal mining methods. Mechanization and coal preparation. Mine gases. Accident prevention. State mining codes. Compensation laws. Mining law and court interpretations. Taxation.
145. Placer and Quarries. Placer, hydraulic mining and dredging. Quarries.
146. Thesis. Preparatory work on the mining thesis.
147. Thesis. Preparation of an original thesis on some mining project, covering the exploration and development of a mining property.
148. Thesis. Completion of thesis project.
- 151-152-153. Special Problems in Mining. Seminar work on mining problems. Credits and hours to be arranged.

MINING ENGINEERING

- 1-2-3. Mine Surveying. Theory and problems in mine surveying, including land subdivision, stadia measurements, triangulation, railroad curves and cross sections, computation of areas by co-ordinates; differential leveling, plane table surveying, topographic map reading, solar observations, shaft plumbing, underground traversing and leveling.
4. Field Work. Practice in general plane surveying during the month of May. Practice in underground surveying during the first three weeks of June. This work is given on the iron ranges of Minnesota.
- 105-106-107. Mine Mapping. Mine mapping in accordance with prevalent practice in mining districts. Ore and stripping estimates and mine maps based on Mesabi Range practice.

PETROLEUM ENGINEERING

131. Exploration. Location of oil lands, methods of drilling, explosives, blasting, timber treating.
132. Oil Field Development. Aerial surveys, geophysical prospecting, oil and gas production.
134. Oil Field Equipment. Mechanical features of drilling equipment, gas lift, pumping, natural gasoline extraction. Special devices for abnormal conditions.
135. Field Work. Study of equipment and operations in one or more oil fields.
137. Pipe Lines. Mechanical features of transmission lines for oil and gas. Flow formulas, soil corrosion and prevention.

138. Oil Field Mapping. Oil and gas well logs, peg models, records, contour and subsurface maps.
141. Administration. Reports, amortization, corporations, capitalization, stocks and bonds, leases, contracts and specifications.
142. Administration. Accident prevention, state codes, compensation laws, taxation, proration and unitization, production decline.
143. Production Technology. Special problems in oil and gas production.
144. Thesis. Preparation of an original thesis on the exploration and development of an oil property.
145. Thesis. Continuation of thesis project.
146. Thesis. Completion of thesis project.
151. Petroleum Refining. Distillation and purification processes used in the production of commercial products from crude petroleum.
- 155-156-157. Special Problems in Petroleum Engineering. Seminar work on petroleum problems. Credits and hours to be arranged.

PHYSICS

3. Elements of Mechanics and Sound. Mechanics of solids, fluids, wave motion, and sound. A study of the simpler fundamental principles. First part of the general course, 3, 23, 33, 43. Course 4 should be taken in conjunction with this course.
4. Elements of Mechanics and Sound Laboratory. Measurements in the mechanics of solids, fluids, wave motion, and sound; the laboratory part supplementing Course 3. One two-hour session in the laboratory a week. \$2 laboratory fee.
23. Heat. A study of the principles underlying heat phenomena. Course 24 should be taken in conjunction with this course.
24. Heat Laboratory. The laboratory part supplementing Course 23. One two-hour session in the laboratory a week. \$2 laboratory fee.
43. Magnetism and Electricity. A study of the principles underlying magnetic and electric phenomena. Course 44 should be taken in conjunction with this course.
44. Electrical Laboratory. The laboratory part supplementing Course 43. One two-hour session in the laboratory a week. \$2 laboratory fee.

ROMANCE LANGUAGES

FRENCH

- 1-2. Beginning French.
- 3-4. Intermediate French.
- 21-22-23. General Survey of French Literature. Outline of French literature from 1600 to the present. Reading of representative texts.

SPANISH

- 1-2. Beginning Spanish.
- 3-4. Intermediate Spanish.
- 65-66-67. Spanish Literature. Outline of Spanish literature from 1500 to the present. Reading of representative texts.

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Minnesota

North Central School and Station
Grand Rapids, Minnesota

Announcement for the Years
1935-1938



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FACULTY

Lotus D. Coffman, Ph.D., LL.D., President of the University
Walter C. Coffey, M.S., LL.D., Dean of the Department of Agriculture

AT GRAND RAPIDS

ADMINISTRATION

Raymond L. Donovan, B.S., Superintendent
Mary Kulstad, Registrar, Librarian, and Preceptress
Diedrich T. Grussendorf, B.S., Preceptor
Marie Mollins, Director of Dining Hall
August Van Loo, Accountant
Harold Stunck, Secretary

AGRICULTURAL ENGINEERING

Diedrich T. Grussendorf, B.S., Farm Mechanics
Otto W. Swenson, Assistant in Farm Machinery and Motors

AGRONOMY

Raymond L. Donovan, B.S., Soils and Farm Management
Theodore S. Weir, B.S., Soils and Farm Management
Otto W. Swenson, Assistant in Agronomy

ANIMAL HUSBANDRY

Clarence L. Cole, B.S., Animal and Dairy Husbandry
Raymond L. Donovan, B.S., Animal and Dairy Husbandry
Diedrich T. Grussendorf, B.S., Poultry

HORTICULTURE AND ENTOMOLOGY

Theodore S. Weir, B.S.

ASSOCIATED SUBJECTS

Diedrich T. Grussendorf, B.S., Sciences
Mary Kulstad, Mathematics
Marie Mollins, English and Music
Leona Vieths, History and Commercial Subjects
Clarence L. Cole, B.S., Athletics

GENERAL INFORMATION

LOCATION

The North Central School of Agriculture is located at the Experiment Station, one and one-half miles east of Grand Rapids, Minnesota, on the paved State Highway No. 169. Busses from the Twin Cities and from the Mesaba Range stop at the station when requested.

PURPOSE

The North Central School of Agriculture was established in 1926 for the purpose of giving the farm boys of northeast Minnesota an opportunity better to fit themselves for the profession of farming and the necessary training for more useful citizenship. The time of opening the fall term is set late enough so students may help with the fall work on the farm and the spring term closes early enough to permit them to return to the farm for the rush of spring work.

TIME OF OPENING

The fall term opens about the first of October and closes the Friday before Christmas. The winter term opens the first week in January, after New Year's Day, and closes the last of March.

THREE-YEAR COURSE

The course of study offered covers a wide range of subjects, largely agricultural, and requires three winters of six months each for completion. The methods of instruction tend to educate the students toward the farm instead of away from it; to develop in them a love of farm life by showing its possibilities.

ADVANCED COURSES

A student, after completion of the regular three-year course, may desire to prepare himself to enter the University or another higher institution. This preparation is provided for by offering such a student an additional six months at the school, in which time he will be required to cover a prescribed amount of academic work. He may also choose from the elective lists, subjects that he could not obtain during his first three sessions, such as more specialized work in animal husbandry, horticulture, farm engineering, commercial subjects, and academic work.

ADMISSION

Applicants who have completed a common school course will be admitted without examination.

Applicants who have not completed the common school course should write to the registrar for further information.

Students who cannot pursue the full course from either lack of time or proper preparation may make special arrangements for taking such subjects as will be most helpful to them. These students can become candidates for a diploma only after meeting all entrance requirements. State High School Board certificates are accepted for work in English, physiology, algebra, geometry, civics, history, and sciences.

ROOMS IN DORMITORY

The rooms are all cheerful and modern. Each room is furnished with two single beds, a chiffonier, a table, and chairs. Students planning to attend the School of Agriculture should reserve rooms in advance. Write early, asking the registrar to reserve a room in the dormitory.

WHAT TO BRING

Each student should come provided with comforters or blankets, sheets, pillow cases, towels, comb, brushes, tumbler, and nightgowns or pajamas.

EXPENSES*

The necessary expenses for the year do not exceed \$129. This amount does not include traveling and personal expenses.

Each student is required to pay for breakage of apparatus used in practical work, and for all damage done to school property.

Textbooks are furnished at a rental of \$1 to students who do not desire to purchase. A fee of \$2.50 each term will entitle all students to attend all school functions, athletic contests, games, and entertainments.

It should be remembered that fees are for the entire term; after the first month, the only expenses are for board and room.

Board is payable the first of each month in advance. A surtax of 2 per cent is added to all bills delinquent more than ten days. No deduction is made for board for any absence of less than five days. If students are compelled to be absent for that length of time, they are allowed half rates, provided they make arrangements with the accountant before leaving. On entering the school, each student should bring sufficient money to pay for one month's board and room, and for books and fees. This amounts to about \$36.

The following expenses are charged to all students. Fees are payable at the time of registration, and board and room at the first of each school month.

* See page 19.

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| Registration fee for any part of school year to residents..... | \$5.00 |
| Deposit as guarantee of proper treatment of school property..... | 5.00 |
| Board, per week..... | 3.50 |
| Room per week, including flat laundry..... | 1.25 |
| Book rent, per term..... | 1.00 |
| Student privilege ticket for all school functions, athletic contests, games, and entertainments, per term..... | 2.50 |
| Health fee, per term..... | 1.50 |
| Registration fee for nonresidents..... | 10.00 |

Special fees in laboratory courses are as follows: carpentry, engineering, farm mechanics, chemistry, at \$1 each a term. Crop studies and dairying, 50 cents each a term. A rental fee of \$1 a month is charged for the use of typewriters.

HEALTH SERVICE FEE

The health service fee provides for physical examinations for all students, doctor's advice as to anything that would correct present health conditions and for sick calls that are made to the school dormitory. It does not provide for nurse's care in case of serious sickness or extra costs caused by epidemics, or hospital care, in case the student is taken to a hospital. These must be paid for by the student receiving the service.

REQUIREMENTS FOR GRADUATION

Completion of the prescribed course of study, including all required work and enough electives to make a total of 160 credit hours.

One summer of supervised home project work. Of the 160 credits necessary for graduation 5 must be home project work, and 10 will be allowed.

- An honorable standing in department.
- Payment of all school accounts.

HOME LIFE IN THE DORMITORY

The dormitory life of the students while attending the School of Agriculture is subject to supervision. Everything possible is done to promote a healthful, moral atmosphere.

The preceptor and preceptress have charge of students in the dormitory and regulations enforced are for the good of all.

From 8:15 a.m. to 4:30 p.m. students are busy with their school work. From 4:30 p.m. to 6:00 p.m. there is a recreation period in which the student's time is at his own disposal. After 7:30 p.m. students are expected to be in their rooms and to be quiet so that all may study undisturbed. Students may leave the campus in the evening only upon the permission of the preceptor or preceptress.

Students are required to be correct in their habits, and to observe pleasantly all directions for their government. Anyone not in accord with these restrictions and not willing to lend a hand toward strong moral growth

should not come to the school. Infraction of dormitory rules may be sufficient cause for dismissal from school.

The use of profanity and tobacco in dormitory rooms is strictly forbidden. Any student found using intoxicating liquor will be immediately expelled from school.

ASSEMBLY PERIOD

An assembly period is held once every week throughout the school year. Students are required to attend these assembly exercises. It is the purpose of the school to secure prominent speakers to address the student body at these morning exercises. The assembly period is also used as a forum for public discussion of the many questions and announcements of importance to the student body. The various societies and organizations also use this period for the promotion of their work.

SUNDAY SERVICES

A short devotional service not exceeding half an hour is offered on Sunday morning immediately following breakfast, with speakers representing various denominations. Attendance at these services is entirely voluntary.

PARLIAMENTARY PRACTICE

Students directed by faculty members are given several exercises in the practice of parliamentary law. This fills a very urgent need especially among people in rural districts. The practice of conducting rural meetings is stressed.

MUSICAL ORGANIZATIONS

A school glee club is organized during the fall term. A school orchestra will also be organized provided a sufficient number desire it. Students are urged to join these organizations.

ELIGIBILITY FOR CONTESTS

The following rules will govern eligibility for all interscholastic games.

1. A student must be enrolled in the school not less than two weeks before the contest, or from beginning of term.

2. He shall be making grade in at least four subjects for which he is enrolled. These four subjects must total twenty credit hours.

3. He must carry 25 hours of work during each quarter unless he is a senior in his last quarter and does not need that amount to graduate, when he shall be allowed to carry one quarter less.

4. No student will be allowed more than four years competition in any one sport, including his high school and agricultural school competition. A year's competition is defined as having won his letter in that sport.

STATE AID FOR AGRICULTURAL SCHOOL PUPILS

The 1935 Minnesota State Legislature passed a law whereby farm boys and girls twenty-one years of age or under, who have graduated from the eighth grade in organized rural districts which do not give accredited high school instruction may attend any of the schools of agriculture with necessary tuition, laboratory, and equipment fees (except deposits) to be paid from state funds. Deposits are to be paid by the individual student.

A rate of \$6 per month has been established to cover all the tuition, laboratory, and equipment fees (except deposits) of such students and the same privilege is extended to any other students in attendance at such schools electing to pay fees on this basis.

For further information regarding this matter, write to Superintendent R. L. Donovan, North Central School and Station, Grand Rapids, Minn.

SCHOLARSHIP AND LOAN FUNDS

The North Central School of Agriculture considers itself very fortunate in being able to present the following loan fund provisions. The donors have specified the purposes for which each may be used. The general purposes, however, are to enable the school to reach a large number, to provide the means of encouraging many to acquire the training which the school offers, and to stimulate greater effort in school work.

For more details regarding these loan funds, write to Superintendent R. L. Donovan, North Central School of Agriculture, Grand Rapids, Minn.

GRAND RAPIDS COMMERCIAL CLUB LOAN FUND

The Commercial Club of Grand Rapids has created a revolving loan fund to aid students at the North Central School of Agriculture.

CALEB DORR CASH SCHOLARSHIP PRIZES

By a decision made in April, 1922, by the Board of Regents of the University of Minnesota, a part of the Dorr fund is now made available to the schools of agriculture. This fund consists of \$50,000 willed by the late Caleb Dorr, of Minneapolis, the income of which will be used to promote scholarship and student activity records. Further information regarding this fund as it applies to the North Central School of Agriculture may be obtained by writing to the superintendent.

WOMAN'S CLUB LOAN FUND

This fund was started in 1933 by the Grand Rapids Woman's Club to aid needy students at the North Central School of Agriculture.

CROP JUDGING TEAM LOAN FUND

This fund was created by the grain judging team from the North Central School of Agriculture that won first place at the World's Grain Judging Contest at Regina, Canada, in July, 1933. Part of the prize money

that was won was donated to establish this fund to aid needy students in attending the North Central School of Agriculture.

LUDDEN TRUST FUND

This fund may be used by students of the North Central School of Agriculture in accordance with the action of the Board of Regents.

STAFF AND EMPLOYEES SCHOOL OF AGRICULTURE LOAN FUND

This fund, created by the staff and employees of the schools of agriculture, is available for student use in accordance with the action of the Board of Regents, June 19, 1933.

4-H CLUB WEEK

The annual 4-H Club Week, which is usually held during the second week in June each year, is open to boys and girls from twelve to twenty years of age. With the exception of \$1 for board, there is no expense connected with the course. The course aims to deepen the interest of boys and girls in life on the farm. Special emphasis is placed on boys' and girls' club work. Instruction is given for the planning and carrying out of work in such projects and contests as gardening, corn and potato growing, pig, calf, and chicken raising, cooking, sewing, and canning. Illustrated lectures, moving pictures of educational value, games, singing, and excursions add interest and pleasure to the course. The 4-H Club one-act play contests and musical contests are usually held at this time.

FARMERS' AND HOMEMAKERS' INSTITUTE

The annual Farmers' and Homemakers' Institute, at the North Central School of Agriculture, is held for one day about the middle of March each year. The course consists of daily programs covering a large field of subjects dealing with problems on agriculture in northern Minnesota, in talks as well as in demonstrations.

GRAIN, LIVESTOCK, AND FLOWER CONTESTS

These contests which have become an annual event are open to farmers' clubs, 4-H clubs, and high schools. The instructor at the head of each department is in charge and judges are secured from the University of Minnesota. In addition to the regular grain and livestock judging contests, there is a tree and flower identification contest for women.

WOMEN'S CAMP

The annual Women's Camp is held at the North Central School during the month of June each year, for three or four days, to provide instruction and recreation for homemakers. Instruction in the form of demonstrations will be offered in homemaking, community building, child training, music, and recreation.

NORTH CENTRAL QUARTERLY

The *North Central Quarterly* is published by the school faculty. It serves as a medium by which former students and alumni are kept in touch with one another and with the school. It also contains much useful information regarding farm problems in horticulture, dairying, poultry, agronomy, and other information that is of much interest to the average farmer.

EXPERIMENT STATION

The North Central School and Station is now conducting extensive experiments in agronomy, soils, horticulture, forestry, animal husbandry, poultry, apiary, and agricultural engineering.

SCHOOL FARM

The farm comprises 457 acres, and furnishes an extensive laboratory for the work of the school. Over 100 acres are in forest reserve, so designated by the Board of Regents; 250 acres are included in crop lands and grounds; and the rest is stump-land pasture not suited for crop purposes. Information concerning the methods employed on the farm is always available to the students. The classroom work is supplemented with actual practice either in the field or with crops grown on the farm.

STATION FLOCKS AND HERDS

The school now maintains an abundance of livestock, all of which may be used for student work in animal husbandry. Purebred Guernsey cattle; Shropshire sheep; purebred Percheron horses; Duroc Jersey hogs; and White Leghorn and White Wyandotte chickens are maintained for station and school purposes. Excellent opportunities are thus provided for students to study intelligently the various courses in animal husbandry.

LIBRARY

The school is equipped with a good reference library to meet the needs of the various departments.

COURSES OF STUDY

THREE-YEAR COURSE

FRESHMAN

| <i>Fall</i> | | <i>Winter</i> | |
|-------------------------------|---------|-----------------------------------|---------|
| <i>Required</i> | Credits | <i>Required</i> | Credits |
| English Ia | 5 | English Ib | 5 |
| Farm Dairying | 3 | Livestock Breeds and Judging.... | 5 |
| Dairy Breeds and Judging..... | 5 | Cereals | 5 |
| Poultry I | 3 | Industrial Geography | 5 |
| Plant Life | 5 | Gymnasium | 1 |
| Arithmetic | 5 | Social Training | ½ |
| Gymnasium | 1 | Electives | 3½ |
| Social Training | ½ | Total | 25 |
| Total | 27½ | | |
| <i>Elective</i> | | <i>Elective</i> | |
| Motors | 2 | Spelling and Penmanship..... | 3 |
| Piano | 2 | Piano | 2 |
| Violin | 2 | Violin | 2 |
| Glee Club | ½ | Glee Club | ½ |
| Typewriting I | 5 | Mechanical Drawing | 2 |
| Spelling and Penmanship..... | 3 | Carpentry I | 2 |
| Farm Shop | 2 | Typewriting I | 5 |
| | | Typewriting II | 5 |
| | | Conservation Training Course..... | 2 |

JUNIOR

| <i>Fall</i> | | <i>Winter</i> | |
|---------------------------------|---------|-----------------------------------|---------|
| <i>Required</i> | Credits | <i>Required</i> | Credits |
| English IIa | 5 | English IIB | 5 |
| Chemistry | 5 | Fruits and Vegetables..... | 5 |
| Forage Crops | 5 | Feeds and Feeding..... | 5 |
| Poultry II | 3 | Gymnasium | 1 |
| Gymnasium | 1 | Physics | 5 |
| Carpentry II | 2 | Electives | 4 |
| Electives | 4 | Total | 25 |
| Total | 25 | | |
| <i>Elective</i> | | <i>Elective</i> | |
| Farm Mechanics | 2 | Mechanical Drawing | 2 |
| Piano | 2 | Piano | 2 |
| Violin | 2 | Violin | 2 |
| Motors | 2 | Glee Club | ½ |
| Corn and Grain Judging | 2 | Bookkeeping II | 5 |
| Glee Club | ½ | Typewriting I | 5 |
| Advanced Livestock Judging..... | 3 | Typewriting II | 5 |
| Bookkeeping I | 5 | Conservation Training Course..... | 2 |
| Typewriting I | 5 | | |
| Typewriting II | 5 | | |

COURSES OF STUDY

SENIOR

| <i>Fall</i> | | <i>Winter</i> | |
|------------------------------|---------|------------------------------------|---------|
| <i>Required</i> | | <i>Required</i> | |
| | Credits | | Credits |
| English IIIa | 5 | English IIIb | 5 |
| United States History..... | 5 | Government | 5 |
| Soils | 5 | Farm Management and Accounts .. | 5 |
| Farm Forestry | 2 | Electives | 10 |
| Electives | 8 | | |
| | — | | — |
| Total | 25 | Total | 25 |
| <i>Elective</i> | | <i>Elective</i> | |
| Farm Mechanics | 2 | Farm Machinery | 2 |
| Dairy Management | 3 | Livestock Management and Market- | 5 |
| Piano | 2 | ing | 5 |
| Violin | 2 | Ornamental Planting | 2 |
| Glee Club | ½ | Insects and Bees..... | 2 |
| Bookkeeping I | 5 | Piano | 2 |
| Shorthand Ia | 5 | Violin | 2 |
| Shorthand IIa | 5 | Glee Club | ½ |
| Typewriting I | 5 | Bookkeeping II | 5 |
| Typewriting II | 5 | Shorthand Ib | 5 |
| Advanced Stock Judging | 3 | Shorthand IIb | 5 |
| Advanced Grain Judging..... | 3 | Typewriting I | 5 |
| | | Typewriting II | 5 |
| | | Conservation Training Course | 2 |

ADVANCED

| <i>Fall</i> | | <i>Winter</i> | |
|-----------------------------|---------|------------------------------------|---------|
| <i>Required</i> | | <i>Required</i> | |
| | Credits | | Credits |
| English IVa | 5 | English IVb | 5 |
| Ancient History | 5 | Modern History | 5 |
| Elementary Algebra I..... | 5 | Elementary Algebra II..... | 5 |
| Geometry I | 5 | Geometry II | 5 |
| Electives | 5 | Electives | 5 |
| | — | | — |
| Total | 25 | Total | 25 |
| <i>Elective</i> | | <i>Elective</i> | |
| American Problems | 3 | Insects and Bees..... | 2 |
| Glee Club | ½ | Ornamental Planting | 2 |
| Piano | 2 | Livestock Management and Market- | 5 |
| Violin | 2 | ing | 5 |
| Bookkeeping I | 5 | Animal Breeding | 3 |
| Typewriting I | 5 | Bookkeeping II | 5 |
| Typewriting II | 5 | Typewriting I | 5 |
| Shorthand IIa | 5 | Typewriting II | 5 |
| Advanced Stock Judging..... | 3 | Shorthand IIb | 5 |
| Advanced Grain Judging..... | 3 | Glee Club | ½ |
| | | Piano | 2 |
| | | Violin | 2 |
| | | Conservation Training Course | 2 |

DESCRIPTION OF COURSES

AGRONOMY AND FARM MANAGEMENT

- A. **Cereal Crops.** A study of the principal cereal crops, classes, and varieties adapted to northern Minnesota; production, seed selection, seed treatment, control of disease, soil and cultural practices, harvesting. Mr. Swenson.
- B. **Forage Crops.** A study of leguminous crops, grasses for pastures and meadows; annual forage crops, root and tuber crops grown for livestock; seed selection, cultural requirements and their importance to the farm. Mr. Swenson.
- C. **Grain Judging.** Score card practice, grading and judging; identification of farm crop plants; seeds and weed seeds, diseases and weed plants, with the object of making the student proficient in judging and identifying good and pure seed. Mr. Swenson.
- D. **Pure Seed Production.** A study of the methods of breeding and growing purebred seed grain and corn. The course includes certification and seed registration; pure seed and weed laws. Mr. Swenson.
- E. **Soil Management.** Soil formation and classification with particular attention to those of this territory. Factors influencing the fertility of soils and its maintenance including texture, tilth, moisture, air, tiling, organic matter, soil organisms, acidity, plant food, crop rotation, farm manures, commercial fertilizers, and types of farming. Mr. Swenson.
- F. **Farm Management and Accounts.** Study of the farm as organized business, giving consideration to types of farming, combination of enterprises, field and homestead arrangement, crop rotation, soil management, livestock labor, equipment and improvements, factors affecting cost of production and farm profits, land tenure. A study of farm accounts. Mr. Swenson.
- G. **Advanced Grain Judging.** Primarily for those interested in becoming more proficient in grain judging and identification of grains and grasses. Mr. Swenson.

HORTICULTURE AND ENTOMOLOGY

- A. **Plant Life.** A course in the study of the names and function of the different parts of a flowering plant. Elementary botany. Mr. Weir.
- B. **Ornamental Planting.** A study of the most common plants used in home beautification, trees, shrubs, annual and perennial flowers; arrangement and propagation; planning the grounds, making lawns. Mr. Weir.
- C. (a) **Fruit and Vegetable Crops.** Fruit growing. Importance of farm orchard and small-fruit gardens is emphasized. Field work consists of a study of orchard soils, planting and cultural methods, propagation, pruning, spraying, harvesting, marketing, selection of varieties of native and hardy fruits. Mr. Weir.

- (b) Vegetable Gardening. The value of the home vegetable garden, preparation of the ground, and selection of plants and seeds are given attention. Includes tillage, rotation, transplanting, preparation and care of hotbeds, and insects dangerous to the garden. Mr. Weir.
- D. Farm Forestry. Identification of native trees. Study of growing conditions and habits of growth; woodlots; selection of suitable species, planting, and care. Planting and conserving forests as a crop. Mr. Weir.
- E. Insects and Bees. An elementary study of insects, anatomy and life-history of a number of the more important species. A study of the life-history and habits of bees, management and equipment. Mr. Weir.

AGRICULTURAL ENGINEERING

- A. Blacksmithing. Instruction is given in the common hot-metal operations on the farm including forging, welding, tempering of tools. Mr. Grussendorf.
- B. Carpentry I. Care and sharpening of wood-working tools useful on the farm. Construction and repair of agricultural equipment and farm buildings. Mr. Grussendorf.
- C. Carpentry II. Continuation of Carpentry I with emphasis on building construction, foundation, framing, rafter cutting, concrete work. Mr. Grussendorf.
- D. Mechanical Drawing. The use of mechanical drawing instruments is taught by drawing farm equipment and buildings. Mr. Swenson.
- E. Farm Motors. The principles of construction and operation of gasoline engines is given by laboratory work on stationary engines. Mr. Grussendorf.
- F. Farm Shop. Practice in rope work, soldering, belt lacing, pipe fitting, and harness repair. Mr. Grussendorf.
- G. Farm Mechanics. Practice is given in stump and rock blasting, in running levels for drainage and foundations, study of home conveniences such as water, heating, and lighting system. Mr. Grussendorf.
- H. Farm Machinery. Selection, use, care, and operation of farm machinery including plows, disk harrows, cultivators, binders, mowers, etc. Mr. Swenson.

DAIRY AND ANIMAL HUSBANDRY

- A. Farm Dairying. A study of the principles and practices of producing dairy products, including a discussion of dairy barns and silos, milk production and testing. Mr. Cole.
- B. Dairy Breeds and Judging. Various breeds for dairy purposes are studied. Comparative judging. Score cards. Mr. Cole.
- C. Livestock Breeds and Judging. Breeds of beef cattle, hogs, horses, and sheep are discussed as to origin, development, characteristics, adaptation, and economic importance. Score card judging. Mr. Cole.

- D. Feed and Feeding. General composition of the animal body; composition and digestibility of feeds; feeding standards; methods of feeding. Mr. Cole.
- E. Dairy Management. Feeding and general management of dairy herd; value of purebred sires; study of records and pedigrees, herd books, and method of registration. Problems of sanitation and disease. Mr. Cole.
- F. Livestock Management and Marketing. Study of market classes and grades, market reports, management of livestock, butchering, meat cutting. Mr. Cole.
- G. Animal Breeding. Theory and practice of animal breeding, including variation, heredity, selection, effect of purebred animals in improving types of stock and pedigrees. Mr. Cole.
- H. Advanced Livestock Judging. Continuation of first year judging. Mr. Cole.
- I. Advanced Stock Judging. Primarily for those interested in becoming more proficient in the art of livestock judging. Mr. Donovan.

POULTRY HUSBANDRY

- A. Poultry I. A study of the farm laying flock covering feeding for egg production, culling, housing, and the poultry breeds. Mr. Grussendorf.
- B. Poultry II. A continuation of the study of the laying flock with emphasis on diseases, fattening, and marketing. Some time is given to turkeys, ducks, and geese. Selection, care, and feeding of the breeding flock. Incubation and brooding, including the feeding and diseases of baby chicks. Mr. Grussendorf.

ENGLISH

- A. English Ia. Review of parts of speech. Oral and written themes required. An appreciation of good literature is encouraged by the reading of the simpler classics. Book reviews are given. Mrs. Mollins.
- B. English Ib. Continuation of English Ia. Sentence and paragraph structure. Letter writing. Theme work is continued. Most common rules of punctuation. Mrs. Mollins.
- C. English IIa. More advanced theme writing. Oral reports. Book reports. Standard books and selections of interest are read. Mrs. Mollins.
- D. English IIb. A continuation of English IIa. Punctuation is studied extensively. Business letters. Outlining in oral and written reports. Mrs. Mollins.
- E. English IIIa. Advanced work in written composition of descriptive type. Advanced classics and extensive outside reading. History of American literature is also taken up in this year with readings from American authors. Special emphasis is placed on contemporary American writers. Mrs. Mollins.
- F. English IIIb. Reading of classics continued. Composition work of narrative and argumentative types. Simple newspaper writing. American literature continued. Mrs. Mollins.

- G. English IVa. History of English literature with reading from masterpieces. A few themes. Mrs. Mollins.
- H. English IVb. Continuation of English IVa. Mrs. Mollins.
- I. Public Speaking and Debate. The purpose is to develop skill and experience in appearing before the public as both speakers and debaters. Orations and topics are used for drill in deportment and in expression and the principles of argumentation are taught by debating. Methods of conducting public meetings are taught by parliamentary procedure. Mr. Grussendorf.

SOCIAL SCIENCES

- A. Industrial Geography. A review of physical and political geography of the world with a study of the principal commodities in commerce and conditions, natural and otherwise, that affect their production. Mr. Weir.
- B. United States History. The early discovery and colonization of the continent are studied, conditions leading to the formation of the Union, growth of the nation, the Civil War, and subsequent problems. Miss Vieths.
- C. Ancient History. This course shows the emergence of mankind from savagery, the formation of the ancient nations and especially the contributions of Greece and Rome to modern civilization. In the medieval period, the rise of modern nations, inventions and conditions affecting modern life are noted. Mr. Weir.
- D. Modern History. The development of the present European nations is studied, particularly as it influences conditions in America. Changes in political, economic, and social conditions during the last one hundred years are stressed with post-war developments in international relations. Miss Vieths.
- E. Government. The divisions of government from township to the state are studied and the work is especially adapted to Minnesota, its laws and its courts. The national government, its tendencies and present-day problems, is then studied. Miss Vieths.
- F. American Problems. A study of problems, social, economic, and political, confronting the citizens of our country, their history, causes, and effect on everyday life. Miss Vieths.

MATHEMATICS

- A. Arithmetic. A review of the simple mathematical processes. Drill on tables. Application of knowledge to farm problems with a view of using practical short cuts. Miss Kulstad.
- B. Algebra I. This course covers the usual first half-year academic credit work in algebra. Miss Kulstad.
- C. Algebra II. A continuation of Course I. Miss Kulstad.
- D. Geometry I. This course is designed to cover the usual first half-year credit work in plane geometry. Miss Kulstad.
- E. Geometry II. Continuation of Geometry I. Miss Kulstad.

BUSINESS TRAINING

- A. Bookkeeping I. The principles of double entry bookkeeping as far as controlling accounts are illustrated by exercises and sets. The use of ordinary business papers is shown with the principles of banking and transportation. Miss Vieths.
- B. Bookkeeping II. Continuation of Bookkeeping I with more on accruals, trade discounts, consignments, etc. Required before credit is given for Bookkeeping I. Miss Vieths.
- C. Shorthand I. The fundamental principles of shorthand given in the *Gregg Manual* and *Speed Studies* are covered. Miss Vieths.
- D. Shorthand II. After the principles of Gregg shorthand are mastered, business letters are dictated to give speed and experience with new outlines. Work is given in reading notes and prepared articles in shorthand with emphasis on neatness and accuracy of letter forms. Miss Vieths.
- E. Spelling and Penmanship. Drill in spelling a certain set of words in common use. Rules for spelling. Daily drill and individual instruction in penmanship. Miss Kulstad.
- F. Typewriting I. The first drills are given for the purpose of memorizing the keyboard and learning the use of the machine. Drills are then given in touch and speed and simple letter forms. Miss Vieths.
- G. Typewriting II. Continuation of Typewriting I with emphasis on letter writing, business forms, and drills for speed and accuracy. Miss Vieths.

CHEMISTRY

- A. Elementary Chemistry. A general introductory course in chemistry treating of the fundamental principles necessary for an understanding of chemistry in its relation to agriculture. Mr. Grussendorf.

PHYSICS

- A. Agricultural Physics. A laboratory study of mechanics, heat, light, sound, and electricity with special attention to these forces as they appear on the farm. Mr. Grussendorf.

MUSIC

- A. Glee Club. A glee club is organized each term with practice twice a week. Three- and four-part songs are sung. Reading of notes is aimed at in every practice. The organization furnishes musical numbers for the literary society and assembly programs. Mrs. Mollins.
- B. Chorus. All members of the school are included in the chorus which meets weekly. Two-, three-, and four-part songs are used. Mrs. Mollins.
- C. Orchestra. Credit to be arranged.

CONSERVATION TRAINING COURSE

It is believed that no one is more interested in the economic value of wild life and its relation to agriculture than students of schools of agriculture so a series of twenty-four lessons in conservation has been planned and is now offered with regular school credits.

The topics studied will be: improving the farm environment for wild life; how to attract useful birds; harmful birds and their relation to man; conservation and propagation of fish; farm forestry; windbreaks and woodlots. Class will meet twice a week. Mr. Weir.

SUMMER HOME PROJECTS

AGRICULTURAL PROJECTS

- A. Dairy Herd Management. Student assumes care of dairy herd on his home farm for at least six months, making regular reports in regard to feeding and management and keeping accurate accounts of milk production, butterfat tests, feed consumed, etc. 5 credits.
- B. Swine Management. Management and feeding of the home herd. Farrowing records, feed records, and cost of production figures are made a part of this project. Opening and closing inventories are required and a financial statement showing total costs and receipts. 5 credits.
- C. Lamb Production. Ten or more ewes are required for this project. Lambing records are kept, the lambs are earmarked and date of birth recorded. Feed records are kept and the lambs weighed up when averaging 150 days old. The student is required to show a pen of at least 3 lambs at his county fair. 5 credits.
- D. Management of the Laying Flock. The student takes full charge of the laying flock of 50 or more hens for egg production. A balanced ration is fed, and feed and production records are made a part of the project. 5 credits.
- E. Incubation and Brooding. In this project 100 or more chicks are brooded, fed, and raised by the student. A definite ration is fed throughout the project and accurate records are kept. 5 credits.
- F. Potato Production. Growing an acre or more of a standard variety. The work includes selection and treatment of seed, control of diseases, cultural practices, costs of production, and financial returns. 5 credits.
- G. Home Beautification. Planning and planting foundation shrubs and plants around the farm home and other buildings, caring for the same during the growing season and preparing for winter. The student makes a planting plan which is approved before the work is undertaken. 5 credits.
- H. Beekeeping. In this project the student takes charge of an apiary of not less than 3 hives. Care, management, and production records are included as a part of the project. 5 credits.
- I. Tree Fruits. Establishing an orchard of not less than 12 trees consisting of varieties recommended by the Minnesota Horticultural Society. 5 credits.

- J. Small Fruits. Establishing a patch large enough to supply a family of five with at least any two of the following: raspberries, strawberries, currants, gooseberries, grapes, etc. Varieties recommended by the Minnesota Horticultural Society. 5 credits.
- K. Pure Seed Production. Consists of raising not less than an acre of certified seed of any of the recommended grain varieties. Cost of production records are kept. 5 credits.
- L. Plant and Weed Identification. Students who are living in town and are situated so they cannot carry on any other agricultural project are required to collect, press, and mount not less than 150 specimens of weeds, grasses, grains, legumes, excluding trees. Field notes are to be taken of these various specimens and monthly progress reports must be handed in to the project supervisor. 5 credits.
- M. Windbreak Planting. Consists of planting a windbreak or shelter belt to shelter the farmstead. The use of cuttings, seed, or seedlings. The selection and choice of trees to suit the particular site and the subsequent care and maintenance. 5 credits.
- N. Community Social Improvement. Includes 4-H club work, Boy Scout work, farm bureau, young people's society, dramatic clubs, orchestra, etc. 5 credits.
- O. Home Improvement. Establish water system, septic tank; install toilets, electric lights, cement walks, homemade shower bath; improve kitchen arrangements for convenience. 5 credits.
- P. Farm Structures. Plan and build brooder house, poultry house, machine shed, garage, dairy barn, and other farm buildings. 5 credits.

SCHOOL EXPENSES

SIX-MONTH SCHOOL YEAR

First Term

| | |
|---|----------|
| To Be Paid on Registration Day | |
| ‡Entrance fee..... | \$ 5.00 |
| ‡‡Breakage deposit | 5.00 |
| Health fee | 1.50 |
| Book rent | 1.00 |
| Privilege ticket | 2.50 |
| Board and room (first four weeks)..... | 19.00 |
| | 34.00 |
| Board and room (second four weeks)..... | 19.00 |
| Board and room (third four weeks)..... | 19.00 |
| | 72.00 |
| Total payment on registration day..... | 34.00 |
| Board and room (second four weeks)..... | 19.00 |
| Board and room (third four weeks)..... | 19.00 |
| | 72.00 |
| Total for first term..... | \$ 72.00 |

Second Term

| | |
|---|----------|
| To Be Paid on Opening Day | |
| Health fee | \$ 1.50 |
| Book rent | 1.00 |
| Privilege ticket | 2.50 |
| Board and room (first four weeks) | 19.00 |
| | 24.00 |
| Board and room (second four weeks)..... | 19.00 |
| Board and room (third four weeks)..... | 19.00 |
| | 62.00 |
| Total payment on opening day..... | \$24.00 |
| Board and room (second four weeks)..... | 19.00 |
| Board and room (third four weeks)..... | 19.00 |
| | 62.00 |
| Total for second term..... | \$ 62.00 |
| | 134.00 |
| ‡‡Less breakage deposit | 5.00 |
| | 129.00 |
| Total for school year..... | \$129.00 |

The above itemized statement does not take into account laboratory fees, typewriter rentals, etc. These additional fees must be paid at the beginning of the term.

Note all first term fees and first four weeks' board and room must be paid on registration day. Balance of board and room must be paid on the first Monday of each four-week period.

Second term fees must be paid on opening day after Christmas vacation.

Students starting school second term must pay entrance fee and breakage deposit fee the same as in first term.

‡ Entrance fee for nonresidents of Minnesota is \$10.

‡‡ Breakage deposit is refunded at end of year if no charges for breakage, loss, etc. are brought against it.



*The Bulletin
of the University of
Minnesota*



*ANNOUNCEMENT
AND PROGRAM
of
EXTENSION CLASSES*

in MINNEAPOLIS
in ST. PAUL
on THE CAMPUS

1935 - 1936

*University of Minnesota
General Extension Division*



FIRST SEMESTER
September 30 to February 8

SECOND SEMESTER
February 10 to June 6

VOL. XXXVIII

NO. 39

AUGUST 8, 1935

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CALENDAR

| | | | |
|-----------|--------|----------|---|
| 1935 | | | |
| September | 16 | Monday | Registration, first semester, begins |
| September | 30 | Monday | Classes begin |
| October | 5 | Saturday | Last day for registration without extra fee |
| November | 25 | Monday | Mid-semester grades due |
| December | 21 | Saturday | Christmas recess begins |
| 1936 | | | |
| January | 6 | Monday | Classes resumed |
| January | 27 | Monday | Registration, second semester, begins |
| February | 3 to 8 | | Examinations, first semester |
| February | 8 | Saturday | First semester closes |
| February | 10 | Monday | Second semester classes begin |
| February | 15 | Saturday | Last day for registration without extra fee |
| April | 6 | Monday | Mid-semester grades due |
| June | 1 to 6 | | Examinations, second semester |
| June | 6 | Saturday | Second semester closes |
| June | 14 | Sunday | Baccalaureate service |
| June | 15 | Monday | Sixty-fourth annual commencement |

WHERE TO REGISTER

| | | |
|--------------|-----|--|
| Minneapolis: | 402 | Administration Building, University of Minnesota, Main 8177, Richard R. Price, Director |
| Minneapolis: | 690 | Northwestern Bank Building, Marquette Ave. and Sixth St. South, Main 0624, A. H. Speer, Resident Manager |
| St. Paul: | 500 | Robert St., Extension Center, Cedar 7312, C. H. Dow, Resident Manager |
| Duluth: | 404 | Alworth Building, Melrose 7900, John L. Macleod, Resident Manager |

The Administration Building on the University campus may be reached by going two blocks on Church Street from the Washington Avenue car line, or three blocks on 17th Avenue S.E., from the Oak-Harriet car line.

OFFICE HOURS

From September 23 to October 5, and from February 3 to February 15 (registration periods), 8:30 a.m. to 8:30 p.m., including Saturdays.

At other times, 8:30 a.m. to 5:00 p.m.; Saturday, to 12 m.

From September 16 to March 6 the campus office will be open from 8:30 a.m. to 8:30 p.m., except on Saturday.

REGISTRATION TIME

All registrations should be made and fees paid, before the first week of each semester. Registrations made later than Saturday, October 5, for the first semester, and Saturday, February 15, for the second semester, are subject to a late registration fee.

ANNOUNCEMENT AND PROGRAM

of

EXTENSION CLASSES

In Minneapolis, Downtown

In St. Paul, Downtown

On the Campus

UNIVERSITY OF MINNESOTA

1935-1936

First Semester

September 30 to February 8

Second Semester

February 10 to June 6

This book contains all information regarding extension classes, as well as the program for the current year. Classes are grouped in four units, as follows:

S.L.A. Classes, page 10

Business Classes, page 32

Education Classes, page 27

Engineering Classes, page 40

FOREWORD

This program of classes is the twenty-third since the General Extension Division was formally organized in 1913. Classes offered previous to that year were almost exclusively in the field of business, and represented the efforts of one department, Economics. The new division made an immediate effort to open other fields of instruction to extension students, but the main emphasis was primarily on "practical" or vocational matters. The gradual development of the extension program to include nearly every phase of education and to appeal to a wide variety of students is the ideal which had its inception at that time and has continued ever since.

Each year some new, or unique, classes are added to the program, sometimes in response to a demand, often in an experimental way, to test student interest. These may be in regular university subjects that have not had previous attention, or they may be in subjects or activities that have no connection with any college curriculum. Whatever the subject, the objective is the offering to all the opportunity to profit by some sort of study to which they are attracted, in the belief that education is not a restricted process. On the following page are listed such offerings for the current year, so varied in content that any prospective student must find something of interest.

The majority of classes offered still represent work which may be counted toward a college degree. Each year more and more of our students are taking advantage of them, to secure what is called a college education, and perhaps ultimately to earn a degree. But all classes, whether of degree character or not, should be considered as open to all interested, regardless of their present educational ambitions, or their previous educational attainments. These means of adult education are open to all who can make use of them.

KEEP THIS BOOK FOR FUTURE REFERENCE

NEW, SHORT, AND NOVEL CLASSES

Page

PERSONAL INTEREST CLASSES

| | |
|---|----|
| Birds of Minnesota. An authoritative introduction to residents and migrants..... | 27 |
| Cartooning. A practical course in conceiving and drawing cartoons..... | 13 |
| Current Problems in Light of American History. A study of the genealogy, so to speak, of many current problems..... | 18 |
| European Dictatorships. A study of the extreme changes in some governments..... | 22 |
| Functions of Government. An exceedingly appropriate class; whither government, anyway?.... | 22 |
| Gardening—for the man of the house, or his whole family. A practical class—three classes, in fact—that deal with everyday gardening problems..... | 13 |
| Minnesota Plant Life. How to know all the trees, shrubs, plants, and flowers that one sees.... | 13 |
| Practical Speech Making. Extempore speeches—or the other kind, if they are in order..... | 26 |
| Social Security Proposals. Old age insurance or pensions..... | 34 |
| Stamp Collecting (Philately). Perhaps the perfect hobby—highly interesting, educative, and sometimes profitable | 27 |
| Vocabulary Building. No one ever learns too many words—or uses them too well..... | 26 |

PROFESSIONAL OR TECHNICAL INTEREST CLASSES

| | |
|--|----|
| Air Conditioning | 45 |
| Clinical Dynamics in School Children. The health and happiness problems of children..... | 32 |
| Direct Mail Advertising | 36 |
| Engineering Finance. How to figure the job..... | 41 |
| Foundry Practice. Some of the theory back of the day's work..... | 46 |
| Interior Decorating. For the professional as well as the amateur..... | 28 |
| Mathematics of Investment | 19 |
| Practical Preventive Medicine | 19 |
| Public Finance. Spending money from taxes—what is a good job?..... | 38 |
| Rock Study | 17 |
| Textiles | 39 |
| Tuberculosis and Its Control..... | 19 |

RECREATIONAL INTEREST CLASSES

| | |
|--|--------|
| Art for Everyday. A class for delving in the art processes themselves..... | 15 |
| Games and Dances—Group and Individual..... | 31 |
| Golf—for Men, and for Women..... | 31 |
| Handicrafts | 29 |
| Life Saving—for Women. The technique of the prevention of drowning..... | 30 |
| Puppetry, Marionette plays | 27 |
| Sketching. Drawing for the amateur, "just for fun," if you like..... | 29 |
| Swimming—for Men, and for Women..... | 30, 31 |

ADDED SUBJECTS—NOT AVAILABLE LAST YEAR

| | |
|--|----|
| Abnormal Psychology | 22 |
| Adult Mental Ability | 30 |
| Advanced Economics | 38 |
| Casualty Insurance | 39 |
| Danish Literature. Study in the original Danish masterpieces..... | 24 |
| Geology of Minnesota | 17 |
| German Composition. Speaking and writing German in a conversational fashion..... | 17 |
| Italian. Introduction to the language..... | 23 |
| Logic | 21 |
| Milton | 15 |
| Physics—Heat and Acoustics | 21 |
| Political and Social Ethics..... | 21 |
| Psychology of Beauty and Art..... | 22 |
| Shakespeare | 15 |
| Strength of Materials. Fundamental matter for the engineer and the builder..... | 46 |

PROGRAM INFORMATION

Extension classes are ordinarily offered on the basis of a demand already established, and of the distribution of that demand over a series of years. Some classes are offered every year, a few every semester; other classes may have a limited demand and cannot be offered so frequently. Those described and programmed in this bulletin are those for which it is anticipated there will be a sufficient demand during the year to insure their organization.

Classes on Demand.—Extension classes will be conducted in any available subject on petition of a sufficient number of students. The exact number will depend on the subject and the conditions of offering, and will be determined on application. Such a petition may be made to any office of the Division, and should be accompanied by self-addressed envelopes for each petitioner, in which notice may be given of the status of the class. When a class is organized in this manner fees may be paid without the late registration fee any time during the week of the first class meeting, but **no refund of fees will be made for cancellation.**

Minimum Size Classes.—Classes programmed for any semester will not ordinarily be organized for a smaller enrolment than fifteen. Under exceptional circumstances some advanced or continuation classes may be conducted for a smaller enrolment, while on the other hand in some classes a larger number may be required. All such variations of the rule are made only with the approval of the director.

Any announced class may be withdrawn if its registration is not considered sufficient. In such case students may transfer their registration to some other class, or may have a full refund of the fees paid. If a class with a subminimum registration is continued no refunds will be made for cancellation therefrom.

Class Schedule.—The majority of classes meet once a week for two (academic) hours for a period of seventeen weeks, the last of which is devoted to the examination, and carry three credits. This may be considered the standard class. Exceptions, such as classes meeting for a longer period, or those in laboratory sciences meeting twice a week, and carrying more credit, are noted in the description and program of the class.

Five-credit classes in beginning languages, history, mathematics, and some other subjects are announced in some number in this program. Such classes meet for an actual time of two hours and forty-five minutes, which, with an allowance for a recess, makes a session of approximately three hours.

Wherever possible classes are scheduled either at 6:20 p.m., closing at 8:00, or at 8:05 p.m., closing at 9:45. This enables a student to attend two classes in one evening. Classes meeting for more than two hours cannot conform to this schedule. The time of meeting for each class is stated in the program.

Holidays.—Extension classes meet regularly for the entire semester without regard to holidays, except for the Christmas recess. For this recess, classes will be suspended Saturday, December 21, and will resume on Monday, January 6. Classes whose meetings fall on any holiday may, by agreement between students and instructors, be dismissed, but such meetings must be made up by extra meetings before the close of the semester in which they occur.

Places of Meeting.—Classes meet in designated buildings on the University campus, Minneapolis, or in places chosen for convenience in downtown Minneapolis and St. Paul. The location of these places is printed on the outside back cover of this bulletin.

English Placement Tests.—All students beginning the work in English composition are, by general university regulation, required to take the placement tests prescribed by the Department of English. These tests will be given according to the following schedule:

| | | | |
|------------------|--------------|--------------------------------|--|
| First Semester: | | | |
| 7:30 Friday | September 27 | Room 110, Folwell Hall, Campus | |
| 7:30 Friday | October 4 | Room 110, Folwell Hall, Campus | |
| 7:30 Friday | September 27 | St. Paul, Extension Center 200 | |
| Second Semester: | | | |
| 7:30 Friday | February 7 | Room 110, Folwell Hall, Campus | |
| 7:30 Friday | February 14 | Room 110, Folwell Hall, Campus | |
| 7:30 Friday | February 7 | St. Paul, Extension Center 200 | |

Class Indications.—The number prefixed to the title of a class, as well as the title itself, is usually the same as that used for the corresponding class in the bulletin of the college where it originates. The letters *ex* affixed to a number indicate either

that the class has no corresponding class offered in day classes, or that it is a material modification for extension purposes of a corresponding day class; it does not indicate necessarily that a class does not carry credit toward a degree.

Classes marked with a † are what are known as continuation classes requiring the completion of two, or sometimes three, classes before credit is given for either.

The time and place of meeting of classes is indicated by abbreviations, which in most cases, will be obvious. The days of the week are indicated by the first letters, and the buildings in St. Paul and Minneapolis by the titles or abbreviations of them. For example, "T 6:20 St.P.Pub.Lib.Aud." means that the class will meet on Tuesday at 6:20 in the auditorium of the St. Paul Public Library. In some cases a number precedes the letter indicating the day of the week. This refers to the number of the class offered so that there may be no confusion as to which class is offered in either semester.

GENERAL INFORMATION

ADMISSION

Because of the broad and general purpose for which they are organized, extension classes are open to all persons who can profitably pursue them. The only requirements, therefore, are sufficient maturity and ability to study successfully the work undertaken.

Those wishing to count extension class study toward any university degree must satisfy requirements for admission to the University as well as specific requirements for the degree concerned. These requirements are explained in paragraphs below (see page 5). Those who do not desire this credit need not meet any university entrance requirements, and may freely choose among the classes offered in terms of their needs and desires, ordinarily without regard to prerequisites.

Regularly Matriculated University Students.—No student regularly registered for the day class work of any unit of the University of Minnesota may register for an extension class without the approval of the dean of his college. Such approval is not usually granted when the extension class would increase the student's work beyond the normal load.

Dropped Students.—A student who has been dropped by any unit of the University may not register for extension classes until such time as he has been accepted for readmission to his unit.

CREDITS

A large proportion of all extension courses carry credit that may be applied toward a university degree whenever a student becomes properly registered in one of the colleges of the University, and has met the prerequisites for the courses involved. Students may accumulate credits toward a degree in advance of registration in a particular college, but are advised to secure the acceptance of their credentials for admission as early as possible.

In response to particular demands some classes are offered that are outside the field of regular university instruction. They may, however, carry credit toward an appropriate General Extension Division certificate. (Exception must be made of the Junior College certificate since that is part of the work for a degree and may include only courses which carry degree credit.) Such courses are indicated in the program of classes. A few sub-collegiate classes are offered carrying no credit whatever.

Every student who successfully completes the work of an extension class, including the final examination, receives the credit stated in the announcement of the class. This credit is permanently recorded in the office of the university registrar and remains as extension credit until such time as the student may qualify for its transfer to some other college of the University.

It is assumed that every student registers on this credit basis, plans to do the work of the class, to take the final examination, and to receive a grade. This is probably good educational procedure, assuring the best results for the student.

Auditors.—Students who do not desire, or are unable, to do the entire work of a class may be accepted as auditors, upon petition for this privilege upon blanks provided. Those in this status will not be expected to participate in class work, nor take the final examination, and may never receive credit for the work. A registration may be changed to the status of auditor at any time during progress of a class up to the time for the final examination. Auditors pay the same fees as other students.

An auditor may change to the credit status not later than the eighth week of a semester. Apply to any extension office.

Amount of Credit.—Classes meeting for two hours once a week for a semester normally carry 3 quarter credits. (Altho extension classes are on a semester basis, credits are computed in quarter hours in accordance with the regular university usage.) Classes meeting oftener than once a week, or for more or less than the two-hour period carry appropriate credit based upon their relation to the normal three-credit class. Such variations are indicated in connection with each class concerned.

Prerequisites for Credit.—For the benefit of students who expect to use their credits toward a degree each class announcement contains a statement of prerequisites. These consist of other classes that should precede the class to which they refer. Extension students may ordinarily disregard these prerequisites. **The only requirement for such students is that they be sufficiently mature and competent to do the work of the class for which they register.** Of this the instructor will be the judge; and only when the lack of previous classes results in inability to do the work of a class will a student be excluded.

Candidates for a degree may even enter classes without prerequisites, provided they are otherwise competent, but they must ultimately meet the prerequisites in some way before the credit can be used toward a degree.

Residence Credit.—By action of the University Senate attendance in extension classes in Minneapolis, St. Paul, and Duluth is interpreted as meeting the requirements of residence at the University; that is, such attendance may be counted in fulfilling the requirement of time spent in residence study, as prescribed for various degrees by the University or by the separate colleges. (This interpretation does not apply to extension classes outside the three cities named, nor to correspondence study.)

CREDIT TOWARD A UNIVERSITY DEGREE

Students who wish to become candidates for a degree must meet the requirements for admission into the school or college granting the degree, and the requirements regarding the conversion of extension credits into credits toward a degree. Admission to the University is either by certificate or by examination, as defined below.

Admission by Certificate.—The applicant must present a certificate of graduation from an accredited preparatory school, or certificates showing that he has passed examinations in preparatory subjects as given by the Minnesota State Board of Education, or corresponding examinations in another state where such examinations are recognized by the state university in that state, or examinations given by the College Entrance Board, or by the regents of the University of the State of New York, or examinations in preparatory courses offered by correspondence study by the University of Minnesota. Such certificates are to be filed for evaluation by the university registrar. (For specific subjects and units of each required, see the Bulletin of General Information of the University.)

Admission by Examination.—Applicants for admission to the University (this does not apply to admission to extension classes; see above under Admission to Extension Classes) who are high school graduates, or who are at least nineteen years of age, and are unable to meet the requirements for entrance by certificate will be admitted provisionally, and subject to one year of satisfactory work at the University, upon passing the following tests:

- a. College aptitude test
- b. Test of proficiency in English
- c. Such special placement tests as the school or college to which the candidate desires admission may prescribe.

Applicants failing to pass tests (b) or (c) may apply for a subsequent examination upon payment of a fee of \$5 at any scheduled date. Those failing to pass test (a) may enter only upon satisfactorily meeting the entrance requirements by the certificate method.

Conversion of Extension Credit into University Credit.—Extension credit will become credit toward a university degree when the student has formally presented himself to the proper official of the college of his choice and has been accepted as having completed the required work for entrance into an accepted curriculum at the time of his application. In the College of Science, Literature, and the Arts application will be made to the assistant dean for the Senior College, following the completion of the two years' work of the Junior College. In the School of Business Administration and the College

of Education, application will be made to the Students' Work Committee of the college concerned.

N.B.—Students accepted for a degree in the above manner should have each semester's registration for extension classes approved by an official of their college.

In the College of Engineering and Architecture extension credits must be validated by the successful completion of a comprehensive examination in the work covered by the extension classes, the examination to be set by the college. The necessary examinations will be given to the student, without charge, when he applies for admission into the college at the time when he is ready to complete the work for a degree beyond what can be given in extension classes.

It is possible, as an increasingly large number of students are realizing, to complete a considerable portion of the requirements for a Bachelor's degree in extension classes. The curriculum requirements of each college must be met and the student will be held for any requirements, such as comprehensive final examinations, which may be given from time to time. In the major and minor subjects chosen by the candidate for a degree there will always be advanced courses which cannot be offered by the Extension Division because of insufficient demand. In order that the student may make a practical program which will enable him to get the greatest benefit from his extension classes and reduce to a minimum the time that is spent in securing advanced courses in day classes, it is necessary that advice and assistance should be sought at the earliest possible moment.

Advanced Standing.—This University accepts credits earned at all reputable colleges and universities, state teachers colleges, and junior colleges if they are accredited to the University. Such credits are accepted as far as they represent courses equivalent to those offered in this University. They must be certified upon the official blank of the institution granting them and give specific information regarding the subject and its descriptive title, time spent, number of credits, the grade, the preparatory units presented for entrance, and a statement of honorable dismissal.

Work done at nonaccredited institutions will be accepted for advanced standing only upon satisfactory completion of a comprehensive examination for each course presented, and in limited amount. If such examinations are taken within six weeks after formal matriculation they are given without charge. A fee of \$5 is charged if the examination is taken at a later date. Students desiring advanced standing should consult the Students' Work Committee through which arrangements will be made either for the evaluation of credentials or for special examinations.

Filing of Credentials.—Students who have previous records in other institutions are urged to file their credentials for admission with advanced standing as early as possible. This makes possible the determination of the student's present status and the giving of specific advice as to the work which should be taken up.

Graduate Credit.—Under the regulations of the Graduate School credits earned in extension classes may not regularly be counted toward a graduate degree.

REGISTRATION

1. **Registration Dates.**—First semester, September 16 to October 5; second semester, January 27 to February 15. Registrations will be accepted after these dates, on terms stated below, paragraph 6.

2. Registration may be either by mail, or by personal application. Those desiring to register by mail should make application (by mail, telephone, or in person) to the main office of the General Extension Division for registration blanks, program of classes, and other necessary material. These will be promptly supplied so that students may not be delayed in making necessary study of classes offered and in filing registration.

3. The registration blank, consisting of several sections, no one of which should be detached, must be filled out completely according to instructions printed thereon.

4. Registration accompanied by the payment for fees may be mailed to the main office of the General Extension Division, 402 Administration Building, University of Minnesota, Minneapolis. The receipted fee statement, constituting formal acceptance of the registration, will be returned by mail. Registrations with fee payments will be accepted if delivered in person to any of the offices of the General Extension Division.

5. Those desiring to register in person will apply at any one of the offices during their office hours, as listed on inside cover. Students registering for the first time are advised to register in person in order that they may be assisted or advised by those in attendance. A member of the Students' Work Committee is in attendance during the

office hours at the main office, and resident managers in other offices endeavor to be available for most of the registration period.

6. Late Registration.—Students should register before the first meeting of their classes, but they are permitted to register up to and including Saturday of the third week of either semester. For this privilege a late registration fee is charged. For registrations made from Monday, October 7 to Saturday, October 12, for the first semester, and from Monday, February 17, to Saturday, February 22, for the second semester, the fee is one dollar (\$1). Dates are inclusive. Following these periods the fee is two dollars (\$2). The fee applies to each class for which registration is made.

N.B.—Registrations sent by mail and postmarked later than midnight of October 5 for the first semester, and February 15, second semester, will be subject to the late registration fee and will be held up until the fee is paid.

Students desiring to register later than the third week of a semester must secure the approval of the Students' Work Committee.

7. Completion of Registration.—A registration is completed when payment of fees is received; the receipted fee statement mailed to the student is his evidence of completion. Class cards are mailed to the instructor and become his evidence of the completion of the student's registration. The failure of an instructor to receive a class card usually indicates that the registration has failed of completion; the student should make sure of his responsibility in the matter. Matters of irregularity may be referred to the Students' Work Committee. No credit for a class will be granted unless registration is complete.

8. Change of Registration.—Students who desire to transfer from one class to another may do so by making application to the main office of the General Extension Division. There is no fee for transfers. After the third week of the semester such a change requires the approval of the instructor to whose class the change is made. If the change is made after the eighth week of the semester no credit can be allowed for either class involved. Failure to observe this regulation, so that proper record of transfer may be made, may result in loss of credit.

9. Cancellation.—Students who cease to attend a class should have their registration officially cancelled by application to the main office of the General Extension Division. Failure to do this leaves an incomplete record which has the possibility of becoming an embarrassment.

10. Advice on Registration.—The Students' Work Committee of the General Extension Division is ready to advise students regarding a number of matters. Students registering for the first time may learn what classes are most appropriate for them, in view of their preparation. Those planning to earn a certificate, or a degree, may save themselves mistakes in choosing classes which do not count in their courses. Those who have accumulated a number of credits may be advised as to what certificate or degree they should work for, and what classes to choose. Credits may be submitted for evaluation and the determination of advanced standing. Consultations may be had any time either by telephone or by personal interview. Students who wish to make most effective use of their study should not neglect to check their work with the committee.

All candidates for degrees will be directed to the proper official in the college involved, from whom authoritative advice regarding the degree and the appropriate curriculum may be had.

FEES

The usual fee for an extension class meeting once a week, for two hours, and continuing for one semester, carrying 3 credits, is \$10. Wherever the fee is more or less than this standard the amount is stated in the announcement of the class. For classes meeting for two hours and forty-five minutes, and carrying 5 credits, the fee is \$17. Classes in chemistry and other sciences have fees varying with the amount of laboratory involved. These are tuition fees, do not include texts or materials, and are the same for auditors as for regular students.

Laboratory Fees.—These charges for materials or service are made in connection with certain classes where necessary. In most cases they are payable with the tuition, but in classes in chemistry at the Chemistry Department.

Material Fees.—In some classes material is furnished, usually in place of textbooks, and a minimum charge is made, payable at time of registration. All classes involving extra fees are indicated in their description (announcement).

Late Registration.—For the privilege of registration after the regular time a fee is charged, on a schedule set up in paragraph 6, under Registration.

Registration is not complete until fees have been paid. Checks should be for the exact amount due, and made payable to the University of Minnesota.

Special Fees for Examinations.—For the removal of a grade of Condition, examinations are given, for which the fee is \$1. This should be paid before the examination; the grade cannot be recorded until the fee is paid. For special examinations for credit for work done elsewhere a fee of \$5 is charged, except under conditions specified on page 6 (Advanced Standing). This exception applies to comprehensive examinations given for credit in the College of Engineering and Architecture.

Refunds.—Students who cancel their registration before the ninth week of a semester may obtain a pro rata refund of the tuition fee according to a scale established by the Board of Regents, provided written notice is given any office of the General Extension Division at the time of cancellation. **No refund is made after the eighth week of a semester, or the sixth week of a quarter, nor to a member of a special class organized on a minimum registration.** Two dollars (\$2) of each fee is non-refundable, being withheld to cover registration expense. Remittance of refunds by mail requires a period of time, but immediate refunds may be had by making application in person between 9:00 a.m. and 12:00 m. or 1:00 and 3:00 p.m., at the campus office of the General Extension Division.

EXTENSION STUDENT LOAN FUND

The General Extension Division has at its disposal a fund from which it can make loans for tuition to needy and worthy students. Prospective students who find it difficult or impossible to pay tuition fees should make application to the director for assistance.

STUDENTS' WORK REGULATIONS

Admission.—Students are accepted in extension classes whenever they manifest the desire, the maturity, and the ability to profit by the work. No university entrance requirements need be met. The only provision is that students shall be of such ability that their presence in a class will not impair the work of the rest of the class. Instructors will be the judges of this ability. In some classes of an advanced nature admission will be conditional on experience or preparation. No regulation is intended to exclude any student who can profit by the work. (For details dealing with regularly matriculated students, dropped students, see under Admission, page 4.)

Normal Load.—The maximum amount of extension work to be carried by students regularly employed in some vocation is 9 or 10 credit hours, the equivalent of 3 three-credit or 2 five-credit classes, per semester. Twelve credit hours may be allowed by permission of the Students' Work Committee, provided the student's record of a previous semester shows an average of 1½ honor points per credit hour. Permission for more than 12 credit hours may be granted under exceptional circumstances.

Correspondence Study.—Students may be enrolled for both extension classes and correspondence study courses only with the permission of the Students' Work Committee. The amount of work taken by such a combination may not exceed the permissible maximum stated in the paragraph above.

Attendance.—Attendance at every meeting of a class is expected; success in the work of a class is based on this attendance. Instructors are required to report continuous absences in order that the Students' Work Committee may inquire into the causes of absence and the student's intentions, may recommend what may be best for the student, and determine the student's status. Such inquiry and recommendation is entirely in the interest of the student and in no sense disciplinary; extension students are in classes for very definite purposes, are quite competent to govern their comings and goings, and may be trusted to give the attendance necessary to the accomplishment of their purposes.

Examinations.—Examinations in all classes are given during the last week of each semester. All students desiring credit must pass these examinations.

Other examinations or quizzes are entirely at the option of the instructor.

Examinations for the removal of the grade of Condition (E) will be given on application at a time and place agreed upon by the student and the instructor. A fee of one dollar (\$1), payable at any office of the General Extension Division, is charged for a condition examination.

Special examinations for advanced standing or for credit for work done elsewhere will be given on application. (See page 6.)

Grades—Four grades, A, B, C, and D are given for work of varying degrees of merit, D being the lowest passing grade. Work below passing is marked E, a condition, or F, a failure. Work which is of at least D grade, but for acceptable reasons not complete, may be marked I, incomplete, provided not more than one fourth remains incomplete.

A condition is a temporary grade representing a deficiency which may be made up without repeating the course. It may be removed by additional work, by an examination, or by both. If not removed within two semesters following the resumption of the student's extension class work it becomes a failure. Pending such removal the student may register for a continuation or dependent class in a succeeding semester. The permanent grade resulting from the removal of a condition may not be higher than C.

A failure represents a deficiency so serious that the student must repeat the course in order to obtain credit in it. Following a failure the student will not be permitted to register for a continuation class.

Incomplete work may be completed in any way the instructor may prescribe, and should have the student's earliest attention. If this is not done within two semesters following the resumption of the student's extension class work the grade becomes a condition or a failure, as the instructor may elect, subject to the rules applying to those grades.

Credits and Honor Points.—Credits are used to indicate the amount of work done, in terms of the time spent in classes and in preparation for them. It is expected that at least two hours will be spent in preparation for every hour spent in class. Quality of work is expressed in honor points assigned to the several grades. Each credit with a grade of C carries one honor point; of B, two; of A, three. The grade D carries no honor point, and the grade F one minus honor point which cannot be cancelled by repeating the course with a passing grade.

Most of the colleges of the University make use of these honor points in determining student status, requiring an average grade of C (one honor point per credit) for graduation, and making concessions to students with higher ratings. Students in extension classes who are seeking degrees should consult an officer of the college in which a degree is sought regarding the status of honor points in that college. The General Extension Division requires a C average for all its certificates.

Grade Reports.—Reports of students' grades are sent to the office of the university registrar at the close of each semester. A report of each student's grades and credits is sent from that office, and will not be furnished by the office of the General Extension Division.

Instructors are required to report at each mid-semester all grades below D, on the work so far completed. On the basis of these reports students are advised and counselled by the Students' Work Committee.

The Students' Work Committee.—This committee of the General Extension Division has direct supervision of the work done by students of the division. It functions in an advisory capacity for those desiring information about the sequence of courses, certificates, relation of extension classes to the work of other colleges, credits presented from other colleges, the organization of a program of study, and other similar matters. For candidates for degrees it offers its services in securing the advice and direction of the proper officials of the college concerned, from whom only can issue authoritative information.

Appointments with the committee may be made at any time by application at any office of the General Extension Division. Under ordinary circumstances these conferences should be held during usual business hours; during registration periods these hours are extended to the evening; at other times special appointments may be made as necessary.

STUDENT SEASON ATHLETIC BOOKS

The student season athletic book admits to all intercollegiate athletic events, except swimming, during the college year. It is a privilege book and consequently the privilege may be denied to any student who violates any of the conditions under which the book is issued.

Who May Purchase.—Any student enrolled in any department of the University, including Graduate, Extension, etc., whether regular or special, and carrying a minimum scholastic load of three quarter credits, who presents a receipted fee statement at the time of the sale, covering a course of study running concurrent with the time for which the book is issued, is entitled to purchase one book if single, or two if married. Students in correspondence study courses are not eligible to this privilege.

The privilege books must be exchanged the first week in January for new privilege books, covering the winter and spring sports schedule. This exchange will not be made unless a receipted fee statement for the winter quarter or second semester is presented, except that extension students may make this exchange without a fee statement by paying a \$2 transfer fee per ticket, and thus obtain the privilege books for the winter and spring schedules. **This transfer fee will be applied to the registration fee for the second semester if the extension student enrolls for the second semester.** If the student fails to enroll for the second semester of the same academic year, the exchange ticket may be used for all remaining winter and spring sports, but the transfer fee will be retained by the Department of Athletics.

The price of the student book is \$7.

Where Purchased.—The sale begins Freshman Week each year and ends the day before the first game. Books may be purchased at the Minneapolis or St. Paul offices of the Extension Division or at the ticket booth in the Administration Building. Extension students are expected to make their purchase through the office where they register. They must appear in person with fee statement. If the student is buying an additional book for husband or wife, the husband or wife must also be present at the time for the purpose of photographic identification.

Seat Location.—At football games the seat location will be in the student section, the exact seat to be determined by lottery. This section is not open to nonstudents nor can students sit outside of this section. Nonstudents will not be admitted to the section at basket-ball games. For all other events the book admits to unreserved sections.

Cancellation of Registration—Refunds.—The student season book is a privilege extended to students only and it becomes void the moment an individual ceases to be a student in the University whether by cancellation of registration, expulsion, or in any other manner. The book is not transferable and cannot be resold, nor will the purchase price be refunded after the book has been used for any event except in cases where the student is required, by the University, to cancel his registration.

SCIENCE, LITERATURE, AND THE ARTS CLASSES

The classes offered in this department are selected from the program of the College of Science, Literature, and the Arts, or from classes offered by other colleges but carrying credit in the College of Science, Literature, and the Arts. This selection makes available a portion, at least, of the university offerings in liberal arts to those who may be interested in pursuing a college degree, and also to those who are interested in exploring for their own satisfaction the various fields of human knowledge.

Candidates for Degrees.—All students who have the slightest desire or hope to acquire a Bachelor's degree should consult the Students' Work Committee regarding the details of the completion of the work of the Junior College, the application for acceptance in the Senior College, and the appointment of a major adviser. The assistant dean and advisers in the Senior College are ready to give their assistance but application must be properly made. Students should make no delay but ascertain early their status. The college requires that 45 credits be completed subsequent to the student's acceptance.

EXTENSION CERTIFICATES

Credits earned in this department may be applied towards either of two certificates which are offered by the General Extension Division for the completion of 90 credits of work, the equivalent of two years' full time residence in the University. These certificates are as follows:

Junior College Certificate.—Requirements for this certificate correspond to the requirements for the first two years of the work of the College of Science, Literature, and the Arts. These represent one half of the work for a Bachelor's degree, and consequently, all of the credits must conform to degree standards as to the subjects and courses involved, prerequisites, and correspondence to similar courses offered in day classes. In addition, a candidate for this certificate must have met university entrance requirements, (see page 5).

I. To obtain this certificate the student must earn 90 credits and must maintain a C average. (Honor points may not be counted to reduce the total of 90 credits, but they may be applied whenever these credits are employed in meeting the requirements of a degree in the Senior College of Science, Literature, and the Arts.)

II. The following group requirements must be met :

1. English Composition 4-5-6 (9 credits) or English A-B-C (15 credits) or exemption from the requirement. All students desiring to register for these classes will take a placement test. See page 3.
2. Foreign Language. A total of 20 credits (18 if in 3-credit units) in one foreign language, in high school and college courses combined. For every full year of such language presented for entrance, the above requirement shall be reduced 5 credits. Students, for instance, who have had two years of a foreign language in high school may complete by taking 10 credits in that same language in college courses.

The work done in English or a foreign language may be counted toward the subject requirement in Group A.

3. Ten credits (9 if in 3-credit units) in each of five subjects, one to be chosen from each of Groups A, B, C, and two to be chosen at large from Groups A, B, C, D.

Group A. *Humanities*: English and foreign languages and literature, speech, music, fine arts.

Group B. *Social Studies*: Anthropology, economics, geography, history, political science, sociology.

Group C. *Natural Sciences*: Astronomy, botany, chemistry, geology (including laboratory), physics, psychology (including laboratory), zoology.

Group D. Philosophy, mathematics.

III. These credits may be earned in any classes offered by the University, or by correspondence study courses, or may be transferred from another accredited institution under the regular university rules of transfer.

IV. Students who have, previous to September, 1934, begun work on these requirements under the provisions existing at that time may complete under those provisions.

V. These requirements may be modified to conform to the requirements for admission to specific schools and colleges of the University, such as the prebusiness, premedical, pre dental, or other requirements. Specific information regarding this will be given by the Students' Work Committee.

VI. A student may not count credits for the beginning courses (two semesters) in more than one foreign language (exclusive of Greek and Italian), except on petition.

VII. The requirements in Physical Education and Military Science and Tactics, which cannot be offered in extension, are considered as postponed until such time as the student may enter the Senior College.

The order in which the credits are accumulated is not material. It is always best to take classes in one subject in their regular order, each preparing for that which follows. Outside of this, subjects or classes may be taken in any order to suit the student.

Liberal Education Certificates.—In contrast to the Junior College certificate this represents work that may be done without regard to any degree requirements, any particular sequence of classes, or prerequisites, except ability of the student to do the work of the class. The requirements are reduced to a minimum, that minimum being quite flexible; they are a requirement in English, a breadth or spread requirement, and a concentration requirement. The details are as follows:

1. English—9 credits, in any classes for which student has preparation.
2. Spread—at least 6 credits, two classes, in each of the three following fields: natural sciences (astronomy, botany, chemistry, geology, physics, psychology, zoology, or mathematics); social science (anthropology, economics, geography, history, political science, sociology); arts or humanities (fine arts, languages, philosophy, speech). Total, 18 credits.
3. Concentration—at least 18 credits in one subject, or in closely related subjects.
4. Electives—45 credits. To make a total of 90. All elections may be made regardless of college lines, as student interest dictates.

This certificate is recommended to those who are not interested in a college degree, but nevertheless wish to pursue their study with some sort of system and organization.

All extension classes are open to registration by any person qualified by maturity and ability to profit by the study. In practically all cases only those who expect to qualify for a university degree will be expected to meet the requirements of prerequisites. **PREREQUISITES ARE STATED FOR INFORMATION, NOT AS OBSTACLES.**

DESCRIPTION AND PROGRAM OF CLASSES

ACCOUNTING

(See Business Classes, page 34)

ADVERTISING

(See Business Classes, page 36)

ANATOMY

5 Human Anatomy. 4 credits. \$13.50.

Primarily for students in physical education. Study of dissected specimens, but no dissection. No prerequisites.

FIRST SEMESTER

MT 7:30 Campus Anatomy 304, Erdmann

Phys.Ed.22 Kinesiology. 4 credits. \$13.50.

The science of muscle movement; especially of the therapeutic use of these movements. Prereq., for degree, see instructor.

SECOND SEMESTER

MT 6:20 Campus Anatomy 304, Erdmann

ART

(See Fine Arts, p. 15; Art Education, p 28; Engineering, p. 42; Cartooning, p. 13)

ASTRONOMY

11 Descriptive Astronomy. 3 credits. \$10.

The general principles and fundamental facts of astronomy; illustrated by lantern slides, simple problems, and naked eye and telescopic observations. Higher mathematics not necessary. No prerequisites.

FIRST SEMESTER

W 6:20 Campus Physics 166, Luyten

13 Practical and Stellar Astronomy. 3 credits. \$10.

Supplements Astronomy 11, which however is not prerequisite; higher mathematics not necessary. A detailed description of the constellations and individual stars, the structure of the sidereal universe, and such problems as the determination of time from the stars; extended opportunity for the use of the telescope and the observation of the heavenly bodies.

SECOND SEMESTER

W 6:20 Campus Physics 166, Luyten

BACTERIOLOGY

41 General Bacteriology. 5 credits. \$17 and \$2 laboratory fee.

Culture media; methods of staining and identification; principles of sterilization and disinfection; examination of air, water, milk; relation of bacteriology to the industries. Prereq. for degree, 10 cred. in chemistry and 10 cred. in biology.

FIRST SEMESTER

TTh 7:30 Campus Millard 214, Gunderson

102 Special Bacteriology. 4 credits. \$13.50 and \$2 laboratory fee.

The pathogenic bacteria especially in relation to definite diseases; principles of infection and immunity. For technicians and others. Prereq. for degree: Bact. 41.

SECOND SEMESTER

TTh 7:30 Campus Millard 214, Gunderson

116 Immunity. 3 credits. \$10 and \$2 laboratory fee.

General and special laboratory technique; immunological phenomena; preparation of vaccines; production and collection of immune sera; demonstrations of various immune substances; technique of forensic blood tests, the Wasserman test, modified Wasserman, and the Kahn test; allergy, anaphylaxis, atopy; blood grouping. Primarily for technicians; for prerequisites for credit, see instructor.

FIRST SEMESTER

MW 7:30 Campus Millard 214, Gunderson

Bacteriological Methods. 5 credits. \$17 and \$2 laboratory fee.

A laboratory course in standard and approved methods for the bacteriological examination of water, milk, and foods; preparation and use of standard culture media; methods for standardization of germicides. Prereq., Bact. 41.

FIRST SEMESTER

TTh 7:30 Campus Millard 201, Skinner

AIR CONDITIONING*(See Engineering Classes, page 45)***BIRDS OF MINNESOTA***(See Zoology, page 27)***BOTANY****1 General Botany.** 4 credits. \$13.50.

A survey lecture course on plants and their human interest, contributing to liberal culture; characteristics of living matter; fundamental facts of structure, growth, and reproduction; relation of plants to their environment and to each other; principles underlying inheritance, variation, plant breeding, and organic evolution. No prereq.

FIRST SEMESTER
M 6:20-8:30 Campus Botany Aud., Huff

10ex Minnesota Plant Life. 3 credits. \$10.

A study of our native wildflowers, trees, shrubs, ferns, liverworts, mosses, lichens, and mushrooms. A class for teachers, camp and scout leaders, and all who would know more of their native plants and their habits. No prerequisites.

SECOND SEMESTER
M 8:05 Campus Botany 4, Huff

Home Gardening I. No credit. 17 weeks. \$10.

A class for those who want home surroundings beautiful with growing things, and like to take a hand in the growing process. Attention to soil and seeds; planting and transplanting; propagation of plants, shrubs, annual and perennial plants and vines; designing a garden; care and maintenance—in fact just the things a home gardener needs, and wants to know. Lectures, demonstrations, discussions, and projects for working out—practical and instructional. Open, without prerequisites, to all who are interested.

SECOND SEMESTER
W 8:05 Campus Botany 5, Phillips

Home Gardening II. No credit. 17 weeks. \$10.

A continuation of Home Gardening I dealing with special gardening problems in greater detail: garden construction and maintenance, fall work in the garden, plant propagation and culture, with some attention to indoor gardening or house plant culture. Lectures, demonstrations, and student projects. Open to all.

FIRST SEMESTER
W 8:05 Campus Botany 5, Phillips

Garden Design and Materials. No credit. 17 weeks. \$10.

An introduction to the principles and practices of landscape design, especially for amateur gardeners who wish to know more about planning as well as planting gardens and home grounds; combined with a study of plant materials—trees, shrubs, vines, and herbaceous plants with special reference to their use and importance in landscape gardening. Illustrated lectures and design problems a feature. Open to all.

FIRST SEMESTER
T 8:05 Campus Botany 4, Phillips

CARTOONING**Cartooning.** Extension credit only. \$10 each quarter.

Principles and art of devising and drawing cartoons for reproduction in newspapers and magazines; the problem of the cartoon so far as its message is concerned; the technique of drawing with especial reference to reproduction and individual style; the comic strip, the political cartoon, etc. No previous training in drawing necessary. Students furnish their own materials. Meets once a week for two and one half hours.

First Quarter, October 2 to December 11
Second Quarter, January 8 to March 18
Third Quarter, April 7 to June 10
W 7:00 Campus Jones 207B, Asch

CHEMISTRY*(See Engineering Classes, page 42)***CHILD WELFARE****40 Child Training.** 3 credits. \$10.

The physical and mental development of the child; the training of young children; behavior problems and their various aspects; technique of good and bad management. Prereq. for degree, Psy. 1-2.

FIRST SEMESTER SECOND SEMESTER
M 8:05 St. P. Ext. Center 200, Cummings M 7:30 Mpls. N. W. Bank Bldg. 690, Faegre

80 Child Psychology. 3 credits. \$10.

A survey of child development with special reference to nursery school and kindergarten. Prereq., Psy. 1-2.

FIRST SEMESTER
T 7:30 Campus Folwell 105, McGinnis

82ex Later Childhood and Adolescence. 3 credits. \$10.

The meaning of adolescence; growth and personality development; vocational guidance; sex education, social adjustment, and emancipation from the family. Prereq., Psy. 1-2.

FIRST SEMESTER SECOND SEMESTER
T 7:30 Mpls. N. W. Bank Bldg. 690, Faegre T 7:30 Campus Folwell 105, McGinnis

Clinical Dynamics in School Children. See Preventive Medicine, page 32.

ECONOMICS

(See Business Classes, page 38)

ENGLISH*Courses in Composition***Subfreshman Composition.** No credit. \$7.50.

Intensive drill on grammatical forms, punctuation, sentence structure, and theme writing; for those not prepared to carry successfully Eng. 4-5-6. Satisfactory completion admits to Composition 4 without placement test.

FIRST SEMESTER SECOND SEMESTER
T 6:20 Campus Folwell 212, Litchfield T 6:20 Campus Folwell 212, Litchfield
W 8:05 St. P. Ext. Center 201, Litchfield

A-B-C Freshman English. 5 credits each semester. Met by completion of Composition 4-5-6 (see next below) and Eng. 1-2-3 (see Freshman Literature below).

4-5-6 Freshman Composition. 3 credits each semester. \$10.

Practical training in writing, largely exposition, analysis of specimens of good prose; reports on assigned readings. Designed for students having the equivalent of high school English, presupposes a mastery of spelling, grammar, and punctuation.

N.B.—All students registering for Composition 4 will take required tests in English before permanent assignment to classes. See page 3.

FIRST SEMESTER SECOND SEMESTER
4 M 6:20 Campus Folwell 226, Avery 4 T 6:20 Campus Folwell 226, Nolte
T 8:05 Campus Folwell 226, Avery
W 6:20 Campus Folwell 226, Scallon W 8:05 St. P. Ext. Center 203, Kerr
Th 8:05 St. P. Ext. Center 204, Nolte
5 M 6:20 Campus Folwell 204, Grandy 5 M 6:20 Campus Folwell 226, Avery
Th 8:05 St. P. Ext. Center 204, Avery
6 M 6:20 Campus Folwell 202, McFadyen 6 M 6:20 Campus Folwell 204, Grandy
Th 6:20 St. P. Ext. Center 204, Nolte

27-28† Sophomore Composition. 3 credits each semester. \$10. Both required for credit.

The first two quarters of a course newly adopted in the Department of English, covering Exposition in the first semester, and Description and Narration in the second. It replaces Courses 11-12, and 18-19, previously offered and should be elected by those wishing to go on with a writing course following Comp. 4-5-6. The latter, or exemption, is prerequisite.

FIRST SEMESTER SECOND SEMESTER
27 Th 6:20 Campus Folwell 204, Christie 28 Th 6:20 Campus Folwell 204, Christie

69-70† Short-Story Writing I and II. 3 credits each semester. \$10. Both required for credit.

The technique of the short story with constructive work in story writing. For those with experience in writing. Prereq., junior standing, average of B in two semesters of 27-28, 29 or 65.

FIRST SEMESTER SECOND SEMESTER
69 M 6:20 Campus Folwell 205, Briggs 70 M 6:20 Campus Folwell 205, Briggs

91-92 Seminar in Writing (Advanced Short Story). 3 credits each semester. \$10.

For advanced students who write with facility and desire personal direction. Criticism of manuscript submitted. Prereq., senior standing and 9 credits in Senior College courses.

FIRST SEMESTER SECOND SEMESTER
91 M 8:05 Campus Folwell 304, Phelan 92 M 8:05 Campus Folwell 304, Phelan

31ex English for Everyday. No credit. \$10.

Drill in the mechanics of good English, clearing up common errors in grammar, usage, sentence structure, for those grown careless or puzzled as to correct form, or for teachers desiring a simple method for language fundamentals. No prereq.

FIRST SEMESTER
W 6:20 Campus Folwell 202, Hayes
M 6:20 St. P. Ext. Center 204, Hayes

Vocabulary Building. See Speech Classes, page 26.

Business English. See page 38.

Classes in Literature

1-2-3 Freshman Literature. 2 credits each semester. \$7.

A beginning course in the study and appreciation of English literature. Forms the literature part of Eng. A-B-C (5 credits each) offered to beginning students in the College of Science, Literature, and the Arts; the requirements of this sequence may be met by the completion of Eng. 1-2-3 and Comp. 4-5-6. Course 1, Prose; Course 2, Drama; Course 3, Poetry. No prereq. Students may enter either semester.

| FIRST SEMESTER | | | SECOND SEMESTER | | |
|----------------|------|-------------------------------|-----------------|------|-------------------------------|
| 1 M | 8:05 | Campus Folwell 226, Avery | 2 M | 8:05 | Campus Folwell 204, Avery |
| 3 Th | 6:45 | St. P. Ext. Center 206, Avery | 1 Th | 6:45 | St. P. Ext. Center 205, Avery |

21-22-23 Introduction to Literature. 5 credits each semester. \$17. Meets one period of 3 hours each week. Two consecutive semesters necessary for credit. Students may enter any semester.

A survey of English literature, as to history and types of writing. 21, pre-eighteenth century; 22, eighteenth century; 23, nineteenth century. Prerequisite to major sequence; 22 and 23 required for teacher's certificate. Prereq., Comp. 4-5-6 or exemption.

| FIRST SEMESTER | | | SECOND SEMESTER | | |
|----------------|------|---------------------------------|-----------------|------|---------------------------------|
| 23 W | 6:20 | Campus Folwell 204, Avery | 22 W | 6:20 | Campus Folwell 204, Avery |
| 22 M | 6:20 | St. P. Ext. Center 206, Hessler | 21 M | 6:20 | St. P. Ext. Center 206, Hessler |

Judging Modern Books and Plays. See Journalism Classes, page 18.

A class designed to assist the reader in passing rather critical judgment on books and plays as they appear. Open to all, with or without credit.

40-41 Bible As Literature I and II. 3 credits each semester. \$10.

A study of the Bible with relation to the history out of which it grew, with special attention to literary form. First semester (40) deals with history and biography, second semester (41) with prophecy and poetry. Prereq., Comp. 4-5-6.

| | | SECOND SEMESTER | |
|--------------------------|--|-----------------|---|
| (41 not offered 1935-36) | | 40 T | 4:30 Mpls. N. W. Bank Bldg. 603, Powell |
| | | M | 4:15 St. P. Ext. Center 204, Powell |

55-56 Shakespeare I and II. 3 credits each semester. \$10. Both required for credit.

Shakespeare's development as a dramatist; a careful study of a selected list of plays. Prereq., Comp. 4-5-6 or exemption, and 6 additional credits or 10 credits in 21-22-23.

| FIRST SEMESTER | | SECOND SEMESTER | | | |
|----------------|------|-----------------------------|------|------|-----------------------------|
| 55 W | 6:20 | Campus Folwell 205, Nichols | 56 W | 6:20 | Campus Folwell 205, Nichols |

73-74 American Literature I and II. Not offered 1935-36.

62 Milton. 3 credits. \$10.

The man and his poetry, with some consideration of his contemporaries. Prereq., Eng. 21-22, or 55-56.

| | | SECOND SEMESTER | |
|--|--|-----------------|---|
| | | Th | 4:30 Mpls. N. W. Bank Bldg. 690, Powell |
| | | W | 4:15 St. P. Ext. Center 204, Powell |

129 Modern Drama. 3 credits. \$10.

Contemporary drama from 1880 to the present time. Prereq., 6 cred. above 50, incl. 55-56.

| FIRST SEMESTER | |
|----------------|--------------------------------------|
| T | 6:20 St. P. Ext. Center 201, Scallan |

FINE ARTS

For technique classes see Art Education, p. 28, Engineering classes, p. 42, and Cartooning, p. 13; Psychology of Art, p. 22.

Art for Everyday. No degree credit. Meets 3 hours weekly. \$10 and \$1.50 materials fee.

Understand and enjoy art through participation. All of the principles underlying art forms, from the funny page to the Sistine Madonna, from a cabin to a cathedral, are easily understood and applied when to their explanation is added some experience in using them. This class will have an hour's lecture and discussion of principles and their application, with many illustrations, and then will follow a two-hour laboratory period where each student may experiment with any and all art media, from finger-painting to sculpture, and learn to make his own applications, each in his own way. Not a class for professional or technical training but an opportunity for those who just like art to get a better understanding of it. Open to all, regardless of art ability.

| FIRST SEMESTER | | SECOND SEMESTER | | | |
|----------------|------|------------------------------------|---|------|------------------------------------|
| W | 6:20 | Campus Wesbrook 206, 301, Faulkner | W | 6:20 | Campus Wesbrook 206, 301, Faulkner |

History of Painting, Sculpture, Architecture, etc. Not offered 1935-36.

GARDENING

(See Botany Classes, page 13)

GEOGRAPHY

51 Human Geography. 5 credits. \$17. Basic for all geography classes. Meets once a week for three hours.

A study of the factors of the environment (space relationships, climate, soils, drainage, topography, mineral wealth, contact with the sea, fauna and flora) with particular reference to their limiting effect on man's activities. Projects of current interest such as the Shelter Belt, the Boulder Dam Project, and others are used as illustrative material.

FIRST SEMESTER

T 6:20 Campus Burton 103, Davis
W 6:20 St. P. Ext. Center 206, Davis

41 Commercial Production. 5 credits. \$17. Meets once a week for three hours.

The geographic basis for the production of the principal commodities which enter into world trade. No prereq.; Geog. 51 recommended.

FIRST SEMESTER

W 6:20 Campus Burton 103, Hartsborne

53 Historical Geography. 3 credits. \$10.

A study of the geography of past periods of American history. Prereq. for degree, Geog. 51 or 15 cred. in hist.

SECOND SEMESTER

W 6:20 Campus Burton 103, Brown

71 Geography of North America. 3 credits. \$10.

The geographic regions of North America and their development as affected by the physical environment. Prereq. for degree, Geog. 51.

FIRST SEMESTER

Th 6:20 Campus Burton 103, Dicken

101 Geography of Europe. 3 credits. \$10.

The major geographic regions of Europe with emphasis upon the economic activities and their geographic basis. Prereq. for degree, Geog. 51.

SECOND SEMESTER

T 6:20 Campus Burton 103, Hartsborne

120 Geography of Asia. 3 credits. \$10.

Areal differentiation in the major geographic regions of Asia; special consideration of China, Japan, and India. Prereq. for degree, Geog. 51.

SECOND SEMESTER

W 6:20 St. P. Ext. Center 206, Davis

GEOLOGY

1 General Geology (Dynamic). 3 credits. \$10.

A General Geology Laboratory. 2 credits. \$7.

These classes, 1 and A combined, constitute Geology 1 of the College of Science, Literature, and the Arts.

An introductory treatment of the materials of the earth and the geologic processes; principles of earth sculpture, glaciation, volcanic activity, mountain building, etc.; geologic occurrence of gems, ores, oils, and other economic mineral resources. No prereq.

N.B.—Registrations may be made for the combined classes or for Geol. 1 alone. Students who have already completed 3 credits in Geol. 1 or 8 may register for Geol. A.

FIRST SEMESTER

1 T 6:20 Campus Pillsbury 210, Thiel
A T 8:05 Campus Pillsbury 220, Dutton

2 Historical Geology. 3 credits. \$10.

B Historical Geology Laboratory. 2 credits. \$7.

These classes, 2 and B combined, constitute Geology 2 of the College of Science, Literature, and the Arts.

A study of the changing geology and life of the earth during the geologic past as interpreted from the rock record. Prereq. for degree, Geol. 1 or 8.

N.B.—Registrations may be made for the combined classes, or for Geol. 2 alone. Students who have already completed 3 credits in Geol. 2 may register for Geol. B.

SECOND SEMESTER

2 T 6:20 Campus Pillsbury 210, Dutton
B T 8:05 Campus Pillsbury 210, Dutton

4 Geology of Minnesota. 3 credits. \$10.

The influence of geologic processes and their results as seen in the geology of the iron ranges, the granite districts, the areas of sedimentary rocks, the state parks, and the lake regions of Minnesota. Prereq. for degree, Geol. 1 or 8 and 2.

FIRST SEMESTER

Th 6:20 Campus Pillsbury 210, Thiel

19 Geology of Our National Parks. 3 credits. \$10.

A study of the relation between the present form of the land surfaces with the geologic structure, with regard to the physiographic subdivisions of the United States; emphasis on areas of special interest, such as the national parks. Prereq. for degree, Geol. 1 or 8 and 2.

SECOND SEMESTER

Th 6:20 Campus Pillsbury 210, Dutton

25 Elements of Rock Study. 3 credits. \$10.

A study of rock-forming minerals and of igneous, sedimentary, and metamorphic rocks, their occurrence and classification. For prerequisites for degree consult instructor.

FIRST SEMESTER

Th 6:20 Campus Pillsbury 100, Gruner

GERMAN

1-2-3 Beginning German A, B, C. 5 credits each. \$17.

N.B.—Classes in German 1-2-3-4 are offered in 5-credit units to correspond with regular day classes, meeting one period a week for 3 hours, each course counting as equivalent to one year preparatory school German.

FIRST SEMESTER

1 M 6:20 Campus Folwell 207, Davies
Th 6:20 St. P. Ext. Center 200, Downs
3 M 6:20 Campus Folwell 206, Wangness
T 6:20 St. P. Ext. Center 200, Prottengeier

SECOND SEMESTER

2 M 6:20 Campus Folwell 207, Davies
Th 6:20 St. P. Ext. Center 200, Downs

4 Intermediate German. 5 credits. \$17.

Modern narrative prose. Prereq., 3.

SECOND SEMESTER

M 6:20 Campus Folwell 206, Wangness
T 6:20 St. P. Ext. Center 200, Prottengeier

17 German for Graduate Students. No credit. \$10.

Enables candidates for advanced degrees to acquire a reading knowledge of German. Presupposes no knowledge of the language.

FIRST SEMESTER

M 6:20 Campus Folwell 212, Lussy

SECOND SEMESTER

M 6:20 Campus Folwell 212, Lussy

50-51-52 German Composition and Conversation. 3 credits each semester. \$10.

A practical course in oral and written German; makes use of matters common in everyday speaking and writing. Course 50 and first half of 51 in first semester, balance in second. Prereq., German 4.

FIRST SEMESTER

Th 6:20 Campus Folwell 202, Pfeiffer

SECOND SEMESTER

Th 6:20 Campus Folwell 202, Pfeiffer

GOLF

(See Physical Education Classes, page 31)

GREEK (in English)

45 Greek Mythology. 3 credits. \$10. No knowledge of Greek required.

The origin and evolution of the myth, its relation to the literature, philosophy, religion, and art of ancient Greece, its influence on later literature. Illustrative readings and lectures with stereopticon. No prereq.

FIRST SEMESTER

M 7:00 Mpls. Pub. Lib., Savage
W 7:00 St. P. Pub. Lib. 6, Savage

43 Greek Drama. 3 credits. \$10. No knowledge of Greek required.

Reading and interpretation of representative Greek plays. Lectures dealing with the origin, growth, character, and influence of the Greek drama; stereopticon illustrations. No prereq.

SECOND SEMESTER

M 7:00 Mpls. Pub. Lib., Savage
W 7:00 St. P. Pub. Lib. 6, Savage

HISTORY

1-2† The Modern World. 5 credits each semester. \$17.

Political, social, and economic factors. Course 1—1500-1799; Course 2—1799 to the present. Both required for credit. Meets 3 hours once a week. No prereq.

FIRST SEMESTER

1 M 6:20 Campus Folwell 104, Mudgett
T 6:20 St. P. Ext. Center 206, Mudgett

SECOND SEMESTER

2 M 6:20 Campus Folwell 104, Mudgett
T 6:20 St. P. Ext. Center 206, Mudgett

7-8† American History. 3 credits each semester. \$10. Hist. 7-8-9 required for credit.

Course 7—1766-1840; 8—1840-1877. No prereq.

| | | | | | |
|-------------------------------|--------|--------------------------------|---|--------|------------------------------|
| <small>FIRST SEMESTER</small> | | <small>SECOND SEMESTER</small> | | | |
| 7 | T 6:20 | Campus Folwell 104, Kane | 8 | T 6:20 | Campus Folwell 104, Kane |
| M | 6:20 | St. P. Ext. Center 200, Kane | M | 6:20 | St. P. Ext. Center 200, Kane |

9 Recent American History (Since 1877). 3 credits. \$10.

Special emphasis on the social and economic factors. Prereq., Hist. 7-8.

FIRST SEMESTER
W 6:20 Campus Folwell 104, Kane

56-57-58† Early Modern European History. 3 credits each semester. \$10.

57, French Revolution, first semester, 58, Napoleonic Era, second; 56, not offered 1935-36. Prereq. for degree, junior standing. All three required for credit.

| | | | | | |
|-------------------------------|--------|--------------------------------|----|--------|--------------------------|
| <small>FIRST SEMESTER</small> | | <small>SECOND SEMESTER</small> | | | |
| 57 | T 8:05 | Campus Folwell 104, Kane | 58 | T 8:05 | Campus Folwell 104, Kane |

83-84-85† American Economic History. 4½ credits each semester. \$15.

American economic life in the colonial, early and later national periods. Course 83 and half of 84 in first semester; remainder in second. Prereq. for degree, junior standing. All required for credit.

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|-------------------------------|------|--------------------------------|----|------|-----------------------------|
| <small>FIRST SEMESTER</small> | | <small>SECOND SEMESTER</small> | | | |
| Th | 6:20 | Campus Folwell 104, Mudgett | Th | 6:20 | Campus Folwell 104, Mudgett |

Current Problems in Light of American History. No degree credit. Meets alternate weeks. \$5.

A lecture and discussion study of basic problems and movements in American history known to be related to the social, political, and economic problems of today; some of the problems: Federal Power versus State Rights, Farmer-Debtor Movement (agrarian and populist), "Sound Money" versus Inflation, Labor Movement, Growth and Control of Capital, Trusts, etc. A class for those not satisfied with traditional history teaching, and seeking interpretations. No prereq. Begins October 3 on campus, October 7 in St. Paul; second semester, February 13 on campus, February 17 in St. Paul.

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|-------------------------------|------|--------------------------------|----|------|------------------------------|
| <small>FIRST SEMESTER</small> | | <small>SECOND SEMESTER</small> | | | |
| Th | 6:20 | Campus Folwell 105, Kane | Th | 6:20 | Campus Folwell 105, Kane |
| M | 8:05 | St. P. Ext. Center 205, Kane | M | 8:05 | St. P. Ext. Center 200, Kane |

HOME ECONOMICS

Interior Decorating. See Educational Classes, page 28.

Textiles. See Business Classes, page 39.

JOURNALISM

13 Introduction to Reporting. 3 credits. \$10.

A study of news, its sources, methods of finding and gathering; correct style of written presentation; brief survey of the place and purpose of the newspaper and the processes of newspaper production. Prereq. for degree, Eng. Comp. 4-5-6, or exemption.

FIRST SEMESTER
W 8:05 Campus Folwell 5, Steward

69 Newspaper and Magazine Articles. 3 credits. \$10.

The special feature article; typical subjects and their preparation for magazines, trade papers, Sunday newspapers, syndicates, house organs, etc.; the qualities that make stories salable, and the market; principles of illustration. Prereq., Introduction to Reporting 13.

SECOND SEMESTER
W 8:05 Campus Folwell 5, Steward

76 Judging Modern Books and Plays. 3 credits. \$10. Equivalent to Critical Writing.

A class for the reader who wishes to approach modern works with a better discrimination; not a technical journal class. Standards of judgment and the need for them; application to fiction, poetry, essays, biography, criticism, humor, scientific and philosophical writings; the modern theater and its development; the work of the dramatic critic; the motion picture and its present stage of development; responsibility of reviewers. Open to all; degree students consult instructor for prerequisites.

FIRST SEMESTER
T 8:05 Campus Folwell 110, Ford

MATHEMATICS

(Numbers of the classes are those used in the College of Science, Literature, and the Arts)

20a&b Mathematics of Investment. 3 credits each semester. \$10.

The principles of the mathematical theory of Interest, Annuities, Amortization, Valuation of Bonds, Sinking Funds, and Depreciation. Valuable for those engaged in accounting and auditing, finance and banking, insurance, engineering management and teaching; almost indispensable for some of these vocations. Prereq., college algebra or Math. 8, and a knowledge of logarithms.

20a M 8:05 Campus Folwell 103, Gibbens 20b M 8:05 Campus Folwell 103, Gibbens

| | |
|-------|-----------------------|
| A-Bex | Elementary Algebra |
| Cex | Solid Geometry |
| 5 | Higher Algebra |
| 6 | Trigonometry |
| 7 | College Algebra |
| 30 | Analytic Geometry |
| 50 | Differential Calculus |
| 51 | Integral Calculus |

For description and program of these classes
see Engineering Classes, pp. 44-45.

106 *Differential Equations.* Not offered 1935-36.

MEDICINE

§Practical Preventive Medicine. Open only to practicing physicians. \$10.

A consideration of the present status of scientific knowledge covering the more important preventive measures and their practical application in the practice of medicine. Among the subjects covered are immunization against diphtheria, scarlet fever, whooping cough, measles, etc.; the common cold, influenza, pneumonia, parasitic diseases of man of importance in Minnesota; undulant fever, tularemia, poliomyelitis and encephalitis; tetanus and gas gangrene; allergic diseases. Dr. Diehl will be assisted by Drs. Reimann, Riley, Ellis, O'Brien, Green, and Manson.

Th 6:20 Campus Millard 129, Diehl

§Tuberculosis and Other Diseases of the Chest. Open to practicing physicians only. \$10.

Diagnosis and treatment of bronchitis, bronchiectasis, bronchial asthma, pulmonary abscess, pneumoconiosis (particularly silicosis), carcinoma, etc. The new viewpoint on tuberculosis control will be presented, with the most modern methods of diagnosis and treatment, with special emphasis on artificial pneumothorax.

Th 8:05 Campus Univ. of Minn. Hosps. Eustis
Aud., Myers

§ These classes are offered on the same evening for the convenience of those who wish to take both.

P.M.&P.H. 60 Tuberculosis and Its Control. \$10.

A nontechnical class, particularly for nurses, social workers, teachers, and others interested. History of tuberculosis movement and campaign in the United States; early diagnosis and sanitary treatment; tuberculosis in children; psychology of tuberculosis; supervision of returned sanatoria patients; state program for the eradication of tuberculosis; legislation. For credit and prerequisites consult instructor.

Th 7:30 Campus Univ. of Minn. Hosps. Eustis
Aud., Myers

Preventive Medicine, see Education Classes, p. 31.

MUSIC

3-4-5 Harmony (First Year). 3 credits each semester. \$10.

Study of chords, their construction, relations, and progressions. Each semester corresponds to a quarter in day classes. No prereq.

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|---|---|------|---------------------------|---|---|------|---------------------------|
| 3 | T | 6:20 | Campus Music 103, Malcolm | 4 | T | 6:20 | Campus Music 103, Malcolm |
| 5 | T | 8:05 | Campus Music 103, Malcolm | | | | |

8-9-10⁺ Introduction to Music. 3 credits each semester. \$10.

A course in historical appreciation. Previously offered under that name but now given the numbers and title used by the College of Science, Literature, and the Arts. Designed to give an understanding of music as literature. A nontechnical account of the principal music forms, the historical origins and associations; the nature and scope of musical expressions. Extensive musical illustrations. No prereq. Entire course required for credit.

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|-----|----|------|----------------------------|------|----|------|----------------------------|
| 8-9 | Th | 6:20 | Campus Music 103, Ferguson | 9-10 | Th | 6:20 | Campus Music 103, Ferguson |
|-----|----|------|----------------------------|------|----|------|----------------------------|

40-41-42 Orchestra. 3 credits for the year. \$5 per semester.

The University Symphony Orchestra is made available for registration through the General Extension Division. Section 1 consists of the Symphony Orchestra, open to those qualified, both day and extension students; section 2 will furnish opportunity for acquiring the skill and orchestral routine necessary for membership in the Symphony Orchestra. Try-outs to determine section membership, for both day and extension students. Open to all players of orchestral instruments.

| FIRST SEMESTER | | | SECOND SEMESTER | | |
|----------------|--------|-----------------------------------|-----------------|--------|-----------------------------------|
| Sec. 1 | W 7:30 | Campus Northrop Aud., Pepinsky | Sec. 1 | W 7:30 | Campus Northrop Aud., Pepinsky |
| Sec. 2 | T 7:30 | Campus Music Aud., Pepinsky | Sec. 2 | T 7:30 | Campus Music Aud., Pepinsky |

56-57† Bach, Beethoven, Wagner, and Brahms. 3 credits each semester. \$10.

Critical study of selections from the master works of the four greatest composers; biographical readings, topics and analyses, giving historical and literary background to culminate periods in composition. Open to those who have been in extension classes in music appreciation. 56-57-58 required for credit. Prereq., Mu. 8-9-10.

| FIRST SEMESTER | | | SECOND SEMESTER | | |
|----------------|--------|----------------------------|-----------------|--------|----------------------------|
| 56 | W 6:20 | Campus Music 103, Ferguson | 57 | W 6:20 | Campus Music 103, Ferguson |

61-62-63 Ensemble. 3 credits each semester. \$10.

Open to players of the piano, violin, or wood-wind instruments suitable for chamber music; practice in duets, trios, quartets, and similar combinations of string and wood-wind instruments.

| FIRST SEMESTER | | | SECOND SEMESTER | | |
|----------------|------|-----------------------------|-----------------|------|-----------------------------|
| M | 6:20 | Campus Music Lib., Pepinsky | M | 6:20 | Campus Music Lib., Pepinsky |

Church Music. No credit toward degree. \$10.

Place of music in worship; qualities church music should have; characteristic church music and composers of different periods—as Gregorian, polyphonic, Bach, Palestrina—and use and interpretation appropriate to each; hymnology; service playing for organists; choir administration. Designed to develop discrimination in understanding and interpreting music of the church service; of interest primarily to clergymen, choir singers, directors, and organists. Outstanding church compositions analyzed for interpretation (as illustrations). Open to all without prerequisites.

| FIRST SEMESTER | | |
|----------------|------|------------------------|
| T | 8:05 | Campus Music 4, Sircom |

N.B.—Individual instruction in music, as well as study in the regular classes offered by the Department of Music, is open for registration through the General Extension Division by students who are not able to attend day classes full time. This includes instruction in piano, organ, voice, violin, cello, and all orchestral instruments, as well as classes in history and theory of music. Students will register as for extension classes but attend the regular day sessions. The courses offered, the time and place of meeting, and the fees for individual instruction will be found in the program of classes for the College of Science, Literature, and the Arts, in the Combined Class Schedule. For further information consult any office of the General Extension Division.

NURSING

(See Education Classes, page 30)

ORIENTATION**1-2† Orientation I-II.** 3 credits each semester. \$10.

A survey of certain aspects of contemporary thought concerning the physical and social sciences; nontechnical, designed for the layman. First semester, physical; second semester, social sciences. No laboratory work and no knowledge of science required. No prereq. For degree, both required for credit.

N.B.—Students may enter either class; I is not prerequisite to II.

| FIRST SEMESTER | | | SECOND SEMESTER | | |
|----------------|---------|---------------------------------|-----------------|---------|---------------------------------|
| 1 | T 6:20 | Campus Main Eng. 104, Shaw | 2 | T 6:20 | Campus Main Eng. 104, Shaw |
| | Th 6:20 | St. P. Ext. Center 203, Schmidt | | Th 6:20 | St. P. Ext. Center 203, Schmidt |

PARLIAMENTARY LAW**7ex Parliamentary Law.** 3 credits for certificate only. \$10.

Presents a system based on principles (not a mere list of rules) a knowledge of which will supply the answer to 7,000 possible questions that may arise as to procedure in a deliberative assembly. No text required. No prereq.

| FIRST SEMESTER | | | SECOND SEMESTER | | |
|----------------|------|--------------------------------|-----------------|------|--------------------------------|
| T | 8:05 | Campus Law 6, Hawley | T | 8:05 | Campus Law 6, Hawley |
| Th | 8:05 | St. P. Ext. Center 206, Hawley | Th | 8:05 | St. P. Ext. Center 203, Hawley |

PHILOSOPHY

1 Problems of Philosophy (Introduction). 3 credits. \$10.

Introduction to the problems of philosophy; the main fields of investigation; permanent problems; principal methods and schools of philosophy; historical and contemporary views. No prereq.

FIRST SEMESTER
T 8:05 Campus Folwell 322, Conger

2 Logic. 3 credits. \$10.

Practical aids to effective thinking; the nature of knowledge; the laws of reasoning; principles and methods of scientific proof; sources of error and incorrect thinking; prejudice and fixed convictions as interferences. No. prereq.

FIRST SEMESTER
Th 6:20 Campus Folwell 205, Castell

SECOND SEMESTER
W 8:05 St. P. Ext. Center 204, Castell

3 Principles of Ethics. 3 credits. \$10.

A sketch of the development of morality; analysis of conscience; the nature and authority of moral principles. No prereq.

FIRST SEMESTER
W 8:05 St. P. Ext. Center 204, Castell

115 Contemporary Philosophy. 3 credits. \$10.

An examination of the philosophy of such contemporaries as Bertrand Russell, John Dewey, William James, Henri Bergson, George Santayana, A. N. Whitehead, and others. For prereq., consult instructor.

FIRST SEMESTER
T 8:05 Campus Folwell 204, Conger

124 Political and Social Ethics. 3 credits. \$10.

An examination of the ethical principles underlying social institutions and forms of social organization, such as the state, the church, the school, the family, etc. For prereq., consult instructor.

SECOND SEMESTER
Th 6:20 Campus Folwell 205, Castell

PHYSICS

13 Acoustics. 3 credits. \$10.

A study of the principles underlying sound phenomena. Prereq., for degree, Physics 3.

SECOND SEMESTER
W 7:30 Campus Physics 133, Buchta
or assistant

23 Heat. 3 credits. \$10.

A study of the principles underlying heat phenomena. Prereq. for degree, Physics 3.

FIRST SEMESTER
W 7:30 Campus Physics 133, Miller
or assistant

3 Elements of Mechanics. 3 credits. \$10.

First part of general course in physics; laws of motion, force, and energy applied to solids, fluids, and gases. Prereq. for degree, trigonometry.

FIRST SEMESTER
M 7:30 Campus Physics 166, Erikson

SECOND SEMESTER
M 7:30 Campus Physics 166, Erikson
or assistant

33 Light. Offered 1936-37.**43 Electricity. Offered 1936-37.**

Elementary Electricity. See Engineering Classes, page 43.

POLITICAL SCIENCE

1-2-3† American Government and Politics. 4½ credits each semester. \$15.

A survey of the American political system and national, state, and municipal government organizations; basic principles and problems of government in the modern industrial age. Entire course required for credit for a degree. Course 1 and first of 2, first semester, balance second. No prereq.

FIRST SEMESTER
M 6:20 Campus Burton 209, Young, Starr

SECOND SEMESTER
M 6:20 Campus Burton 209, Starr

25 World Politics. 3 credits. \$10.**26 Tutorial Work in World Politics. 2 credits. \$7.** } Taught jointly.

A study of the principal international problems of Europe and Asia, both postwar and to a lesser extent prewar; for example, armaments and alliances, nationalism and imperialism. Prereq., 9 credits in political science. Registrations to be made for both classes. Weekly meetings, 3 hours.

FIRST SEMESTER
Th 6:20 Campus Burton 209, Young, Mills

SECOND SEMESTER
Th 6:20 Campus Burton 209, Mills

148 European Dictatorships. 2 credits. Meets for one quarter, 11 weeks, beginning October 2. \$7.

Description and evaluation of contemporary absolute government, especially in Soviet Russia, Italy, and Germany; organization and policies of political parties. Prereq. for degree, see instructor.

FIRST SEMESTER

Fall quarter, September 30
W 6:20 Campus Burton 209, Starr

Functions of Government. No degree credit. 17 meetings. \$10.

A critical examination of the expanding rôle of government in the present order; factors causing this growth; administrative organization on problems of government service agencies. A class for those who seek to determine for themselves what the proper sphere of government activity is. Prereq., a reasonable knowledge of American governmental organization.

FIRST SEMESTER

T 6:20 Campus Burton 209, Christensen

SECOND SEMESTER

Th 8:05 St. P. Ext. Center 206, Christensen

PREVENTIVE MEDICINE AND PUBLIC HEALTH

- 53 Elements of Preventive Medicine
- 58 Maternal and Child Hygiene
- 62 Principles of Public Health Nursing
- 63 Special Fields in Public Health Nursing
- 71 Supervision of Public Health Nursing
- 80 Health of the School Child
- Clinical Dynamics in School Children

} See Education Classes, pp. 31-32.

60 Tuberculosis and Its Control
Practical Preventive Medicine

} See Medicine, p. 19.

PSYCHOLOGY

1-2 General Psychology. 3 credits each semester. Both required for credit, except for certain extension certificates. \$10.

A general introduction to the study of human behavior with emphasis on the development of the individual.

FIRST SEMESTER

1 M 6:20 Campus Folwell 110, White
M 8:05 Campus Folwell 109, White
Th 8:05 Campus Folwell 110, White
T 6:20 St. P. Public Lib. Aud., White

SECOND SEMESTER

2 M 8:05 Campus Folwell 110, White
W 6:20 Campus Folwell 110, White
T 6:20 St. P. Public Lib. Aud., White

1-2 (General) Combined Course. Psychology 1 first 8 weeks; 2 the second 8 weeks. \$10 each class, \$20 total. Registrations accepted for combined course or for one class at a time, either class.

SECOND SEMESTER

MTh 6:20 Campus Folwell 109, White

3 Psychology Applied to Daily Life. 3 credits. \$10.

A course in the use of psychological methods in dealing with people in life situations in general.

FIRST SEMESTER

Th 6:20 Campus Folwell 109, White
W 6:20 St. P. Public Lib. Aud., White

SECOND SEMESTER

W 8:05 Campus Folwell 109, White

56 Psychology of Advertising. 3 credits. \$10.

Analysis of advertising, national and local, from the standpoint of attention, memory, desire, and action; experimental techniques for investigating advertising problems. Of fundamental value to all advertisers. Prereq., 1-2, and Principles of Economics.

FIRST SEMESTER

T 6:20 Campus Psychology 115, Longstaff

72 Psychology of Beauty and Art. 3 credits. \$10.

The psychology of esthetic experience; factors which constitute beauty of various kinds and for different individuals, and the capacity for enjoying and originating beauty; illustrations from music, literature, painting, etc.; emphasis upon experimental studies. Prereq., 1-2.

SECOND SEMESTER

M 6:20 Campus Psychology 211, Hevner

144-145† Abnormal Psychology. 3 credits each semester. \$10. Both required for credit.

Normal and abnormal behavior contrasted; varieties of maladjustment as illustrated in criminality, deficiency, fanaticism, and insanity; the inadequacies of personality as shown in everyday life. Prerequisites arranged

FIRST SEMESTER

144 M 8:05 Campus Psychology 115, Rundquist

SECOND SEMESTER

145 M 8:05 Campus Psychology 115, Rundquist

Educational Psychology. See Education Classes, p. 29.

Child Psychology. See Child Welfare, p. 14.

PUPPETRY

Puppetry. See classes in Speech, p. 27.

ROMANCE LANGUAGES

French

1-2† Beginning French. 3 credits each semester. \$10.

Grammar, pronunciation, reading, and practice in speaking. No prereq. Both required for credit.

| FIRST SEMESTER | | SECOND SEMESTER | |
|----------------|--------------------------------------|-----------------|--------------------------------------|
| 1 | W 6:20 Campus Folwell 227, Clefton | 2 | W 6:20 Campus Folwell 227, Clefton |
| | T 6:20 St. P. Public Lib. 5, Johnson | | T 6:20 St. P. Public Lib. 5, Johnson |

3-4 Intermediate French. 3 credits each semester. \$10.

Grammar, review, composition, readings from modern authors. Prereq., 2 or 2 years of preparatory French.

| FIRST SEMESTER | | SECOND SEMESTER | |
|----------------|-----------------------------------|-----------------|-----------------------------------|
| 3 | T 6:20 Campus Folwell 227, Sirich | 4 | T 6:20 Campus Folwell 227, Sirich |

5 French for Graduate Students. No credit. \$10.

Grammar and reading, preparing candidates for advanced degrees for French examination. No prereq.

| FIRST SEMESTER | | SECOND SEMESTER | |
|----------------|---------------------------------|-----------------|---------------------------------|
| T | 6:20 Campus Folwell 207, Frelin | T | 6:20 Campus Folwell 207, Frelin |

20a-b Elementary French Conversation and Composition I, II. 3 credits each semester. \$10.

A practical course in oral and written French with emphasis upon pronunciation and practical phonetics. Prereq., 3-4.

| FIRST SEMESTER | | SECOND SEMESTER | |
|----------------|------------------------------------|-----------------|------------------------------------|
| 20a | M 8:05 Campus Folwell 205, Olmsted | 20b | M 8:05 Campus Folwell 205, Olmsted |

68-69 Nineteenth Century French Readings. 3 credits each semester. \$10.

Selections from standard writings. Prereq. for degree, French 4.

| FIRST SEMESTER | | SECOND SEMESTER | |
|----------------|-------------------------------------|-----------------|-------------------------------------|
| 68 | T 6:20 Campus Folwell 205, Guinotte | 69 | T 6:20 Campus Folwell 205, Guinotte |

Spanish

1-2† Beginning Spanish. 3 credits each semester. \$10.

Grammar, pronunciation, reading, and practice in speaking. No prereq. Both required for credit.

| FIRST SEMESTER | | SECOND SEMESTER | |
|----------------|-------------------------------------|-----------------|-------------------------------------|
| 1 | M 6:20 Campus Folwell 102, Grismer | 2 | M 6:20 Campus Folwell 102, Grismer |
| | T 6:20 St. P. Public Lib. 6, LeFort | | T 6:20 St. P. Public Lib. 6, LeFort |

3-4 Intermediate Spanish. 3 credits each semester. \$10.

Review, composition, readings from modern authors. Attention to correspondence and commercial practice if desired. Prereq., 1-2 or 2 years of preparatory Spanish.

| FIRST SEMESTER | | SECOND SEMESTER | |
|----------------|-------------------------------------|-----------------|-------------------------------------|
| 3 | M 6:20 Campus Folwell 201, Brackney | 4 | M 6:20 Campus Folwell 201, Brackney |

56-57 Spanish Composition I-II. 3 credits each semester. \$10.

Practical composition, including correspondence. Prereq., 3-4.

| FIRST SEMESTER | | SECOND SEMESTER | |
|----------------|------------------------------------|-----------------|------------------------------------|
| 56 | T 6:20 Campus Folwell 209, Grismer | 57 | T 6:20 Campus Folwell 209, Grismer |

Italian

1-2 Beginning Italian. 3 credits each semester. \$10.

Grammar, pronunciation, reading, practice in speaking. No prereq.

| FIRST SEMESTER | | SECOND SEMESTER | |
|----------------|---------------------------------|-----------------|---------------------------------|
| W | 6:20 Campus Folwell 201, Nissen | W | 6:20 Campus Folwell 201, Nissen |

SCANDINAVIAN

Norwegian

1-2 Beginning Norwegian. 3 credits each semester. \$10.

Grammar, composition, selected readings, and easy prose and poetry. No prereq.

| FIRST SEMESTER | | SECOND SEMESTER | |
|----------------|---------------------------------------|-----------------|---------------------------------------|
| 1 | Th 6:20 Campus Folwell 206, Madsen | 2 | Th 6:20 Campus Folwell 206, Madsen |
| | W 6:20 St. P. Ext. Center 201, Madsen | | W 6:20 St. P. Ext. Center 204, Madsen |

71-73 Danish Literature of the 19th Century. 3 credits each semester. \$10.

First semester, 1850 and earlier, preceded by prefatory study of early literature, Reformation and humanism, Age of Holberg, Romanticism; second semester, since 1850, Hertz, Müller, Winther, Hans Christian Andersen, Goldschmidt, Schack, Jacobsen, Drachmann. Prereq. for degree, Norwegian 1-2 or equivalent.

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| FIRST SEMESTER | | | SECOND SEMESTER | | |
| 71 | Th 8:05 | Campus Folwell 206, Madsen | 73 | Th 8:05 | Campus Folwell 206, Madsen |

*Swedish***7-8 Beginning Swedish.** 3 credits each semester. \$10.

Grammar, composition, conversation, reading of selected prose. No prereq.

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| FIRST SEMESTER | | | SECOND SEMESTER | | |
| 7 | W 6:20 | Campus Folwell 206, Stomberg | 8 | W 6:20 | Campus Folwell 206, Stomberg |

10-11 Advanced Swedish. 3 credits each semester. \$10.

Continuation of language study through literary examples. Prereq. for degree, Swedish 7-8-9.

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| FIRST SEMESTER | | | SECOND SEMESTER | | |
| 10 | T 6:20 | Campus Folwell 206, Stomberg | 11 | T 6:20 | Campus Folwell 206, Stomberg |

SOCIOLOGY**I. Classes in Sociology; prerequisite to technical social work classes.****1 Introduction to Sociology.** 3 credits. \$10.

A study of the culture of human society and effect upon it of such influences as location, sex, race, custom, invention; culture patterns, processes, and social interactions; social change and means of control. No prereq.

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|----------------|------|--------------------------------|-----------------|------|-----------------------------|
| FIRST SEMESTER | | | SECOND SEMESTER | | |
| M | 6:20 | Campus Jones 109, Monachesi | M | 6:20 | Campus Jones 104, Monachesi |
| Th | 6:30 | Campus Jones 109, Weinfeld | | | |
| T | 8:05 | St. P. Ext. Center 201, Schmid | | | |

6 Social Interaction. 3 credits. \$10.

The basis and forms of social interaction and social relationships with detailed attention to some of the fundamental behavior patterns of contemporary society. Prereq., Soc. 1.

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| SECOND SEMESTER | | |
| M | 6:20 | Campus Jones 109, Kirkpatrick |
| T | 8:05 | St. P. Ext. Center 201, Kirkpatrick |

14 Rural Sociology. 3 credits. \$10.

A study of rural and urban relationships; the principles of sociology applied to the position of an agricultural class in an industrial society; the contributions and obligations of farmers to the larger society, and vice versa. Prereq., Soc. 1.

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| FIRST SEMESTER | | |
| M | 6:20 | Campus Folwell 3, Lundquist |

49 Social Pathology. 3 credits. \$10.

A survey course in contemporary social problems with especial emphasis on the conditions and processes in personal demoralization and social disorganization. The scientific approach to the study of poverty, physical diseases and defectiveness, feeble-mindedness, insanity, vagrancy, etc. Prereq. for degree, 10 cred. in soc.

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| FIRST SEMESTER | | |
| W | 6:20 | Campus Jones 109, Schmid |

53 Elements of Criminology. 3 credits. \$10.

Causes and social control of crime; treatment from the point of view of processes of social interaction. Prereq., 10 cred. in soc.

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| SECOND SEMESTER | | |
| W | 8:05 | Campus Jones 109, Vold |

101 Social Organization. 3 credits. \$10.

The social mind and its communication; problems of democracy, of class and caste, of social conflict and revolution; integration and disintegration of social groups and institutions; the rational and scientific basis for social efficiency and progress. Prereq., 4 courses in soc., or Soc. 1, and 15 credits in soc. sci., educ., phil., or psy.

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|----------------|------|--------------------------|
| FIRST SEMESTER | | |
| M | 6:20 | Campus Jones 104, Sletto |

110 Rural Organization. 3 credits. \$10.

Social organization as it affects living conditions in small towns and rural districts. Especially designed for rural social workers and specialists in rural sociology or agricultural economics. Prereq., same as for 101.

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|-----------------|------|-----------------------------|
| SECOND SEMESTER | | |
| Th | 6:20 | Campus Folwell 3, Lundquist |

119 The Family. 3 credits. \$10.

The evolution of the family; development of family unity or disunity; the rôles of the several members of the family; methods of investigation of the family. Prereq., 4 courses in soc., or Soc. 1 and 15 cred. in soc. sci., educ., phil., or psy.

FIRST SEMESTER

W 8:05 Campus Jones 109, Kirkpatrick

120 Social Progress. 3 credits. \$10.

Theories of progress and a critique of the idea of progress; contributions of fundamental social institutions; converting drift into progress. Prereq., same as for 101. 3 credits.

FIRST SEMESTER

Th 6:20 Campus Folwell 3, Lundquist

160 Population Problems. 3 credits. \$10.

The major quantitative and qualitative problems of population in our contemporary society, including: population theories and doctrines since Malthus; the growth and distribution of population; changes in population composition and their social consequences; problems of human migration; urbanization and the ecology of the city; trends in mortality and morbidity; the quality of the population, significance of differential death rates, heredity, and environment. Prereq., consult instructor.

SECOND SEMESTER

W 6:20 Campus Jones 2, Schmid

II. Classes in Technical Social Work.

N.B.—These classes are open to persons employed in social work positions who are recommended by the executive of the agency in which they are employed and then approved by an adviser in the University Training Course for Social and Civic Work. Credits thus earned will be accepted to satisfy the requirements in professional organizations.

52 Elementary Case Work. 3 credits. \$10.

An introduction to the problems and methods of social case work. Prereq., Soc. 49. Special attention to the subject of relief administration.

FIRST SEMESTER

T 6:20 Campus Jones 109, Koontz

SECOND SEMESTER

Th 6:20 St. P. Ext. Center 204, Koontz

60 Social Protection of the Child. 3 credits. \$10.

Social obligations to the child; development of the child-saving movement in the United States; infant and child mortality, recreation, education; courts, institutions, societies, and other public efforts for the child. Prereq., Soc. 49 and 52.

FIRST SEMESTER

T 8:05 Campus Jones 109, Mason

64 Human Behavior. 3 credits. \$10.

Normal behavior and its transition to abnormal behavior; problems of motivation and influences of environment on human behavior.

FIRST SEMESTER

M 6:20 St. P. Wilder Disp., Lippman

W 6:20 Campus Folwell 105, Lippman

65 Psychiatric Aspects of Social Case Work. 3 credits. \$10.

A detailed discussion of cases that have been under intensive treatment; analysis of methods and philosophy of treatment; the methods of psychoanalysis. Prereq., Soc. 129 or equivalent. Limited to twenty students.

SECOND SEMESTER

M 6:20 St. P. Wilder Disp., Lippman

W 6:20 Campus Folwell 105, Lippman

127 Legal Aspects of Social Work. 3 credits. \$10.

A selected group of legal problems treated from the viewpoint of the social worker; the court system; legal process; protection and enforcement of the legal rights of indigent persons; problems of the small wage earner—garnishment, small loans, eviction; problems in domestic relations. Not designed to teach technical law, but to furnish background for understanding social problems having legal implications.

FIRST SEMESTER

T 6:20 Campus Jones 104, Finke

129 Selected Problems in Social Case Work. 3 credits. \$10.

Social case work practices as applied to selected problems. Prereq., Soc. 52, 91, or simultaneously.

SECOND SEMESTER

Th 6:20 Campus Jones 2, Fenlason

SPEECH (PUBLIC SPEAKING)

Practical Speech Making. No credit. 11 weekly meetings each quarter. \$7 each quarter.

Designed for business and professional people, dealing only with practical speech making in everyday life, helping the student to organize his ideas so that they may be expressed with confidence and effectiveness; individual attention to cases of nervousness and embarrassment; each student speaks before the class each meeting. Students may continue through two or three quarters or may enter any quarter. New types and problems of speech presented each quarter with no duplication of work or prerequisites. Open to all.

First Quarter, October 1-3 to December 10-12, **Extempore Speaking.**

Second Quarter, January 7-9 to March 17-19, **Business Speaking.**

Third Quarter, March 24-26 to June 2-4, **Impromptu and After-Dinner Speaking.**

Class meets, all quarters: T 6:20 Campus Folwell 5, Fulton
Th 8:05 St. Paul. Ext. Center 201, Fulton

Vocabulary Building I. No credit. Meets weekly for one hour. \$5, plus \$1 materials fee.

A practical course designed to increase students' speaking and reading vocabularies; presentation and discussion of words; exercises, reading lists. Mimeographed matter, in lieu of text, issued each meeting. Home study suggested but not required. Not a recitation course. No prereq.

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| FIRST SEMESTER | | SECOND SEMESTER | |
| M 7:00 | Campus Folwell 301, Hurd | M 7:00 | Campus Folwell 301, Hurd |

Vocabulary Building II. No credit. Meets weekly for one hour. \$5, plus \$1 materials fee.

A more advanced and detailed study of words. May be taken as a continuation of Course I, or together with it. A recitation course, with written and oral composition exercises, reports, tests, and home study required.

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| FIRST SEMESTER | | SECOND SEMESTER | |
| M 8:05 | Campus Folwell 301, Hurd | M 8:05 | Campus Folwell 301, Hurd |

1-2-3† Fundamentals of Speech. (Formerly 41-42-43). 3 credits each semester. \$10. All required for credit.

A course for the practical needs of business and professional persons. Extemporaneous speaking; organization of speech material; study of model speeches; technique of body and voice; practice for correctness and effectiveness in delivery. Prereq., Eng Comp. 4-5-6, or exemption.

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|----------------|----|------|---------------------------------|-----------------|----|------|---------------------------------|
| FIRST SEMESTER | | | | SECOND SEMESTER | | | |
| 1 | M | 6:20 | Campus Folwell 308, Fulton | 1 | W | 6:20 | Campus Folwell 308, Bryngelsson |
| | W | 8:05 | Campus Folwell 308, Bryngelsson | | M | 8:05 | St. P. Ext. Center 201, Knower |
| | *T | 6:20 | N. W. Bank, Mpls. 603, Gislason | 2 | *T | 6:20 | Mpls. N. W. Bank 603, Gislason |
| | M | 6:20 | St. P. Ext. Center 201, Knower | | W | 8:05 | Campus Folwell 308, Bryngelsson |
| 2 | W | 6:20 | Campus Folwell 308, Bryngelsson | | M | 6:20 | St. P. Ext. Center 201, Knower |
| | M | 8:05 | St. P. Ext. Center 201, Knower | 3 | *T | 6:20 | Mpls. N. W. Bank 603, Gislason |
| 3 | W | 6:20 | Campus Folwell 308, Bryngelsson | | W | 8:05 | Campus Folwell 308, Bryngelsson |
| | M | 8:05 | St. P. Ext. Center 201, Knower | | M | 6:20 | St. P. Ext. Center 201, Knower |

* This class is purely extemporaneous speaking.

51-52 Advanced Public Speaking 1-2. 3 credits each semester. \$10.

Speeches on public questions; analysis and outlining; methods of reasoning; adaptation of material to audience. Conducted on discussion plan with free, extemporaneous rebuttal to speeches. Prereq., Speech 1-2-3.

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|----------------|----|------|------------------------------|-----------------|----|------|------------------------------|
| FIRST SEMESTER | | | | SECOND SEMESTER | | | |
| 51 | Th | 7:00 | St. P. Pub. Lib. Aud., Rarig | 52 | Th | 7:00 | St. P. Pub. Lib. Aud., Rarig |

71-72-73† Elements of Play Production. 3 credits each semester. \$10, plus \$1 laboratory fee each semester. All required for credit.

Principles of the production of plays: directing, rehearsing, staging, make-up; organization and management of the production staff; knowledge and use of stage equipment; reading of plays; history of the theater. Conducted on practical production plan. Prereq., Speech 1-2-3.

N.B.—Students may register for either Speech 71, 72, or 73 either semester. Any member of class eligible to try out for parts in all University Theatre productions.

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|----------------|------|----------------------|--|-----------------|------|----------------------|--|
| FIRST SEMESTER | | | | SECOND SEMESTER | | | |
| Th | 6:20 | Campus Music 19, Lee | | Th | 6:20 | Campus Music 19, Lee | |

77-78-79† Acting. 3 credits each semester. \$10, plus \$1 laboratory fee each semester. All required for credit.

The arts of pantomime, voice, and characterization, with exercises in one-act plays and projects of the University Theatre. Prereq., Speech 1-2-3.

N.B.—Students may register for either Speech 77, 78, or 79 either semester. Any member of class eligible to try out for parts in all University Theatre productions.

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|----------------|------|------------------------|--|-----------------|------|------------------------|--|
| FIRST SEMESTER | | | | SECOND SEMESTER | | | |
| M | 6:20 | Campus Music 19, Riley | | M | 6:20 | Campus Music 19, Riley | |

Puppetry (Marionette plays). Noncredit. \$10. Class limited to twenty.

History and adaptation of puppetry to education (correlating the teaching of literature, social studies, art, handicraft and spoken language), to religion, visual story telling in libraries, camp craft, occupational therapy, and recreation. Practical instruction in hand puppetry, black and white shadows, colored shadows and marionettes, including the steps necessary to a finished performance—the dramatization of the story, the making of the puppets, their authentic costuming, the construction of properties, back drops and theater, and the technique of manipulation. No text-book required, but small amount of materials. Students may enter either semester. No prereq.

FIRST SEMESTER
 Th 6:20 Campus Folwell 101, Meader
 F 6:20 St. P. Ext. Center 204, Meader

SECOND SEMESTER
 (repeated on demand)
 Th 6:20 Campus Folwell 101, Meader
 F 6:20 St. P. Ext. Center 204, Meader

STAMP COLLECTING (PHILATELY)

Stamp Collecting. No credit. Regular weekly periods. \$10.

A class for collectors and those who might be collectors. The story of stamps and collecting; the language of philately and its significance; collecting and buying, what to do and not to do, for pleasure and for possible profit; what makes value; materials for, and handling of, a collection. Open to all.

FIRST SEMESTER
 M 6:20 Campus Folwell 113, Burgess

SWIMMING

(See *Physical Education Classes, pages 30-31*)

TEXTILES

(See *Business Classes, page 39*)

ZOOLOGY

1-2† General Zoology. 5 credits each semester. \$17. Both required for credit.

Structure, physiology, embryology, classification, and evolution of animals. Equivalent to 1-2-3 in day classes. No prereq.

FIRST SEMESTER
 1 TTh 6:20 Campus Zoology 211, Wodsedalek

SECOND SEMESTER
 2 TTh 6:20 Campus Zoology 211, Wodsedalek

21 Histology. 5 credits. \$17.

A study of the structure of the cell, the tissues, and the organs; lecture and laboratory. Prereq., Zool. 1-2.

FIRST SEMESTER
 TTh 6:20 Campus Zoology 201, Ringoen

Birds of Minnesota. No credit for degree. \$10.

A laboratory and field class in identifying and enjoying the birds of this region. Early meetings will make use of the collections of the Museum of Natural History, but as soon as weather permits the class will meet in field locations. Study will be based on the manual by Dr. T. S. Roberts, who will be responsible for the class. Open to all.

SECOND SEMESTER
 T 8:05 Campus Zool. 204, Roberts and others

EDUCATION CLASSES

Classes offered under this head are primarily for teachers in service who are unable to attend day classes on the University campus. Only those courses have been listed that are primarily for credit in the College of Education. Many other courses are offered, especially in the academic classes of the College of Science, Literature, and the Arts, which are accepted for credit toward a degree in the College of Education. All classes are open to students other than teachers who may have an interest in any phase of formal education and its methods of instruction and supervision.

Credit in the College of Education is dependent upon the qualifications of the student who must have completed the two years' work required for admission to the College of Education. This work may be completed either by graduation from a teachers college or normal school, a two-year course in the Junior College of the University or any accredited college, or in extension classes.

Students expecting to qualify for a degree should secure a copy of the College of Education Bulletin, which contains a statement of general requirements for graduation, of

required courses in majors and minors, and of the specialized curricula, and should consult a major adviser as early in their course as possible. Failure to do so often delays graduation and makes extra work necessary.

The Students' Work Committee of the General Extension Division will be glad to assist students by explaining the various curricula and printed requirements for each; by advising what credits may be secured through extension classes; by assisting in securing the necessary official advice from the proper persons in the College of Education.

N.B.—Classes in Education, unless otherwise stated, carry credit only in the College of Education. They may, however, be acceptable toward General Extension Division certificates when properly approved.

All extension classes are open to registration by any person qualified by maturity and ability to profit by the study. In practically all cases only those who expect to qualify for a university degree will be expected to meet the requirements of prerequisites. PREREQUISITES ARE STATED FOR INFORMATION, NOT AS OBSTACLES.

DESCRIPTION AND PROGRAM OF CLASSES

ADMINISTRATION AND SUPERVISION

119 Elementary School Curriculum. 3 credits. \$10, plus \$1 materials fee.

The principles underlying the selection and organization of subject-matter for courses in the elementary schools; critical examination of current practices. Prereq., senior standing.

FIRST SEMESTER

T 4:15 St. P. Ext. Center 204, Sorenson

150 Supervision and Improvement of Instruction. 3 credits. \$10.

Analysis of the functions and duties of the supervisor as related to the improvement of instruction; specific supervisory technique; objective analysis of classroom activity; concrete applications to present day problems; case studies. Prereq., senior standing.

FIRST SEMESTER

W 8:05 Campus Main Eng. 203, Sorenson

ART EDUCATION

For other classes in Art see Fine Arts (S.L.A. Classes, page 15), Art (Engineering Classes, page 42).

Special Interior Decorating Classes, Noncredit

Interior Decorating I. No credit. 10 weeks. \$5. Begins October 2-4, and February 10.

A lecture course of special interest to homemakers offered at a convenient time. Same emphasis as in credit course. Optional field trips.

FIRST SEMESTER

W 2:00 to 3:30 Mpls. Pub. Lib., Lewis T 2:00 to 3:30 Mpls. Pub. Lib., Lewis

SECOND SEMESTER

F 2:00 to 3:30 St. P. Ext. Center 201, Lewis

Interior Decorating II. No credit. 10 weeks. \$5. Begins February 12-14.

A continuation of Course I; emphasis on fabrics and color. Open to all.

SECOND SEMESTER

W 2:00 to 3:30 Mpls. Pub. Lib., Lewis

F 2:00 to 3:30 St. P. Ext. Center 201, Lewis

3 Interior Decorating (Principles of Design 3). 3 credits. \$10, plus laboratory fee \$.50.

Design principles in relation to the home; identification of period furniture; wall treatment; floor coverings; furniture arrangement; color schemes; modern style window treatment; field trips to the Institute of Arts and to furniture stores. No prereq.

FIRST SEMESTER

M 6:20 Campus Jones 207B, Lewis M 6:20 Campus Jones 207B, Lewis

SECOND SEMESTER

T 6:20 Campus Jones 207B, Lewis

23 Advanced Interior Decorating (Second Year Design). 3 credits. \$10, plus laboratory fee \$.50.

Continuation of Interior Decorating 3, emphasizing color theories in relation to room color schemes, floor coverings, draperies, etc.; classification and use of fabrics, period and present day; decorative arts; room interiors appropriate to types of furniture. Prereq., 3.

SECOND SEMESTER
T 6:20 Campus Jones 207A, Lewis

4-5-6 Still Life. 3 credits. \$10.

Drawing from objects in charcoal; emphasis on form, value relations, perspective, and composition. No prereq.

FIRST SEMESTER
T 4:30 Campus Jones 203, Lewis

Orientation in Simple Handicrafts. 3 credits each semester. \$10.

Experience in simple handicrafts selected with reference to their recreational value, for those interested in camps, playgrounds, clubs, and adult education. First semester: pottery (hand building), metal and simple jewelry, bookbinding and portfolio making, basketry; second semester: pottery (pouring and wheel building), weaving (hand and loom), wood-block and linoleum printing, stenciling (fabrics and paper), crayonnex, batik, wood-carving, leather tooling, and pressing and dyeing. Students may enter either semester. No prereq.

FIRST SEMESTER
W 6:20 Campus Jones 10, Ross

SECOND SEMESTER
W 6:20 Campus Jones 10, Ross

7-8-9 Sketching. 3 credits. \$10. Model fee \$1, payable to instructor.

Drawing from the posed figure in charcoal, pencil, and crayon; short action poses. Elementary, with individual help for the beginner. No prereq.

FIRST SEMESTER
T 4:30 Campus Jones 203, Lewis

Cartooning. See S.L.A. Classes, page 13.

Puppetry (Marionette plays). See Speech, page 27.

Textiles. See Business Classes, page 39.

For other classes in Art see Fine Arts (S.L.A. classes, page 15).

EDUCATIONAL PSYCHOLOGY

See S.L.A. Classes for General Psychology, page 22, and Child Psychology, page 14.

55 Elementary Educational Psychology. Now taught as Ed.51 for secondary school curricula, and Ed.61 for elementary. See General Education, below.

60 Introduction to Educational Statistics. 3 credits. \$10.

Statistical methods applied to educational investigations; measures of central tendency, variability, and correlation; for classroom teachers and principals. No higher mathematics required. Prereq., 6 cred. in psy.

SECOND SEMESTER
Th 4:15 Mpls. N. W. Bank Bldg. 603, Sorenson
W 8:05 St. P. Ext. Center 201, Sorenson

111 Educational Measurements in the Elementary School. 3 credits. \$10.

The typical educational problems involving educational scales and standard tests; nature of tests; methods used; analysis of results obtained; remedial educational procedure. Prereq., 55 or equivalent.

FIRST SEMESTER
Th 5:00 Mpls. N. W. Bank Bldg. 603,
Van Wageningen

134 Mental Tests. 3 credits. \$10.

Laboratory study of group mental tests for all school levels; reliability and validity as instruments for educational guidance. Prereq., 55 and 60.

FIRST SEMESTER
W 8:05 Campus Main Eng. 203, Sorenson

GENERAL EDUCATION

51 (61) Introduction to Teaching—Psychological Foundations. 3 credits. \$10.

A survey of the fundamental facts of human behavior involved in educational activities. Course 51 for secondary school teaching, 61 for elementary. Not open to students who have credit for Ed. Psy. 55, which it replaces. Prereq., 6 credits in psychology.

N.B.—Credit in this course will be granted only when the student has completed Ed. 52 and Ed. 53 (or Ed. 62 and Ed. 63) and passed the Qualifying Examination in Education. (See bulletin of the College of Education.)

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| FIRST SEMESTER | | SECOND SEMESTER | |
| Th 6:20 | Campus Main Eng. 203, Sorenson | W 6:20 | St. P. Ext. Center 201, Sorenson |

Adult Mental Ability. No credit. Weekly for 8 weeks. \$5.

Adult mental powers, learning abilities, mental growth and decline; effect of exercise and of disuse on mental abilities; emphasis on age and its relationship to intellectual powers. Open to all without prereq. Begins October 1, first semester and February 11, second semester.

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| FIRST SEMESTER | | SECOND SEMESTER | |
| T 6:20 | St. P. Ext. Center 204, Sorenson | T 6:20 | Campus Main Eng. 203, Sorenson |

HOME ECONOMICS

Interior Decorating, see Art Education, page 28.

Textiles, see Business Classes, page 39.

MATHEMATICS

Mathematics of Investment. Applications of algebra to the solution of particular problems in business. Valuable extension of the training of teachers of mathematics. See Mathematics Classes, in S.L.A., page 19.

NURSING EDUCATION

70ex Principles of Teaching and Supervision in Schools of Nursing. Open to graduate nurses. 3 credits. \$10.

Conditions favoring best preparation of the student nurse; sources, selection, and organization of subject-matter; evaluation of nursing; principles and practices, and teaching methods; content and methods of clinical teaching.

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| SECOND SEMESTER | |
| T 8:05 | Campus Millard 129, Petry |

60 Ward Administration. Open to graduate nurses. 2 credits. \$7.

Principles of administration, their application to ward management; opportunities for clinical teaching through efficient ward administration.

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| FIRST SEMESTER | |
| T 8:05 | Campus Millard 129, Densford |

53ex Research Methods Applied to Nursing. 2 credits. \$7.

Time studies, questionnaires, and other methods of compiling and analyzing data on nursing problems; the graphic method of presentation of the data.

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| FIRST SEMESTER | |
| M 8:05 | Campus Millard 129, Gordon |

Public Health Nursing. See page 32.

PHYSICAL EDUCATION

3ex Swimming—for Women. No credit. One hour, weekly. \$5.

Class and individual instruction. Department furnishes regulation suits. Health examination at first meeting.

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|----------------|---------------------------|---|----------------------------|-----------------|---------------------------|---|----------------------------|
| FIRST SEMESTER | | | | SECOND SEMESTER | | | |
| M 6:30 | Campus Women's Gym. | } | Snell, Eibner, Starr | M 6:30 | Campus Women's Gym. | } | Snell, Eibner, Starr |
| M 7:30 | Campus Women's Gym. | | | M 7:30 | Campus Women's Gym. | | |
| W 6:30 | Campus Women's Gym. | | | W 6:30 | Campus Women's Gym. | | |
| W 7:30 | Campus Women's Gym. | | | W 7:30 | Campus Women's Gym. | | |
| Th 6:30 | Univ. Farm Gym., Kaercher | | | Th 6:30 | Univ. Farm Gym., Kaercher | | |
| Th 7:30 | Univ. Farm Gym., Kaercher | | | Th 7:30 | Univ. Farm Gym., Kaercher | | |

Life Saving—for Women. No credit. One hour, weekly. \$5.

Instruction and practice in approved Red Cross methods of life saving. Red Cross certificates will be given those who pass examination. Department furnishes regulation suits. Health examination at first meeting.

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| SECOND SEMESTER | |
| M 8:30 | Campus Women's Gym., Eibner, Starr |

Swimming—for Men. No credit. One hour, weekly. \$5.

Class and individual instruction. Woolen bathing suits not permitted. Health examination at first meeting. Other sections arranged on demand.

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| FIRST SEMESTER | SECOND SEMESTER |
| M 8:05 Campus Athletic Bldg., Thorpe | M 8:05 Campus Athletic Bldg., Thorpe |

Elementary Golf—for Women. No credit. One hour, weekly. \$5.

Class and individual instruction. Classes limited to 25. Equipment (clubs and soft balls) furnished by members of the class.

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| FIRST SEMESTER | SECOND SEMESTER |
| T 6:30 Campus Women's Gym. 151, Kissock, Snell, Christensen | T 6:30 Campus Women's Gym. 151, Kissock, Snell, Christensen |

Golf—for Men. No credit. One hour weekly. \$5.

The fundamentals of golf—the clubs, the grips, stance, drive, etc., with some attention to historical and tournament aspects. Motion pictures will show proper form of stroke. First six weeks in class; next five weeks, individual instruction in driving nets, on schedule arranged to suit members of class; last six weeks, weather permitting, at University Golf Course, practice field, where various local professionals will assist. (Outdoor schedule adjusted to light.) Students furnish own clubs.

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| SECOND SEMESTER |
| M 7:00 Campus Athletic Bldg. 206, Smith, Mund |

Recreational Activities for Mixed Groups: Badminton, Deck Tennis, Duck Pin Bowling, Archery, Mixers (ice-breakers), Social Dancing, etc. No credit. One hour, weekly. \$5, plus \$1 laboratory fee.

Instruction and practice in games and get-acquainted activities; adaptation for use at picnics, outings, and other informal situations. Open to men and women.

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| FIRST SEMESTER | SECOND SEMESTER |
| M 6:30 Campus Women's Gym. 151, Baker, Snell, Warnock | M 6:30 Campus Women's Gym. 151, Baker, Snell, Warnock |

Rhythmic Exercises—for Women. No credit. One hour, weekly. \$5, plus \$1 laboratory fee.

Rhythmic exercises for reducing, relaxation, general conditioning, and just fun. There will be a variety of emphases including rhythmic movements basic to dance, and adaptations of German and modern Danish gymnastics.

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| FIRST SEMESTER | SECOND SEMESTER |
| M 7:30 Campus Women's Gym. 153, Baker, Snell, Christensen | M 7:30 Campus Women's Gym. 153, Baker, Snell, Christensen |

Elementary Tap Dancing—for Men and Women. No credit. One hour, weekly. \$5, plus \$1 laboratory fee.

Individual and group tap routines. Suitable for the beginner who desires the work for his own pleasure, or for teachers who wish elementary material for junior or senior high school classes.

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| FIRST SEMESTER |
| M 6:30 Campus Women's Gym. 151, Warnock |

Intermediate Tap Dancing—for Men and Women. No credit. One hour, weekly. \$5, plus \$1 laboratory fee.

Individual and group tap routines and clog dances. Suitable for those with some previous experience in tap who wish work for their own pleasure or for advanced junior or senior high school classes.

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| FIRST SEMESTER |
| M 7:30 Campus Women's Gym. 151, Warnock |

PREVENTIVE MEDICINE AND PUBLIC HEALTH

N.B.—Classes marked with ¶ carry credit in the College of Science, Literature, and the Arts.

53¶ Elements of Preventive Medicine. 3 credits. \$10.

Nutrition, diet, susceptibility, resistance, and immunity to disease; methods of spread and prevention of communicable and degenerative diseases; protection of food, water, and milk; school health work; vital statistics. Prereq., 12 cred. in biological sciences, or consent of instructor.

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| FIRST SEMESTER |
| M 6:20 Campus Millard 129, Radl |

58 Maternal and Child Hygiene. 3 credits. \$10.

The maternal welfare program; importance of breast feeding; conduct of infant welfare clinics; consideration of child of preschool and school age as to malnutrition, physical defects, cardiac and nervous disorders. Prereq., 40 or 53.

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| FIRST SEMESTER | SECOND SEMESTER |
| W 6:20 Campus Millard 129, Boynton | M 6:20 St. P. Ext. Center 204, Boynton |

N.B.—The second semester class in St. Paul is for nurses.

60 Tuberculosis and Its Control. See Science, Literature, and the Arts Classes, page 19.

62 Principles of Public Health Nursing. 3 credits. \$10.

Development of principles of organization, administration, and supervision of public health nurses; methods of co-operation of social agencies; health teaching in promotion of individual and community well-being. Primarily for public health nurses. Prereq., 53.

FIRST SEMESTER

W 8:05 St. P. Ext. Center 200, Butzerin

63 Special Fields in Public Health Nursing. 3 credits. \$10.

Development, scope of program, and analysis of services in various special fields of public health nursing. Prereq., 62 or equivalent.

SECOND SEMESTER

Th 6:20 Campus Millard 129, Butzerin

71 Supervision of Public Health Nursing. 3 credits. \$10.

Planned for the experienced public health nurse. The principles and practices of supervision of public health nursing; the problems encountered in both city and rural communities. Prereq., 61, 63, or permission of instructor.

FIRST SEMESTER

T 6:20 Campus Millard 129, Butzerin

80|| Health of the School Child. 3 credits. \$10.

For teachers and others interested in the health and development of the school child. Mental and physical growth; discovery of physical defects; exercises; fatigue; emotional problems; health habits; diseases of school children; practical problems of health supervision and health instruction. For prerequisites for degree, see instructor.

SECOND SEMESTER

M 6:20 Campus Millard 129, Diehl

Clinical Dynamics in School Children. No degree credit. 17 meetings. \$10.

For teachers, school and public health nurses, and others responsible for the management of children of school age. Psychobiology of work, with special reference to all factors influencing efficiency; normal defenses against functional disorders; fatigue, nervousness, and other common disorders of school children; the rôle of the school and the school teacher in the prevention and management of these disorders. No prereq.

FIRST SEMESTER

T 8:05 Mpls. N. W. Bank Bldg. 603, Seham

Practical Preventive Medicine. (For physicians. See S.L.A. Classes, page 19.)

BUSINESS CLASSES

This department recognizes the professional status of the business executive. Scientific methods in analyzing business data, trained intelligence in handling the human relationships inherent in business, and a well-developed sense of moral responsibility will be the foundations of business effectiveness of the future. The training of prospective executives along these lines is more important than any detailed drill on special processes. At the same time there are those with definite interest in certain special fields who seek improvement and advancement, and to these the opportunity for scientific training and information is invaluable. The classes here offered aim to serve both classes of students; and those whom they serve are able, because of their daily employment in work related to their studies, to make the most advantageous use of their opportunity.

Candidates for Degrees.—With a few exceptions all of the classes offered in business carry credit toward a degree in the School of Business Administration. The classes which do not are specifically indicated in their description. It is necessary, however, for the students who are interested in degrees to secure their credits in two separate units. The first is the prebusiness course, or the first two years, which is administered in the College of Science, Literature, and the Arts. These requirements are modifications of those required for the Junior College certificate offered by the General Extension Division, and embrace a number of subjects other than those specifically concerned with either economics or business administration. Theoretically this prebusiness requirement should be completed before the work of the Senior College is done. In practice, however, most extension students do more of the work of the Senior College than of the work of the Junior College in working for their various certificates. Provision is made, however, for arranging an approved curriculum for all students, regardless of the order in which some of their work may have been done. A student desiring such a curriculum must apply to the dean of the School of Business Administration at least one year before he expects to be eligible for a degree, and complete at least 45 credit hours of the requirements for a degree under the supervision of the adviser appointed for him. The Students' Work Committee of the General Extension Division will be glad to assist the student in arranging for this advice.

CERTIFICATES

The General Extension Division certificate in business is awarded to students who have met the requirements listed below, as a recognition of their completion of a well-planned program of study. This program contains a basic core requirement which is a broad and general preparation for business life. In addition, it offers a number of specialized lines on which the student may concentrate as a specific preparation for his immediate vocation.

1. Each candidate must have completed 90 credits, with an average grade of C, including the following basic requirements:

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| Principles of Economics I-II (6 and 7)..... | Credits 6 |
| English, Composition IV, or Business English..... | 3 |
| Report Writing | 3 |
| Students whose work in these classes in English and Report Writing is not entirely satisfactory may be required to take other English classes. | |
| Business Law A, B, and C or D..... | 9 |
| Principles of Accounting 20, 25, 26, or 25L, 26L..... | 9 |
| Mechanism of Exchange (Money and Banking)..... | 3 |
| Elements of Statistics | 3 |
| Advanced General Accounting (not required of accounting students)..... | 3 |
| (Same as Interpretation of Financial Statements) | |
| Corporation Finance | 3 |
| Business Cycles | 3 |
| Investments | 3 |
| Orientation I and II..... | 6 |
| Total | 54 |

2. Each candidate must also have completed 18 credits in one of the following groups, selecting those credits from the classes listed herewith:

- a. *Accounting*: Practice and Procedure A and B; Auditing A and B; Cost Accounting A, B, C, and D; Income Tax Accounting; Accounting Topics.
- b. *Finance*: Advanced Money and Banking; Labor Problems; Securities Market; Economics of Public Utilities; Public Finance; Bank Administration; Finance Management; Advanced General Economics; Cost Accounting; Business Law D.
- c. *General Business*: Business Policy; Geography 41, 51; Market Administration; Cost Accounting; Labor Problems.
- d. *Insurance*: Psychology, 6 or 9 credits; Life Insurance; Fire and Marine Insurance; Casualty Insurance; Fidelity and Surety Bonding; Life Insurance Salesmanship; Mathematics.
- e. *Advertising*: Psychology 1, 2, 56; Journalism 13, Reporting; Journalism 69, Special Articles; Elementary Advertising; Retail Advertising; Advanced Advertising and Typography; Commercial Drawing; Market Administration.
- f. *Merchandising*: Retail Credits; Retail Store Management; Survey of Marketing; Psychology 1 and 56; Elementary and Retail Advertising; Market Administration; Transportation I and II.
- g. *Transportation (Traffic)*: Economics of Public Utilities; Geography 41, 51, 102; Transportation I, II, III, IV, V; Insurance—Property, Casualty, Fire, and Marine.

3. The remaining 18 credits, to make a total of 90, may be chosen from any classes offered in business subjects and any classes in Science, Literature, and the Arts or Engineering which may be approved. Classes in the following subjects will be acceptable, unless when offered they bear the indication that they are not acceptable: English Composition and Literature; Geography; History; Interior Decorating; Journalism; Mathematics; Parliamentary Law; Philosophy; Political Science; Psychology; Speech; Textiles; Sciences such as Anthropology, Chemistry, Geology, Zoology, Sociology.

4. Students who have completed 45 credits of the above certificate requirement and have had these credits approved by the Students' Work Committee will be granted a preliminary certificate. These preliminary certificates are for such use as students may find it possible to make of them and are to be issued informally.

5. Students who have already entered upon a program for the completion of the requirements for one of the 45-credit certificates, which are replaced by the above 90-credit certificate, will be protected until the completion of their work and the appropriate certificates will be issued informally.

All extension classes are open to registration by any person qualified by maturity and ability to profit by the study. In practically all cases only those who expect to qualify for a university degree will be expected to meet the requirements of prerequisites. **PREREQUISITES ARE STATED FOR INFORMATION, NOT AS OBSTACLES.**

DESCRIPTION AND PROGRAM OF CLASSES

GENERAL BUSINESS

Social Security Proposals. Noncredit. 8 weeks. \$5.

The economic backgrounds and implications of the current demands for provision for old age and unemployment, by legislation or other means. Aims to clarify opinion through an understanding of what is involved in the operation of any plan for insurance or pensions or other form of economic guarantees, and to enable one to use intelligent discrimination as to the proposals instead of mere emotional desire. Open to all.

SECOND SEMESTER

W 8:05 Campus Sch. Bus. 102, Schmidt

In addition to the classes listed under the head of Business there are many other classes mentioned in this program that may be of interest to those engaged in business. Among them are:

Air Conditioning, page 45.**Geography**, page 16.**Golf and Swimming**, pages 30-31.**Government**, page 21.**Interior Decorating**, page 28.**Mathematics**, pages 19, 44.**Psychology**, page 22.**Public Speaking**, page 26.**Stamp Collecting**, page 27.

ACCOUNTING

N.B.—Attention is called to the alternative sequences in which one may begin the study of accounting. Choice between the two sequences should be made in terms of the objectives for which the student is working. Either will furnish an adequate foundation for further study.

I. Beginning Accounting—general sequence. This combination of the following three classes (Ec. 20, 25, 26) is recommended for those who wish primarily to understand the principles of accounting and the interpretation of accounting statements. No laboratory practice is included but accounting problems are prepared outside the classroom. Three semesters are ordinarily required to complete the sequence except when a student, because of previous study or experience, is able to omit Ec. 20 (see note below).

Ec. 20 Elements of Accounting. 3 credits. \$10.

The principles underlying bookkeeping and accounting; sufficient practice in technical processes to serve as a background for more advanced work; specific preparation for Principles of Accounting A-B (Ec. 25-26). No prereq. Credit conditional upon completion of Ec. 25-26.

N.B.—Students who have had preparation in bookkeeping may, upon application to the instructor, be permitted to omit this class and go directly into Principles of Accounting 25.

FIRST SEMESTER

M 6:20 Campus Sch. Bus. 302, Alm

SECOND SEMESTER

M 8:05 Campus Sch. Bus. 302, Alm

Ec. 25-26† Principles of Accounting A-B. 3 credits each semester. Both required for credit. \$10.

The fundamentals of accounting: accounts, statements, valuations, depreciation, sinking funds, surplus, reserve accounts, capital accounts; lectures supplemented by textbook, without laboratory. Prereq., Ec. 20, or exemption from it.

FIRST SEMESTER

25 W 6:20 Campus Sch. Bus. 302, Reighard

SECOND SEMESTER

25 M 6:20 Campus Sch. Bus. 302, Alm
26 W 6:20 Campus Sch. Bus. 302, Reighard

II. Beginning Accounting—laboratory sequence. This, composed of the following two classes (Ec. 25L-26L), is recommended to those whose interest is primarily in preparing themselves to do actual accounting work and who wish to submit themselves to the discipline of working out actual cases under the guidance of an instructor. Full evening sessions are devoted partly to lecture and discussion, and partly to laboratory practice.

Ec. 25L-26L† Principles of Accounting and Accounting Laboratory A-B. 4½ credits each semester. \$15 plus \$1 materials fee. Both required for credit.

Lectures and discussions with working out of selected cases; compilation of accounting data; balance sheets, operating statements, accounting records, adjustment of accounts, accounting work

sheets; the principles underlying the computation of profit and loss and the statement thereof. No prereq.

| FIRST SEMESTER | | | | SECOND SEMESTER | | | |
|----------------|----|------|------------------------------------|-----------------|----|------|------------------------------------|
| 25L | M | 6:20 | Campus Sch. Bus. 301, Smith | 26L | M | 6:20 | Campus Sch. Bus. 301, Smith |
| | Th | 6:20 | Mpls. N. W. Bank Bldg. 603, Rotzel | | Th | 6:20 | Mpls. N. W. Bank Bldg. 603, Rotzel |
| | Th | 6:20 | St. P. Ext. Center 202, Blandin | | Th | 6:20 | St. P. Ext. Center 202, Blandin |
| | F | 6:20 | St. P. Ext. Center 202, LeBorivous | | F | 6:20 | St. P. Ext. Center 202, LeBorivous |

N.B.—The following Combined Course offers Accounting 25L the first eight weeks, 26L the second eight weeks. Fee, \$15 each course, plus materials fee. Registration and fees accepted for Combined Course, or for one class at a time, either class.

| SECOND SEMESTER | | | |
|-----------------|------|---|--|
| TTh | 6:20 | Campus Sch. Bus. 301, Smith | |
| TF | 6:20 | St. P. Ext. Center 202(T) 206(F), Blandin | |

Survey of Accounting (A.I.B.). 2 credits. Meets for 1½ hours. \$7 plus \$1 materials fee.

A beginning class in accounting, designed primarily for members of the American Institute of Banking, but not restricted to them. No prereq. Semester begins September 11 and ends correspondingly early.

| FIRST SEMESTER | | | |
|----------------|------|--|--|
| W | 4:30 | St. P. First National Bank, LeBorivous | |

Elements and Principles of Accounting (A.I.B.). I and II. 7½ credits for 2 semesters, 14 weeks each; \$12.50 each semester.

A special class, primarily for members of the American Institute of Banking, Minneapolis chapter, covering the essentials of Economics 20, 25, and 26, which see above. Students completing both semesters receive 7½ credits and may continue with advanced classes in accounting. No prereq.

| FIRST SEMESTER | | | | SECOND SEMESTER | | | |
|---------------------|------|------------------------------|--|--------------------|------|-----------------------------|--|
| Begins September 16 | | | | Begins December 30 | | | |
| MF | 5:00 | Mpls. N. W. Bank Bldg., Lund | | MF | 5:00 | Mpls. N. W. Bank Bldg, Lund | |

B.A. 137-138† Accounting Practice and Procedure A-B. 3 credits each semester. Both required for credit. \$10 plus \$1 materials fee.

Practice in the peculiar accounting problems of business and the particular skills of the practicing accountant. Prereq., Ec. 26 or 26L, or equivalent.

| FIRST SEMESTER | | | | SECOND SEMESTER | | | |
|----------------|---|------|---------------------------------|-----------------|---|------|------------------------------------|
| 137 | T | 6:20 | Campus Sch. Bus. 302, Houston | 138 | T | 6:20 | Campus Sch. Bus. 302, Houston |
| | M | 6:20 | St. P. Ext. Center 202, Blandin | | M | 6:20 | St. P. Ext. Center 202, LeBorivous |
| | M | 8:05 | St. P. Ext. Center 202, Blandin | | M | 8:05 | St. P. Ext. Center 202, LeBorivous |

B.A. 131-132† Cost Accounting. 3 credits each semester. Both required for credit. \$10.

Principles used to determine the profitableness of each branch of manufacturing, and basis for judging the relative efficiencies of operation; materials, labor, and burden; continuous process and production order costs; burden distribution methods, standard costs, etc. Prereq., Ec. 26 or 26L, or equivalent.

| FIRST SEMESTER | | | | SECOND SEMESTER | | | |
|----------------|---|------|--------------------------------|-----------------|---|------|--------------------------------|
| 131 | T | 6:20 | Campus Sch. Bus. 301, Rotzel | 132 | T | 6:20 | Campus Sch. Bus. 209, Rotzel |
| | T | 6:20 | St. P. Ext. Center 202, Tuttle | | T | 6:20 | St. P. Ext. Center 204, Tuttle |

B.A. 135-136 Auditing A-B. 3 credits each semester. \$10.

N.B.—Students may register for either without the other.

First semester: the conduct of audits and investigations; setting up of accounts based upon audits; audit reports; all with reference to the work of the public accountant in making audits; meeting requirements of the Securities Act. Second semester: the principles of internal check or audit; accounting systems; applications of machine accounting; introduction to budgetary control; the work of the comptroller. Prereq., B.A. 138.

| FIRST SEMESTER | | | | SECOND SEMESTER | | | |
|----------------|---|------|--------------------------------|-----------------|---|------|--------------------------------|
| 135 | M | 6:20 | Campus Sch. Bus. 202, Reighard | 136 | M | 6:20 | Campus Sch. Bus. 202, Reighard |
| | W | 6:20 | St. P. Ext. Center 204, Rotzel | | | | |

B.A. 139. Advanced General Accounting (Interpretation of Financial Statements). 3 credits. \$10.

Primarily for the general business student. Interpretation of balance sheets and statements, particularly as found in corporation and investment publications; preparation, analysis, and utilization of statements; use of budgets; accounting methods in different businesses. Prereq., Ec. 26 or 26L.

| FIRST SEMESTER | | | |
|----------------|------|-------------------------------|--|
| W | 8:05 | Campus Sch. Bus. 209, Heilman | |

B.A. 134 Income Tax Accounting. 3 credits. \$10.

Application of federal income law to various business and business conditions; possible errors in preparation of income tax reports. Prereq., B.A. 138.

| FIRST SEMESTER | | SECOND SEMESTER | |
|----------------|----------------------------------|-----------------|--------------------------------|
| T 8:05 | Campus Sch. Bus. 209, Preston | T 8:05 | Campus Sch. Bus. 209, Connolly |
| M 8:05 | St. P. Ext. Center 204, Connolly | | |

B.A. 182A Accounting Topics—Audits and Investigations. 3 credits. \$10.

Adjusting journal entries; financial condition; problems in inventory valuation, in property accounting; appraisals; "writing down" of assets, and depreciation; application of funds; balance sheet giving effect to financing; the auditor's "results from operation" statement; material facts; certificates and reports. Prereq., consent of instructor.

| FIRST SEMESTER | | SECOND SEMESTER | |
|----------------|------------------------------|-----------------|--------------------------------|
| T 8:05 | Campus Sch. Bus. 301, Rotzel | W 6:20 | St. P. Ext. Center 200, Rotzel |

B.A. 133 Cost Accounting Methods.**B.A. 181A Topics in Cost Accounting.** Constituting Cost Accounting C and D. 3 credits each semester. \$10.

These established classes are given the titles and numbers of classes in the School of Business Administration to which they correspond. They constitute a detailed practical application to business situations of the principles of cost accounting, and the installation of cost systems; burdens and burden centers; pro forma journal entries; wage methods; change from job to process cost methods; by-product accounting; forms. Prereq., B.A. 132.

| FIRST SEMESTER | | SECOND SEMESTER | |
|----------------|--------------------------------|-----------------|--------------------------------|
| 133 M 6:20 | Campus Sch. Bus. 102, Tuttle | 181a M 6:20 | Campus Sch. Bus. 102, Tuttle |
| T 8:05 | St. P. Ext. Center 202, Tuttle | T 8:05 | St. P. Ext. Center 204, Tuttle |

B.A. 180A Accounting Topics—Budgetary Control. 3 credits. \$10.

Budget systems in business, types and kinds; budgeting of every sort of item; budget administration, committees, etc.; budget reports and statements, form, content, and use; problem studies, solutions; recent developments in foundations for budgetary control. Prereq., see instructor.

| FIRST SEMESTER | |
|----------------|--------------------------------|
| W 8:05 | St. P. Ext. Center 203, Rotzel |

N.B.—This class will be offered in Minneapolis on demand of fifteen students.

Mathematics of Investment. An invaluable equipment for all accountants. See Mathematics Classes, in S.L.A., page 19.

ADVERTISING AND SALESMANSHIP**68ex Salesmanship.** 3 credits toward certificate only. \$10.

Principles underlying salesmanship—buying motives, pre-approach, approach, the interview, meeting objections, closing the sale; demonstration sales. No prereq.

| FIRST SEMESTER | | SECOND SEMESTER | |
|----------------|--------------------------------|-----------------|----------------------------------|
| Th 8:05 | Campus Sch. Bus. 209, Faragher | W 8:05 | St. P. Ext. Center 202, Faragher |

B.A. 88 Elementary Advertising. 3 credits. \$10.

Development of advertising; market analysis; principles of lay-out and arrangement; typography, illustrations, copy; selection of media; practice in lay-out and writing. Prereq., B.A. 77, Psychology 56.

| FIRST SEMESTER | |
|----------------|----------------------------------|
| Th 6:20 | Campus Sch. Bus. 209, Mills |
| W 6:20 | St. P. Ext. Center 200, Faragher |

B.A. 87ex Retail Advertising. 3 credits toward certificate only. \$10.

Fundamentals of modern department and chain store advertising; organization of advertising department; relation to other departments; analysis of market; evaluation of media; sales planning, selection of merchandise and departments to be advertised. Laboratory practice in retail store lay-out and copy-writing stressing ready-to-wear, home furnishings, foods, drugs, fabrics, institutional, and bargain basement themes.

| SECOND SEMESTER | |
|-----------------|---------------------------------|
| Th 6:20 | Campus Sch. Bus. 6, Whitney |
| W 6:20 | St. P. Ext. Center 202, Whitney |

Direct Mail Advertising—Sales Letter Writing. 3 credits for certificate only. \$10.

Personal coaching course covering: the vital points in planning campaigns; selecting papers and processes; "timing" mailings; layout of mailing pieces; getting letters and advertising read; getting low-cost inquiries; how to write letters that pull; how to "follow-up" by mail; how to close sales; the "Check Chart" for increasing results; the five "MUST" factors of every mailing; the 12 major mistakes that ruin returns. Students work out own advertising and letters with instructor's guidance. Open to all; no prereq.

| FIRST SEMESTER | |
|----------------|--------------------------------|
| Th 8:05 | Campus Sch. Bus. 202, Brownson |

Psychology of Advertising. See S.L.A. Classes, page 22.

Commercial Art. See Engineering Classes, page 42.

B.A. 194-195-196, Advanced Advertising Procedure. Not offered 1935-36.

BANKING AND FINANCE

Ec. 3 Mechanism of Exchange (Finance A, Money and Banking). 3 credits. \$10.

The nature and functions of money; the function of credit; character and operations of various types of financial institutions; their relation to the economic structure. No prereq.

FIRST SEMESTER

M 6:20 Campus Sch. Bus. 209, Stehman
W 6:20 St. P. Ext. Center 202, Kozelka

B.A. 58 Elements of Public Finance. 3 credits. \$10.

Public revenues, expenditures, debts; special attention to tax principles, practices, and burdens. Adapted to citizens generally, but of especial interest to public officials. Prereq. for degree, Ec. 6-7. Required of all candidates for degree in business.

SECOND SEMESTER

W 8:05 Campus Sch. Bus. 102, Borak

Ec. 141 Monetary and Banking Policy. 3 credits. \$10.

An advanced course in money and banking and theory of the value of money; control of reserves; providing a scientific currency; regulation of credit; fluctuations of the general price level, their causes and possible reduction. Prereq., Ec. 3, 6, and 7.

FIRST SEMESTER

W 6:20 Campus Sch. Bus. 202, Marget

B.A. 146A-146B Investments (Finance C-D). 3 credits each toward certificate; 146A toward degree, 146B toward certificate only. \$10.

Bonds, mortgages, stocks, and other investment securities; investment policy for the conservative investor; criteria of a good investment; stock exchange organization and operation. Prereq., 3 and 155 (Finance A and B).

FIRST SEMESTER

146A W 6:20 Campus Sch. Bus. 209, Fraine
Th 6:20 St. P. Ext. Center 201, Finger

SECOND SEMESTER

146B W 6:20 Campus Sch. Bus. 209, Fraine
Th 6:20 St. P. Ext. Center 201, Finger

149 Business Cycles. 3 credits. \$10.

Analysis of factors involved in business fluctuation; comparison of theories of the cause of prosperity and depression; introduction to the statistical data and the methods of business forecasting. Prereq., 141 or equivalent.

SECOND SEMESTER

W 6:20 Campus Sch. Bus. 202, Marget

B.A. 155 Corporation Finance (Finance B). 3 credits. \$10.

Types of corporate securities and their uses; forms of corporate organization; marketing of securities; holding companies, mergers, consolidations, and reorganizations; testing of corporations, statistics and reports. Prereq., Ec. 3, 6, 7.

SECOND SEMESTER

M 6:20 Campus Sch. Bus. 209, Stehman
M 8:05 St. P. Ext. Center 204, Kozelka

Mathematics of Investment. A technique for the solving of many problems in banking and finance. See Mathematics Classes, in S.L.A., page 19.

Engineering Finance. See Engineering Classes, page 41.

BUSINESS ADMINISTRATION

66ex Retail Credits. 3 credits toward certificate only. \$10.

Conducted jointly by the instructor and several experienced retail credit men of the Twin Cities. Economic and legal background of credit; relations of retail credit to other forms of credit; sources of retail credit information; work of credit bureau and credit department; collection methods; installment credit practice. No prereq.

FIRST SEMESTER

T 6:20 Campus Sch. Bus. 209, Heilman

B.A. 89 Production Management. 3 credits. \$10.

Location and layout of industrial plants; types of operating organization; shop personnel; standards of operation; purchasing and inventory control; routing, scheduling, and dispatching of product; scientific management; practical problems in production control. No prereq. (Same as Mech. Eng. 171.) Included in core group requirements for all candidates for a degree in business.

FIRST SEMESTER

T 6:20 Campus Mech. Eng. 202, Koepke

Production Management—Time and Motion Studies. See Industrial Engineering 174, page 44, for description of this class.

BUSINESS ENGLISH

1ex Business English. 3 credits toward certificate; may be substituted for Composition 4 when followed by Composition 5 and 6. \$10.

A practical class for business people who recognize the value of good English in business and in general writing and conversation. The various kinds of business writing are studied with some attention to letter types; application of good grammar and correct forms in all business writing. No prereq.

| FIRST SEMESTER | | SECOND SEMESTER | |
|----------------|------------------------------------|-----------------|------------------------------------|
| M | 6:20 Campus Main Eng. 203, Mallam | M | 8:05 Campus Main Eng. 215, Edmunds |
| Th | 6:20 Campus Main Eng. 136, Edmunds | | |
| W | 6:20 St. P. Ext. Center 203, Haga | | |

2ex Business Correspondence. 3 credits toward certificate. \$10.

A continuation of Business English, with less emphasis on grammar and form, and more upon the general principles underlying successful letter writing; types of letters—adjustment, acknowledgment, recommendation, application, follow-ups, sales, interdepartmental, etc. No prereq., but students will do well to complete Business English 1ex first.

| SECOND SEMESTER | |
|-----------------|-----------------------------------|
| M | 6:20 Campus Main Eng. 203, Mallam |
| W | 6:20 St. P. Ext. Center 203, Haga |

N.B.—For classes in English Composition see S. L. & A. Classes, page 14.

BUSINESS LAW

B.A. 51-52-53†-54ex Business Law A, B, C, D. 3 credits each semester; 51, 52, and 53 must be completed before credit is granted. \$10 plus \$1 materials fee each class; no textbook.

Comprehensive course in the fundamental principles of law for the business and professional man. Business Law A (B.A.51): Contracts—their formation, interpretation, operation, transfer, and discharge; Agency—the creation, nature, and terms of the relation, rights and liabilities of the parties. Business Law B (B.A.53): Personal property and transactions concerning it; law of sales, bailments, and of the Uniform Negotiable Instruments and Bills of Lading Acts. Business Law C (B.A.52): Organization, management, and responsibility of associations; business trusts; partnerships and corporations; laws relating to partnership and bankruptcy. Business Law D (B.A.54ex): Nature and classification of real estate; deeds and conveyances; landlord and tenant; recording and abstracting; Torrens titles; liens and mortgages; wills, the probating of estates, and duties of executors and administrators. No prerequisite, but Business Law A should precede other classes.

| FIRST SEMESTER | | SECOND SEMESTER | |
|----------------|--------------------------------------|-----------------|--------------------------------------|
| A T | 6:20 Campus Sch. Bus. 102, Jackman | A T | 8:05 Campus Sch. Bus. 102, Jackman |
| M | 6:20 St. P. Ext. Center 203, Jackman | Th | 6:20 St. P. Ext. Center 206, Jackman |
| B T | 8:05 Campus Sch. Bus. 102, Jackman | B T | 6:20 Campus Sch. Bus. 102, Jackman |
| C W | 6:20 Campus Sch. Bus. 102, Jackman | M | 6:20 St. P. Ext. Center 203, Jackman |
| M | 8:05 St. P. Ext. Center 203, Jackman | D W | 6:20 Campus Sch. Bus. 102, Jackman |
| | | M | 8:05 St. P. Ext. Center 203, Jackman |

ECONOMICS AND STATISTICS

Ec. 6-7† Principles of Economics 1-2. 3 credits each semester. \$10. Both required for credit.

Fundamental principles underlying the economic activities of society; utility and valuation; prices and the cost of production; the factors of production; division of labor and its relation to the development of industry; wages, rent, interest; capitalization, enterprise, business profits. Fundamental to the study of any business subject. No prereq.

| FIRST SEMESTER | | SECOND SEMESTER | |
|----------------|------------------------------------|-----------------|------------------------------------|
| 6 Th | 8:05 Campus Sch. Bus. 102, Graves | 6 W | 6:20 Campus Sch. Bus. 6, Graves |
| T | 8:05 St. P. Ext. Center 203, Myers | T | 6:20 St. P. Ext. Center 203, Myers |
| | | 7 Th | 8:05 Campus Sch. Bus. 102, Graves |
| | | T | 8:05 St. P. Ext. Center 203, Myers |

Ec. 103-104† Advanced Economics—Competition, Monopoly, and Inequality of Incomes. 3 credits each semester; both required for credit. \$10.

An advanced course in economic theory, prices, and costs; the value theory; the distribution of wealth—causes and effects of inequality; the distribution of income—inequality, rent, wages, interest, and profits. Prereq., see instructor. May be substituted for B.A. 101-102 in requirements for degree in business.

| FIRST SEMESTER | | SECOND SEMESTER | |
|----------------|----------------------------------|-----------------|----------------------------------|
| 103 Th | 6:20 Campus Sch. Bus. 102, Waite | 104 Th | 6:20 Campus Sch. Bus. 102, Waite |

Ec. 14 Elements of Statistics. 3 credits. \$10.

The principles of statistical methods applied to business; selection, tabulation, interpretation of statistical data; averages, ratios, errors, index numbers, graphs and charts. Prereq., Ec. 6-7.

| FIRST SEMESTER | |
|----------------|--------------------------------------|
| W | 6:20 Campus Sch. Bus. 6, Graves |
| W | 8:05 St. P. Ext. Center 202, Kozelka |

B.A. 165 The Economics of Public Utilities. 3 credits. \$10.

The economic aspect of government regulation of the finances, rates, and services of municipal public utilities; economic characteristics, legal position, regulation, valuation, and government ownership. Prereq., Ec. 3, 6 and 7.

FIRST SEMESTER

Th 8:05 St. P. Ext. Center 203, Schmidt

Ec. 161 Labor Problems and Trade Unionism. 3 credits. \$10.

Employment; hours; wages; extent and stronghold of unionism; open and closed shops; collective bargaining; industrial unrest; government regulation of labor disputes. Special emphasis on the current proposals for industrial recovery and the re-employment of labor. Prereq., Ec. 6-7.

FIRST SEMESTER

M 8:05 Campus Sch. Bus. 102, Yoder

Ec. 166 Current Economic Problems. 3 credits. \$10.

Practical application of the principles of economics in the study of selected problems of the day; stabilization of prices; Federal Reserve rediscount policy, industrial fluctuations; international trade barriers; distribution of wealth and income. Prereq., Ec. 6-7.

FIRST SEMESTER

W 8:05 Campus Sch. Bus. 202, Marget
T 6:20 St. P. Ext. Center 203, Myers

INSURANCE

3ex General Insurance. 3 credits toward certificate only. \$10.

A basic course in the principles and practices involved in underwriting the various forms of insurance coverage, property and casualty in particular. Prerequisite to all other insurance classes. No prereq.

FIRST SEMESTER

M 8:05 Campus Sch. Bus. 6, Ware

B.A. 61 Casualty Insurance. 3 credits. \$10.

The risks of insurance coverages and policy provisions in the more important lines of casualty insurance—accident and health, employer's liability, workmen's compensation, automobile, robbery and theft, plate glass, and miscellaneous damage types. Prereq., Ec. 6-7.

SECOND SEMESTER

M 8:05 Campus Sch. Bus. 6, McGee

B.A. 59 Life Insurance. Not offered 1935-36.

B.A. 60 Fire and Marine Insurance. Not offered 1935-36.

Life Insurance Salesmanship. Not offered 1935-36.

Mathematics of Investment. Applications of algebra to problems of business often involving insurance. See Mathematics Classes, in S.L.A., page 19.

TEXTILES

3 Textiles. 3 credits. \$10.

A course for the consumer, the merchant, the salesman. Woven fabrics of rayon, cotton, silk, wool, and linen; manufacturing and finishing processes; qualities, tests, uses, maintenance; knit fabrics and drapery and upholstery fabrics; explanation of technical terms and characteristics determining comparative value, and of substitution. No prereq.

FIRST SEMESTER

W 6:20 Campus Chemistry 115, Caplin

Interior Decorating. See Art Education Classes, page 28.

TRANSPORTATION (TRAFFIC)

B.A. 71-72 Transportation Services and Charges. 3 credits each semester. \$10 plus \$1 materials fee.

The rail, water, and highway transportation facilities, services, rates, and laws, and their relation to business establishments; problems in handling freight, express, and rail shipments; scope, selection, and use of the facilities and services of common carriers; storage of express, freight, and mail; private ownership and transportation facilities. 71 prerequisite to 72. Prereq., Ec. 6-7.

FIRST SEMESTER

71 F 6:20 Campus Sch. Bus. 6, Mann

SECOND SEMESTER

72 F 6:20 Campus Sch. Bus. 6, Mann

ENGINEERING CLASSES

In this department two kinds of classes are offered for two rather distinct classes of students. Classes of regular college standing are offered for those who wish to accumulate as much of the work of the regular engineer's course of training as they can while regularly employed. For those whose requirements are less exacting and who wish practical rather than theoretical, scientific, or mathematical training some classes of subcollegiate level are offered. The student's own needs or desires are to determine which work is to be followed, and no disparaging distinctions are made between the two kinds.

Classes of the second kind are in the program indicated as without prerequisites and without credit. They are offered freely to all who have the appropriate interest, for such value as they may possess. Each such class is usually complete in itself. A few may carry credit when the student has met requirements set up by the College of Engineering. These courses, however, are not offered as equivalents for any of the work in the College of Engineering.

The regular collegiate courses offered correspond to those given to full time engineering students, and are based on the same prerequisites. Students taking these classes are those who wish to be thoroly prepared and do the maximum of work in each class. Students who do not meet the prerequisite requirements may be admitted to these classes, but only as auditors, and are not permitted to make extra demands upon the instruction which would tend to retard the progress of the prepared students.

All credits earned in classes in this department may carry credit toward an extension certificate. They may count toward a degree in the College of Engineering only after the successful completion of a comprehensive examination given by that college in the work of the course. These examinations, given at the time of formal entry into the College of Engineering, for the completion of the degree are without expense. Taken at other times, they entail a fee of \$5 for each examination. The prerequisites for credit in all classes are stated primarily to show the proper order in which the classes should be taken. While it is possible to disregard these prerequisites in some cases, it is not recommended, for best results are obtained only when the proper sequence of classes is maintained. Such a strict regard for prerequisites is compulsory in classes in Mathematics and in Chemistry. Without prerequisites, it is impossible to do the work of those classes.

CERTIFICATES

The General Extension Division certificate in engineering is issued as an evidence of the completion of an organized program of study in engineering subjects. While not the equivalent of a degree in engineering, it represents a comprehensive yet concentrated training in several branches of engineering which will be found valuable in many phases of industry and activities which utilize engineering ability. The program embraces a core of fundamental subjects, including all the mathematics required for an engineering degree, and the opportunity for specialization in either of several engineering fields. The requirements are as follows:

1. Each candidate must complete a total of 90 credits with an average grade of C in engineering subjects, of which the following are required:

| Mathematics: | Credits |
|---------------------------------|-----------|
| 9 Higher Algebra | 5 |
| 11 College Algebra | 5 |
| 12 Trigonometry | 5 |
| 13 Analytic Geometry | 5 |
| 24 Differential Calculus | 5 |
| 25 Integral Calculus | 5 |
| Mechanical Drawing 1-2..... | 6 |
| Advanced Applied Mechanics..... | 5 |
| Strength of Materials..... | 5 |
| Total | 46 |

2. Each candidate will be required to complete additional classes totaling approximately 30 credits in one of the separate fields of Engineering—Aeronautical, Architectural, Chemical, Civil, Electrical, Mechanical.

3. The remaining credits, approximately 14, may be completed either in optional courses within the chosen field, or in approved elective courses in one of the allied fields. Selection of classes in which to earn these credits should be made with the advice and approval of the Students' Work Committee.

4. Upon the completion of an approved 45 credits a preliminary certificate will be in-

formally issued for such purposes as the candidate may wish to use it. The approval of classes which will yield these 45 credits must be had from the Students' Work Committee.

5. Students who have already entered upon a program for the completion of the requirements for one of the 45-credit certificates, which are replaced by the above 90-credit certificate, will be protected until the completion of their work and the appropriate certificates will be issued informally.

DESCRIPTION AND PROGRAM OF CLASSES

Extension classes in Engineering subjects are open to all who can profit by the study, without regard to previous classes or other education, except the preparation essential to the successful completion of the work attempted. In general this necessary preparation is indicated in the prerequisites, or their equivalent, listed in the description of a class. **THE INSTRUCTOR OF A CLASS WILL ALWAYS BE THE JUDGE OF THE ADEQUACY OF A STUDENT'S PREPARATION AND SHOULD ALWAYS BE CONSULTED WHEN THE STUDENT IS IN DOUBT.**

N.B.—An extension class in Engineering carries credit toward a degree in the College of Engineering and Architecture, or in the School of Chemistry, only when the student has successfully passed a comprehensive examination, given by the college, in the work of the class.

GENERAL ENGINEERING

Consultation Period. No fee.

A session for guidance purposes, open to all students registered in engineering classes; affords opportunity for consultation, discussion, or study, under direction, in all engineering subjects. An instructor will be present.

FIRST SEMESTER
F 7:00 Campus Main Eng. 136

SECOND SEMESTER
F 7:00 Campus Main Eng. 136

Survey of Engineering Practice. No credit. \$10.

A course of sixteen lectures dealing with the practical problems of the civil, hydraulic, electrical, mechanical, industrial, sanitary, and municipal engineer, given by prominent engineers of the Twin Cities. Each will discuss the field in which he is in practice. Each lecture followed by a period of discussion by the class. No prereq.

FIRST SEMESTER
T 7:30 Campus Main Eng. 107, Various instructors

Engineering Finance. 3 credits toward certificate. \$10.

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. Prereq., college algebra and first half of Mathematics of Investment.

SECOND SEMESTER
T 7:30 Campus Main Eng. 107, Teeter, Edwards

AERONAUTICAL ENGINEERING

2a-bex Aircraft Engines 1-2. 3 credits each semester. \$10.

Development of the airplane engine; present types; air cooled, radial, and in line; water cooled, V, W, and in line; principles of ignition, carburetion, combustion; modern magnetos and carburetors; fuels and detonation; the aircraft Diesel. Laboratory tests; engine performance. No prereq.

N.B.—Taught jointly with M.E. 50 Internal Combustion Engines. Students may enter either semester.

FIRST SEMESTER
2aex W 7:30 Campus Exp. Eng. 209, Robertson

SECOND SEMESTER
2bex W 7:30 Campus Exp. Eng. 209, Robertson

5a-bex Elementary Aeronautics and Airplane Construction I-II. 3 credits each semester. \$10.

Nomenclature; theory of lift and drag; wind tunnels; air-foil characteristics; types of airplanes; demonstration and inspection of airplane and its parts; materials and their properties; principles in propeller theory; navigation instruments; dead reckoning; maps and charts; laying out and checking course; radio use; magnetic compass and its use; the atmosphere and clouds; reading of weather map; principles of celestial navigation. Prereq., elementary mathematics.

FIRST SEMESTER
M 7:30 Campus Exp. Eng. 110, Akerman
and Barlow

SECOND SEMESTER
M 7:30 Campus Exp. Eng. 110, Akerman
and Barlow

AIR CONDITIONING

See Mechanical Engineering Classes, p. 45.

ARCHITECTURE

Classes in Architectural Design. Not offered 1935-36.

Building Cost Estimating. See Engineering Drawing, G.E. 81.

ART

(See also Fine Arts (S.L.A. Classes, p. 15), Art Education (p. 28), and Cartooning (p. 13).)

N.B.—All art classes scheduled for a given meeting will be taught simultaneously. Students may enter any unit listed, either semester. The beginning classes in Commercial and Freehand Drawing may, if registration is below minimum, be combined on one night.

1-2ex Commercial Drawing I-II. 3 credits each semester, toward certificate only. \$10.

Elementary and advanced commercial art; design, lettering, layouts, posters, figure drawing, in pen and ink, pencil, color, or any media. Solutions of practical problems stressed. Open to beginners and advanced students either semester. No prereq.

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| <small>FIRST SEMESTER</small> | <small>SECOND SEMESTER</small> |
| M 7:30 Campus Main Eng. 417, Doseff | M 7:30 Campus Main Eng. 417, Doseff |

24-25-26 Freehand Drawing I-II. 1½ credits each unit. \$10.

Drawing from geometric solids, architectural ornaments or figures, and still life, in charcoal, pencil, pen and ink, water color, or any media. Students for either unit may enter either semester. No prereq.

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| <small>FIRST SEMESTER</small> | <small>SECOND SEMESTER</small> |
| T 7:30 Campus Main Eng. 417, Doseff | T 7:30 Campus Main Eng. 417, Doseff |

27-28-29ex Freehand Drawing III, IV, V, VI. 1½ credits each unit. \$10. Model fee \$1 payable to instructor.

Life drawing; figure composition; pencil, pen, charcoal, oil, water colors; print making. Prereq., 26.

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| <small>FIRST SEMESTER</small> | <small>SECOND SEMESTER</small> |
| W 7:30 Campus Main Eng. 417, Burton | W 7:30 Campus Main Eng. 417, Burton |

CHEMISTRY

N.B.—All Chemistry classes meet for a minimum of one lecture, one recitation, and three hours' laboratory a week.

9ex‡ General Inorganic—Nonmetals. 5 credits. \$17.

The common nonmetallic elements and their principal compounds; the laws and theories of chemistry. No prereq.

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| <small>FIRST SEMESTER</small> |
| TTh 7:30 Campus Chem. 210, 315, Geiger |

12ex‡ General Inorganic and Qualitative Analysis. 5 credits. \$17.

The common metallic elements and their principal compounds; the laws and theories involved; systematic qualitative analysis. Prereq., 9ex or its equivalent.

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| <small>SECOND SEMESTER</small> |
| TTh 7:30 Campus Chem. 210, 315, Geiger |

1ex‡ Quantitative Analysis—Gravimetric. 5 credits. \$17.

Principles and methods of gravimetric analysis; typical problems and proper laboratory practice. Prereq., Qualitative Analysis.

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| <small>FIRST SEMESTER</small> |
| TTh 7:30 Campus Chem. 310, 315, Geiger |

2ex‡ Quantitative Analysis—Volumetric. 5 credits. \$17.

General principles and methods of volumetric analysis. Prereq., Qualitative Analysis.

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| <small>SECOND SEMESTER</small> |
| TTh 7:30 Campus Chem. 310, 315, Geiger |

7ex‡ Quantitative Analysis—Premedical. 5 credits. \$17.

Introductory, covering principles and methods of gravimetric and volumetric quantitative analysis; typical problems and proper laboratory practice. (Given in connection with 2ex.) Prereq., Qualitative Analysis.

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| <small>SECOND SEMESTER</small> |
| TTh 7:30 Campus Chem. 310, 315, Geiger |

123-124ex‡ Advanced Quantitative Analysis. 123ex, 5 credits, \$17; 124ex, 4 credits, \$13.50.

Those desiring this class meet with class in Quantitative Analysis (1ex) in Room 310 first night. Prereq. for degree 1ex, 2ex or permission of instructor.

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| <small>FIRST SEMESTER</small> | <small>SECOND SEMESTER</small> |
| 123ex TTh 7:30 Campus Chem. 310, 315, Geiger | 124ex TTh 7:30 Campus Chem. 310, 315, Geiger |

‡ All chemistry classes require a deposit of \$5, payable at Chemistry Department, of which \$2 is laboratory fee and the remainder for breakage. The unused portion is to be returned.

Textiles. See Business Classes, p. 39.

CIVIL ENGINEERING

11 Plane Surveying. 3 credits. \$10.

Field problems; use of chain, compass, transit; leveling; field notes and their computation and plotting; care, use, and adjustment of instruments. Prereq., trigonometry and drawing.

FIRST SEMESTER
T 7:30 Campus Main Eng. 215, Cutler

21 Curves and Earthwork. 3 credits. \$10.

Mathematics of simple, compound, and spiral curves; plotting and profiling; vertical curves; cross-sectioning and computation of earthwork volumes; computing overhaul; mass diagram. Prereq., 11.

SECOND SEMESTER
T 7:30 Campus Main Eng. 215, Cutler

51-52 Highways and Pavements I-II. 3 credits each semester. \$10.

Elementary economics, location, construction, and maintenance of highways and pavements; road building materials, and methods of testing with laboratory practice. Students may enter either semester. Prereq., Trigonometry.

N.B.—In the interest of those professionally engaged in road building and desirous of registering for these classes the following plan has been adopted: if class 51 does not have a sufficient enrolment at its first meeting its opening will be postponed to November 28; by meeting twice weekly thereafter the class will finish at the end of the first semester. Similarly class 52, by meeting twice weekly, will finish in time for the opening of the road building season.

FIRST SEMESTER
51 W 7:30 Campus Exp. Eng. 215, Lang
SECOND SEMESTER
52 W 7:30 Campus Exp. Eng. 215, Lang
Hydraulics. Not offered 1935-36.
Reinforced Concrete. Not offered 1935-36.

ECONOMICS

A variety of classes, including Statistics, Finance, Advertising and Selling, will be found in Business Classes, pages 34 to 39.

ELECTRICAL ENGINEERING

Elementary Electricity. 3 credits each semester, toward certificate only. \$10.

The fundamental facts about electricity and its action, as applied in the construction and use of electrical machines, appliances, and transmission equipment. Prepares particularly for the study of electrical engineering in classes of college level; valuable also to those engaged in the electrical trades and to users of electrical appliances. Both semesters necessary. Prereq., elementary algebra.

FIRST SEMESTER
Th 7:30 Campus Main Eng. 106, Edwards
SECOND SEMESTER
Th 7:30 Campus Main Eng. 106, Edwards

11-13-15 Elements of Electrical Engineering. 4½ credits each semester. \$15.

Introduction to the development, principles, materials, safety, and general applications of electrical engineering. Lectures, recitations, and laboratory. Begins the regular sequence, sophomore year; to be followed by work of junior and senior years, leading to the engineering degree. Prereq., mathematics to differential calculus, or see instructor.

FIRST SEMESTER
TTh 7:30 Campus Elec. Eng. 237, Johnson,
Kuhlmann
SECOND SEMESTER
TTh 7:30 Campus Elec. Eng. 237, Johnson,
Kuhlmann

66-67ex Radio Communication I-II. 3 credits each semester, toward certificate only. \$10.

An elementary course dealing with a qualitative understanding of the basic principles of radio reception and transmission. Prereq., Elementary Algebra.

FIRST SEMESTER
66ex T 7:30 Campus Elec. Eng. 339, Swanson
SECOND SEMESTER
67ex T 7:30 Campus Elec. Eng. 339, Swanson

68-69ex Radio Communication III-IV. 3 credits each semester, toward certificate only. \$10.

Designed especially for those engaged in such work as radio station operation, design of radio apparatus, and operation of public address systems. Mathematical discussion of such topics as detection, amplification, oscillation, modulation, transmission lines, and various circuit networks. Prereq., Integral Calculus or permission of instructor.

FIRST SEMESTER
68ex Th 7:30 Campus Elec. Eng. 339, Swanson
SECOND SEMESTER
69ex Th 7:30 Campus Elec. Eng. 339, Swanson

ENGINEERING DRAWING

1-2 Engineering Drawing. 3 credits each semester. \$10.

Elements of drafting, representation, geometry, sketching, lettering, working drawings, conventions, tracing. Auxiliary views, multiple projection, detail and assembly drawings. No. prereq.

N.B.—Students may enter either class either semester.

FIRST SEMESTER
Th 7:30 Campus Main Eng. 201, French
W 7:30 St. P. Mechanic Arts High, Dow
SECOND SEMESTER
Th 7:30 Campus Main Eng. 201, French
W 7:30 St. P. Mechanic Arts High, Dow

Descriptive Geometry and Alignment Charts. Given on demand.

22 Structural Drafting. 3 credits for one semester; repeated second semester. \$10.

Details of fabrication of beams, girders, columns, trusses, etc.; concrete construction; material bills. Prereq., Drawing 1-2.

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| FIRST SEMESTER | SECOND SEMESTER |
| Th 7:30 Campus Main Eng. 201, French | Th 7:30 Campus Main Eng. 201, French |

29 Advanced Mechanical Drawing. 3 credits one semester; repeated second semester. \$10.

Drafting of details of machine fastenings, pipe and pipe fastenings; bearings and journals, pulleys, gears, cams; assembly, diagrammatic and layout drawings. Prereq., Drawing 1-2.

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| FIRST SEMESTER | SECOND SEMESTER |
| Th 7:30 Campus Main Eng. 201, French | Th 7:30 Campus Main Eng. 201, French |
| W 7:30 St. P. Mechanic Arts High, Dow | W 7:30 St. P. Mechanic Arts High, Dow |

G.E. 70 Use of Engineer's Slide Rule. 1 credit. One hour meetings, weekly. \$5.

Theory and computation practice necessary for those who wish to use the slide rule in ordinary office procedure. Prereq., Trigonometry or current registration therein. Repeated second semester.

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| FIRST SEMESTER | SECOND SEMESTER |
| Th 7:30 Campus Main Eng. 201, French | Th 7:30 Campus Main Eng. 201, French |

G.E. 81 Cost Estimating. 3 credits. \$10, plus materials fee, \$2; no textbook required.

Blueprint reading, quantity surveying, mensuration; estimates of concrete, brick, timber, and steel structures. Use of slide rule optional. No prereq.

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| FIRST SEMESTER | SECOND SEMESTER |
| Th 7:30 Campus Main Eng. 201, French | Th 7:30 Campus Main Eng. 201, French |

INDUSTRIAL ENGINEERING**M.E. 171 Production Control.** 3 credits. \$10.

Same as Bus. Adm. 89; for description see p. 37.

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| FIRST SEMESTER |
| T 6:20 Campus Mech. Eng. 202, Koepke |

M.E. 174 Production Management—Time and Motion Studies. 3 credits. \$10.

Lectures and laboratory studies of various operations; the use, time, and photographic means of analysis; charting of micromotion results; study of fatigue; rate setting. Primarily for those in charge of production processes. Open to noncredit students without prerequisites.

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| SECOND SEMESTER |
| T 6:20 Campus Mech. Eng. 202, Koepke |

MATHEMATICS

The numbers of these courses are those used by the College of Engineering and Architecture.

7-8ex Elementary Algebra. Credit toward entrance only. \$10.

Elements of algebra, to quadratic equations. No prereq. Both semesters necessary.

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| FIRST SEMESTER | SECOND SEMESTER |
| M 8:05 Campus Main Eng. 106, Edwards | M 8:05 Campus Main Eng. 106, Edwards |

Shop Mathematics I. No degree credit. \$10, plus \$1 materials fee.

A beginning course in mathematics using arithmetical processes in connection with practical problems; prepares students to begin the study of algebra and furnishes foundation that makes all subsequent study in mathematics clearer and hence easier. No prereq.

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| SECOND SEMESTER |
| M 6:20 Campus Main Eng. 106, Edwards |

5 Solid Geometry. Credit toward entrance only. \$10.

Standard theorems and exercises; practice in special proofs and original exercises. Class will finish December 16; extra sessions arranged to make semester's work complete. Prereq., Plane Geometry.

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| FIRST SEMESTER |
| M 6:20 Campus Main Eng. 106, Edwards |

9 Higher Algebra. 5 credits. \$17.

A review and collegiate treatment of the topics of elementary algebra, which is prerequisite. Not open for credit to those who present higher algebra for entrance to college.

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| FIRST SEMESTER |
| T 7:00 Campus Main Eng. 106, Edwards |
| F 7:00 St. P. Ext. Center 203, Dow |

11 College Algebra. 5 credits. \$17.

Quadratic equations; equations in the quadratic form; simultaneous quadratic equations; graphical representation; progressions; mathematical induction; binomial theorem; permutations; combinations; probability; determinants; theory of equations. Prereq., 9.

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| SECOND SEMESTER |
| T 7:00 Campus Main Eng. 106, Edwards |
| F 7:00 St. P. Ext. Center 203, Dow |

12 Trigonometry. 5 credits. \$17.

Logarithms and plane trigonometry. Prereq., 9.

FIRST SEMESTER
Th 7:00 Campus Main Eng. 107, Teeter**13 Analytic Geometry, Plane and Solid.** 5 credits. \$17.

Elements of plane analytic geometry including conic sections; brief introduction to solid analytic geometry. Prereq., Trigonometry.

SECOND SEMESTER
Th 7:00 Campus Main Eng. 107, Teeter**24 Differential Calculus.** 5 credits. \$17.

Limit; derivative; simple applications of derivative; maxima and minima; differentials; rates; change of variables; radius of curvature; mean value; indeterminate forms; partial differentiation; series. Prereq., 13.

FIRST SEMESTER
W 7:00 Campus Main Eng. 106, Edwards**25 Integral Calculus.** 5 credits. \$17.

Expansion of function; Taylor's theorem; standard elementary forms; definite integral; rational fractions; integration by substitution, by parts; reduction formulas; integration of processes of summation; successive and partial integration; elementary ordinary differential equations. Prereq., 24.

SECOND SEMESTER
W 7:00 Campus Main Eng. 106, Edwards*151-152ex Differential Equations. Not offered 1935-36.***Mathematics of Investment.** Valuable for all engineers and prerequisite to Engineering Finance. See Mathematics Classes, in S.L.A., page 19.**MECHANICAL ENGINEERING***Machine Design. Not offered 1935-36.***M.E. 65-66ex Air Conditioning—Elementary.** 3 credits each semester, toward certificate. \$10, plus \$1 materials fee.

Especially designed for those engaged in selling, installing, or recommending the modern types of appliances for heating, cooling, humidifying, or otherwise conditioning the air of houses and other buildings. Deals with the wants of the human body; the laws of temperature, pressure, humidity, etc.; the methods of heating, cooling, cleaning, and distributing air and the peculiarities of each; testing and measuring pressure, humidity, etc., and the instruments used; critical evaluation of the results of processes. Both semesters required to complete the matter outlined, or to receive credit. No prereq. Mimeographed matter and blueprints issued in lieu of a textbook.

FIRST SEMESTER
W 7:30 Campus Exp. Eng. 110, Algren,
LundSECOND SEMESTER
W 7:30 Campus Exp. Eng. 110, Algren,
Lund**M.E. 67-68ex Air Conditioning—Advanced.** 3 credits each semester, toward certificate. \$10, plus \$1 materials fee.

The application of the principles of air conditioning to practical problems; the design of systems to meet the requirements of occupied spaces and industrial plants. A continuation of Air Conditioning—Elementary (M.E. 65-66) which is to be considered prerequisite. Instructor will decide whether students have equivalent preparation. Mimeographed material in lieu of textbook.

FIRST SEMESTER
T 7:30 Campus Exp. Eng. 110, AlgrenSECOND SEMESTER
T 7:30 Campus Exp. Eng. 110, Algren**50a-b Internal Combustion Engines.** 3 credits each semester. \$10.

A practical course in theory, construction, testing of gasoline, semi-Diesel and Diesel engines; fuels; combustion; lubrication; cooling and electric systems; carburetors; theoretical and practical engine cycles; use of instruments for determining horsepower, mechanical, and thermal losses in engine operation; laboratory tests. No prereq.

N.B.—Taught jointly with Aero. 2, Aircraft Engines. Students may enter either semester.

FIRST SEMESTER
50a W 7:30 Campus Exp. Eng. 209, RobertsonSECOND SEMESTER
50b W 7:30 Campus Exp. Eng. 209, Robertson**Diesel Engines (Theory, Construction and Operation).** 3 credits each semester, for certificate. \$10.

Development of the modern Diesel engine, air injection equipment, mechanical injection pumps, fuel spray nozzles, combustion chamber construction, Diesel power generating plants, high speed Diesels for rail cars, busses, tractors, and aircraft; Diesel fuels and the chemistry of combustion; operating equipment and care. A course for operating engineers and others interested in a broad technical study of the Diesel engine. Two semesters, continuous, both necessary.

FIRST SEMESTER
Th 7:30 Campus Exp. Eng. 110, RobertsonSECOND SEMESTER
Th 7:30 Campus Exp. Eng. 110, Robertson

M.&M. 128a,b Strength of Materials. 3 credits each semester. \$10.

Mechanical and elastic properties of materials of construction; beams, shafts, and columns; hollow cylinder rollers; plates, curved bars, and springs; combined stresses, dynamic stresses, and true stresses. Prereq., Calculus and Technical Mechanics.

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| FIRST SEMESTER | | SECOND SEMESTER | |
| M 7:30 | Campus Main Eng. 107, Teeter | M 7:30 | Campus Main Eng. 107, Teeter |

Foundry Practice. 3 credits each semester toward certificate. \$10, plus \$1 materials fee.

A lecture course to supplement the practical work of foundry workers and others interested in the production and use of castings. First semester: Elementary Chemistry, Foundry Materials (properties, composition, use), Foundry Products (cast iron, cast steel, malleable and non-ferrous alloys), Molding Problems (gating and heading); second semester: Elementary Metallurgy (properties of alloys), Standard Specifications and Tests Bars, Melting Practice and Furnace Operation, Blueprint Reading and Cost Finding. No prereq.

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| FIRST SEMESTER | | SECOND SEMESTER | |
| W 7:30 | Campus Main Eng. 136, Potter | W 7:30 | Campus Main Eng. 136, Potter |

METALLOGRAPHY**1-2ex Metallography and Heat Treatment of Iron and Steel.** 3 credits each semester, toward certificate only. \$10.

A beginning course suitable for those engaged in practical heat treatment, in writing specifications, purchasing or selling iron or steel; lectures, demonstrations and laboratory work in pyrometry, thermal analysis, preparation of alloys, microscopic examination of metal alloys, preparation of photomicrographs; the theory of heat treating, its relation to practice.

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| FIRST SEMESTER | | SECOND SEMESTER | |
| 1ex M 7:30 | Campus Sch. Mines 306, Dowdell | 2ex M 7:30 | Campus Sch. Mines 306, Dowdell |

PETROLEUM PRODUCTS**106ex Petroleum and Petroleum Products.** Open to all without credit. \$10.

A practical course for those interested in petroleum. The topics covered will be the origin of petroleum, its chemistry, refining, including various processes of cracking and various solvent processes for refining lubricating oils; nature and properties of various products and their application; methods of test and their significance.

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| FIRST SEMESTER | |
| T 7:30 | Campus Exp. Eng. 215, Peterson |

107ex Testing of Petroleum Products. Open to all without credit. \$10, plus \$5 laboratory deposit, payable at registration.

A laboratory class in testing gasoline, kerosene, gas oil, lubricating oil, road oil, and asphalt. Includes interpretation of all test results. Unused portion of laboratory deposit to be refunded. For best results should be preceded by 160ex above.

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| SECOND SEMESTER | |
| T 7:30 | Campus Exp. Eng. 210, Peterson |

GENERAL EXTENSION DIVISION FACULTY

Lotus D. Coffman, Ph.D., LL.D., President
 Richard Rees Price, M.A., Ed.D., Director of University Extension
 Curtis E. Avery, M.A., Instructor in English
 Charles H. Dow, C.E., Assistant Professor of Civil Engineering
 Oliver C. Edwards, B.S., M.E., Assistant Professor of Mechanical Engineering
 Haldor B. Gislason, B.A., LL.B., Assistant Professor of Speech
 Jerome Jackman, B.A., LL.B., Instructor in Business Law
 Irving W. Jones, Ph.B., Assistant Professor, Chairman of Students' Work Committee
 Edward M. Kane, M.A., Instructor in History
 Helen P. Mudgett, M.A., Instructor in History
 John W. Powell, B.A., D.D., S.T.D., Lecturer in English
 Clare L. Rotzel, B.C.S., C.P.A., Associate Professor of Accounting
 Herbert Sorenson, Ph.D., Assistant Professor of Educational Psychology
 Algernon H. Speer, B.A., Head of Correspondence Study Department
 Thomas A. H. Teeter, B.S.(C.E.), Associate Professor of Engineering
 Wendell White, Ph.D., Assistant Professor of Psychology

John D. Akerman, B.S.(Aero.E.), Professor of Aeronautical Engineering
 Axel B. Algren, M.S.(M.E.) Assistant Professor of Mechanical Engineering
 Ingvald W. Alm, B.S., Instructor in Accounting and Economics
 Stan Asch, Instructor in Cartooning
 Gertrude Baker, M.A., Associate Professor of Physical Education
 Howard W. Barlow, B.S.(M.E.), M.S.(Aero.E.), Assistant Professor of Aeronautical Engineering
 Adolph A. Blandin, B.S., Instructor in Accounting
 Arthur M. Borak, Ph.D., Assistant Professor of Economics

Ruth E. Boynton, M.S., M.D., Associate Professor of Preventive Medicine and Public Health
 Emmert M. Brackney, M.A., Instructor in Romance Languages
 Harold E. Briggs, M.A., Instructor in English
 Ralph H. Brown, Ph.D., Assistant Professor of Geography
 Lewis Brownson, B.S., Instructor in Advertising
 Bryng Bryngelson, Ph.D., Assistant Professor of Speech
 J. William Buchta, Ph.D., Associate Professor of Physics
 Gerald H. Burgess, Instructor in Philately
 S. Chatwood Burton, M.A., Professor of Fine Arts
 Eula B. Butzerin, R.N., M.A., Assistant Professor of Preventive Medicine and Public Health
 Jessie F. Caplin, M.S., Instructor in Textiles
 Alburey Castell, Ph.D., Instructor in Philosophy
 Asher N. Christensen, B.A., Instructor in Political Science
 Grace Christensen, B.S., Instructor in Physical Education
 Ruth Christie, M.A., Instructor in English
 Herbert E. Cleton, Ph.D., Assistant Professor of Romance Languages
 George P. Conger, Ph.D., Associate Professor of Philosophy
 John L. Connolly, LL.B., Instructor in Income Tax Problems
 Pearl T. Cummings, B.S., Instructor and Extension Worker in Child Welfare
 Alvin S. Cutler, C.E., Professor of Railway Engineering
 James Davies, Ph.D., Assistant Professor of German
 Darrell H. Davis, Ph.D., Professor of Geography
 Katharine J. Densford, M.A., R.N., Professor of Nursing
 Samuel N. Dicken, Ph.D., Assistant Professor of Geography
 Harold S. Diehl, M.A., M.D., Professor of Preventive Medicine and Public Health, Dean of Medical Sciences
 Ivan Doseff, B.S., Instructor in Drawing and Painting
 Ralph L. Dowdell, Met.E., Ph.D., Professor of Metallography
 Lynwood G. Downs, Ph.D., Instructor in German
 Carl E. Dutton, Ph.D., Instructor in Geology and Mineralogy
 James M. Edmunds, M.A., Instructor in English
 Marie Eibner, B.S., Instructor in Physical Education
 Charles A. Erdmann, Ph.D., M.D., Associate Professor of Anatomy
 Henry A. Erikson, Ph.D., Professor of Physics
 Marion L. Faegre, B.A., Assistant Professor of Parent Education and Extension Worker, Institute of Child Welfare
 Reginald G. Faragher, B.A., Instructor in Elementary Advertising
 Ray Faulkner, M.L.A., Instructor in Art Education
 Anne L. Fenlason, M.A., Associate Professor of Sociology
 Donald N. Ferguson, M.A., Professor of Music
 Clarence L. Finger, Instructor in Finance
 Walter W. Finke, B.A., LL.B., Instructor in Sociology
 Edwin H. Ford, M.A., M.S., Assistant Professor of Journalism
 Harold G. Fraine, Comml. Eng., Instructor in Investments
 Jules T. Frelin, B.A., Assistant Professor of Romance Languages
 Robert W. French, B.S.(C.E.), Professor of Drawing and Descriptive Geometry
 Albert M. Fulton, Ph.M., Instructor in Speech
 I. William Geiger, Ph.D., Associate Professor of Analytic Chemistry
 Gladys E. C. Gibbens, Ph.D., Assistant Professor of Mathematics
 H. Phoebe Gordon, M.S., Instructor in Nursing
 Adah G. Grandy, B.L., Instructor in English
 Richard A. Graves, M.A., Instructor in Economics and Insurance
 Raymond L. Grismer, Ph.D., Associate Professor of Romance Languages
 John W. Gruner, Ph.D., Associate Professor of Geology
 Marguerite Guinotte, M.A., Certificat d'Aptitude Pédagogique, Instructor in Romance Languages
 Millard F. Gunderson, Ph.D., Instructor in Bacteriology
 Clifford I. Haga, B.A., Instructor in English
 Richard Hartshorne, Ph.D., Assistant Professor of Geography
 Edward W. Hawley, B.A., LL.M., Instructor in Parliamentary Law
 Bridget T. Hayes, M.A., Instructor in English for Every Day
 Ernest A. Heilman, Ph.D., Associate Professor of Accounting
 Lewis B. Hessler, Ph.D., Assistant Professor of English
 Kate Hevner, Ph.D., Assistant Professor of Psychology
 G. Sidney Houston, Instructor in Accounting
 Ned L. Huff, M.A., Assistant Professor of Botany
 Melba F. Hurd, M.A., Instructor in Speech
 Elmer W. Johnson, B.S., E.E., M.E., Associate Professor of Electric Power Engineering
 Mabel C. Johnson, M.A., Instructor in Romance Languages
 Gladys Kaercher, Instructor in Swimming
 Elizabeth M. Kerr, M.A., Instructor in English
 Clifford Kirkpatrick, Ph.D., Associate Professor of Sociology
 May S. Kissock, M.A., Assistant Professor of Physical Education
 Franklin H. Kowner, Ph.D., Instructor in Speech
 Charles A. Koepke, M.S.(M.E.), Associate Professor of Industrial Engineering
 Ruth H. Koontz, B.A., Instructor in Sociology
 Richard L. Kozelka, Ph.D., Assistant Professor of Economics
 Fred C. Lang, C.E., Professor of Highway Engineering
 William LeBorjous, Instructor in Accounting
 Warren M. Lee, Instructor in Dramatics
 Emilio LeFort, M.A., Instructor in Spanish
 Alex S. Levens, M.S.(C.E.), C.E., Assistant Professor of Drawing and Descriptive Geometry
 Leah M. Lewis, B.S., Instructor in Art Education
 Hyman S. Lippman, M.D., Ph.D., Assistant Professor of Pediatrics

Ella Litchfield, M.A., Instructor in English
 Howard P. Longstaff, Ph.D., Lecturer in Psychology
 Clarence E. Lund, M.S.(M.E.), Instructor in Experimental Engineering
 Reuel I. Lund, C.P.A., M.A., Instructor in Accounting
 Gustav A. Lundquist, Ph.D., Assistant Professor of Rural Sociology
 George F. Lussky, Ph.D., Associate Professor of German
 Willem J. Luyten, Ph.D., Associate Professor of Astronomy
 Jesse M. McFadyen, Ph.D., Instructor in English
 Leo C. McGee, Instructor in Insurance
 Esther McGinnis, Ph.D., Professor and Director of Extension in Institute of Child Welfare
 Thorvald B. Madsen, M.A., Instructor in Scandinavian
 Mary Malcolm, B.S., Assistant in Music
 Edward D. Mallam, M.A., Instructor in English
 J. George Mann, Instructor in Transportation
 Arthur W. Marget, Ph.D., Professor of Economics and Banking
 Sue H. Mason, M.S.S., Lecturer in Sociology and Supervisor of Field Work
 Deborah S. Meader, B.A., Instructor in Puppetry
 Louallen F. Miller, Ph.D., Professor of Physics
 Lennox A. Mills, Ph.D., Assistant Professor of Political Science
 Taylor Mills, M.A., Instructor in Advertising
 Elio D. Monachesi, Ph.D., Assistant Professor of Sociology
 Walter Mund, Golf Professional
 J. Arthur Myers, M.D., Ph.D., F.A.C.P., Professor of Preventive Medicine and Public Health
 Walter R. Myers, Ph.D., Assistant Professor of Finance
 Charles W. Nichols, Ph.D., Assistant Professor of English
 Elizabeth Nissen, Ph.D., Assistant Professor of Romance Languages
 Julius M. Nolte, B.A., Instructor in English
 Everett W. Olmsted, Ph.D., Professor of Romance Languages
 Abe Pepinsky, M.A., Assistant Professor of Public School Music
 Marshall A. Peterson, Ch.E., Instructor in Petroleum and Petroleum Products
 Lucile Petry, R.N., M.A., Assistant Professor of Nursing
 Frederick L. Pfeiffer, Ph.D., Assistant Professor of German
 Anna H. Phelan, Ph.D., Assistant Professor of English
 Robert A. Phillips, B.S., Instructor in Gardening
 Orrin W. Potter, E.M., M.S. Assistant Professor of Drawing and Descriptive Geometry
 Charles H. Preston, B.A., C.P.A., Associate Professor of Income Tax Problems
 Alvin Prottinger, M.A., Instructor in German
 Robert B. Radl, M.D., M.S., F.A.C.P., Assistant Professor of Preventive Medicine and Public Health
 Frank M. Rarig, M.A., Professor of Speech
 John J. Reighard, M.A., C.P.A., Associate Professor of Accounting
 A. Dale Riley, M.A., Assistant Professor of Speech
 Adolph R. Ringoen, Ph.D., Associate Professor of Zoology
 Thomas S. Roberts, M.D., Professor of Ornithology
 Burton J. Robertson, E.E., Associate Professor of Internal Combustion Engines
 Gertrude D. Ross, B.S., Instructor in Art Education
 Edward A. Rundquist, Ph.D., Instructor in Psychology
 Charles A. Savage, Ph.D., Professor of Greek
 Margaret S. Scallon, M.A., Instructor in English
 Calvin F. Schmid, Ph.D., Assistant Professor of Sociology
 Emerson P. Schmidt, Ph.D., Assistant Professor of Economics
 Max Seham, M.D., Associate Professor of Pediatrics
 Mary S. Shaw, Ph.D., Instructor in Orientation
 Rupert Sircom, Instructor in Music
 Edward H. Sirich, Ph.D., Professor of Romance Languages
 Charles E. Skinner, Ph.D., Instructor in Bacteriology
 Raymond F. Sletto, M.A., Instructor in Sociology
 Arthur V. Smith, C.P.A., Instructor in Accounting
 Catherine Snell, B.S., Assistant Professor of Physical Education
 Joseph R. Starr, Ph.D., Assistant Professor of Political Science
 J. Warren Stehman, Ph.D., Professor of Finance
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 Jerry E. Wodsedalek, Ph.D., Professor of Zoology
 Dale Yoder, Ph.D., Professorial Lecturer in Economics
 Jeremiah S. Young, Ph.D., Professor of Political Science
 Anthony Zeleny, Ph.D., Professor of Physics

INDEX

| | Page | | Page |
|----------------------------------|--------|-----------------------------------|--------|
| Accounting | 34 | Engineering classes | 40 |
| Admission, Extension Classes.. | 4 | Aeronautical | 41 |
| University | 5 | Certificates | 40 |
| Adult Mental Ability | 30 | Civil | 43 |
| Advanced standing | 6 | Credit toward degree | 41 |
| Advertising | 36 | Electrical | 43 |
| Air Conditioning | 45 | General | 41 |
| American Government | 21 | Industrial | 44 |
| Anatomy | 12 | Mechanical | 45 |
| Architecture | 42 | English, classes in | 14 |
| Art | 42 | Business | 38 |
| (See also Fine Arts) | | Placement test | 3 |
| Art Education | 28 | Esthetics (Psychology of | |
| Astronomy | 12 | Beauty) | 22 |
| Athletic books | 9 | Ethics | 21 |
| Auditors | 4 | Examinations | 8 |
| Bacteriology | 12 | Fees for | 8 |
| Banking | 37 | Extempore Speaking | 26 |
| Bible as Literature | 15 | Failures | 9 |
| Bards of Minnesota | 27 | Fees | 7 |
| Books and Plays, Judging | 18 | Finance | 37 |
| Many | 13 | Fine Arts | 15 |
| Building Cost Estimating | 44 | Foundry Practice | 46 |
| Business Administration | 37 | French | 23 |
| Business classes | 32 | Games | 31 |
| Candidates for degrees | 32 | Gardening | 13 |
| Certificates | 33 | Geography | 16 |
| Business English | 38 | Geology | 16 |
| Business Law | 38 | German | 17 |
| Cancellations (of registration). | 7 | Golf | 31 |
| Cartooning | 13 | Grades | 9 |
| Certificates | | Graduate credit | 6 |
| Business | 33 | Greek | 17 |
| Engineering | 40 | Handicrafts | 29 |
| Junior College | 10 | Harmony | 19 |
| Liberal Education | 11 | Highways and Pavements | 43 |
| Chemistry | 42 | History | 17 |
| Child Welfare | 13 | Holidays | 3 |
| Church Music | 20 | Home Economics | 30 |
| Classes, size, demand, etc. | 3 | Honor points | 9 |
| Composition (English) | 14 | Incompletes | 9 |
| Condition, removal | 9 | Insurance | 39 |
| Correspondence Study | 8 | Interior Decorating | 28 |
| Credits | 4 | Investments | 37 |
| for university degrees | 5 | Italian | 23 |
| Criminology | 24 | Journalism | 18 |
| Descriptive Geometry | 43 | Junior College certificate | 10 |
| Dictatorships | 22 | Labor Problems | 39 |
| Diesel Engines | 45 | Late registration | 7 |
| Drama, Modern | 15 | Literature | |
| Drawing | | Danish | 24 |
| Cartooning | 13 | English | 15 |
| Commercial | 42 | French | 23 |
| Engineering | 43 | Loan fund | 8 |
| Freehand | 42 | Logic | 21 |
| Sketching | 29 | Magazine articles | 18 |
| Economics | 38 | Marionette Plays | 27 |
| Education classes | 27 | Mathematics | 19, 44 |
| General | 30 | Medicine | 19 |
| Electrical Engineering | 43 | Metallography | 46 |
| Engineering classes | | Money and Banking | 37 |
| Aeronautical | 41 | Music | 19 |
| Certificates | 40 | Norwegian | 23 |
| Civil | 43 | Nursing Education | 30 |
| Credit toward degree | 41 | Orchestra | 20 |
| Electrical | 43 | Orientation | 20 |
| General | 41 | Parliamentary Law | 20 |
| Industrial | 44 | Petroleum Products | 46 |
| Mechanical | 45 | Philosophy | 21 |
| English, classes in | 14 | Physical Education | 30 |
| Business | 38 | Physics | 21 |
| Placement test | 3 | Play Production | 26 |
| Esthetics (Psychology of | | Political Science | 21 |
| Beauty) | 22 | Prerequisites | 5 |
| Ethics | 21 | Preventive Medicine | 31 |
| Examinations | 8 | Production Management | 37 |
| Fees for | 8 | Psychology | 22 |
| Extempore Speaking | 26 | Child | 14 |
| Failures | 9 | Educational | 29 |
| Fees | 7 | of Beauty | 22 |
| Finance | 37 | Public Health | 31 |
| Fine Arts | 15 | Public Speaking (Speech) | 26 |
| Foundry Practice | 46 | Public Utilities, Economics of .. | 39 |
| French | 23 | Puppetry | 27 |
| Games | 31 | Radio | 43 |
| Gardening | 13 | Refunds, of fees | 8 |
| Geography | 16 | Registration, procedure | 6 |
| Geology | 16 | Changes, cancellation, etc. | 7 |
| German | 17 | Regulations, Students' work ... | 8 |
| Golf | 31 | Residence credit | 5 |
| Grades | 9 | Retail Credits | 37 |
| Graduate credit | 6 | Romance Languages | 23 |
| Greek | 17 | Salesmanship | 36 |
| Handicrafts | 29 | Scandinavian | 23 |
| Harmony | 19 | Science, Literature, and the Arts | |
| Highways and Pavements | 43 | classes | 10 |
| History | 17 | Candidates for degree | 10 |
| Holidays | 3 | Certificates | 10 |
| Home Economics | 30 | Short-Story Writing | 14 |
| Honor points | 9 | Slide Rule, Use of | 44 |
| Incompletes | 9 | Social Security Proposals | 34 |
| Insurance | 39 | Sociology | 24 |
| Interior Decorating | 28 | Spanish | 23 |
| Investments | 37 | Speech (Public Speaking) | 26 |
| Italian | 23 | Stamp Collecting | 27 |
| Journalism | 18 | Statistics | 29 |
| Junior College certificate | 10 | Students' Work Committee | 9 |
| Labor Problems | 39 | Surveying | 43 |
| Late registration | 7 | Swedish | 24 |
| Literature | | Swimming | 30, 31 |
| Danish | 24 | Textiles | 39 |
| English | 15 | Transportation (Traffic) | 39 |
| French | 23 | Tuberculosis | 19 |
| Loan fund | 8 | Vocabulary Building | 26 |
| Logic | 21 | World Politics | 21 |
| Magazine articles | 18 | Zoology | 27 |
| Marionette Plays | 27 | | |
| Mathematics | 19, 44 | | |
| Medicine | 19 | | |

WHERE EXTENSION CLASSES MEET

MINNEAPOLIS:

University of Minnesota Campus:

| | |
|-----------------------------------|---------------------|
| Anatomy Building | Mines Building |
| Athletic Building | Music Building |
| Botany Building | Physics Building |
| Burton Hall | Pillsbury Hall |
| Chemistry Building | Psychology Building |
| Folwell Hall | Wesbrook Hall |
| Jones Hall | Women's Gymnasium |
| Law School | Zoology Building |
| Millard Hall | |
| Electrical Engineering Building | |
| Experimental Engineering Building | |
| Main Engineering Building | |
| Mechanical Engineering Building | |
| Northrop Memorial Auditorium | |
| School of Business Administration | |
| University of Minnesota Hospitals | |

Downtown:

Minneapolis Public Library
Northwestern Bank Building, Rooms 603, 690

ST. PAUL

First National Bank Building, 4th and Robert Streets
Mechanic Arts High School, Central and Robert Streets
Public Library, Fourth and Washington Streets
University Extension Center:
500 Robert Street, Foot-Schulz Building
Wilder Dispensary Building, 279 Rice Street

FOR YOUR SERVICE

The Bulletin
of the University of
Minnesota

Northwest School and Experiment
Station

Crookston, Minnesota

Announcement for the Year
1935-1936



Vol. XXXVIII No. 40 August 12 1935

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SCHOOL CALENDAR

1935-36

1935

| | | | |
|-----------|----|----------|--|
| September | 30 | Monday | Registration |
| October | 1 | Tuesday | Organization of classes |
| October | 26 | Saturday | Homecoming Day |
| November | 2 | Saturday | Parents' Day |
| November | 28 | Thursday | Thanksgiving Day |
| December | 20 | Friday | First term closes; Christmas recess begins |

1936

| | | | |
|----------|-------|----------|---|
| January | 6 | Monday | Registration of new students |
| January | 7 | Tuesday | Second term begins; organization of classes |
| February | 3-7 | Week | Northwest School Farmers' Week |
| March | 27 | Friday | School term closes |
| June | 8-12 | | Tenth Annual Women's Camp |
| June | 15-20 | | 4-H Club Short Course |
| June | 27 | Saturday | Annual Alumni Reunion |

COMMENCEMENT WEEK

| | | | |
|-------|----|-----------|--|
| March | 21 | Saturday | Interclass field meet |
| March | 22 | Sunday | Baccalaureate address |
| March | 23 | Monday | Declamatory contest |
| March | 24 | Tuesday | Superintendent's reception to graduating class |
| March | 25 | Wednesday | Music Recital |
| March | 26 | Thursday | Class Day exercises and commencement |

FACULTY

Lotus D. Coffman, Ph.D., LL.D., President of the University
Walter C. Coffey, M.S., LL.D., Dean of the Department of Agriculture

AT CROOKSTON

ADMINISTRATION

Austin A. Dowell, Ph.D., Superintendent
John W. Mlinar, B.S., Registrar
Fanny B. Lippitt, B.S., Director of Dining Hall
Lydia Dahlen, R.N., School Nurse
Mrs. J. S. Schmit, Secretary
Kate Bedard, Accountant

AGRICULTURAL ENGINEERING

Arnold M. Foker, Carpentry and Farm Engineering
V. C. Kallal, B.S.A., Field Machinery, Tractors, Electricity
H. M. Woolery, B.S.A., Farm Shop, Motors

AGRONOMY

Ray S. Dunham, M.S.A., Farm Crops and Soils
Elmer R. Clark, M.S.A., Pure Seed Work and Home Projects

ANIMAL HUSBANDRY

Orville M. Kiser, M.S.A., Animal and Dairy Husbandry
R. J. Christgau, B.S.A., Animal Husbandry and Physical Training
Alvey M. Pilkey, Poultry

HOME ECONOMICS

Fanny B. Lippitt, B.S., Foods and Nutrition
Retta Bede, B.S., Foods and Cookery
Elsie Mae Kingston, B.S., Clothing and Textiles
Lydia Dahlen, R.N., Nursing

HORTICULTURE

Thomas M. McCall, M.S.A., Horticulture

ASSOCIATED SUBJECTS

Carl H. Ritzman, M.A., History, Debate, English
Fae Hughbanks, Business Training
John W. Mlinar, B.S., Academic Subjects
Henry A. Pflughoeft, B.S., Boys' and Girls' Club Work
Katherine A. Hennig, B.S., Music
Constance Lane, B.A., Piano
Dorothy M. Smith, M.A., English
Grace M. Warne, B.A., English and Violin

GENERAL INFORMATION

LOCATION

The Northwest School of Agriculture is located at the Experiment Farm, one and one-half miles north of Crookston, Minnesota. There is paved roadway between the school and the city, and regular bus service is maintained.

PURPOSES

The school was organized in 1906. It offers a practical course of study designed to fit young men and young women for successful farm life, and aims to give its students the necessary preparation for useful citizenship.

The work of the school aims to interpret for the young men and the young women from the farms, the life with which they are familiar. It gives reasons for the various farm operations, and makes a scientific basis for the proper management of the farm and the home.

TIME OF OPENING

The fall term of the Northwest School of Agriculture will open for registration on September 30, 1935, and classes will begin at 8 o'clock on Tuesday, October 1. The fall term closes on December 20, 1935.

The winter term will open for registration on January 6, and classes will begin at 8 o'clock on January 7, 1936. The winter term closes March 27, 1936.

THREE YEARS' COURSE

The course of study offered covers a wide range of subjects, and is largely technical in character. It is briefly outlined on pages 17 to 30, inclusive. The regular course for both young men and young women requires three winters of six months each for completion.

The methods of instruction tend to educate students toward the farm instead of away from it, to develop in them a love for farm life by showing them its possibilities. In this respect the school has been very successful, as nearly all of its graduates continue agricultural pursuits.

ADVANCED COURSES

Many students, after having taken three years of six months each, are interested in additional work, therefore a fourth six months of work is offered. During this fourth session, graduates of the long course may elect to specialize in one of the lines of work listed below. They may at the same time choose from the elective lists subjects that they could not obtain during their first three sessions. The major lines of work suggested for boys are dairying, beef production, farm engineering, carpentry, advanced farm management, and academic subjects. The major lines for girls are dressmaking, advanced home management, nursing, music, and business training.

COLLEGE PREPARATORY

Graduates of the Northwest School of Agriculture, who have completed two summers of supervised work on their home farms, one additional school year of six months, and one additional summer's work or the equivalent thereof, will be admitted to the various colleges of the University of Minnesota, private colleges, and state teachers colleges.

DEPARTMENT OF MUSIC

For those who are interested, credit courses in piano, violin, and voice instruction are offered. Twelve half-hour lessons per term are given, with special time for practice. Fees of \$7 per term for the lessons are charged. Special rooms are set aside for practice, making it possible to do good, thoro work. A class in musical theory meets once a week, and instruction is also given in the history of music, ear training, and the rudiments of harmony and interpretation.

WHEN TO COME

Students should not come before Monday, September 30, or Monday, January 6. Dormitories will not be open before that time and the first meal in the dining hall will be served at noon on those days.

HOW TO GET TO THE SCHOOL

Check all baggage to Crookston and bring checks to the school. A charge of 25 cents is made by the school for transporting trunks at the opening of school. The same charge is made for the return of the baggage at the close of school, provided it is ready to go on the days assigned. A charge of 50 cents is made for transporting trunks at any other time.

ADMISSION

Applicants who have completed a common school course will be admitted without examination and boys must have had six months' practical experience on a farm.

Applicants who have not completed the common school course should write to the registrar for further information.

Students more than twenty-one years of age who cannot pursue the full course, either from lack of time or of proper preparation, may make special arrangements for taking such projects as will be most helpful to them.

Students from city or grade schools will not be admitted before finishing eighth grade work, or until their former school records have been passed upon by the superintendent. These records must be presented at least three weeks prior to the opening of school.

State High School Board certificates are accepted for work in English, physiology, algebra, geometry, and civics, or credits of 75 per cent or more received on state teachers' examinations.

ROOMS IN DORMITORIES

Old or new students planning to attend the School of Agriculture should reserve rooms in advance. Write early to the registrar, asking him to reserve a room in one of the dormitories. This may be done by paying a deposit fee of \$2 which will apply on the first month's rent. If the student is unable to enter school, the deposit may be reclaimed before September 15, after which time it is forfeited. Each dormitory room is furnished with two single beds, a dresser, table, and chairs. The rooms are all lighted by electric light and heated by steam. Preferences as to roommates should be stated early and will be considered as far as possible.

WHAT TO BRING

Each student should come provided with sheets, blankets, quilts, one bedspread, one pillow, three pillow cases, dresser scarf, towels, napkins, comb, brushes, one glass tumbler, and one teaspoon, and at least two night-gowns.

Each girl should bring with her, in addition to her ordinary supply of clothing, kimono and bedroom slippers, laundry bag, black gymnasium shoes, and swimming cap. Be prepared to purchase material for blouse.

EXPENSES

Necessary expenses for the year will amount to about \$130. This does not include traveling and personal expenses nor allow for state aid to eligible students. (See page 7 for information regarding state aid for farm boys and girls.)

Each student is required to pay for breakage of apparatus used in practical work, and for all damage done to school property.

Textbooks are furnished at a rental of \$2 per year to students who do not desire to purchase. A gymnasium fee of \$1 per term is charged all students.

Music fees for private lessons are \$7 for each term.

A fee of \$2 each term entitles each student to attend all school functions, athletic contests, and games and entertainments.

It should be remembered that expenses for fees are for the entire term, and after the first month the only expenses are for board and room.

The cost to the student for board is the actual cost of maintaining the table (including management). Board is payable the first of each month in advance. *A surcharge of 10 per cent is added to all bills delinquent more than ten days. No deduction is made for board for any absence of less than five days. No room refunds will be made for any period of less than one month. If students are compelled to be absent for that length of time, they are allowed half rates, provided they make arrangements with the accountant before leaving.*

On entering the school, each student should bring sufficient money to pay one month's board and room, and to pay for his books and fees. This will amount to from \$35 to \$40.

The following expenses are charged to all students. Fees are payable at the time of registration, and board and room at the first of each month.

| | |
|---|---------|
| Registration fee for any part of the school year..... | \$ 5.00 |
| Deposits as guarantee of proper treatment of school property..... | 5.00 |
| Health fee for term, required of all students..... | 2.00 |
| Board per week (price subject to change)..... | 3.50 |
| Room per week, including flat laundry (price subject to change)..... | 1.25 |
| Book rent, per term..... | 1.00 |
| Gymnasium fee (required of all), per term..... | 1.00 |
| Student privilege tickets for all school functions, athletic contests, and games and entertainments (required of all students)..... | 2.00 |
| ‡Registration fee for nonresidents of Minnesota..... | 10.00 |

Special fees in laboratory courses are as follows: blacksmithing, \$1 per term; carpentry, motors, tractor construction, advanced electricity, farm shop, dairying, field machinery, sewing, cooking, chemistry, 50 cents per term; farm accounts, 75 cents per term. A fee of \$3 per term is charged for use of typewriters, and \$7 per term for private music lessons.

NOTE.—The 1935 Minnesota State Legislature passed a law whereby farm boys and girls twenty-one years of age or under, who have graduated from the eighth grade in organized rural districts which do not give accredited high school instruction may attend any of the schools of agriculture with necessary tuition, laboratory, and equipment fees (except deposits) to be paid from state funds. Deposits are to be paid by the individual student.

A rate of \$6 per month has been established to cover all the tuition, laboratory, and equipment fees (except deposits) of such students and the same privilege is extended to any other students in attendance at such schools electing to pay fees on this basis.

HEALTH SERVICE

The health fee collected from all students is used to maintain the Students' Health Service. A fully equipped hospital is maintained and a full-time nurse is engaged during the school year. The health fee provides for physical examinations for all students and care by the nurse in case of sickness. *It does not provide for extra nurses or physicians in case of serious sickness, when such are necessary. A charge of 75 cents a day will be made for detention in the hospital after the first twenty-four hours.*

REQUIREMENTS FOR GRADUATION

1. *Boys' and girls' regular courses.*—The completion of the prescribed courses of study, including all the required work and enough elective work to make a total of 160 credit hours for the boys and 154 for the girls.
2. Honorable standing in department.
3. An essay of not less than one thousand words upon a topic selected from a list of topics suggested by the faculty, typewritten on paper of approved size for binding and filing in the library.

‡ See page 35 for dates and amounts of payments.

4. Attendance at the school for at least one year. (Students transferring from other secondary schools must earn at least 20 credits in required vocational work during the year.)

5. For young men, practical experience in farm work during each of the two summers that come between the freshman and senior years. Students will register for the study of some definite farm problem to be studied each summer and report at stated intervals during the summer the progress made. Five of the 160 credits must be earned by home projects and ten are allowed. (See also College Preparatory, page 5.)

HOME LIFE OF THE CAMPUS

The life of the student while attending the school is subject to supervision. Students residing in the school dormitories are not allowed to leave the campus without permission of the preceptor or preceptress. The home life of each student is carefully guarded and everything is done to promote a healthful and moral atmosphere.

The preceptor of the School of Agriculture has charge of the boys in their dormitory and social life, and the preceptress has charge of the girls in their dormitory and social life, under such regulations as may be approved by the superintendent. Students are required to be correct in their habits and to observe pleasantly all directions for their government.

From 8:15 a.m. to 4:30 p.m., students not at recitation or assembly are expected to be in their rooms or in the library, studying or reading; also after 7:30 in the evening. The rooms shall at all times be quiet, especially in the evening, so that no student may be disturbed.

Anyone not in accord with these restrictions, and not willing to lend a hand toward a strong moral growth, should not come to the School of Agriculture.

ASSEMBLY

On each Tuesday, Thursday, and Saturday at 11:40 a.m., the students assemble in the auditorium. After the opening exercises, brief talks are given by the superintendent, members of the faculty, or invited guests.

During the year the list of speakers includes prominent men, state and national officials, business men, particularly those connected with the agricultural industries, professional men, prominent clergymen of all denominations, educators from other institutions, and successful farmers. The addresses are of great interest and value to the students.

LECTURE COURSE

During the school year, a lecture and entertainment course, consisting of five lectures and musical programs, will be given at a low cost. It is hoped to provide high grade lectures and programs which will furnish a pleasant relaxation from school work and be instructive as well.

MUSICAL ORGANIZATIONS

A school orchestra is maintained each year. A competent leader has charge of this work. Glee clubs, choruses, and quartets contribute greatly toward creating an interest in music.

STUDENTS' CHRISTIAN ASSOCIATIONS

Young Men's and Young Women's Christian associations have been formed, having for their objects social fellowship and moral and spiritual development. Bible classes will be held Sunday morning at 8:45. The associations are non-sectarian. Religious exercises are held at the school each Sunday evening at 7 o'clock. Various pastors and business men address the students at these meetings. The Christian associations conduct the exercises and secure the speakers.

RED RIVER AGGIE

The *Red River Aggie* is an annual published by the senior class of the school. The book gives an outline of all school and class activities, is fully illustrated, and contains, in addition to brief articles of student interest, a complete record of the development and growth of the institution.

NORTHWEST MONTHLY

The *Northwest Monthly* is published by the faculty of the school. It serves as a community publication, and is a medium by which former students and alumni are kept in touch with one another and with the school. It is also published to disseminate useful information and results of station work.

LOAN FUNDS

The Northwest School of Agriculture considers itself very fortunate in being able to present the following loan fund provisions. The donors have specified the purposes for which each may be used. The general purpose, however, is to enable the school to reach a large number, to provide the means of encouraging many to acquire the training which the school offers, and to stimulate greater effort in school work.

THE GILFILLAN TRUST FUND

This fund may be used by students of the Northwest School of Agriculture in accordance with the action of the Board of Regents taken September 26, 1916. The regulations governing the administration of the income from the fund may be learned by addressing the superintendent of the Northwest School of Agriculture, Crookston, Minnesota.

THE LUDDEN TRUST FUND

This fund may be used by students of the Northwest School of Agriculture in accordance with the action of the Board of Regents. The regulations governing the fund may be learned by addressing the superintendent of the Northwest School of Agriculture, Crookston, Minnesota.

STAFF AND EMPLOYEES SCHOOL OF AGRICULTURE LOAN FUND

This fund, created by the staff and employees of the schools of agriculture is available for student use in accordance with the action of the Board of Regents, June 19, 1933. For additional information governing

the loan, write to the superintendent of the Northwest School of Agriculture, Crookston, Minnesota.

FAIRFAX-ANDOVER SOCIAL CLUB LOAN FUND

The Fairfax-Andover Social Club (a farm club near Crookston) provides \$150 to be used as a students' loan fund. This money will be loaned to students at 5 per cent interest as a temporary loan.

CLASS OF 1917 LOAN FUND

The class of 1917 has provided \$140 to be used as a students' loan fund. The interest from this fund shall be awarded annually to the student who makes the greatest progress in debating.

ALUMNI ASSOCIATION LOAN FUND

The Northwest School Alumni Association has provided \$200 to be used as a students' loan fund. The regulations governing the fund may be learned by addressing the superintendent of the Northwest School of Agriculture, Crookston, Minnesota.

SCHOLARSHIPS

CALEB DORR CASH SCHOLARSHIP PRIZES

By a decision made in April, 1922, by the Board of Regents of the University of Minnesota, part of the Dorr fund is now made available to the schools of agriculture. This fund consists of \$50,000 willed by the late Caleb Dorr, of Minneapolis, the income of which will be used to promote scholarship and student activity records. Further information regarding this fund as it applies to the Northwest School of Agriculture may be obtained by writing to the superintendent.

O. W. PETERSON MEMORIAL SCHOLARSHIP

Wishing to honor the memory of O. W. Peterson, whose life in the Crookston community was a source of inspiration and encouragement to all music lovers, a group of friends presented the sum of \$225 to the Northwest School. The interest from this fund shall be presented each year to a worthy student, selected by the faculty, to pay for instruction in music.

SPECIAL COURSES

A few students are unable to enter in the fall or unable to attend school for the three years. In order to provide for such students, the course of study for the first year has been so arranged that new students may take the regular work and complete a course of study, beginning January 6, 1936.

JUNIOR SHORT COURSE

The twenty-fifth annual Junior Short Course, from June 15 to June 20, 1936, is open to boys and girls from 12 to 20 years of age. With the exception of \$1 for board, there is no expense connected with the

course. The course aims to deepen the interest of boys and girls in life on the farm. Special emphasis is placed on boys' and girls' club work. Instruction is given for the planning and carrying out of work in such projects and contests as gardening, corn and potato growing, pig, calf, and chicken raising, conservation of wild life, cooking, sewing, and canning. Illustrated lectures, moving pictures of educational value, games, singing, and excursions add interest and pleasure to the course.

NORTHWEST SCHOOL FARMERS' AND WOMEN'S WEEK

The exhibit of farm crops in connection with the course was the origin of the annual Red River Valley winter show held at Crookston during the second week of February, which now includes farm crops, livestock, poultry, and industrial exhibits. A five-day meeting at this time held under the auspices of the Northwest School serves the purpose of the original short course.

WOMEN'S CAMP

The tenth annual Women's Camp will be held at the Northwest School June 8-12, 1936, to provide instruction and recreation for homemakers. Instruction in the form of demonstrations will be offered in homemaking, community building, child training, music, and recreation.

EXPERIMENT STATION

The Northwest School and Station is now conducting extensive experiments in agronomy, soils, horticulture, animal husbandry, and agricultural engineering. Bulletins and circulars containing discussions of the results of experiments carried on are issued from time to time. These are mailed free upon application.

SCHOOL FARM

The farm comprises approximately 600 acres, and furnishes an extensive laboratory for the work of the school. Information concerning the methods employed on the farm is always available to the students. The classroom work is supplemented with actual practice either in the field or with crops grown on the farm.

STATION FLOCKS AND HERDS

The school now maintains an abundance of livestock, all of which is used for student work in the Animal Husbandry Department. Purebred Holstein and Shorthorn cattle; grade and purebred Percheron horses; Shropshire sheep; Poland China hogs; White Leghorn and Rhode Island Red chickens are maintained for station and school purposes. These furnish excellent opportunities for students to study intelligently the various courses in animal husbandry.

COURSES OF STUDY

The numbers preceding the names of courses refer to descriptions given on pages 17-30. Courses listed in the first column are required of all boys. Courses listed in the second column are electives. Students should select electives to make a total of not more than 27 credit hours per semester together with the required subjects.

BOYS' THREE-YEAR COURSE

FIRST YEAR

Fall Term

| REQUIRED | | | ELECTIVES | | |
|----------|---------------------------|---------|-----------|-------------------------|---------|
| No. | Title | Credits | No. | Title | Credits |
| 101a | English I | 4 | 121 | Industrial Geography .. | 5 |
| 101a | Speech I | 1 | 51 | Poultry Principles | 5 |
| 106a | Debate I | 1 | 16 | Carpentry | 5 |
| 61 | Botany | 5 | 15 | Blacksmithing | 5 |
| 31 | Animal Husbandry I .. | 5 | 11a | Elementary Motors A.. | 4 |
| 1 | Cereal Crops | 5 | 13 | Field Machinery | 5 |
| 111 | Arithmetic† | 5 | 14 | Farm Shop | 3 |
| 141a | Music I | 1 | 151a | Typewriting and Short- | |
| 171 | Hygiene and Social Ethics | 2 | | hand I | 8 |
| 172 | Physical Education | 1 | 140 | Private Music | 2 |

Winter Term

| No. | Title | Credits | No. | Title | Credits |
|------|---------------------------|---------|------|-------------------------|---------|
| 101b | English I | 4 | 122 | Industrial History ... | 5 |
| 101b | Speech I | 1 | 51 | Poultry Principles | 5 |
| 106b | Debate I | 1 | 16 | Carpentry | 5 |
| 31 | Animal Husbandry I .. | 5 | 15 | Blacksmithing | 5 |
| 62 | Biology | 5 | 11b | Elementary Motors B.. | 4 |
| 1 | Cereal Crops | 5 | 13 | Field Machinery | 5 |
| 111 | Arithmetic† | 5 | 14 | Farm Shop | 3 |
| 141b | Music I | 1 | 151b | Typewriting and Short- | |
| 171 | Hygiene and Social Ethics | 2 | | hand I | 8 |
| 172 | Physical Education | 1 | 140 | Private Music | 2 |

† All freshmen who do not have a State Board certificate in arithmetic will be required to register for this subject. Credits will be allowed for graduation. Students who have a certificate may register for the course without credit.

COURSES OF STUDY

SECOND YEAR

Fall Term

| REQUIRED | | | ELECTIVES | | |
|----------|--------------------------|---------|-----------|-------------------------|---------|
| No. | Title | Credits | No. | Title | Credits |
| 102a | English II | 4 | 123 | Ancient History | 5 |
| 102a | Speech II | 1 | 11c | Tractor Construction .. | 4 |
| 33a | Livestock Feeding | 4 | 18 | Mechanical Drawing .. | 5 |
| 33b | Livestock Judging | 1 | 65 | Beekeeping | 3 |
| 2 | Agricultural Chemistry . | 5 | 35 | Farm Meats | 3 |
| 63 | Fruit and Vegetables .. | 5 | 142a | Music II | 1 |
| 107a | Debate II | 1 | 151a | Typewriting and Short- | |
| 173 | Physical Education | 1 | | hand I | 8 |
| | | | 152a | Typewriting and Short- | |
| | | | | hand II | 8 |
| | | | 140 | Private Music | 2 |
| | | | 17 | Advanced Carpentry .. | 3 |

Winter Term

| No. | Title | Credits | No. | Title | Credits |
|------|--------------------------|---------|------|-------------------------|---------|
| 102b | English II | 4 | 124 | Modern History | 5 |
| 102b | Speech II | 1 | 12 | Advanced Electricity .. | 4 |
| 107b | Debate II | 1 | 19 | Farm Drawing | 5 |
| 52 | Poultry Husbandry | 5 | 34 | Dairy Production | 5 |
| 3 | Forage Crops | 5 | 35 | Farm Meats | 3 |
| 4 | Farm Accounts | 2½ | 36 | Judging Breed Types of | |
| 64 | Farm Forestry | 2½ | | Livestock | 2 |
| 173 | Physical Education | 1 | 156 | Bookkeeping | 5 |
| | | | 142b | Music II | 1 |
| | | | 128 | Parliamentary Law ... | 1 |
| | | | 151b | Typewriting and Short- | |
| | | | | hand I | 8 |
| | | | 152b | Typewriting and Short- | |
| | | | | hand II | 8 |
| | | | 140 | Private Music | 2 |
| | | | 17 | Advanced Carpentry ... | 3 |

NOTE.—Second year boys may choose from the list of electives offered for first year boys.

THIRD YEAR

Fall Term

| REQUIRED | | | ELECTIVES | | |
|----------|--------------------------|---------|-----------|------------------------|---------|
| No. | Title | Credits | No. | Title | Credits |
| 103a | English III | 4 | 126 | Civics | 5 |
| 103a | Speech III | 1 | 53 | Poultry Management .. | 5 |
| 5 | Soil Management | 5 | 38 | Advanced Stock Judging | 2 |
| 37 | Animal Breeding | 3 | 114a | Algebra | 5 |
| 127 | Rural Sociology | 3 | 125a | American History | 5 |
| 129a | Farm Marketing | 2 | 108a | Debate III | 1 |
| 174 | Physical Education | 1 | 143a | Music III | 1 |
| | | | 140 | Private Music | 2 |
| | | | 7 | Advanced Crop Judging | 1 |

Winter Term

| REQUIRED | | | ELECTIVES | | |
|----------|-------------------------|---------|-----------|------------------------|---------|
| No. | Title | Credits | No. | Title | Credits |
| 103b | English III | 4 | 20 | Physics | 5 |
| 103b | Speech III | 1 | 53 | Poultry Management .. | 5 |
| 6 | Farm Management | 5 | 108b | Debate III | 1 |
| 39 | Livestock Management .. | 5 | 114b | Algebra | 5 |
| 129b | Marketing | 2 | 125b | American History | 5 |
| 174 | Physical Education | 1 | 143b | Music III | 1 |
| | | | 140 | Private Music | 2 |
| | | | 66 | Floriculture | 2 |

NOTE.—Third year boys may choose from the list of electives offered for first and second year boys.

CREDIT REGULATIONS REGARDING BOYS' THREE-YEAR COURSE

In addition to the required work of the term, students must elect enough work to make a total of not more than 27 credit hours.

Students desiring to complete the business training work may elect such subjects in the second and third year in place of a required subject, upon conference with the Students' Work Committee.

Credit toward graduation will be allowed for work in debate, literary societies, school athletic teams, or other student activities, on a basis to be determined by the Students' Work Committee.

Two credits per term may be earned by approved work in instrumental or vocal music. A special fee will be charged for such courses.

A class will not be maintained for less than six students, except in shop work, where the minimum is eight students.

GIRLS' THREE-YEAR COURSE

FIRST YEAR

Fall Term

| REQUIRED | | | ELECTIVES | | |
|----------|--|---------|-----------|--|---------|
| No. | Title | Credits | No. | Title | Credits |
| 101a | English I | 4 | 54 | Poultry Culling and Housing | 5 |
| 101a | Speech I | 1 | | Botany | 5 |
| 106a | Debate I | 1 | 61 | Industrial Geography .. | 5 |
| 81a | Freshman Sewing | 3 | 121 | Private Music | 2 |
| 84a | Related Art | 3 | 140 | Typewriting and Short- hand I | 8 |
| 71a | Freshman Cooking | 3 | 151a | | |
| 76 | Physiology, Hygiene and Social Ethics | 3 | | | |
| 141a | Music I | 1 | | | |
| 111 | Arithmetic† | 5 | | | |
| 181 | Physical Education | 1 | | | |

† All freshmen who do not have a State Board certificate in arithmetic will be required to register for this subject. Credits will be allowed for graduation. Students who have a certificate may register for the course without credit.

COURSES OF STUDY

Winter Term

| REQUIRED | | | ELECTIVES | | |
|----------|------------------------------------|---------|-----------|------------------------------------|---------|
| No. | Title | Credits | No. | Title | Credits |
| 101b | English I | 4 | 54 | Poultry Culling and Housing | 5 |
| 101b | Speech I | 1 | | Biology | 5 |
| 106b | Debate I | 1 | 62 | Industrial History | 5 |
| 81b | Freshman Sewing | 3 | 140 | Private Music | 2 |
| 84b | Related Art | 3 | 151b | Typewriting and Short-hand I | 8 |
| 71b | Freshman Cooking | 3 | | | |
| 77 | Public Health and Sanitation | 2 | | | |
| 141b | Music I | 1 | | | |
| 111 | Arithmetic† | 5 | | | |
| 181 | Physical Education | 1 | | | |

SECOND YEAR

Fall Term

| REQUIRED | | | ELECTIVES | | |
|----------|---|---------|-----------|--------------------------------------|---------|
| No. | Title | Credits | No. | Title | Credits |
| 102a | English II | 4 | 55 | Poultry Sanitation and Feeding | 5 |
| 102a | Speech II | 1 | | Fruit and Vegetables .. | 5 |
| 107a | Debate II | 1 | 63 | Beekeeping | 3 |
| 72a | Junior Cooking | 3 | 65 | Ancient History | 5 |
| 82a | Junior Sewing | 3 | 123 | Agricultural Chemistry. | 5 |
| 74 | Household Science | 3 | 2 | Mechanical Drawing .. | 5 |
| 78 | Home Hygiene and Care of the Sick | 2 | 18 | Private Music | 2 |
| 142a | Music II | 1 | 140 | Typewriting and Short-hand I | 8 |
| 182 | Physical Education | 1 | 151a | Typewriting and Short-hand II | 8 |
| | | | 152a | | |

Winter Term

| No. | Title | Credits | No. | Title | Credits |
|------|---|---------|------|--------------------------------------|---------|
| 102b | English II | 4 | 55 | Poultry Sanitation and Feeding | 5 |
| 102b | Speech II | 1 | | Farm Forestry | 2½ |
| 107b | Debate II | 1 | 64 | Modern History | 5 |
| 72b | Junior Cooking | 3 | 124 | Parliamentary Law | 1 |
| 82b | Junior Sewing | 3 | 128 | Private Music | 2 |
| 79 | Care and Training of Infants and Children.... | 2 | 140 | Typewriting and Short-hand I | 8 |
| 142b | Music II | 1 | 151b | Typewriting and Short-hand II | 8 |
| 182 | Physical Education | 1 | 152b | Bookkeeping | 5 |
| | | | 156 | | |

NOTE.—Second year girls may choose from the list of electives offered for first year girls.

THIRD YEAR

Fall Term

| REQUIRED | | | ELECTIVES | | |
|----------|-------------------------|---------|-----------|--------------------------|---------|
| No. | Title | Credits | No. | Title | Credits |
| 103a | English III | 4 | 56 | Poultry Culture | 5 |
| 103a | Speech III | 1 | 108a | Debate III | 1 |
| 75a | Home Management | 2 | 114a | Algebra | 5 |
| 73a | Senior Cooking | 1 | 125a | American History | 5 |
| 127 | Rural Sociology | 3 | 40 | Utilization of Meats ... | 2 |
| 143a | Music III | 1 | 126 | Civics | 5 |
| 183 | Physical Education | 1 | 140 | Private Music | 2 |

† See footnote, page 14.

Winter Term

| REQUIRED | | | ELECTIVES | | |
|----------|-------------------------|---------|-----------|--------------------------|---------|
| No. | Title | Credits | No. | Title | Credits |
| 103b | English III | 4 | 56 | Poultry Culture | 5 |
| 103b | Speech III | 1 | 66 | Floriculture | 2 |
| 75b | Home Management | 2 | 108b | Debate III | 1 |
| 73b | Senior Cooking | 1 | 114b | Algebra | 5 |
| 83 | Senior Sewing | 3 | 125b | American History | 5 |
| 143b | Music III | 1 | 40 | Utilization of Meats.... | 2 |
| 183 | Physical Education | 1 | 20 | Agricultural Physics ... | 5 |
| | | | 140 | Private Music | 2 |

NOTE.—Third year girls may choose from the list of electives offered for first and second year girls.

ADVANCED AND COLLEGE PREPARATORY COURSES

The work offered in this course is arranged to fit young men and women to enter the University of Minnesota, the private colleges in the state, and the state teachers colleges. It will cover a period of six months, beginning and closing at the same time as the regular school classes. Students capable of carrying satisfactorily all the subjects required will be granted a certificate.

Graduates of the three-year course of the Northwest School of Agriculture who have completed two summers of supervised work on their home farms, one additional school year of six months, and one additional summer's work or the equivalent thereof, will be admitted to the University of Minnesota, to the state teachers colleges, and to the high school teacher training departments.

Students from other schools who wish to prepare for college or university entrance may elect subjects from the school course which will meet the necessary requirement.

OUTLINE OF COURSES (FOURTH YEAR)

| <i>Fall Term</i> | | | <i>Winter Term</i> | | |
|------------------|--|---------|--------------------|--|---------|
| No. | Title | Credits | No. | Title | Credits |
| 114a | Algebra | 5 | 114b | Algebra | 5 |
| 115a | Plane Geometry | 5 | 115b | Plane Geometry | 5 |
| 104a | American Literature and Composition | 4 | 104b | American Literature and Composition | 4 |
| 104a | Speech IV | 1 | 104b | Speech IV | 1 |
| 105a | English Literature | 5 | 105b | English Literature | 5 |
| 125a | American History | 5 | 125b | American History | 5 |

NOTE.—Students registered in the fourth year may select electives offered in the first, second, and third years.

DESCRIPTION OF COURSES

Following each course is a statement, in parentheses, of credits, classes of students eligible, prerequisites, and recitation and laboratory hours, required. Thus (5 cred.; fr., jr., sr., adv.; prereq., Carpentry; 4 hrs. rec., 5 hrs. lab.) means that the course carries 5 credits, is open to freshmen, juniors, seniors, and students of advanced standing, has for a prerequisite Carpentry, and requires 4 hours of recitation and 5 hours of laboratory.

AGRICULTURE

1. Cereal Crops. Leading cereal crops, classes and varieties adapted to northwestern Minnesota, production and distribution, soil and climate adaptations, seed treatment, cultural practices, and control of diseases. Laboratory includes specimens of grain diseases and exercises in grain judging. (5 cred.; fr., jr., sr., adv.; 4 hrs. rec., 2 hrs. lab.) Mr. Clark.
2. Agricultural Chemistry. A study of elementary chemistry and its application to soil and fertilizers. Laboratory experiments in elementary chemistry and soils tests. (5 cred.; jr., sr., adv.; 5 hrs. rec.) Mr. Dunham.
3. Forage Crops. Grasses, legumes, roots, and tuber crops grown for livestock. Cultural directions. Laboratory work with dried and green specimens includes identification, characteristics, and habits of growth of the various crops. (5 cred.; jr., sr., adv.; 5 hrs. rec.) Mr. Dunham.
4. Farm Accounts. Practical farm records and their uses for the Red River Valley farmers. Calculations involved in farm accounting. Special emphasis upon the requirements of the income tax law. (2½ cred.; jr., sr., adv.; 5 hrs. rec., 6 weeks.) Mr. Clark.
5. Soil Management. Soil formation and classification. The principles of soil management are brought out in a study of soil moisture, pore space, organic matter, tillage, drainage, and crop rotations. Laboratory experiments with soils from students' home farms. (5 cred.; sr., adv.; 5 hrs. rec.) Mr. Dunham.
6. Farm Management. Systems of farming; selection of farm; the planning of rotations suitable to the students' home farms and to farms operated under different systems. Cost of producing crops; marketing products; business methods applied to the farm. (5 cred.; sr., adv.; 5 hrs. rec.) Mr. Dunham.
7. Advanced Crop Judging. Laboratory practice in judging wheat, oats, barley, flax, sweet clover, and alfalfa for seed. Identification of all important grain and forage plants and seeds, weed plants and seed, and principal cereal diseases. (1 cred.; jr., sr., adv.) Mr. Clark.

AGRICULTURAL ENGINEERING

- 11a. Elementary Motors A. Principles of motors; engine construction; valve timing; ignition timing; cooling; and lubrication. Six weeks of the course are devoted to an elementary course in agricultural-engineering physics, and its practical application. (4 cred.; fr., jr., sr., adv.; 2 hrs. rec., 4 hrs. lab.) Mr. Kallal, Mr. Woolery.

- 11b. Elementary Motors B. Elementary ignition, fuels and oil; carburetion; clutches; transmission; drive methods; differentials; rear axles; and steering gears. Four weeks of this course are devoted to troubleshooting on motors in the laboratory. (4 cred.; fr., jr., sr., adv.; prereq., Elementary Motors A; 2 hrs. rec., 4 hrs. lab.) Mr. Kallal, Mr. Woolery.
- 11c. Tractor Construction and Overhauling. Students are given thoro training in modern tractor design and construction, as well as practical work in valve grinding, bearing tightening, piston and piston ring fitting; ignition timing, valve clearance setting, carburetor adjustment and overhauling of transmission, and rear and front axles. (4 cred.; jr., sr., adv.; prereq., Elementary Motors B; 2 hrs. rec., 4 hrs. lab.) Mr. Kallal.
12. Advanced Electricity. Course deals with the construction, operation, and adjustment of the electrical parts of the automobile, starting and lighting, and ignition system. Practical work is given in overhauling, ignition systems, starting motors, and generators. (4 cred.; jr., sr., adv.; prereq., Tractor Construction and Overhauling; 2 hrs. rec., 4 hrs. lab.) Mr. Kallal.
13. Field Machinery. A course dealing with the construction, operation, and adjustment of farm implements, including plows, harrows, cultivators, mowers, binders, threshing machines, and combines. (5 cred.; fr., jr., sr., adv.; 3 hrs. rec., 4 hrs. lab.) Mr. Woolery.
14. Farm Shop. Rope work; soldering; pipe fitting, belt work; cement work; and babbitting. Recommendations are given on practical farm shops and equipment. (3 cred.; fr., jr., sr., adv.; 6 hrs. lab.) Mr. Woolery.
15. Blacksmithing. Instruction is given in the management of the forge; in bending, shaping, and welding iron and steel, and tempering steel tools, thus familiarizing the student with operations necessary for blacksmithing repair work on the farm. (5 cred.; fr., jr., sr., adv.; 10 hrs. lab.) Mr. Foker.
16. Carpentry. Care and use of tools taught by means of practical farm problems, methods of sharpening tools, practical application of the various carpentry tools. (5 cred.; fr., jr., sr., adv.; 10 hrs. lab.) Mr. Foker.
17. Advanced Carpentry. Continuation of carpentry with emphasis on building construction including foundation, framing, stair and rafter cutting and selection of material, and concrete work. (3 cred.; jr., sr., adv.; prereq., Carpentry; 6 hrs. lab.) Mr. Foker.
18. Mechanical Drawing. Practice in lettering and emphasis on working drawings for the shop. Designing of small farm structures. (5 cred.; jr., sr., adv.; 5 hrs. rec.) Mr. Foker.
19. Farm Drawing. Continuation of Mechanical Drawing. Specializing in the planning and arranging of various buildings on the farm. Attention is given to building materials, estimates of costs, and specifications. (5 cred.; jr., sr., adv.; prereq., Mechanical Drawing; 5 hrs. rec.) Mr. Foker.
20. Agricultural Physics. Nature of matter and force, heat, light, sound,

and electricity in their applications to everyday use. (5 cred.; sr., adv.; 5 hrs. rec.) Mr. Clark.

DAIRY AND ANIMAL HUSBANDRY

31. Animal Husbandry I. The livestock industry; the market classes of cattle, sheep, swine, and horses, and their relation to production; fundamentals of livestock judging. Study of the dairy breed type; origin, adaptability, and characteristics of dairy breeds; practice in dairy stock judging. (5 cred.; fr., jr., sr., adv.; 3 hrs. rec., 4 hrs. lab.) Mr. Christgau.
- 33a. Livestock Feeding. The principles of plant growth as applied to the production of feeds. Physiological functions of the organs of digestion and circulation as applied to animal nutrition. Feeding standards, characteristics of various feeding stuffs, formation, and rations. Feeding livestock under farm conditions. Consideration of experimental work and present practice. Practical feeding problems. Efficiency and economy in the feeding of rations. (4 cred.; jr., sr., adv.; prereq., Animal Husbandry; 4 hrs. rec.) Mr. Kiser.
- 33b. Livestock Judging. Open to only those students registered for 33a. (1 cred.; 2 hrs. lab.) Mr. Kiser.
34. Dairy Production. Selection, care, and management of the dairy herd; selection of the sire; calf raising; principles of dairy cattle feeding; production and care of milk; milk testing; dairy herd records. (5 cred.; jr., sr., adv.; 4 hrs. rec., 2 hrs. lab.) Mr. Kiser.
35. Farm Meats. Slaughtering of hogs, sheep, and beeves. Judging a carcass. Study of meat cuts and meats. (3 cred.; jr., sr., adv.; 6 hrs. lab.) Mr. Kiser.
36. Judging Breed Types of Livestock. The origin, present day characteristics, and adaptability of the breeds of cattle, sheep, swine, and horses; practice in judging purebred animals. (2 cred.; jr., sr., adv.; prereq., Animal Husbandry; 4 hrs. lab.) Mr. Kiser.
37. Animal Breeding. Theory and practice of animal breeding. Special attention is given to variation, heredity, and selection. The effect of purebred animals in livestock improvement. Study of pedigrees, herd books, and methods of registration. (3 cred.; sr., adv.; prereq., Livestock Feeding; 3 hrs. rec.) Mr. Kiser.
38. Advanced Stock Judging. Primarily for those interested in becoming more proficient in the art of livestock judging. (2 cred.; sr., adv.; prereq., Judging Breed Types of Livestock; 4 hrs. lab.) Mr. Kiser.
39. Livestock Management. The business side of livestock production, buying and selling market and purebred livestock. Buildings and equipment, keeping herd records, health problems and sanitary measures necessary to success. (5 cred.; sr., adv.; prereq., Animal Husbandry, Livestock Feeding, and Animal Breeding; 5 hrs. rec.) Mr. Kiser.
40. Utilization of Meats (for girls). Demonstrations of cuts of beef, pork, and mutton carcass; laboratory practice in preparing meat cuts

for cooking; identification of meat cuts; curing and storing of meats for summer use. This course is especially recommended for girls. (2 cred.; sr., adv.; 4 hrs. lab.) Mr. Kiser.

POULTRY HUSBANDRY

51. Poultry Principles. Culling of the laying flock. Principles of selection of the laying hen. Housing the laying and breeding hen. Principles of housing poultry. Feeding the laying and breeding stock. Principles of poultry feeding. (5 cred.; fr., jr., sr., adv.; 5 hrs. rec.) Mr. Pilkey.
52. Poultry Husbandry. Culling the farm flock; poultry house construction; feeds and feeding; the respiratory and digestive system of the fowl; artificial illumination of the poultry house; diagnosis and treatment of common diseases; sanitation program for poultry; preparing poultry and eggs for market; breeds and breeding of poultry; incubation and brooding of chicks; summer care of the growing stock; the production of turkeys, ducks, and geese. (5 cred.; required of all junior boys; sr., adv.; 5 hrs. rec.) Mr. Pilkey.
53. Poultry Management. Anatomy and physiology of the domestic fowl; use of artificial illumination on laying and breeding stock; mechanics of artificial illumination; keeping and studying of flock records; combating parasites, pests, and vices of fowl; selection and mating of breeders; principles of breeding poultry; eggs, their care and hatching; brooding and rearing of chicks; preventing and treating of chick diseases; capons and caponizing; summer egg production; fitting, exhibiting, and judging of poultry; classes, breeds, and varieties of poultry. (5 cred.; prereq., Poultry Husbandry; 5 hrs. rec.) Mr. Pilkey.
54. Poultry Culling and Housing (girls only). Culling the laying flock; principles of selection of the laying hen; housing the laying and breeding hen; principles of housing poultry. (5 cred.; fr., jr., sr., adv.; 5 hrs. rec.) Mr. Pilkey.
55. Poultry Sanitation and Feeding (girls only). Feeding the laying stock; principles of poultry feeding; a few of the common diseases of the fowl; maintaining sanitary conditions; preparing eggs for market; incubation and brooding of chicks. (5 cred.; jr., sr., adv.; prereq., Poultry Culling and Housing; 5 hrs. rec.) Mr. Pilkey.
56. Poultry Culture (girls only). Hatching the eggs; brooding the chicks; common chick diseases, parasites, and vices; summer care of the growing stock; classes, breeds, and varieties of fowl; the production of turkeys, ducks, and geese. (5 cred.; sr., adv.; prereq., Poultry Sanitation and Feeding; 5 hrs. rec.) Mr. Pilkey.

HORTICULTURE AND BEEKEEPING

61. Botany. Taught with special reference to plants of interest to the northern Minnesota farmer. Seeds and plants of the common weeds are studied, classified, and identified. Special emphasis is placed upon various methods of weed eradication. (5 cred.; fr., jr., sr., adv.; 4 hrs. rec., 2 hrs. lab.) Mr. McCall.

62. Biology. A course dealing with all living things. The chief objectives of the course are: to develop an appreciation of life, to note the interdependence of its various forms, and to study the economic importance of organisms in their relation to human health and enjoyment of life. (5 cred.; fr., jr., sr., adv.; 5 hrs. rec.) Mr. McCall.
63. Fruit and Vegetable Crops. 1. *Fruit Growing*.—Importance of farm, orchard, and small-fruit gardens is emphasized. Field work consists of a study of orchard soils, planting and cultural methods, propagation, pruning, spraying, harvesting, marketing, selection of varieties of native and hardy fruits. 2. *Vegetable Gardening*.—The value of the home vegetable garden, preparation of the ground, and selection of plants and seeds are given attention. Includes tillage, rotation, transplanting, preparation and care of hotbeds, and insects dangerous to the garden. 3. *Potato Culture*.—The importance of the potato as a crop for Minnesota is recognized in this laboratory course. Includes the study of potato soils, seed selection, growing the crop, harvesting, storing, marketing, diseases and their control. (5 cred.; jr., sr., adv.; 5 hrs. rec.) Mr. McCall.
64. Farm Forestry. Why, how, when, and where to plant windbreaks and woodlots is taught; also characteristics and adaptability of the more common trees; methods of propagation and the conservation of planted and natural forests. (2½ cred.; jr., sr., adv.; 5 hrs. rec., 6 weeks.) Mr. McCall.
65. Beekeeping. Value and importance of bees as a source of income for the farm, study of different races of bees, practical exercises in handling of bees. Local apiaries furnish abundance of material for practical demonstrations. (3 cred.; jr., sr., adv.; 3 hrs. rec.) Mr. McCall.
66. Floriculture. Study of flowers, with special reference to planting, growing, and propagation. Considerable time spent on grouping and planting of ornamental flowers and shrubs, and making landscape planting plans. Station greenhouses supply material for laboratory work. (2 cred.; sr., adv.; 2 hrs. rec.) Mr. McCall.

HOME ECONOMICS

- 71a-b. Freshman Cooking. A course in elementary cooking, taking up the classification of foods, a study of the principles involved in their cooking, and the body needs. Laboratory work consists of the cooking of fruits, vegetables, cereals, batters, doughs, pastries, etc. Serving of simple breakfasts and luncheons is done. Table manners are discussed in relation to the serving of meals. A study of dishes and silver and kitchen utensils and equipment is also included in this course. (3 cred.; fr., jr., sr., adv.; 4 hrs. lab., 1 hr. rec.) Miss Bede.
- 72a-b. Junior Cooking. A continuation of freshman cooking, and study of foods. Laboratory work consisting of work in canning and preserving, a study of meats and their cooking. Invalid cookery and some work in fancy cooking will be done. Planning, cooking, and serving meals for various occasions with special attention to balanced diets and

- caloric values will be especially emphasized. (3 cred.; jr., sr., adv.; prereq., Freshman Cooking; 4 hrs. lab., 1 hr. rec.) Miss Bede.
- 73a-b. Senior Cooking. Class work will be in connection with theory work given in the home management class. Special work on budgeting of foods and discussion of household accounts will be problems in this course. Table service and serving of meals in home management work and daily menus and costs for a group of six or eight people is part of this course. (1 cred.; sr., adv.; prereq., Freshman Cooking and Junior Cooking; 2 hrs. lab.) Miss Bede.
74. Household Science. A study of types of houses, construction, location, lighting, heating, water supply and drainage, special laboratory work in construction and furnishing of a farm home. (3 cred.; jr., sr., adv.; 2 hrs. lab., 1 hr. rec.) Miss Bede.
- 75a. Home Management. Problems of nutrition; balanced menus worked out for men, women, and children of different ages; the special needs of the young child. Planning of the family dietary. Corrective foods for the sick and convalescent. (2 cred.; sr., adv.; prereq., Junior Cooking; 2 hrs. rec.) Miss Lippitt.
- 75b. Home Management. Purchasing, care, and preparation of food for the family; organization and administration of the home; distribution of the family income. Budgeting of time, energy, and money. Actual practice in home management with household problems in the care of a home, purchasing supplies, preparation and serving of meals, and the entertaining of guests. (3 cred.; sr., adv.; prereq., Home Management 75a; 2 hrs. rec., lab.) Miss Lippitt.
76. Physiology, Hygiene, and Social Ethics. A study of the uses of the systems of the human body. Relation of food, air, rest, and exercise to individual health. Conventions of home, school, and public life. (3 cred.; fr., jr., sr., adv.; 3 hrs. rec.) Miss Bede, Miss Dahlen, Miss Kingston.
77. Public Health and Sanitation. Spread and prevention of contagious diseases; protection of food, water, and milk; community health. (2 cred.; fr., jr., sr., adv.; 2 hrs. rec.) Miss Dahlen.
78. Home Hygiene and Care of the Sick. Sick room furnishings and etiquette; bedside care of the sick adult; feeding patients; first aid in emergencies. (2 cred.; jr., sr., adv.; 2 hrs. rec. and dem.) Miss Dahlen.
79. Care and Training of Infants and Children. Consideration of the infant as to heredity and environment. Physical and mental training of the baby and preschool child. (2 cred.; jr., sr., adv.; 2 hrs. rec. and dem.) Miss Dahlen.

CLOTHING

- 81a-b. Freshman Sewing. Construction processes involved in the making of simple garments; use and care of sewing machines; study of cotton and linen fibers and fabrics for clothing and household use. Use of commercial patterns; study of children's clothing. (3 cred.; fr., jr., sr., adv.; 4 hrs. lab., 1 hr. rec.) Miss Kingston.

- 82a. Junior Sewing. Construction problems involved in the making of a woolen garment and selection of appropriate accessories. Study of woolen fabrics, selection and care. Pattern alterations and fitting. (3 cred.; jr., sr., adv.; prereq., Freshman Sewing; 4 hrs. lab., 1 hr. rec.) Miss Kingston.
- 82b. Junior Sewing. Construction problems involved in the making of a woolen garment and selection of appropriate accessories. Study of silk, and rayon fibers and fabrics; selection, use, and care. (3 cred.; jr., sr., adv.; prereq., Freshman Sewing; 4 hrs. lab., 1 hr. rec.) Miss Kingston.
83. Senior Sewing. Planning and construction of an economical wardrobe for graduation on a limited budget; the amount to be uniform as decided upon by the instructor and students. Problems involved in making over garments, construction of a made-over garment. (3 cred.; sr., adv.; prereq., Junior Sewing; 4 hrs. lab., 1 hr. rec.) Miss Kingston.
- 84a. Related Art. Principles of design as applied to dress design. Selection and planning of appropriate, becoming costumes for all types and all occasions. Special emphasis on a school girl's wardrobe. (3 cred.; fr., jr., sr., adv.; 2 hrs. lab., 2 hrs. rec.) Miss Kingston.
- 84b. Related Art. Principles of design as applied to home furnishings, such as curtains, floor and wall coverings, furniture, pictures, household linens, dishes, and accessories. Special emphasis on dormitory room and various rooms in own house. (3 cred.; fr., jr., sr., adv.; prereq., Related Art 84a; 2 hrs. lab., 2 hrs. rec.) Miss Kingston.

ENGLISH

- 101a-b. English I. Oral and written composition; with particular attention to sentence structure, punctuation, and spelling. Letter writing. Drills for the purpose of eliminating errors. The reading of simple classics to create a love for literature. Silent reading to train for quick and accurate reading and thus speed up the thought getting process and develop the habit of concentration; grammar; intensive drill on parts of speech and sentence analysis. (4 cred.; 4 hrs. rec.) Miss Warne.
- Speech I.*—Reading aloud, drilling upon articulation and enunciation. Breathing and voice drills; short talks on familiar subjects, public programs to enable the students to speak clearly and easily before an audience. (1 cred.; 1 hr. rec.) Miss Warne, Mr. Ritzman.
- 102a-b. English II. Practical Business English. Paragraphing and methods of paragraph development. Narration, description, and exposition in oral and written composition. Study of good literature as a basis for composition work and means of increasing student's vocabulary. (4 cred.; 4 hrs. rec.) Miss Warne.
- Speech II.*—Extemporaneous talks, interpretation, and a little dramatic work. (1 cred.; 1 hr. rec.) Miss Warne.
- 103a-b. English III. Study of sentence structure and principles of composition. Organization of longer themes. Reading of a few of the best English classics. Shakespeare. (4 cred.; 4 hrs. rec.) Miss Smith.

- Speech III.*—Special study of extemporaneous speech. Frequent participation in public programs. (1 cred.; 1 hr. rec.) Miss Smith.
- 104a-b. American Literature and Composition. The history and development of American literature with selected readings from each period. A careful study of compositions with college entrance requirements in mind. (4 cred.; 4 hrs. rec.) Miss Smith.

- Speech IV.*—Analysis of various forms of literature. Interpretation based on study of action and voice. Study of the drama with practice in production. (1 cred.; 1 hr. rec.) Miss Smith.
- 105a-b. English Literature. A survey of literature with selected readings from each period. Frequent critical essays on outside readings. (5 cred.; 5 hrs. rec.) Miss Smith.
- 106a-b. Debate I. Principles of argumentation, briefs, debating in class, in public programs and debating societies. (1 cred.; required of all freshmen; 1 hr. rec.) Mr. Ritzman.
- 107a-b. Debate II. A development and continuation of the first year's work. (1 cred.; required of all juniors; 1 hr. rec.) Mr. Ritzman.
- 108a-b. Debate III. An advanced course in argumentation. Open to third and fourth year students. (1 cred.; prereq., Debate II; 1 hr. rec.) Mr. Ritzman.

MATHEMATICS

111. Arithmetic. Fundamentals of arithmetic; fractions; decimals; G.C.M.; L.C.M.; linear measure; square measure; cubic measure; measurement of wood and lumber; liquid measure, dry measure; plastering; carpeting; paper hanging; building construction; silos; grain bins, water tanks, etc.; construction of concrete roads; walks and fences; interest; loans; percentage; insurance; buying and selling; discounts and commissions; commercial and trade discount; problems of profit and loss. (Required of all freshmen who do not have State Board certificates in arithmetic. No credit towards graduation.) Mr. Pilkey.
- 114a-b. Algebra. The work in this covers Hawkes-Luby-Touton *New First Course in Algebra* or equivalent text. (5 cred.; 5 hrs. rec.) Mr. Mlinar.
- 115a-b. Geometry. The course in geometry covers Avery's *Plane Geometry* from Book I to Book V, taking up the study of rectilinear figures, the circle, proportion, and measurement of similar figures; areas of polygons, regular polygons, and the measurement of the circle. (5 cred.; 5 hrs. rec.) Mr. Mlinar.

SOCIAL SCIENCES

121. Industrial Geography. Study of climate, rainfall, location, and other geographical conditions affecting the primary industries. (5 cred.; fr., jr., sr., adv.; 5 hrs. rec.) Mr. Ritzman.
122. Industrial History. A study of the growth of industry, commerce, labor, population, and agriculture in the United States. (5 cred.; fr., jr., sr., adv.; 5 hrs. rec.) Mr. Ritzman.

123. Ancient History. The emergence of mankind from savagery. The contributions of ancient Greece and Rome to modern civilization. The work in this course covers also the Middle Ages. (5 cred.; jr., sr., adv.; 5 hrs. rec.) Mr. Ritzman.
124. Modern History. The development of present European nations is traced from the sixteenth century to the present time. (5 cred.; jr., sr., adv.; 5 hrs. rec.) Mr. Ritzman.
- 125a-b. American History. A study of the early discovery and colonization of the continent leading to the formation of the Union, the growth of the nation, and recent problems. (5 cred.; sr., adv.; 5 hrs. rec.) Mr. Mlinar.
126. Civics. Legislative, judicial, and executive departments and their functions. School districts, township, county, state, and national government. (5 cred.; sr., adv.; 5 hrs. rec.) Mr. Clark.
127. Rural Sociology. The problems of rural communities, of rural health and sanitation, and of rural social institutions will receive attention. (3 cred.; sr., adv.; 3 hrs. rec.) Mr. Christgau.
128. Parliamentary Law. The essentials of parliamentary practices as necessary in conducting public meetings effectively. (1 cred.; jr., sr., adv.; 1 hr. rec.) Mr. Ritzman.
- 129a-b. Farm Marketing. Fundamentals in connection with the problems confronting the farmer today in disposing of his products. (2 cred.; sr., adv.; 2 hrs. rec.) Mr. Dowell.

MUSIC

140. Private Lessons. Pupils of any grade of advancement in piano, vocal, or violin study are admitted to this course. Advanced students are given an opportunity to appear in many programs during the year.
- 140a. Piano. An elementary course is given for beginners, an advancement to the intermediate grade depends on the accomplishment of the student. Intermediate and advanced students study technical exercises for development and control of fingers, and for rhythm. Classical and popular solo compositions are studied in detail and by memory. One-half hour instruction per week. One hour required for daily practice. Special fee. (2 cred.; fr., jr., sr., adv.) Miss Lane.
- 140b. Voice. The vocal student is taught breath control, placement of tone, resonance, correct pronunciation and enunciation in singing. The development of the voice in even scale singing and in range, intervals, and correct phrasing. Songs and ballads by standard composers. One-half-hour lesson per week. Special fee. (2 cred.; fr., jr., sr., adv.) Miss Hennig.
- 140c. Violin. Technique, methods, and studies adapted to the individual student. Solo with piano accompaniment according to the advancement of the student. One half-hour lesson per week under instruction. One hour daily practice required. Special fee. (2 cred.; fr., jr., sr., adv.) Miss Warne.

- 141a-b. Music I. Elementary music. Class work in note reading, ear training, sight reading, group singing. (1 cred. per term; jr., sr., adv.; required of all freshmen; 1 hr. per week.) Miss Hennig.
- 142a-b. Music II. Intermediate. Class singing; study of history and musical appreciation. (1 cred. per term; jr., sr., adv.; 1 hr. per week; pre-req., Music I.) Miss Hennig.
- 143a-b. Music III. Advanced. Note reading and sight singing. Study of opera and classic composers. An acquaintance with the great music of the world through solos and records. (1 cred. per term; sr., adv.; prereq., Music II; 1 hr. per week.) Miss Hennig.
- 144a-b. Glee Club for Boys and Girls. Admittance by try-out. ($\frac{1}{2}$ cred. per term; 1 hr. per week.) Miss Hennig, Miss Lane.
- 145a-b. Mixed Chorus. Four-part singing. Admittance by try-out. This chorus group provides music for special occasions. ($\frac{1}{2}$ cred. per term; 1 hr. per week.) Miss Hennig, Miss Lane.
- 146a-b. Orchestra. Ensemble playing for all orchestral instruments. All players of instruments are urged to join this organization. (1 cred. per term; 2 hrs. per week.) Miss Lane.

BUSINESS TRAINING

- 151a-b. Typewriting and Shorthand I. Proper use of the machine; accuracy in touch typing through finger drills, and writing of required exercises. In Shorthand I the student completes the *Manual of Gregg Shorthand* as well as many easy business letters. Both courses must be taken together. (8 cred.; fr., jr., sr., adv.; 10 hrs. lab. per week.) Miss Hughbanks.
- 152a-b. Typewriting and Shorthand II. In typewriting, the work includes business letters and tabulating and executing legal documents. Forty to fifty words a minute required. The work in Shorthand II reviews the *Manual*, gives much new dictation material, including *Gregg Speed Studies* and work from the *Gregg Writer*. The student's speed should be raised to 100 words a minute. Both courses must be taken together. (8 cred.; jr., sr., adv.; 10 hr. lab. per week.) Miss Hughbanks.
156. Bookkeeping. The principles of double-entry bookkeeping are taught by means of class drills and the working out of model sets of books. In this course the student is made familiar with checks, notes, drafts, and other business papers. (5 cred.; jr., sr., adv.; 5 hrs. rec.) Miss Hughbanks.

PHYSICAL TRAINING

The aim of this department is to maintain the health of the students, to give outdoor and indoor exercises, to stimulate functional activity, to give co-ordination and control, and to form right habits of living.

MEN

171. Hygiene and Social Ethics. Proper care of the human body. Special attention to food, clothing, and cleanliness. Importance of fresh air and exercise. First aid to the injured. Personal habits and social

- usage. To live most—live the best. Conventions of the home, school, and public life. (2 cred.; required of all freshmen; 2 hrs. rec.) Miss Dahlen and local doctors.
172. Physical Education I. Gymnasium and swimming. Required of all first year boys not excused because of physical disability. Aims to inspire pupils with desire to reach and maintain physical efficiency. Gymnasium classes meet twice a week. Work consists of group games, such as kittenball, touchball, basket-ball, and volley ball; also track activities, boxing, and wrestling. Swimming classes are held twice weekly. Individual attention given to those unable to swim. (1 cred.; required of all first year boy students; 4 hrs. per week.) Mr. Christgau.
173. Physical Education II. Required of all second year boy students. (1 cred.; 4 hrs. per week.) Mr. Christgau.
174. Physical Education III. Required of all third year boy students. (1 cred.; 4 hrs. per week.) Mr. Christgau.
175. Physical Education IV. Elective to fourth year students. Gymnasium. Class meets twice a week. Work is a continuation of games listed above. Swimming. Class meets twice weekly. Instruction is given in fundamental strokes; water sports; life saving methods and artificial respiration. Swimming class is open to only those boys who have successfully passed certain swimming requirements. Mr. Christgau.

WOMEN

181. Physical Education I. Instruction and exercises tending to promote good health habits and making for physical fitness. Group games. (1 cred.; required of all freshmen, also all junior girls not registered in Phys. Ed. II.) Miss Kingston.
182. Physical Education II. All students are required to pass a swimming test in a satisfactory manner before graduation, unless otherwise excused. (1 cred.) Miss Kingston.
183. Physical Education III. (Sports.) Active games including kittenball, volley ball, basket-ball, swimming, and track. Class teams will be organized for each sport. The swimming will be for those who passed their test and will meet for 1 period per week. Each of the other sports to be seasonal. (1 cred.) Miss Kingston.

SUMMER HOME PROJECTS

AGRICULTURAL PROJECTS

200. Students will register for the study of some definite farm problem to be studied each summer and report at stated intervals during the summer the progress made. (See courses listed below.)
201. Dairy Herd Management. Student assumes care of dairy herd on his home farm for at least six months, making regular reports in regard to feeding and management, and keeping accurate accounts of milk production, butter tests, feed consumed, etc. (5 cred.) Mr. Kiser.

202. Pork Production. Care and feeding of one or more litters for six months, with complete records of feeding and care, cost of production, and returns. (3 to 5 cred.) Mr. Kiser.
203. Sheep Raising. Care of farm flock for one season, with complete records of feeding and management. (2 to 5 cred.) Mr. Christgau.
204. Baby Beef Production. Care and feeding of baby beef with records of cost of production. (3 to 5 cred.) Mr. Christgau.
205. Livestock Judging. The organization and training of a livestock judging team among the young people of your community. (2 to 3 cred.) Mr. Kiser.
206. Hogging-Off Corn. The growing of corn for hogging-off, with records of cost of production and results. (2 to 3 cred.) Mr. Kiser.
207. Potato Production. Production of one or more acres of potatoes for seed, including tuber unit selection, seed treatment, spraying with Bordeaux mixture and poisonous insecticides, and proper cultural practices. Records of cost of production and financial returns are required. (5 cred.) Mr. McCall.
208. Garden and Truck Crops. Planning, planting, and culture of home vegetable garden, or growing one-fourth acre or more of truck crop for market. Field notes and cost records are required. (3 to 5 cred.) Mr. McCall.
209. Planting Windbreak. Practical application of principles taught in forestry course, in planting windbreak of at least one hundred trees on home farm. (3 to 5 cred.) Mr. McCall.
210. Plant Identification and Weed Eradication. Identification and selection of farm plants and weeds, including common injurious weeds. Field notes on habits of growth and methods of eradication are required. (5 cred.) Mr. McCall.
211. Weed Seed Identification. The student will be required to collect, thresh, identify, and label the seeds of at least 72 weedy plants found in northwestern Minnesota including all those in Class I (primary noxious weed seeds designated by the Minnesota Seed Law), and at least 40 species from Class II. Mr. Clark.
212. Beekeeping. Care of two or more colonies of bees, including approved methods of management, and marketing of honey. (1 to 3 cred.) Mr. McCall.
213. Home Beautification. Planning the improvement of home grounds through planting shrubs and flowers. Includes plans and lists of shrubs and plants to be used, and some preliminary planting. (2 to 5 cred.) Mr. McCall.
214. Corn Production. Production of one acre or more of a standard variety of corn for seed, following up-to-date methods of seed selection, curing, testing, and cultural operations as taught in the classroom. (3 to 5 cred.) Mr. Clark.
215. Pure Seed Production. Production of one acre or more of a pure standard variety of wheat, oats, barley, or flax with special attention to preserving purity of seed and to producing high quality seed grains. (3 to 5 cred.) Mr. Clark.

216. Alfalfa Production. Growing of one acre or more of alfalfa, with records of labor and other production costs, yields, and notes on observations. (1 to 3 cred.) Mr. Dunham.
217. Farm Accounts. Includes the keeping of a complete system of financial accounts on the home farm for one season. (5 cred.) Mr. Clark.
218. Poultry Production. Hatching, brooding, feeding, and management of chicks, ducks, or geese, including records of production costs. (3 cred.) Mr. Pilkey.
219. Poultry Culling. Culling the farm flock. Project may be extended to include demonstrations in other flocks in the community. (1 to 5 cred.)
220. Turkey Production. Hatching and rearing turkeys within an enclosure. (3 to 5 cred.) Mr. Pilkey.
221. Building Construction. Planning, locating, and constructing a garage, machine shed, poultry house, or other farm buildings on the home farm. (1 to 3 cred.) Mr. Foker.
222. Tractor Operation. A study of the management and operation of the tractor on the home farm, including cost of fuel and oil, repair, etc., and complete records of work done. (5 cred.) Mr. Kallal.
223. Community Service. The organization and promotion of 4-H clubs or other community, social, or religious organizations. (5 cred.) Mr. Pflughoeft.

HOME ECONOMICS PROJECTS

1. Bread Baking. Includes the baking of nine batches of yeast bread and six batches of quick bread, and reports on baking, time, and cost of materials. (2 cred.) Miss Bede.
2. Cake Making. Making eight cakes—four sponge cakes and four butter cakes. (1 cred.) Miss Bede.
3. Baking Cookies. Making twelve bakings of cookies, six of which are drop cookies and six rolled out. (1 cred.) Miss Bede.
4. Pie Baking. Making twelve pies, six of which are two-crust pies, and six one-crust pies. (1 cred.) Miss Bede.
5. Canning Fruit and Vegetables. The canning of not less than twelve quarts of vegetables and not less than twelve quarts of fruit with records of methods used and costs. (1 cred.) Miss Bede.
6. Canning Meat. The canning of not less than twelve quarts of meat by the "hot pack" method, with notes and cost record. (1 cred.) Miss Bede.
7. Preserving. The making of not less than six quarts of sweet or sour pickles, at least twelve glasses of jelly, and not less than six pints of preserves, jam, or conserve. (1 cred.) Miss Bede.
8. Meal Preparation. Planning meals for one week, to meet the needs of your home family and following all principles for well-balanced meals. (1 cred.) Miss Bede.
11. House Dress. Making a washable house dress and a 3-piece lingerie set for self. (1 cred.) Miss Kingston.

12. Made-Over Dress. Making over a dress for self. (1 cred.) Miss Kingston.
13. Wool Dress. Making a wool dress, suit, or coat for self. (1 cred.) Miss Kingston.
14. Silk Dress. Making a silk dress or suit for self. (1 cred.) Miss Kingston.
15. Embroidery. Work to be done in wool or cotton on wool, silk, linen, or cotton materials. (1 cred.) Miss Kingston.
16. Hemstitching. Ten yards of either double or Italian hemstitching on appropriate articles. (1 cred.) Miss Kingston.
17. Thrift. Making of 5 articles from flour or feed bags. (2 cred.) Miss Kingston.
20. Room Furnishing. Renovating some room in the house, to make it more efficient and comfortable, carrying out the principles taught in the House Planning courses. (1 cred.) Miss Bede.

SUMMARY OF ATTENDANCE

REGULAR SCHOOL COURSE

1934-35

| | Men | Women | Total |
|--------------------------|-----|-------|-------|
| Advanced | 24 | 11 | 35 |
| Seniors | 49 | 14 | 63 |
| Juniors | 63 | 22 | 85 |
| Freshmen | 67 | 41 | 108 |
| Special | 21 | 17 | 38 |
| | | | |
| Total | 224 | 105 | 329 |
| Women's Camp, 1935..... | | 149 | 149 |
| Short Course, 1935 | 420 | 455 | 875 |
| | | | |
| Total | 644 | 709 | 1,353 |

STUDENTS

1934-35

ADVANCED

| | |
|----------------------------------|------------------------------------|
| Alseth, Stanley, Fox | Molacek, Jerome, Ulen |
| Anderson, Donald, Climax | Mykleby, Raymond, Climax |
| Billberg, Paul, Wannaska | Nelson, Francis, Hendrum |
| Boe, Torleif, McIntosh | Olson, Agatha, Beltrami |
| Burns, James, Crookston | Peterson, Luella, East Grand Forks |
| Carlson, Helen, Halstad | Peterson, Wilbur, Eldred |
| Degerness, Henning, Gary | Quantock, Gladys, Argyle |
| Ellinger, Glenn, Crookston | Sargent, Edward, Crookston |
| Fargo, Gilbert, Crookston | Sargent, Lois, Crookston |
| Field, Fern, Stephen | Sheldon, Ralph, Bagley |
| Gaare, Kenneth, Perley | Sitko, William, Ada |
| Gunderson, Gilbert, Fergus Falls | Swanson, Hulda, Kennedy |
| Haugo, Esther, Mahnomen | Tangen, Harry, Menahga |
| Johansen, Richard, Pitt | Theiling, Norman, Grygla |
| Johnson, Bertrum, Hawley | Vilven, Evelyn, Crookston |
| Johnson, Selmer, Crookston | Washburn, Edson, Jr., Crookston |
| Lerud, Lester, Twin Valley | Worman, Dorothy, Crookston |
| Lerud, Margaret, Twin Valley | |

SENIORS

| | |
|------------------------------------|--------------------------------------|
| Albertson, Kenneth, Crookston | Engelstad, Earl, Thief River Falls |
| Anderson, Arvid, Bagley | Engelstad, Morris, Thief River Falls |
| Anderson, David, Crookston | Fink, Harry, Crookston |
| Bellamy, Wayne, Drayton, No. Dak. | Gandrud, Donald, Callaway |
| Bergeron, Philip, Argyle | Grove, Carlos, Roosevelt |
| Bergeson, Burnet, Twin Valley | Hansen, Laura, Thief River Falls |
| Bergh, Arlo, Hallock | Hanson, Noel, Detroit Lakes |
| Brouillard, Edward, Crookston | Hanson, Wendell, Kennedy |
| Christianson, Velma, Crookston | Hendricks, Henry, Fertile |
| Cumming, Russell, East Grand Forks | Holland, Willis, Shely |
| Dahlen, Olaf, Erie | Holst, Irene, Thief River Falls |

| | |
|---------------------------------------|-----------------------------------|
| Homstad, Clifford, Hallock | Ross, Elmer, Fisher |
| Hovelson, Lloyd, Gary | Sanden, Harold, Beau lieu |
| Johansen, Marie, Pitt | Sanders, Stanley, Crookston |
| Johnson, Alden, Shelly | Sauer, Clifford, Glyndon |
| Johnson, Donald E., Crookston | Scott, Arnold, Lengby |
| Kramer, Marian, Crookston | Sewill, Kenneth, Angus |
| LeBlanc, Elmer, Grand Forks, No. Dak. | Skeim, Manda, Badger |
| Lindberg, Earl, Beltrami | Smrstik, George, Roosevelt |
| Maattala, Ebba, Oklee | Spence, Bert, Crookston |
| MacGregor, Lester, Crookston | Stammes, Joyce, Halma |
| Moore, Boyd, Northcote | Steen, Olive, Halstad |
| Morgan, Genevieve, Crookston | Stone, Berlyn, Kennedy |
| Munby, William, Breckenridge | Stromberg, Clarence, Rosewood |
| Myrold, Joseph, Crookston | Tasa, Glenn, Trail |
| Neslund, Omer, Oklee | Thompson, Orbin, East Grand Forks |
| Odegaard, Clifford, Gonvick | Thoreson, Harry, Plummer |
| Pearson, Melvin, Hallock | Urbaniak, Alvina, Argyle |
| Pester, Harlan, Crookston | Viau, Virginia, Crookston |
| Reitan, Fredrick, Hawley | Wolden, Marcus, Fergus Falls |
| Rindahl, Gladys, Trail | Youmans, Mildred, Crookston |
| Risbrudt, Ralph, Dalton | |

JUNIORS

| | |
|--|------------------------------------|
| Alseth, Gilmar, Badger | Holm, Belva, Climax |
| Anderson, Arnold N., Drayton, No. Dak. | Hoper, Henry, Stephen |
| Anderson, Hazel, Lengby | Ingebretson, Chester, Ulen |
| Arnold, Lee, Crookston | Johansen, Helen, Pitt |
| Austin, Wallace, Barnesville | Johnson, Everett, Lengby |
| Beatty, Walter, Crookston | Johnson, Francis, Lengby |
| Bedard, Marvin, Northcote | Klementson, Clinton, Ulen |
| Bell, Ida, Crookston | Kramer, Arthur, Crookston |
| Berget, Luverne H., Oklee | Kveno, Orville, Gary |
| Bloomquist, Dale L., Drayton, No. Dak. | LaPlante, Francis, Crookston |
| Bothum, Grant, Karlstad | LaRiviere, Evelyn, Crookston |
| Brown, Virgil, Gary | Larson, Llewelyn, Argyle |
| Burseth, Borghild, Fergus Falls | Lerud, Ruth, Twin Valley |
| Carlson, Erling, Halstad | Lindberg, Lowell, Roseau |
| Carlson, Raymond E., Middle River | McVeety, Betty, East Grand Forks |
| Chilson, Martin, Crookston | Mellesmoen, Glenn, Fosston |
| Claney, Barbara, Stephen | Moe, Margaret, Lancaster |
| Cook, Fred, Faunce | Moe, Solveig, East Grand Forks |
| Coulter, Harry, East Grand Forks | Morberg, Marshall, Oslo |
| Dahlgren, Vincent, Kennedy | Morvig, Abner, Fertile |
| Ecklund, Marvin, Hallock | Nabben, Harold, Goodridge |
| Ecklund, Rosella, Hallock | Nelson, Milford, Fergus Falls |
| Evans, Marshall, Middle River | Newhouse, Earl, Crookston |
| Freije, Chan, Crookston | Oen, Raymond, Thief River Falls |
| Gustafson, Gladycie, Trail | Olson, Alfred, Beltrami |
| Gustafson, Lionel, Lancaster | Parduhn, Gladys, Crookston |
| Halvorson, Carl, Fergus Falls | Peterson, Leroy, Thief River Falls |
| Hanson, Leland, Twin Valley | Peterson, Walter, Oklee |
| Hanson, Marlys, Fertile | Ramberg, Edgar, Pitt |
| Hanson, Martin, Thief River Falls | Rasmussen, Martha, Ada |
| Hanson, Morris, Trail | Ross, Harold, Fisher |
| Hartman, Lola, Mentor | Rowley, Alvah, Lancaster |
| Haugen, Clarence, Oslo | Rynning, Axel, Kennedy |
| Haugen, Oliver, St. Hilaire | Scarr, Raymond, Crookston |
| Hegreberg, Phillip, Ada | Sovick, Reuben, Clearbrook |
| Heng, Bertha, Barnesville | Stanko, John, Blackduck |
| Hofstad, Ann, Oklee | Strand, Tilford, Twin Valley |

Swenson, Stanley, Kennedy
 Tasa, Irene, Trail
 Thompson, Elmer, Malung
 Thompson, Hilbert, Fergus Falls
 Torkelson, Alta, Crookston
 Viker, Donald, Halstad

Weckwerth, James, Hazel
 Wentzel, Roland, Fisher
 Wold, Anthony, Crookston
 Wyer, Joe, Georgetown
 Youmans, Marie, Crookston

FRESHMEN

Abbott, Dorothy, Mentor
 Adkins, Beulah, Gary
 Altpeter, Florence E., Crookston
 Altpeter, Helen, Crookston
 Anderson, Alexis M., Grygla
 Arness, Alton, Eldred
 Barrett, Jean, East Grand Forks
 Bicking, Thelma, Gary
 Blakely, Marie, Fisher
 Bolstad, Kenneth, Fosston
 Brandt, Ralph, Gonvick
 Claussen, Harvey, Goodridge
 Claussen, Margery, Fergus Falls
 Colebank, Maynard, Erskine
 Dahl, Morris, Kennedy
 Dahlgren, Verne, Kennedy
 Dalager, Cora, Pelican Rapids
 Durbahn, Patricia, Angus
 Egeland, Raymond, Fisher
 Evans, Dorothy, Middle River
 Evans, Woodrow, Fosston
 Fairbanks, Ethel, Red Lake
 Folland, John, Halma
 Forseth, Melford, Climax
 Gusa, Theodore, Middle River
 Hanson, Gilman, Crookston
 Hanson, Howard B., Kennedy
 Hanson, Thorvald, Lockhart
 Hanstad, Alpha, Climax
 Hanstad, Benora, Climax
 Harris, Leonard, Crookston
 Haug, Lois, Oslo
 Haugo, Einar, Mahnomen
 Haugo, Sigvald, Mahnomen
 Hedlund, Lucille, Gully
 Hegre, Norman, Fertile
 Hegreberg, Delene, Ada
 Hemmestvedt, Truman, Goodridge
 Higgin, Raymond, Bronson
 Hoard, Hugh, Graceton
 Hoiseth, Myra, Crookston
 Hoiseth, Olive, Crookston
 Homstad, Howard, Hallock
 Iverson, Glennie, Erie
 Jeffrey, Bernadette, East Grand Forks
 Jenni, Ruth, Euclid
 Jensen, Leo, Goodridge
 Johnson, Clinton, Viking
 Johnson, Phyllis M., Baudette
 Kast, Arthur J., Goodridge
 Kellerman, Helen, Roseau

Kellerman, Leona, Roseau
 Kelly, Harvey, Gentilly
 Kinshella, Ralph, Pelan
 Koppang, Norman, Climax
 Krogstad, Janet, Fertile
 Landsverk, Oliver, Fosston
 Lantz, Kenneth, Lengby
 Lokken, Lynn, Shelly
 Lunder, Niles, Dale
 McVeety, Ivy, East Grand Forks
 Magnusson, Udell, Duxby
 Magnusson, Yvonne, Duxby
 Marcotte, Clarence, Red Lake Falls
 Mjelde, Maurice, Beltrami
 Moen, Duane, Gary
 Nabben, Marvin, Goodridge
 Nisbet, Myrtle, East Grand Forks
 Norquist, Lambert, Roseau
 Oistad, Noel, Shelly
 Olson, Grace, Halstad
 Orvik, James, Shelly
 Orvik, Norman, Lockhart
 Patenaude, John, Red Lake Falls
 Pauley, Elmer, Stephen
 Pearson, Ferdie, Lancaster
 Peltier, Donald, Crookston
 Peterson, Stewart, Mentor
 Purath, Russell, Red Lake Falls
 Remmen, Palmer, Audubon
 Riopelle, Elfay, Argyle
 Roed, Carus, Erskine
 Satre, Mary, Grygla
 Schulstad, Kenneth, Gary
 Shenand, Virginia, Lengby
 Sims, Gayle, Fertile
 Slettvedt, Orda, Oklee
 Solberg, Harry, Erie
 Soltvedt, Marvel, Oslo
 Sovick, Arvilla, Clearbrook
 Stolan, Clifford, Fosston
 Stoneouse, Effie, Oklee
 Swenson, Alta, Fertile
 Tandberg, Chester, Newfolden
 Tangen, Gladys, Menahga
 Tiedje, Carl, Ulen
 Torkelson, Alec, Thompson, No. Dak.
 Trangsrud, Clifford, Duxby
 Trangsrud, Kermit, Duxby
 Tveiten, Geline, Trail
 Wardell, Warren, Crookston
 Watt, Virginia, Bagley

Weindorf, Werner, Red Lake
 Wellbrock, Wilfred, Fergus Falls
 Wiemer, Evelyn, Lengby

Worman, Esther, Crookston
 Worman, Gladys, Crookston
 Yonke, Gerald, St. Hilaire

SPECIAL

Anderson Earl, Hampden, No. Dak.
 Bang, Melbern, Crookston
 Becker, Henry, Mahnomen
 Bergh, J. Vincent, Perley
 Bjorgen, Martin, Mentor
 Bjorgo, Oral, McIntosh
 Busse, Edward, Crookston
 Bysom, Marjorie, Fosston
 Cameron, Emery, Hallock
 Clark, Margaret, Crookston
 Dowell, Annette, Crookston
 Dowell, Hannah, Crookston
 Dowell, Margaret, Crookston
 Dowell, Ruth, Crookston
 Dunham, Jean, Crookston
 Dunham, Margaret, Crookston
 Dunham, Raymond, Jr., Crookston
 Eide, Lillian, Spooner
 Gerth, August, Crookston

Hanson, Walter, Trail
 Hart, Warren, Pembina, No. Dak.
 Hillmon, Donna, Crookston
 Kiser, Beth, Crookston
 Kiser, Loren, Crookston
 Lindholm, Gladys, Baudette
 McCall, Barbara, Crookston
 McCall, Robert, Crookston
 Nelson, Stanley, Crookston
 O'Brien, Thomas, Hampden, No. Dak.
 Parnow, Ray, Erie
 Seeger, Phillip, Mahnomen
 Simon, Lucille, Nielsville
 Simon, Phyllis, Nielsville
 Smith, Ilah, Puposky
 Tveit, Gudrun, Thief River Falls
 Vig, Reuben, Crookston
 Wagner, Elroy, Crookston
 Walker, Glenn, Clearbrook

SCHOOL EXPENSES

SIX-MONTH SCHOOL YEAR, SEPTEMBER 30, 1935, THROUGH
MARCH 27, 1936

First Term

| | | |
|--|---------|--|
| September 30 | | |
| ‡ Entrance fee | \$5.00 | |
| ‡‡ Breakage deposit | 5.00 | |
| Health fee | 2.00 | |
| Book rent | 1.00 | |
| Gymnasium fee | 1.00 | |
| Student privilege ticket | 2.00 | |
| (For all school functions, athletic contests, and movies) | | |
| Board and room (4 weeks)..... | 19.00 | |
| (Board per week, \$3.50; room, including flat laundry, \$1.25) | | |
| Total payment, September 30..... | \$35.00 | |
| October 28 | | |
| Board and room (4 weeks)..... | 19.00 | |
| November 25 | | |
| Board and room (November 25 to December 20) | 17.65 | |
| Total for first term..... | \$71.65 | |

Second Term

| | | |
|--|----------|--|
| January 6 | | |
| Health fee | \$2.00 | |
| Book rent | 1.00 | |
| Gymnasium fee | 1.00 | |
| Student privilege ticket | 2.00 | |
| Board and room (4 weeks) | 19.00 | |
| Total payment, January 6..... | \$25.00 | |
| February 3 | | |
| Board and room (4 weeks)..... | 19.00 | |
| March 2 | | |
| Board and room (March 2 to March 27)..... | 17.65 | |
| Total for second term..... | 61.65 | |
| Total for school year..... | \$133.30 | |
| Less deposit returned if no deductions for loss and breakage are necessary.. | 5.00 | |
| | \$128.30 | |

‡ Entrance fee for nonresident of Minnesota, per term, \$10.

‡‡ Returned at end of year, less charges for breakage.

NOTE.—In addition there are laboratory fees of 50 cents per term for carpentry, motors, tractor construction, advanced electricity, farm shop, dairying, field machinery, sewing, cooking, chemistry; 75 cents per term for farm accounts; \$1 per term for blacksmithing; \$7 per term for private music lessons; \$3 per term for typewriting. *If any of these subjects is taken that cost must be added to the total for each term.* Most of these subjects are elective, therefore the expense indicated above is a fair estimate of the student's necessary expenses while attending school.

Trunks are delivered at opening and close of school for 25 cents; at other times for 50 cents.

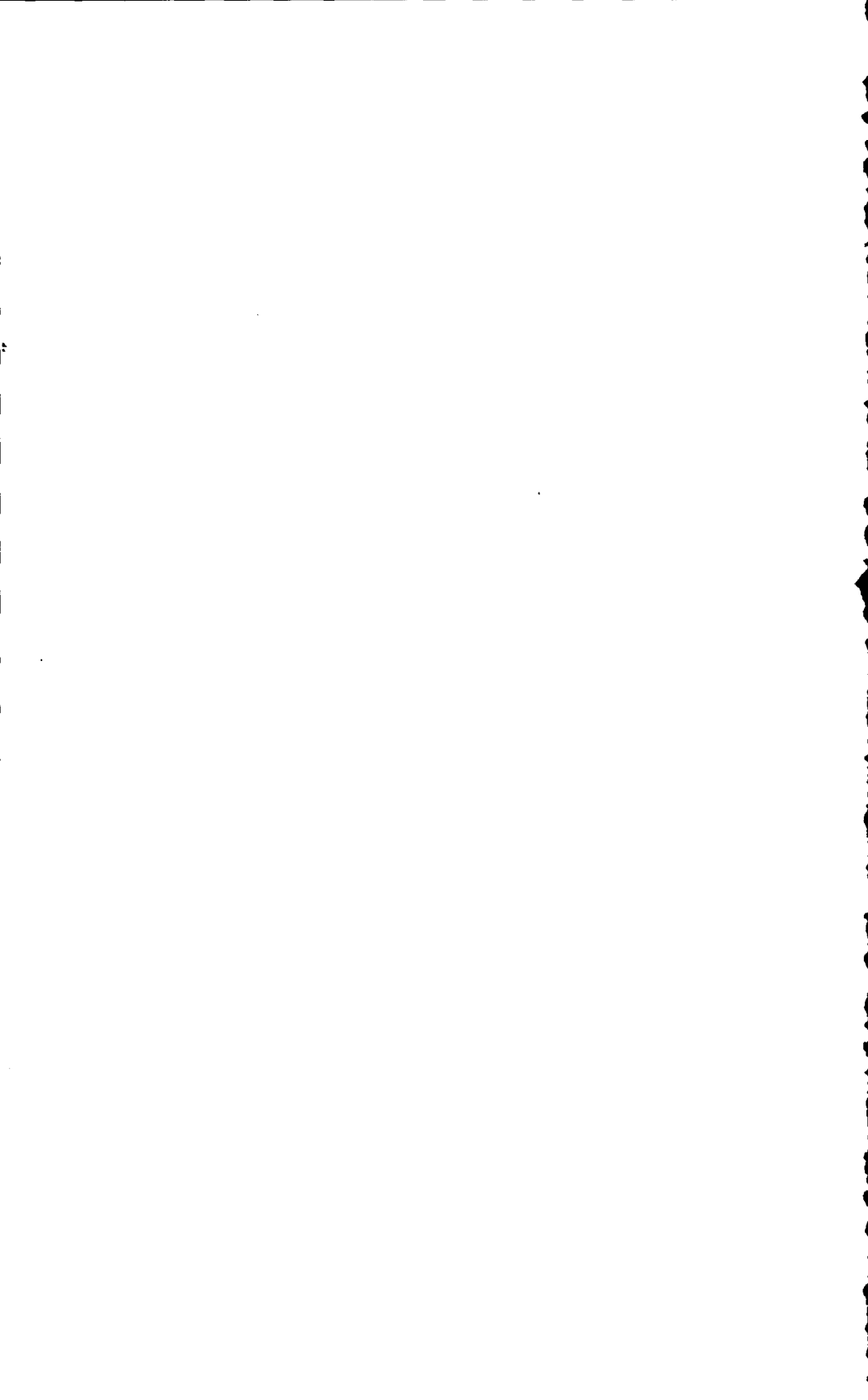
School expenses must be paid at first of each four-week period in advance. Note dates due on above statement. (See page 6 of this bulletin for rules governing school expenses.)

NOTE.—The 1935 Minnesota State Legislature passed a law whereby farm boys and girls twenty-one years of age or under, who have graduated from the eighth grade in organized rural districts which do not give accredited high school instruction may attend any of the schools of agriculture with necessary tuition, laboratory, and equipment fees (except deposits) to be paid from state funds. Deposits are to be paid by the individual student.

A rate of \$6 per month has been established to cover all the tuition, laboratory, and equipment fees (except deposits) of such students and the same privilege is extended to any other students in attendance at such schools electing to pay fees on this basis.

INDEX

| | Page | | Page |
|--|---------|--|---------|
| Admission | 5 | Lecture course | 8 |
| Advanced courses | 4, 16 | Loan funds | 9, 10 |
| Alumni Association loan fund.... | 10 | Location | 4 |
| Assembly | 8 | Ludden trust fund | 9 |
| Attendance summary, 1934-35.... | 31 | Music | 5, 8 |
| Caleb Dorr Scholarship..... | 10 | Northwest School Farmers' and Women's Week | 11 |
| Calendar | 2 | <i>Northwest Monthly</i> | 9 |
| Class of 1917 loan fund..... | 10 | Peterson, O. W., Memorial Schol- arship | 10 |
| College preparatory | 5, 16 | Purposes | 4 |
| Course descriptions | 17-30 | <i>Red River Aggie</i> | 9 |
| Courses of study (advanced).... | 16 | Registration | 4 |
| Courses of study (Boys' 3-yr.)... 12-14 | | Rooms in dormitory | 6 |
| Courses of study (Girls' 3-yr.) .. 14-16 | | Scholarship and loan funds..... | 9, 10 |
| Credit regulations | 14 | School expenses | 6-7, 35 |
| Description of courses | 17-30 | School Farm | 11 |
| Dormitory rooms | 6 | Special courses | 10 |
| Expenses | 6-7, 35 | Staff and Employees School of Agriculture loan fund | 9 |
| Experiment Station | 11 | State aid | 7, 36 |
| Fairfax-Andover Club loan fund | 10 | Station flocks and herds..... | 11 |
| Faculty | 3 | Students enrolled, 1934-35..... | 31-34 |
| Flocks at school station..... | 11 | Summary of attendance | 31 |
| General information | 4-11 | Three years' course..... | 4 |
| Gilfillan trust fund | 9 | Time of opening | 4 |
| Graduation, requirements for.... | 7 | Winter show | 11 |
| Health Service | 7 | Y.M.C.A. | 9 |
| Herds at school station..... | 11 | Y.W.C.A. | 9 |
| Junior Short Course | 10 | | |



UNIVERSITY OF MINNESOTA
NORTHWEST SCHOOL OF AGRICULTURE

Please read the bulletin carefully, noting the paragraphs headed Admission, Time of Opening, Rooms in Dormitories, What to Bring, and Expenses. If you plan to enter the school, fill out the application blank below and mail it to the registrar, Northwest School of Agriculture, Crookston, Minnesota. Send with this application \$2 made payable to the Northwest School for a room reservation in one of the dormitories. This \$2 will be applied on your first month's expenses on entering school. In case your application is received after all space has been assigned, you will be so notified. In case you cannot enter school after making application, you should notify the registrar as soon as possible. If this is done prior to fifteen days before the opening of school, the money will be returned, otherwise it will not. Students are strongly urged to reserve rooms in advance.

Necessary expenses for the year will amount to about \$130. See page 36 regarding state aid.

.....
Mail the following application to the registrar, Northwest School of Agriculture, Crookston, Minnesota:

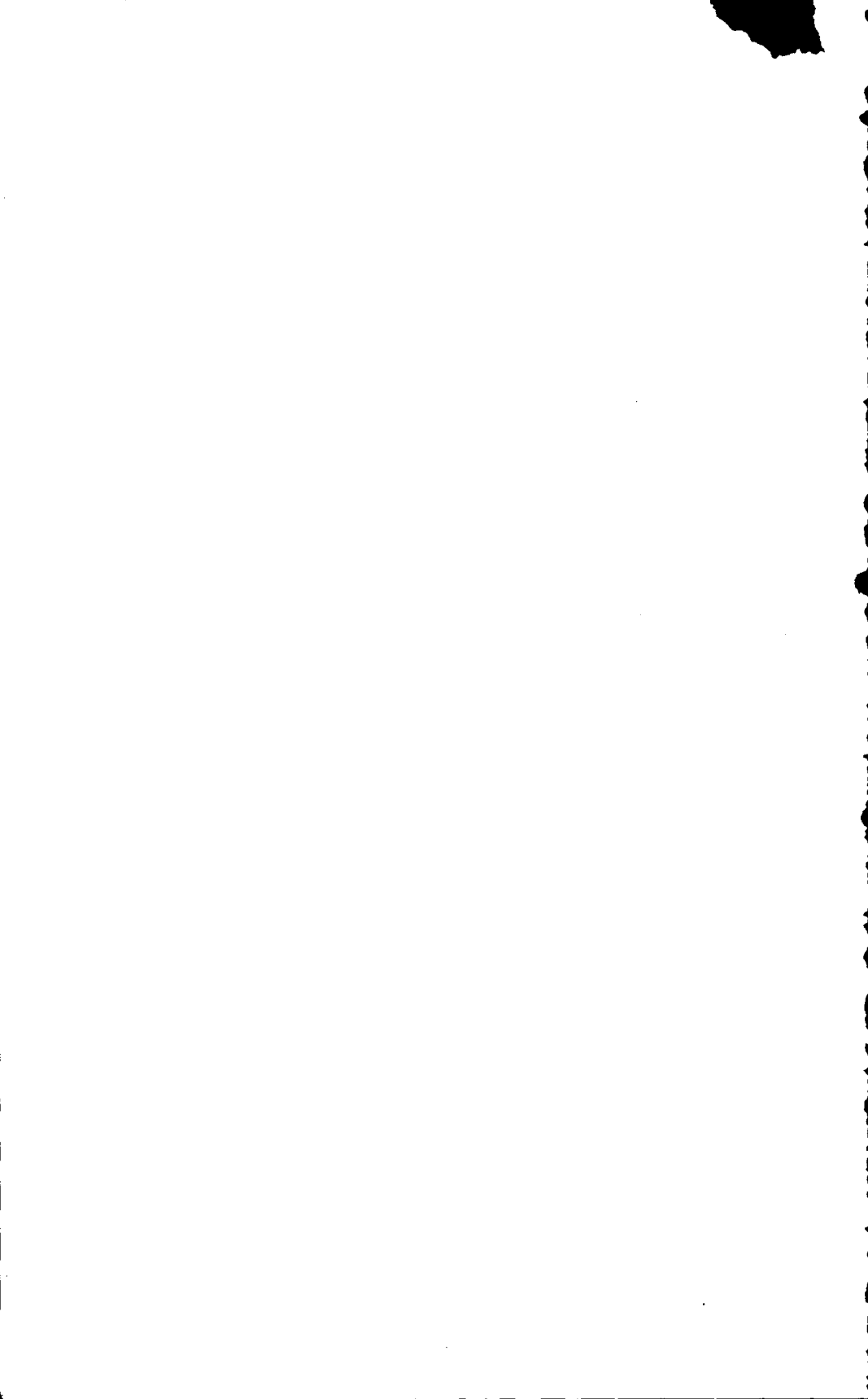
To the Registrar:
Northwest School of Agriculture,
Crookston, Minnesota

I am enclosing \$2 for a room reservation in one of the dormitories.
I wish to room with the following person.....

.....(State preference if any.)

Name

Home address: R.F.D..... Post-office.....



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

The Graduate School
Announcement for the Years
1935-1936



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UNIVERSITY CALENDAR 1935-36

| | | | |
|-----------|----|------------|--|
| 1935 | | | |
| September | 25 | October 12 | Registration of graduate students |
| September | 30 | Monday | Fall quarter classes begin, 8:30 ¹ a.m. |
| October | 10 | Thursday | Examinations in German and French for candidates for advanced degrees |
| November | 7 | Thursday | Last day for filing theses of candidates for the Ph.D. degree for the fall quarter |
| November | 16 | Saturday | Last day for filing subject title of Master's theses for the spring quarter |
| November | 21 | Thursday | Last day for filing theses of candidates for Master's degrees for the fall quarter |
| December | 19 | Thursday | Commencement Convocation |
| December | 21 | Saturday | Fall quarter ends, 6:00 p.m. |
| 1936 | | | |
| January | 6 | Monday | Winter quarter classes begin, 8:30 ¹ a.m. |
| January | 16 | Thursday | Examinations in German and French for candidates for advanced degrees |
| February | 6 | Thursday | Last day for filing theses of candidates for the Ph.D. degree for the winter quarter |
| February | 20 | Thursday | Last day for filing theses of candidates for Master's degrees for the winter quarter |
| March | 19 | Thursday | Commencement Convocation |
| March | 21 | Saturday | Winter quarter ends, 6:00 p.m. |
| March | 30 | Monday | Spring quarter classes begin, 8:30 ¹ a.m. |
| April | 9 | Thursday | Examinations in German and French for candidates for advanced degrees |
| May | 4 | Monday | Last day for filing theses of candidates for the Ph.D. degree in June |
| May | 18 | Monday | Last day for filing theses of candidates for Master's degrees in June |
| June | 12 | Saturday | Spring quarter closes, 6:00 p.m. |
| June | 15 | Monday | Sixty-fourth annual commencement |
| June | 17 | Wednesday | Summer quarter classes begin, 8:00 a.m. |
| July | 2 | Thursday | Last day for filing theses of candidates for advanced degrees for first term of summer quarter |
| July | 23 | Thursday | Commencement Convocation |
| July | 27 | Monday | Second term classes begin, 8:00 a.m. |
| August | 29 | Saturday | Second term closes |

¹ First hour classes begin at 8:15 at University Farm.

THE GRADUATE SCHOOL

ORGANIZATION

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

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

ADMISSION

Any graduate holding a Bachelor's degree or its equivalent from a reputable college or university who has made a satisfactory record in his college course or who has shown special aptitude in some field of study will be admitted to the Graduate School, and may register for such graduate work as he may be found prepared to enter upon.

All inquiries concerning admission to the Graduate School should be addressed to the dean. The student should obtain and fill out an application for admission before presenting himself for registration and accompany this with an official transcript of his college record.

If the applicant's undergraduate preparation is such that he will need additional work before beginning graduate work at the University of Minnesota, he is required to register as a special student in the appropriate undergraduate college of the University and obtain the preliminary training.

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

Advanced standing may be granted for work done in other approved graduate schools. Credits for advanced courses earned while the student is registered in an undergraduate college, even if in excess of the credits required for the baccalaureate degree, cannot be transferred to the Graduate School. In exceptional cases, with permission of the dean of the undergraduate college concerned and of the dean of the Graduate School, undergraduates lacking not more than 6 quarter credits may be permitted to

register also in the Graduate School for partial credit. No transfer of graduate credits will modify the minimum requirements of one academic year in residence as a graduate student in this University for those who are candidates for an advanced degree. This means that no transfers are made in the case of candidates for the Master's degree.

REGISTRATION

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

FEES

| | |
|--|---------|
| Tuition fee for residents (except for clinical medicine) per quarter... | \$20.00 |
| Tuition fee for nonresidents per quarter..... | 30.00 |
| Tuition per credit hour for students carrying less than full work | |
| Residents | 1.75 |
| Nonresidents | 2.50 |
| Tuition fee for graduate study <i>in absentia</i> for the professional engineer degrees (to be paid but once for each degree)..... | 60.00 |
| Incidental fee | 6.00 |
| Matriculation deposit (first quarter in residence)..... | 3.00 |
| Special deposit for Chemistry laboratory | 5.00 |
| Graduation fee | 10.00 |

Registration in the Graduate School includes the making out of the program which must be approved by a departmental adviser and the dean.

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

All the fees above mentioned apply to the regular session. For the summer quarter fees, see special bulletin.

FELLOWSHIPS AND SCHOLARSHIPS

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

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

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

By bequest of the late Caleb Dorr, of Minneapolis, the income from twenty thousand dollars is available for graduate fellowships in the De-

partment of Agriculture of the University of Minnesota. Usually three fellowships of \$500 each will be awarded each year. The holders of these fellowships are exempt from tuition. The basis of the award is scholarship and the prospect and promise of productive research.

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

Candidates for these fellowships should file their applications before March 1 with the dean of the Graduate School. Application blanks may be secured from the dean of the Graduate School or from the dean of the College of Agriculture, Forestry, and Home Economics.

THE 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.

CLARA UELAND FELLOWSHIP

The income from \$11,191.67 is awarded annually to a recent woman graduate of any acceptable college or university for graduate study of problems of government and citizenship. The recipient is exempt from tuition fees.

HONORARY FELLOWSHIPS FOR VISITING SCHOLARS

Professors or other eminent scholars from other institutions, who may desire temporarily the privileges of the library, research facilities, and seminars in the University, and who are not candidates for a degree, may upon recommendation of the dean of the Graduate School and the approval of the president of the University be appointed as honorary fellows without stipend.

Honorary fellows shall not be required to pay any fees except to cover the cost of unusually expensive supplies or equipment.

DEPARTMENTAL SCHOLARSHIPS

Besides the above stipends there are numerous assistantships with varying stipends assigned to various departments, and exemption from tuition in the Graduate School. The amount of graduate work that can be carried is proportioned to the service burden of the assistantships.

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

GRADUATE WORK IN THE SUMMER QUARTER

Work of graduate character done in the summer quarter of the University of Minnesota may be counted for residence credit for advanced degrees. In exceptional cases, the course work for the Master's degree may be completed in four summer terms of six weeks each, or in three full summer quarters. The four successive six-week summer sessions must be taken within six years following the first registration. In the first case,

the candidate may be permitted to carry *in absentia* thesis work to complete the equivalent of three quarters. Students working for the Master's degree in summer terms or quarters must file the subjects of their theses before the completion of the first half of the required work. Theses of summer quarter students must be completed at least four weeks before the end of the session in which they take the degree.

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

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

GRADUATE WORK IN MEDICINE

Graduate work in the laboratory departments and in the clinical branches leading to advanced degrees is offered by the University of Minnesota. This work is under the direction of the Graduate School, and candidates for admission and degrees must meet the requirements of the Graduate School as outlined in the preceding pages. The work is offered by members of the medical faculty in Minneapolis and by members of the graduate faculty on the Mayo Foundation at Rochester, Minnesota, where part or all the residence work may be done. Several teaching fellowships supported by the University and others on the Mayo Foundation are open to qualified students pursuing graduate work in clinical medicine or in the laboratory branches. The basic sciences of medicine which may be pursued as graduate subjects by qualified students who do not hold the M.D. degree are listed in this bulletin. The Graduate School Medical Bulletin should be consulted for graduate work in clinical fields.

GRADUATE WORK BY UNDERGRADUATES

1. No graduate credit allowed for any courses taken without previous arrangement by petition with the Graduate School.

2. No residence credit is possible for courses taken by undergraduates who lack more than 6 quarter credits toward the Bachelor's degree.

3. If not more than 9 quarter credits of undergraduate credit are lacking, petition may be filed to carry a limited amount of graduate work (approved courses above 100) for graduate course credit, such courses not to be applied toward an undergraduate degree.

4. With permission of the dean of the undergraduate college concerned, undergraduates lacking not more than 6 quarter credits may be permitted to register also in the Graduate School. This will be permitted in exceptional cases only.

GRADUATE WORK IN LAW

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

A course leading to the degree of master of laws may be taken under the direction of the Graduate School of the University. Candidates must have completed two years of college work, and the work required for the first law degree in a school which is a member of the Association of American Law Schools. No specific course of study is required, but the course elected must be approved by an adviser. Subjects in the curriculum of the Law School not counted towards the first degree may be elected and additional work in subjects already studied. The candidate may also elect studies in the social sciences in the College of Science, Literature, and the Arts, and in the School of Business Administration. The candidate must complete eight year hours of classroom work and prepare a thesis that will be accepted for publication in the *Minnesota Law Review*. The course may be shaped to secure a more extensive survey of the law and related subjects, or to give a more thoro training in some special branch.

GRADUATE SOCIAL WORK

Education for social work in its various branches is offered in a course of study which includes four years of undergraduate work and one or two years of graduate work leading to a certificate of social work and a Master's degree. Particular attention is given to certain specialized fields of social work: social work with families; work for the protection, guidance, and placement of children; medical social work; work with groups; visiting teacher work; rural social work; psychiatric social work; public welfare administration.

Social work is of graduate professional character. Students who prepare for graduate social work by finishing the preprofessional social work sequence of this University, or its equivalent elsewhere, may expect to complete the graduate requirements for a certificate of social work in five quarters and for the degree of master of arts in a minimum of six quarters. Without such a satisfactory equivalent of undergraduate study directed toward social work the graduate study will require a longer time.

Minimum professional requirements, graduate and undergraduate combined, are as follows: 30 quarter credits in background social and biological sciences; 36 quarter credits in technical social work courses; 15 quarter credits (450 clock hours) of supervised field work in connection with technical social courses. Technical social work courses in class and field work may not be taken earlier than the senior year.

The graduate major in social work leading to a graduate certificate in professional social work: (a) Technical social work graduate courses sufficient to complete a total of 36 credits of technical class courses and 15 credits of field work; (b) A minor or minors consisting of a minimum of 9 graduate hours based on the printed requirements in undergraduate hours in the social science departments: economics, political science, psychology, history, and/or preventive medicine or home economics, which shall together satisfy the requirements of the Graduate School.

A Master's degree in social work and a certificate. Students will meet

all of the requirements above and write a thesis on a social work subject acceptable to the Graduate School.

The program of study, both graduate and undergraduate, must be approved by a major adviser in social work. The major advisers are glad to consult with students interested in social work as early in their college course as possible.

MASTER OF SCIENCE IN PSYCHOMETRICS

The degree of master of science in psychometrics is awarded to candidates who complete a special curriculum in the technique of psychological examining. This curriculum, while conforming to the general requirements for the Master's degree, provides for the distribution of work, with certain options, among courses in the Departments of Psychology, Educational Psychology, Sociology, and Child Welfare. One or more advisers will be designated in each of these departments to direct the work of candidates for this degree. These advisers should be consulted with reference to the details of the curriculum and the opportunities it offers to the student who proposes to become a psychological examiner in schools, personnel work, courts, welfare work, etc.

REQUIREMENTS FOR THE MASTER'S DEGREE

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

The requirements for the degree of master of arts or master of science are covered in general by the statement that these degrees may be earned by properly qualified students only by at least one full academic year's work (three quarters) in residence at this University. Students who have not had adequate preparation in the specific chosen field of work, or who are doing outside work in excess of ten hours a week, will require more than one year to attain the Master's degree. Students registering for the first time after the 1930 summer quarter, will be required to complete the Master's degree within six consecutive years.

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 9 credit hours each quarter. In addition, thesis work (or courses upon which the thesis is based) should be carried to make a total of not less than 15 hours per week for three quarters. In general,

9 quarter credits in the minor and 18 quarter credits in the major, in addition to the thesis (or courses upon which the thesis is based), is regarded as the minimum program for the Master's degree.

In all courses open to graduates only, the student must secure a mark of "Pass." This will be interpreted as the instructor's approval upon the quality of the student's work viewed from the level upon which real graduate work is supposed to be carried on. In the courses open to both graduates and undergraduates the system of marking by letters may be continued for the present. A grade of not less than B must be obtained in any course of this character offered as fulfilling the requirements in the major. A grade of not less than C must be obtained in minor courses.

THE MAJOR WORK

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 WORK

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

The choice of the minor must be in a department whose work can be logically related to that of the department in which the student is doing his major work. The dean and the group committee may in exceptional cases allow the minor subject to be taken in the same department as that of the major.

LANGUAGE REQUIREMENTS

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.

All examinations to meet the language requirement of the Graduate

School, unless otherwise arranged with the language departments, shall be held on the second Thursday of each quarter.

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

MASTER'S THESIS

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

The thesis is required to be in quadruplicate in order to facilitate its consideration. Two copies are retained for the University Library (as noted below), the third copy being finally returned to the candidate. The fourth copy is necessary in cases where the department or adviser desires to retain a copy. Since one copy is usually desired by the adviser or department concerned, a fourth copy should be provided for this purpose. One copy must be upon the specially required red-ruled twenty-pound linen stock of 60 or 70 per cent rag content and the others may be carbon copies on bond paper. The original and first copy must contain all illustrative material. Ample margin should be left for binding purposes. Samples in the dean's office of both the linen stock and carbon paper should be examined before the thesis is typewritten. The body of the thesis should be double spaced, but footnotes may be single spaced.

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

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

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

EXAMINATIONS

All candidates for the M.A. degree will meet the regular requirements as to examinations, topics, reports, etc., of the classes in which they are registered. A special examination in the field of the minor is not required, but this does not excuse the candidate from the regular course examinations.

Besides the usual course examinations, where such are given, the candidate for the Master's degree must pass a final written examination in the major and after acceptance of the thesis, a final oral examination.

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

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

TABULAR SUMMARY OF REQUIREMENTS FOR
THE MASTER'S DEGREE

| WORK | UNDER THE DIRECTION OF | DATE |
|--|---|--|
| Program, major and minor | Adviser and dean of the Graduate School | On entrance |
| Approval of thesis subject | Adviser and group committee | Middle of first quarter in residence |
| Language requirement | Adviser and language department | Before close of second quarter |
| Approval of candidacy | Executive committee | Beginning of third quarter |
| Filing of thesis | Dean of the Graduate School | At least four 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 two weeks before commencement and before final oral examination |
| Final oral examination on all work | Thesis committee; all candidate's instructors; head of major department | Not later than two weeks before commencement |
| (Course examinations as required at the usual times) | | |
| Fee for binding thesis | Registrar | One week before commencement |

Candidates who are eligible for the "preliminary examination" for the Doctor's degree may substitute this examination for the final oral examination for the Master's degree, provided that all other requirements for the preliminary examination (see p. 17) have been met.

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

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

ATTENDANCE AT COMMENCEMENT

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

MASTER OF SCIENCE IN ENGINEERING OR ARCHITECTURE

The requirements and procedure for the degree of master of science in aeronautical, agricultural, architectural, chemical, civil, electrical, mechanical, mining, or petroleum 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 four weeks before graduation. The language requirement will be waived in all of these cases except chemical engineering, in which German is required.

REQUIREMENTS FOR THE ENGINEER DEGREES

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

- a. Bachelor's degree, from an approved school in the corresponding branch of engineering.
- b. One full academic year of graduate engineering study (three quarters) in residence at this University. Graduates of this University may be permitted to carry on this study *in absentia* under the direction of the faculty. Work done *in absentia* may not be substituted for the residence work required for the master of science.
- c. Four years in engineering experience in positions of responsibility, subsequent to receiving the Bachelor's degree. (If the graduate study is done *in absentia*, five years of experience are required.)
- d. A thesis of professional grade.

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

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

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

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

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 degrees 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.

PROGRAM 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 will lie. With the approval of his adviser and the dean, he will also select a minor, and will outline a study program for the year.

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

If the graduate study during the year of residence or *in absentia* is towards the Engineer's degree only, it will be divided into major and minor work, of which the major will usually constitute about two thirds and the minor one third of the total of 12 to 15 credit hours which will be carried each quarter.

STUDY IN ABSENTIA

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

The proposed plan of study should be arranged with the approval of the adviser. A flat fee of \$60 must be paid in advance. The study may, and generally will, extend over more than nine months. There is also the usual graduation fee of \$10. At least 1,500 actual hours of work should be performed as the equivalent of a year's study in residence.

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

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

FEES

A fee of \$60 is required for the year of graduate study towards the professional Engineer degrees if taken *in absentia*. This is in addition to the regular graduation fee of \$10 paid at the time of qualifying for the degree.

STUDY IN RESIDENCE

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

ENGINEER'S THESIS

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

STATEMENT OF EXPERIENCE

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

TABULAR SUMMARY OF REQUIREMENTS FOR THE ENGINEER'S DEGREE

| WORK | UNDER THE DIRECTION OF | DATE |
|---|---|--|
| Program, major and minor | Adviser and dean of the Graduate School | On registration |
| Quarterly reports if <i>in absentia</i> | Adviser | |
| Written examination | Adviser and major and minor staff | At end of year's study or later, as arranged |
| Thesis subject | Adviser and group committee | Six months before graduation |
| Experience statement | Adviser and major staff | Four weeks before graduation |
| Filing thesis | Dean of Graduate School | Four 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.

REQUIREMENTS FOR THE DOCTOR'S DEGREE

In the Graduate School, one Doctor's degree, doctor of philosophy (Ph.D.), is conferred by the University of Minnesota. This degree is granted, not on the basis of successful completion of a definite amount of prescribed work but chiefly in recognition of the candidate's high attainments and ability in his special field, to be shown, first, by the preparation

of a thesis, and second, by successfully passing the required examinations covering both the general and the special fields of the candidate's subjects as detailed later.

Candidates for the Doctor's degree must devote at least three years* of graduate study in 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 STUDY

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 secure from the Graduate School office the Three-Year Program Blank and submit to his adviser and the group committee for approval a tentative outline of his work for the second and third years, including both the major and minor subjects. This program is then to be submitted to the dean for final approval. During the second quarter of the second year he shall file with his adviser's approval the subject of his Doctor's dissertation.

LANGUAGE REQUIREMENTS

Before admission to the preliminary examination, the student must present to the dean of the Graduate School statements from the French and German departments, certifying that the applicant has a reading knowledge of those languages.‡ In addition, a knowledge of other languages may be required in certain cases, as the candidate's major department may prescribe. The student's adviser or his representative at his option shall attend the language examinations and provide literature in the major field from which the test passages are selected. For the dates of these language examinations consult the calendar at the beginning of this bulletin.

THE MAJOR WORK

The major work must be in a department in which the candidate has had, in his undergraduate study, at least the equivalent of three years of work (18 semester or 27 quarter credits) if it be a department open to freshmen, or two years of work (12 semesters 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.

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

‡ The substitution of other foreign languages of greater service in the major field may be permitted by the executive committee on recommendation of the group committee.

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

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

In the case of a student who comes 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.

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.

DOCTOR'S THESIS

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

Not later than six weeks before the commencement at which he expects to take the degree, the student shall deposit at the dean's office his thesis, typewritten, in quadruplicate copy to facilitate reading by the thesis committee. After the final oral examination has been passed, the candidate should file in the office of the Graduate School one bound carbon copy of the thesis.

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

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

REQUIRED SUMMARY FOR PRINTING

Each candidate for the Doctor's degree shall submit with his completed thesis a summary of about ten pages, acceptable to his adviser, embodying the principal findings of the research, and pay to the Graduate School a sum of money not exceeding \$2.50 per printed page, before the candidate be finally recommended for the degree. Such summaries will be published in appropriate volumes.

EXAMINATIONS

Preliminary.—After the language examinations (see p. 15) 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. This committee must not be fewer than six, of whom five shall constitute a quorum. 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 the graduate work taken by the student, and *may include any work fundamental thereto*, except the thesis and the field of definite specialization. This examination shall be in addition to the usual course examinations. It may be written or oral, or both, at the discretion of the committee. Only after the successful completion of this examination may the student be enrolled as a candidate for the Doctor's degree. Students failing to pass this preliminary examination may be excluded from the candidacy for the degree and in any case shall not be re-examined until at least one quarter has passed.

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

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

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

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

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

ATTENDANCE AT COMMENCEMENT

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 . | } Before admission to preliminary examination |
| Minor | Adviser and minor department | |
| Language | Adviser and language department | |
| Recommendation | By major department | |
| Preliminary examination .. | Special committee | Seven months before degree is to be conferred |
| THIRD YEAR | | |
| Major, including thesis ... | Advisers, group committee, and dean of Graduate School | } Six weeks before taking the degree |
| Filing of thesis | Dean | |
| Examination of thesis | Thesis committee | Before admission to final oral examination |
| Final written examination | Major department members of the graduate faculty | Four weeks before taking degree and before final oral examination |
| Final oral examination ... | Special committee | Not later than two weeks before taking the degree |
| Bond for publication of thesis | Registrar | Not later than one week before taking the degree |

DESCRIPTION OF COURSES

EXPLANATIONS

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

AERONAUTICAL ENGINEERING

Professor John D. Akerman; Associate Professors Burton J. Robertson, Joseph A. Wise; Assistant Professor Charles Boehnlein.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 100f-101w-102s. Aerodynamics. Atmospheric properties. Fluid mechanics. Stream functions and velocity potential. Motion of body in liquids in three dimensions. Prandtl's wing theory. Dynamic loads, stability, maneuverability, controllability. Prerequisites: Course 3 and M.&M. 25. 3 credits. Mr. Boehnlein.
- 115f. Airplane Stresses. Deflection of structures. Theory of statically indeterminate structures. Analysis of fuselage trusses, landing gear, wing beams. Structural details and connections. Prerequisite: Course 83. 3 credits. Mr. Wise.
- 116w. Advanced Airplane Stresses. Theory and design of monocoque fuselages. Multispar and unit construction wings. Vibrations. Wing and control-surface flutter. Analysis and design of seaplane hulls and floats. Prerequisite: Course 115. 3 credits. Mr. Wise.
- 120f-121w-122s. Airplane Design. Stress analysis of wings, fuselages, chassis, control surfaces, etc. Specifications. Performance and design calculations. Propellers. Prerequisites: Courses 83, 102, M.&M. 128. 120f, 2 credits; 121w, 4 credits; 122s, 3 credits. Mr. Akerman, Mr. Barlow.
- 123f,w,s-124f,w,s-125f,w,s. Advanced Airplane Design. Problems in airplane design or development. Prerequisite: Course 121. 2 to 5 credits per quarter. Mr. Akerman.
- 126f,w,s-127f,w,s-128f,w,s. Advanced Problems in Airscrew Design. Graphical and analytical methods of investigation. Prerequisite: Course 122. 2 to 5 credits per quarter. Mr. Akerman.
- 140f. Aeronautical Laboratory. Study of airplane parts and their construction. Fittings. Rigging. Inspections and accessories. Prerequisite: Course 102. 2 credits. Mr. Akerman, Mr. Barlow.
- 141w. Aerodynamics Laboratory. Measurement of air flow. Calibration of Pitot tubes and anemometers. Distribution of air pressure on surfaces. Wind tunnel tests of wing, propeller, and airplane models. Prerequisite: Course 102. 2 credits. Mr. Barlow, Mr. Boehnlein.
- 160s. Airships. Theory and design. Rigid and non-rigid types. Stresses. Performance. Prerequisites: Courses 83, 102, M.&M. 128. 3 credits. Mr. Akerman.

- 170s. Air Transport. Economics. Airports and airways and their equipment. Air commerce rules and regulations. Communication. 2 credits. Mr. Salisbury.
- 190f-191w-192s. Seminar. Readings, reports, conferences, and discussions. Prerequisite: Course 102. 1 credit. Mr. Akerman.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 201f-202w-203s. Advanced Theoretical Aerodynamics. Prerequisite: Course 102 or special permission. 3 credits per quarter. Mr. Boehnlein.
- 260s. Advanced Airship Stresses. Coplanar and space rigid frameworks. Secondary stresses. Buckling and elastic instability. Framework of dirigibles, gondolas, and cabins. Prerequisite: Course 115. 3 credits. Mr. Wise.
- 272f-273w-274s. Research in Aeronautical Engineering. 2 credits per quarter. Mr. Akerman, Mr. Robertson, Mr. Boehnlein.

AGRICULTURAL BIOCHEMISTRY

Professors Ross Aiken Gortner, Clyde H. Bailey, Leroy S. Palmer; Associate Professor Cornelia Kennedy; Assistant Professors Henry B. Bull, W. Martin Sandstrom.

Prerequisites.—For major work, credit in general chemistry and qualitative analysis, in organic chemistry, in quantitative analysis, and at least 10 quarter credits in biological science. The instructor with whom the student wishes to work may require additional prerequisites.

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

All students majoring in this division must include Course 224 in their study programs. With the approval of the adviser, courses in bacteriology, botany, dairy husbandry, genetics, plant pathology, physiology, physiological chemistry, zoology, etc., and courses in the School of Chemistry may be accepted as major work.

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. 3 credits each quarter. Mr. Bull.
- 103s. Dairy Chemistry. Lectures and laboratory work on the physical, colloidal, and chemical properties of milk and dairy products, and of the processes involved in the manufacture of dairy products. Prerequisite:

- Course 106 or equivalent. Lect. 3 credits, lect. and lab. 5 credits. Mr. Palmer.
- 105s. Plant Biochemistry. An introduction to the chemistry, metabolism, and nutrition of plants based on the organic and inorganic compounds which are characteristic of plants and plant products, and their reactions and interactions. Prerequisite: organic chemistry. 3 credits. Mr. Gortner, Mr. Bailey.
- 106f. Animal Biochemistry. An introduction to the chemistry, metabolism, and nutrition of animals based on the organic and inorganic compounds which are characteristic of animals and animal products and their reactions and interactions. Prerequisite: organic chemistry. 3 credits. 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. 3 credits. Mr. Bailey.
- 110s. Flour Laboratory Methods. A laboratory course. Analysis of wheat and its products. Designed to train students for research in the cereal industry. Prerequisite: Course 101-102 or food analysis. 3, 4, or 5 credits depending on the amount of work completed. Mr. Bailey.
- 111-112 (summers only). Biochemistry. An advanced course dealing with the colloidal state, and the chemistry of proteins, carbohydrates, glucosides, tannins, fats, plant acids, enzymes and pigments, and their physico-chemical relations to vital processes. Prerequisites: organic chemistry, biology, 1 year. 3 credits each term. Mr. Sandstrom.
- 113f,su-114w,su-115s. Biochemical Laboratory Methods. A laboratory course paralleling the lectures in 111-112, or 119 to 123. Prerequisite: quantitative analysis, parallel 111-112. 2 credits each quarter. Mr. Sandstrom.
- 116w. Advanced Animal Nutrition. Recent developments in animal nutrition, covering the field of proteins, mineral metabolism, and vitamins. Prerequisite: Course 106 or 120 or physiologic chemistry. 3 credits. Mr. Palmer, Miss Kennedy.
- 117s. Laboratory in Animal Nutrition. A laboratory course on methods used in nutrition studies. (Because of limited laboratory facilities permission must be obtained from the instructor before registration.) Prerequisite: Course 116. 3 credits. 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: Course 113-114 or 103 or 110. 3 or 5 credits. Mr. Gortner, Mr. Bailey, Mr. Palmer, Miss Kennedy, Mr. Bull, Mr. Sandstrom.
- 119f. Colloids. Lectures and assigned readings dealing with the colloidal state of matter, the preparation and properties of colloidal systems, and the relation of these to biochemical processes. Prerequisites: Org. Chem. 53 and one year of either zoology or botany. 3 credits. Mr. Gortner.

- 120w. Proteins. Lectures and assigned readings on composition, structure, chemical and physical properties, and the functions of proteins and amino acids. Prerequisite: Course 119. 3 credits. Mr. Gortner.
- 121w. Carbohydrates. Lectures and assigned readings on the composition, structure, chemical and physical properties, and the functions of the carbohydrates. Prerequisite: Course 119. 3 credits. Mr. Bailey.
- 122s. Fats and Lipids. Lectures and assigned readings on the composition, structure, chemical and physical properties, and the functions of the fats and fat-like compounds. Prerequisite: Course 119. 3 credits. Mr. Bull.
- 123s. Enzymes. Lectures and assigned readings on enzyme action, including the methods of preparation and investigation of enzymes and their function in biological and industrial processes. Prerequisite: Course 119. 3 credits. Mr. Sandstrom.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 203f,w,s,su. Research Problems. Special work on particular research problems other than the student's major thesis. Facilities are provided for biochemical investigations and for advanced studies in plant or animal nutrition. 2 to 5 credits. Mr. Gortner, Mr. Bailey, Mr. Palmer, Miss Kennedy, Mr. Bull, Mr. Sandstrom.
- 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. Prerequisites: Courses 119, 120, 121, 122, or 123. 3 credits. Mr. Gortner, Mr. Bailey.
- 212f,w,s. Special Topics in Nutritional Chemistry. A special library course with written reports on assigned readings in protein, mineral, and vitamin nutrition, primarily to train the student as a critic in this field. Prerequisites: Course 116 and reading knowledge of German. 3 credits. Mr. Palmer.
- 213f,w. Seminar in Dairy Chemistry. Permission of instructor. 1 credit. Mr. Palmer.
- 216f,w. Seminar in Nutrition. Permission of instructor. 1 credit. Mr. Palmer, Miss Kennedy.
- 219f,w. Seminar in Colloid Chemistry. Prerequisites: Course 111-112 or 119 and permission of instructor. 1 credit. Mr. Gortner, Mr. Bull.
- 220f,w. Seminar in Protein Chemistry. Prerequisites: Course 111-112 or 120 and permission of instructor. 1 credit. Mr. Gortner, Mr. Sandstrom.
- 221f,w. Seminar in Carbohydrate Chemistry. Prerequisites: Course 111-112 or 121 and permission of instructor. 1 credit. Mr. Bailey.
- 222f,w. Seminar in the Chemistry of the Lipids. Permission of instructor. 1 credit. Mr. Bull.
- 223f,w. Seminar in Enzymes. Prerequisites: Course 111-112 or 123 and permission of instructor. 1 credit. Mr. Sandstrom.
- 224s. General Seminar. Reports of research work of the division. Required

of all students majoring in the department. 1 credit. Mr. Gortner, Mr. Bailey, Mr. Palmer.

See also History of Science, page 95.

AGRICULTURAL ENGINEERING

Professor Harry B. Roe; Associate Professor Arthur J. Schwantes; Assistant Professor Hall B. White.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 101f-102w-103s. Advanced Drainage Problems. Special drainage problems including surface run-off, soil permeability, relation of soil and crop type to drainage, shape and regulation of water table in relation to root growth, etc. Prerequisite: Course 68. 3 to 6 credits per quarter. Mr. Roe, Mr. Neal.
- 111f-112w-113s. Farm Building Problems. Investigations in building materials, methods of construction, cost and efficiency of farm buildings. Prerequisite: Course 67. 3 to 6 credits per quarter. Mr. White, Mr. Neubauer.
- 121f-122w-123s. Farm Power and Machinery Problems. Special studies of farm machinery and mechanical power for the farm, including tests, design, and adaptability to various farm conditions. Prerequisite: Course 126. 3 to 6 credits per quarter. Mr. Schwantes, Mr. Romness.
- 126w. Selection and Management of Agricultural Machinery. Special problems in economical power and machine combinations and their application to the farm. Prerequisites: Courses 14 and 71 and Agr. Econ. 103. 3 credits. Mr. Schwantes.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 201f-202w-203s. Reclamation Research. Studies of design and functioning of reclamation works with especial reference to soil types and soil water conditions. Prerequisites: Course 101 and one quarter's work in mathematical theory of statistics. 3 to 6 credits per quarter. Mr. Roe.
- 211f-212w-213s. Farm Structures Research. Studies in farm structures as related to other factors in the farm business. Prerequisite: Course 111. 3 to 6 credits per quarter. Mr. White.
- 221f-222w-223s. Farm Power and Machinery Research. Studies involving the design or utilization of power and machinery used in connection with farm operations. Prerequisite: Course 121. 3 to 6 credits per quarter. Mr. Schwantes.

AGRONOMY AND PLANT GENETICS

Professor Herbert K. Hayes; Associate Professors Albert C. Arny, Harold K. Wilson.

Prerequisites.—In agronomy, sufficient work in plant science to satisfy the adviser that advanced work may be pursued profitably. Further courses may be required without credit if in the opinion of the adviser this is necessary. With the approval of the adviser, courses in agricultural biochem-

istry, botany, pathology, plant genetics, plant physiology, and soils may be accepted as part of the major work.

In plant genetics, for major or minor work, sufficient credits in plant sciences must be presented to satisfy the adviser. With the approval of the adviser, courses in agricultural biochemistry, agronomy, botany, horticulture, plant physiology, and plant pathology may be accepted as major work. Students majoring in plant genetics are required to continue study during at least one summer. Exemption is made if similar training has been obtained at some other institution.

COURSES IN AGRONOMY

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 121w. Grain Crops. Structure, function, culture, improvement, and uses of corn, wheat, oats, barley, rye, flax, and buckwheat. Prerequisite: 9 credits in botany. 3 credits. Mr. Wilson.
- 122s. Grain and Hay Grading. History and methods of grain grading. Problems involved and applications of work. Judging crops on basis of quality for seed. Prerequisite: Agron. 121, or equiv. 3 credits. Mr. Wilson.
- 123f. Forage Crops. A study of the structure, function, culture, improvement, and uses of forage crops including meadow and pasture management. Prerequisite: 9 credits in botany. 3 credits. Mr. Army.
- 124s. Problems in Farm Crops. Correlation of theory and practice of crop production and management by the problem method. Prerequisites: Agron. 1, 131, and at least two courses from groups 121, 123, 132, 134. 3 credits. Mr. Wilson.
- 126f. Advanced Crop Judging. Advanced work in the commercial grading and judging of grain and forage crops. Prerequisite: Agron. 122. 3 credits. Mr. Wilson.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 201f,w,s. Research in Farm Crops. Special problems in crop physiology, production, and classification of crop plants. Prerequisites: Agron. 121, 123. 3 to 9 credits. Mr. Army, Mr. Wilson.
- 202f,w,s. Farm Crops Seminar. Reviews and discussions of research articles and thesis problems. Prerequisite: 9 credits in farm crops. 1½ credits per quarter. Mr. Army.
- 203s. Crop Research Results and Methods. Studies of the results of investigations with crop plants and applications to agronomic problems. Practice in formulating research plans and in carrying out laboratory technique. Prerequisites: Agron. 121, 123. 3 credits. Mr. Army, Mr. Wilson.
- 204s. History and Classification of Crop Plants. Assignments, discussions, and laboratory work dealing with (a) the botany of crop plants and their evolution; (b) use of plant characters in the identification and systematic classification of species and varieties. Prerequisites: Bot. 113 or 114 or 115; Agron. 121 and 123. 3 credits. Mr. Wilson.

COURSES IN PLANT GENETICS

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 131f,w. Principles of Genetics. Fundamental principles of breeding, heredity, variation, biometry, and evolution. Prerequisite: 9 credits in botany or zoology. 3 credits.
- 132w. Farm Crops Plant Breeding. Applied genetics. Methods of breeding each of the important agricultural crops. Prerequisite: Course 131 or its equiv. 3 credits.
- 134w. Laboratory Problems in Genetics. Methods of taking and arranging genetics data. Special inheritance problems with *Drosophila*. Construction of chromosome map. May parallel Course 131. Mr. Doxtator.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 241f,w,s. Research in Plant Genetics. Special problems in plant genetics, inheritance of plant characters, and cytological studies in relation to plant genetics. May be taken as major or minor work. Mr. Hayes.
- 242f,s. Plant Breeding Seminar. Plant genetics in relation to plant breeding, a discussion of research problems. 1 credit per quarter. Mr. Hayes.
- 243f. Methods in Plant Breeding. The application of biometrical methods to field plot technique, the results of inbreeding and outbreeding, and the results of selection and crossing as a means of improving crop plants. Practice in outlining the correct mode of attack for special plant breeding problems. 3 credits. Mr. Hayes.
- 244su,f. Laboratory Methods in Plant Breeding. Supplementing 243f. Practice in plant breeding technique, methods of controlling pollination, and handling of plant cultures. 3 credits.
- 245w. Advanced Genetics. The establishment of a genetic factor hypothesis, linkage, gene mutations, chromosomal aberrations, and the goodness of fit of Mendelian ratios will be emphasized. 3 credits. Mr. Hayes.
- 246w. Genetics Seminar. Important contributions to genetic theory and practice. 2 credits. Mr. Hayes.
- 247s. Cytogenetics. A laboratory course in technique with special reference to the study of chromosome behavior. Supplementary lectures on recent advances in cytogenetics. Prerequisite: Bot. 118. 3 credits.
- 248s. Applied Statistics. The application of statistical methods to the analysis of biological data, particularly with small samples. "Analysis of Variance," X^2 test, correlation, and regression will be emphasized. Prerequisite: Bot. 101. 3 credits. Mr. Immer.

ANATOMY

A. Courses Offered at the Medical School

Professors Clarence M. Jackson, Edward A. Boyden, Hal Downey, Andrew T. Rasmussen, Richard E. Scammon; Assistant Professors Edith Boyd, Shirley P. Miller.

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, 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. Prerequisite: Anatomy 6-7, or equivalent. 9 credits. Dr. Rasmussen.
- 107s. Human Embryology. The development of the human body. Prerequisite: Anatomy 6-7, or equivalent. 6 credits. Dr. Boyden.
- 111s,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 Zoology 148-149-150. 6 credits. Dr. Rasmussen.
- 115f,w. History of Anatomy. Prerequisite: Anatomy 6-7. 2 credits each quarter. Dr. Miller.
- 129f-130w. Topographic Anatomy. Based upon a study of cross sections of the human body. Lectures and laboratory work. Prerequisite: Anatomy 6-7. 2 credits (or more) each quarter. Dr. Jackson.
- 134f,w. Anatomy of the Newborn. A detailed laboratory study of the anatomy of the newborn. Fourth, fifth, or sixth year medical, or graduate students. Prerequisite: Anatomy 6-7, or equivalent. 3 credits each quarter. Dr. Boyden.
- 149w. Experimental Neurology. A study of the morphology of the central nervous system by experimental methods. Prerequisite: Anatomy 111. 3 credits (or more). Dr. Rasmussen.
- 150f,w. Seminar in Neurology. Largely conferences upon assigned reading. Prerequisite: Anatomy 111. Hours and credits arranged. Dr. 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 graduate students. Dr. Jackson, Dr. Boyden, Dr. Downey, Dr. Rasmussen, Dr. Miller.
- 157s. Developmental Anatomy of the Head. Prerequisite: Anatomy 107. 3 credits. Dr. Boyden.

- 158s. Special Histology and Neurology of the Head Region. Prerequisites: Anatomy 103 and 111. 3 credits. Dr. Rasmussen.
- 160w. Physical Growth. Lectures on the prenatal and postnatal growth of the external dimensions and organs of the human body. Same as Course 260 in Child Welfare. 2 credits. Dr. Boyd.
- 161f-162w-163s. Statistical Work. Instruction given in methods of analyzing quantitatively the data collected by the student. Same as Course 261f-262w-263s in Child Welfare. Hours and credits arranged. Dr. Boyd.
- 165f-166w. Hematology. Normal and pathologic morphology of the blood and blood-forming organs, with special emphasis on the study of the blood from the standpoint of diagnosis and prognosis. 3 credits each quarter. Dr. Downey.

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, Dr. Boyden, Dr. Downey, Dr. Rasmussen, Dr. Scammon.
- 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. 1 credit. Dr. Jackson.

See also History of Science, page 95.

ANIMAL HUSBANDRY

Professors Walter H. Peters, Evan F. Ferrin, Laurence M. Winters; Assistant Professor Alfred L. Harvey.

Prerequisite.—For major work 18 quarter credits in animal husbandry or closely allied subjects.

Major and minor.—Upon approval of the graduate faculty, candidates doing their major work for the Master's degree in animal husbandry may take their minor in animal genetics or in meats. Candidates doing their major work for the Doctor's degree may major in general animal husbandry or in animal genetics but must take a minor in some other department. With the approval of the adviser, courses in agricultural biochemistry, genetics, botany, economics, dairy husbandry, veterinary medicine, and zoology may be accepted as major work.

Language requirement.—Students majoring in animal husbandry may be exempted from the language requirement for the Master's degree.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 101f. Advanced Stock Judging. Competitive judging of market and breed types of beef cattle, hogs, sheep, and draft horses, supplemented by visits to near-by stock farms. 3 credits. Mr. Harvey.

- 106w. Advanced Meats. Advanced work in meat cutting and a study of factors influencing carcass value. 3 credits. 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. 3 credits. Mr. Anderson.
- 112w. Animal Breeding. The application of the principles of the physiology of reproduction and genetics to the breeding of livestock; methods of the master-breeders' and consideration of the practical breeders' problems. Three credits. Mr. Winters.
- 113s. Livestock Management. Fitting the different types of livestock production into farm management systems. Management problems involved in beef cattle, sheep, swine, and horse production. 3 credits. Mr. Peters.
- 115f. The Marketing of Livestock. A study of the methods used in the principal livestock markets; visits to the South St. Paul market; selling purebred livestock. 3 credits. Mr. Peters.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 201f. Physiology of Reproduction. Assigned readings and discussions of the more recent literature concerning the physiology of reproduction in mammals and birds. 3 credits. Mr. Winters.
- 202w. Animal Genetics. Assigned readings and lectures dealing with the genetics of farm and laboratory animals. 3 credits. Mr. Clark.
- 203w. Animal Genetics. A survey of the genetics of domestic birds. 3 credits. Mr. Clark.
- 204s. Embryology of Farm Animals. Textbooks, lectures, and laboratory dealing with prenatal development in farm animals. 3 credits. Mr. Winters.
- 205s. Seminar in Animal Genetics. Review of current literature and discussion of topics having special emphasis on constructive livestock breeding. 2 credits. Mr. Winters.
- 206w. Advanced Livestock Feeding. A study of experimental results bearing on feeding problems and review of scientific literature applicable to them. 3 credits. Mr. Ferrin.
- 207s. Advanced Livestock Feeding. Continuation of 205. Three credits. Mr. Ferrin.
- 208f. Seminar. Special assignments and review of research problems pertaining to the livestock industry. 1 credit. Mr. Peters.
- 209w. Seminar. Continuation of 208. 1 credit. Mr. Peters.
- 210s. Seminar. Continuation of 209. 1 credit. Mr. Peters.
- 211f. Experimental Methods. Theory, plan, and conduct of experimental work in animal husbandry. Factors affecting results, sources of error, interpretation of data. 3 credits. Mr. Ferrin.
- 212f,w,s. Research in Meats. Special problems assigned to fit the needs of each student. 3 to 9 credits. Mr. Anderson.
- 213f,w,s. Research in Animal Husbandry. Special problems assigned to

fit the needs of each student. 3 to 9 credits. Mr. Peters, Mr. Ferrin, Mr. Winters, Mr. Anderson, Mr. Harvey.

See also History of Science, page 95.

ANTHROPOLOGY

Professors Albert Ernest Jenks, Wilson D. Wallis.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 106w. Types of Prehistoric Men and Cultures. Problems of chronology and distribution. Mr. Jenks.
- 107s. American Archeology. Prehistoric man and cultures in America. Mr. Jenks.
- 108s. Philippine Peoples. Brief history of the islands. Their natural resources. The distinctive types of native peoples—each given in distinguishing details. (Alternates annually with 112. Not offered in 1935-36.)
- 110f. Physical Anthropology. The physical types of man, prehistoric and contemporary. Mr. Wallis.
- 112s. The American Negro. The physical types. Problems and methods of interracial adjustments. (Alternates annually with 108.) Mr. Jenks.
- 113s. Peoples of Europe. Racial and cultural characteristics. Mr. Jenks.
- 114w. The American People. The physical, psychic, and cultural characteristics of the peoples in America. Mr. Jenks.
- 121w. Advanced Physical Anthropology. A critical study of problems in physical anthropology. Based on Course 110. Credits arranged. Mr. Wallis.
- 122f-123w-124s. Problems in Anthropology. Advanced work with individual guidance. Also honors course, anthropological backgrounds of the social sciences, on recommendation of their advisers. Credits arranged. Mr. Jenks, Mr. Wallis.
- 150.* Field Trip in Archeology. Summer. 1 to 8 credits. Mr. Jenks.
- 161f. Primitive Religion. The religious concepts and practices of primitive peoples. Mr. Wallis.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 204f-205w-206s. Seminar in Anthropology. Individually directed research. Credits arranged. Mr. Jenks, Mr. Wallis.

ARCHITECTURE

Professors Frederick M. Mann, Leon E. Arnal, S. Chatwood Burton, Robert T. Jones, Roy C. Jones.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 121f,w,s-122f,w,s-123f,w,s. Freehand Drawing. Advanced life drawing, painting, or modeling and decoration. Prerequisite: Course 29. 2 credits per quarter. Mr. Burton.

* This course may be taken for credit only once.

- 131f,w,s-132f,w,s-133f,w,s.* Architectural Design, Grade IV. Long, short, and sketch problems under individual criticism, dealing with complex compositions, and with subjects involving special character and a decorative and imaginative interest. Prerequisite: Course 39. 8 credits per quarter. Mr. Arnal, Mr. R. C. Jones.
- 134f,w,s-135f,w,s-136f,w,s.* Interior Architectural Design. Problems done under individual criticism dealing with the decorative treatment, furniture, and accessories of interiors, for students in interior decoration. Prerequisite: Course 36. 7 credits per quarter. Mr. Arnal, Miss Carter.
- 141f-142w-143s. Building Construction. An advanced study of the technology of building materials, soils, foundations. Prerequisite: C.E. 41 or M.&M. 26. 2 credits per quarter. Mr. R. T. Jones.
- 144f-145w-146s. Construction Design. Problems in design involving the structural and economic phases of buildings. Prerequisites: Courses 39, 43, C.E. 39, 41. 6 credits per quarter. Mr. R. T. Jones.
- 152w. Estimating. Principles of the quantity survey; cost analysis. Prerequisite: senior standing. 1 credit. Mr. Sault.
- 153s. Business Relations. Relations of the architect, owner, and builder; professional ethics and practice; office administration. Prerequisite: senior standing. 2 credits. Mr. Mann.
- 154w. Acoustics of Buildings. Theory and applications in practice. Prerequisite: senior or graduate standing. 2 credits. Mr. Mann.
- 161w. Decoration and Applied Arts. Historical and technical study of decoration, furniture, etc., together with discussion of the use of color. Prerequisites: Courses 16, 26. 2 credits. Miss Carter.
- 163s. Theory of Form and Color. Fundamentals of design. Prerequisite: Course 26. 2 credits. Mr. Burton.
- 165f. Housing. Social, economic, and city planning phases of modern group housing. Prerequisite: senior or graduate standing. 3 credits. Mr. R. T. Jones.
- 182f-183w. Furniture and Decoration. Historical and technical study of ornament, decoration, furniture, textiles, etc. Discussion of the use of color in decoration. Prerequisites: Courses 16, 23. 3 credits per quarter. Miss Carter.
- 184s. Interior Perspective. Principles and methods as applied to interior architecture. Prerequisite: Course 35. 3 credits. Miss Carter.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 219f,w,s. Special Researches in Architectural History. Prerequisite: completion of undergraduate architectural history. 5 credits or less per quarter. Mr. Mann.
- 220f,w,s. Archeology. Prerequisite: completion of undergraduate architectural history. 3 credits or less per quarter. Mr. Arnal.

* Work in all design courses is carried on simultaneously and students pass from one grade to the next in sequence in varying lengths of time according to their accomplishment and irrespective of university time units. Advancement is based upon design "points" earned.

- 221f,w,s-222f,w,s-223f,w,s. Life Drawing and Figure Composition. Prerequisite: Course 123. 2 credits per quarter. Mr. Burton.
- 239f,w,s. Advanced Architectural Design. Prerequisite: completion of undergraduate design. Ten credits or less per quarter. Mr. Arnal.
- 240f,w,s. Technology of Building Materials. Prerequisite: Course 49 or 143. 3 credits per quarter. Mr. R. T. Jones.
- 287f,w,s-288f,w,s-289f,w,s. Advanced Modeling. Prerequisite: Course 89. 2 credits per quarter. Mr. Burton.

ASTRONOMY

Associate Professor Willem J. Luyten.

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

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

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

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 101f. Celestial Mechanics. A course dealing with Newton's Laws of Motion, and their application to gravitational astronomy. Attention is directed toward the theory of planetary motion and perturbations. Prerequisite: Calculus. 3 credits. Mr. Luyten.
- 121f-122w-123s. Astrophysics and Stellar Statistics. An introductory course, with particular reference to the application of statistical methods into astronomy. Practice in measurement of photographic plates, and discussions of the motions of the stars. 3 credits. Mr. Luyten.
- 140w. Method of Least Squares. Applied especially to engineering, physics, and astronomy. Prerequisite: Mathematics 51. 3 credits. Mr. Luyten.

COURSE PRIMARILY FOR GRADUATE STUDENTS

- 211f-212w-213s. Seminar. For students who are prepared for advanced work along particular lines. 1, 2, or 3 credits. Mr. Luyten.

BACTERIOLOGY AND IMMUNOLOGY

A. Courses Offered at the Medical School

Professors Winford P. Larson, Robert G. Green, Arthur T. Henrici; Associate Professor H. Orin Halvorson; Assistant Professor Charles E. Skinner.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 102s. Medical Bacteriology. See Bulletin of the Medical School. Prerequisite: Bacteriology 101. 4 credits. Dr. Larson, Dr. Green, Dr. Henrici.

- 103w. Soil Microbiology. Studies of the microscopic inhabitants of the soil. Prerequisites: Bacteriology 41 and 15 credits in chemistry. Mr. Skinner.
- 114s. Molds, Yeasts, and Actinomycetes. Prerequisite: Bacteriology 41 or 101. 4 credits. Dr. Henrici.
- 116w. Immunity. Laws of hemolysis. Quantitative relationship between antigen and antibody. Wasserman reaction. Opsonins. Vaccines. Toxin. Antitoxin. Precipitin reactions. Blood grouping. Atopy. Anaphylaxis. Prerequisite: Bacteriology 102. 3 credits. Dr. Larson.
- 117s. Pathogenic Protozoa. Prerequisite: Bacteriology 102. 3 credits. Mrs. Green.
- 120s. Bacterial and Virus Diseases Common to Man and Animals. Prerequisite: Bacteriology 102. 3 credits. Dr. Green.
- 121f-122w.* Physiology of Bacteria. Effect of environment on growth. Enzymes. Food requirements. Carbohydrate, protein, and fat metabolism. Products of growth. Dormancy. Death. Prerequisites: Bacteriology 41 and 8 credits in organic chemistry or biochemistry. 6 credits. Dr. Green, Mr. Halvorson.
- 123s. Applied Bacteriology. Industrial fermentations. Bacteriology of water and sewage. Interpretation of bacteriological data. Prerequisite: Bacteriology 121-122. 3 credits. Mr. Halvorson.
- 150f-151w.* Advanced Bacteriology. Prerequisites: Bacteriology 102 or 41, 103, 114. 6 credits. Dr. Henrici, Mr. Halvorson.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 201f,w,s. 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. Green, Dr. Henrici, Dr. Halvorson, Dr. Skinner.
- 203f,w,s. Seminar in Bacteriology. 1 credit. Staff.

B. Courses Offered in the Mayo Foundation

Professors Edward C. Rosenow, Arthur H. Sanford; Associate Professor Thomas B. Magath; Assistant Professor Luther Thompson.

Opportunities for the graduate study of bacteriology and immunology are in connection with routine clinical examinations and in special research. They are open to 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.

- M251f,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. Research in bacteriology and parasitology. Dr. Sanford, Dr. Magath, Dr. Thompson.
- M252f,w,s,su. Experimental Bacteriology. Research in the bacteriology of normal and diseased tissues, the blood, secretions and exudates. Ex-

* To receive credit for any part of this course a student must complete both quarters.

perimental 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.

In addition to the above, students majoring in bacteriology and immunology may take work in experimental physiology or physiologic chemistry. For details, see these departments.

See also History of Science, page 95.

BIOMETRY (Medical Statistics)

Assistant Professor Alan E. Treloar.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 101f,s,‡ Biometric Principles. An introduction to the statistical method as applied to biological data. Topics discussed include: the characteristics of frequency distributions and their quantitative description; significant differences; probability and the test; correlation and regressions for the "normal" surface. Lectures with outline, and machine computation in the laboratory. 5 credits (or 3 credits by special arrangement). Mr. Treloar.
- 102w. Medical Biometry. Topics: sources of quantitative material; tabulation of data; graphic methods for presentation and analysis of data; index numbers; vital statistics; medical statistics. Prerequisite: Course 101. 3 credits.
- 145w,‡ Correlational Analysis. Topics: total, partial, and multiple correlation and regression; correlation ratio; contingency; biserial methods; tetrachoric correlation; rank-order; the symmetrical table and intra-class correlation. Prerequisite: Course 101. 5 (or 3) credits. Mr. Treloar.
- 146f,w,s,‡ Topics in Biometry. Reference reading and laboratory work in special subjects as advanced students may require them. Prerequisite: Permission of instructor. 3 or 5 credits. Mr. Treloar.
- 153s. Statistical Interpretation. A discussion of the sampling distributions of the more familiar statistics, together with analysis of the problems of interpretation of differences. Special attention is given to small samples and the "analysis of variance." Prerequisite: Course 101. 3 credits. Mr. Treloar.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 237f-238w-239s. Research Problems in Biometry. Mr. Treloar.
- 247f-248w-249s. Seminar in Biometry. Discussions of literature and research projects. Mr. Treloar.

See also History of Science, page 95.

‡ A fee of \$1 is charged for laboratory work, if taken.

BIOPHYSICS

A. Courses Offered at the Medical School and in the Department of Physics

Professors Henry A. Erikson, Karl W. Stenstrom.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

148w. Radioactivity. Mr. Erikson.

150f. Conduction through Gases. Mr. Erikson.

152s. X Rays. Mr. Erikson.

Other courses listed under Physics may be considered for credit in biophysics.

104w. Roentgen and Radium Therapy. (See Radiology 104.)

105f. Roentgen Rays, Light, and Radium. (See Physiology 105.)

106s. Physical Therapy. (See Radiology 106.)

170f,w,s,su. Problems in Biophysics. Investigations of the effects of Roentgen, radium, visible, and ultraviolet radiation, may be undertaken. Instruments are available for spectrophotometric work in the visible and ultraviolet regions for temperature measurements by means of thermocouples, and to a certain extent for electrical measurements. Hours and credits arranged. Mr. Stenstrom, Mr. Nurnberger.

COURSES PRIMARILY FOR GRADUATE STUDENTS

204f,w,s,su. Research in Biophysics. Students who want to carry out more extensive and independent investigations should register for this course instead of for Course 170. Dr. Stenstrom, Dr. Nurnberger.

B. Courses Offered in the Mayo Foundation

Professor Charles Sheard; Associate Professor Edward J. Baldes; Instructor Carol B. Pratt.

Graduate work of a research character in biophysics in the Mayo Foundation. These researches have to do chiefly with physical and physico-chemical measurements on the structure and function of cells and tissues.

Research work suitable for theses for the degree of doctor of philosophy is offered to a limited number of well-prepared fellows majoring in biophysics. In general, the Master's degree or its equivalent is a prerequisite for admission to these advanced research courses.

There are numerous problems suitable for a minor for fellows majoring in other departments of surgical, clinical, and experimental work.

M253f,w,s,su. Special Researches in Biophysics. Dr. Sheard, Dr. Baldes, Dr. Pratt.

In addition to the above, students in biophysics may do research work in physiology in the foundation and at the Medical School, and in biology in the University at Minneapolis. For details, see these departments.

See also History of Science, page 95.

BOTANY

Professors C. Otto Rosendahl, George O. Burr, Frederic K. Butters, William S. Cooper, Josephine E. Tilden; Assistant Professor Alan E. Treloar.

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

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

Languages.—Candidates for the Master's degree must have a reading knowledge of German or French; for the Doctor's degree both are required.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 101f,s,‡ Biometric Principles. An introduction to the statistical method as applied to the analysis of biological, medical, and social data; frequency distributions and the measurement of type and dispersal, probability, the χ^2 test, correlation and regression for the normal surface, and probable errors. Computational techniques illustrated in the laboratory. 3 credits. Mr. Treloar.
- 108w. Morphology and Taxonomy of the Pteridophytes. An intensive study of lycopods, ferns, and their allies, their structure and history, with special attention to the classification of living forms. Lectures, reference reading, and laboratory work. Prerequisites: Courses 7 and 23. 5 credits. Mr. Butters.
- 110w. Morphology and Taxonomy of the Gymnosperms. An intensive study of cycads, conifers, and their allies, their structure and history, with special attention to the classification of living forms. Lectures, reference reading, and laboratory work. Prerequisites: Courses 7 and 63. 5 credits. Mr. Butters. (Not offered in 1935-36.)
- 113f-114w-115s. Advanced Taxonomy of the Flowering Plants. An advanced course in which special attention is given to the taxonomy of difficult natural groups, involving systematic principles and practice, rules of nomenclature, systems of classification, etc. Prerequisite: 15 credits, including Course 7. 9 credits. Mr. Rosendahl.
- 118w,‡ Cytology. A survey of cell structure and the various phenomena of division, fusion, and metamorphosis, together with a review of the history of cytological investigations. Methods of cytological research indicated in the laboratory. Prerequisite: 18 credits. 5 credits. Mr. Rosendahl.
- 123w,124s,125su,126f.* Morphology and Taxonomy of Algae; Algal Types. Advanced studies in selected groups. Prerequisite: 15 credits including Course 12, or consent of instructor. 3 to 5 credits. Miss Tilden.
- 127f. Anatomy of Vascular Plants. The microscopic structure of vascular plants with particular attention to the development and evolution of

* Any of the above courses may be taken separately.

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

- the vascular system in the root, stem, and leaf. Prerequisite: 18 credits. 5 credits. 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. 5 credits. 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. 5 credits. Mr. Cooper.
- 133s. Plant Geography of North America. Preliminary discussion of the principles of plant distribution followed by a detailed study of the vegetation regions of North America. Prerequisite: Course 21. 5 credits. Mr. Cooper. (Not offered in 1935-36.)
- 134s.‡ Research Methods in Ecology. Theory and practice of instrumental study of the habitat and of precise investigation of community and succession. Prerequisite: Course 21. 5 credits. Mr. Cooper.
- 140w. General Plant Physiology. Advanced survey of the whole field of plant physiology. Prerequisites: Course 22 or its equivalent and elementary inorganic chemistry. 3 credits. Mr. Burr.
- 141f.‡ Physicochemical Principles in Plant Physiology. Properties of solution, buffers, membranes, osmosis, transpiration, electrometric measurements. Prerequisites: 20 credits in chemistry or biochemistry. 3 or 5 credits. Mr. Burr.
- 142w.‡ Photosynthesis and the Effects of Radiant Energy. A detailed discussion of conditions, theories, and energy relations in the assimilation of carbon. Other effects of radiant energy on organisms included. Prerequisites: 20 credits in chemistry or biochemistry. 3 or 5 credits. Mr. Burr.
- 143s.‡ Plant Metabolism. Nitrogen assimilation and protein synthesis, metabolism of carbohydrates, fats and proteins, biological oxidation, respiration, hormones, growth curves. Prerequisites: 20 credits in chemistry or biochemistry. 3 or 5 credits. Mr. Burr.
- 145w.‡ Correlational Analysis. Mr. Treloar. For description see p. 33.
- 146s.‡ Advanced Biometry. A discussion of moments and the normal curve, with an introduction to the use of mathematical tables; bi-serial, tetrachoric and equivalent probability correlation; rank order correlation; Spearman-Brown correction and prophecy methods; the symmetrical surface and intraclass correlation. Prerequisite: Course 101. 3 credits. Mr. Treloar, Miss Gunstad.
- 149s,150su,151f,152w.* Advanced Phycology. A general survey based on studies in the field and laboratory. Designed for teachers and research workers who wish to acquire a practical knowledge of the algae. Problems assigned and reports required. Prerequisites: Courses 124, 125, or 126, or consent of instructor. 3 to 10 credits. Miss Tilden.
- 153w. Statistical Interpretation. Mr. Treloar. For description see p. 33.

* Any of the above courses may be taken separately.

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

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 201f-202w-203s. Research Problems in the Morphology of Vascular Plants. Mr. Butters.
- 205f-206w-207s. Research Problems in the Taxonomy of Angiosperms. Mr. Rosendahl.
- 209s-210su-211f. Research Problems in Algae. Miss Tilden.
- 213f-214w-215s. Research Problems in Embryology. Mr. Butters.
- 217s-218su-219f. Special Research Problems in the Taxonomy and Distribution of Algae. Directed work in special areas approved by the instructor. Miss Tilden.
- 221f-222w-223s. Research Problems in Ecology. Mr. Cooper.
- 225f-226w-227s. Research Problems in Plant Physiology. Mr. Burr.
- 229f-230w-231s. Research Problems in Cytology. Mr. Rosendahl.
- 233f-234w-235s. Seminar. Students may register for one-hour seminar credit per quarter in any of the research subjects.
- 241s-242su-243f. Review of Phycological Literature with Reference to Selected Problems. Miss Tilden.
- 247f-248w-249s. Seminar in Biometry. Discussion of literature and research projects for advanced students. 1 credit per quarter. Mr. Treloar.
- See also History of Science, page 95.

CHEMICAL ENGINEERING

Professors Charles A. Mann, George H. Montillon; Associate Professor Ralph E. Montonna; Assistant Professor Arthur E. Stoppel.

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 Master's degree in chemical engineering, the major subject and the thesis must be taken in chemical engineering.

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

The candidate for the Master's or the Doctor's degree with chemical engineering as a major must have completed, as undergraduate or graduate, a year's work in physical chemistry, such as, for example, Phys. Chem. 101f-102w-103s or its equivalent.

For the requirements for the professional degree of chemical engineer, see pages 12, 13, and 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.

Examinations.—The written and oral preliminary examinations in chemistry for the Doctor's degree will be given at only four periods during each year. Normally, these will be during the first two weeks of each regular quarter and of the first term of the summer quarter. The exact schedule will be announced at the beginning of each quarter.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 101f,su. Unit Operations. Principles and methods of operation, and uses of the unit operation equipment. Prerequisites: Anal. Chem. 1, 2. 3 credits. Mr. Mann.
- 102s,su. Unit Operations. Industrial stoichiometry. Problems in combustion of fuels, heat balances. Manufacture of producer gas, industrial gases, and burning limestone. Prerequisite: Course 101. 3 credits. Mr. Montillon, Mr. McMillen, Mr. Ruth.
- 103f. Unit Operations. Problems in heat transfer, the use and design of heat exchangers, the applications of the laws of fluid flow, filtration, filter presses and centrifugals. Prerequisite: Course 101. 3 credits. Mr. Montillon, Mr. McMillen, Mr. Ruth.
- 104w. Unit Operations. Problems in leaching and dissolving, counter-current extraction, gas absorption, and distillation. Drying by air, steam, and direct heat dryers, single and multiple effect evaporators. Prerequisite: Course 101. 3 credits. Mr. Montillon, Mr. McMillen, Mr. Ruth.
- 105f,su. Gas and Fuel Analysis. The chemical analysis of solid and gaseous fuels with a determination of their calorific value and methods of testing industrial gases. Prerequisites: Anal. Chem. 1, 2. 3 credits. Mr. Stoppel.
- 106w. Petroleum and Petroleum Products. Technology and testing of petroleum products, principally gasoline, illuminating, fuel, and lubricating oils. Prerequisite: Org. Chem. 51. 3 credits. Mr. Stoppel.
- 108s. Unit Operations Problems. Problems in adsorption, extraction, crystallization, crushing and grinding, and size separation, and discussion of the equipment used. Prerequisite: 104. 3 credits. Mr. Ruth.
- 110s. Special Analytical Apparatus. The use of special apparatus for chemical and physical testing of chemical products including gas apparatus, calorimeters for gases, liquids and solids, optical apparatus, viscosimeters for gases, turbidimeters, etc. Prerequisites: Anal. Chem. 1, 2. 3 credits. Mr. Stoppel.
- 111f-112w-113s. Chemical Engineering Plant Design. Design of equipment and layout of plants based on collected data. Classroom and laboratory work. Prerequisites: Courses 102, 103, 104. 2 credits per quarter. Mr. Montillon.
- 117s. Chemical Engineering Equipment Design. Fundamental principles in the design of simple chemical engineering equipment. Laboratory work. Prerequisite: Course 104. 3 credits. Mr. Montonna.
- 121w. Chemical Engineering Economics. The economic and business considerations controlling chemical engineering industries. Statistical analysis of the characteristics of those industries. Raw and finished products. Principles of plant location, layout, and design. Unit opera-

- tion cost, principles of management, operation, and control. Lectures and recitations. Prerequisite: Course 132. 3 credits. Mr. Montonna.
- 131w. Industrial Inorganic Chemistry. Applications of unit operations common to chemical industries, chemistry involved, equipment used, marketing of products, utilization of by-products, use of trade journals. Topics: industrial waters, acids and alkalies, salts, chlorine, ammonia, glass, pigments, etc. Lectures and recitations. Prerequisites: (for chem. engr.) Course 101; (for chem.) Anal. Chem. 1, 2. 4 credits. Mr. Mann.
- 132s. Industrial Organic Chemistry. Similar to 131 but covering organic field. Destructive distillation of coal and wood, petroleum oils, paper unit organic processes, synthetic products, vegetable and animal oils, fats, waxes, soap, sugar, starch, etc. Lectures and recitations. Prerequisites: (for chem. engr.) Course 101; (for chem.) Org. 52 and Anal. Chem. 1, 2. 4 credits. Mr. Mann.
- 133f. Chemistry of Explosives. The history and development of modern explosives, their manufacture and uses and war gases. Lectures, required reading, and reports. Prerequisite: Course 132. Three credits. Mr. Montonna.
- 134f. Intermediates and Dyestuffs. Their technical chemistry and manufacture. Processes, purification, uses, etc. Lectures and recitations. Prerequisite: Course 132 or equiv. 3 credits. (May be accompanied by laboratory work in 160.) Mr. Montonna.
- 136w. Chemistry and Technology of Cellulose. Discussions on processes and industries based on the use of cellulosic materials including the chemical and technological considerations. Pulp and paper, plastics, esters, rayon, etc. Lectures and recitations. Prerequisite: Org. Chem. 52 or equiv. 3 credits. Mr. Montonna.
- 140w. Sanitary Chemistry. Discussion of the chemistry of sewage and potable waters. Purification of water supplies and the treatment of municipal and industrial wastes. Lectures and recitations. Prerequisite: Bact. 41 or by permission. 3 credits. Mr. Stoppel.
- 141s. Gas Manufacture and Distribution. Fundamental principles of manufacture of coal gas, carbureted water gas, and other industrial fuel gases, and the equipment for manufacture and distribution. Open to chemists and chemical engineers. Prerequisite: Org. Chem. 52. 3 credits. Mr. Montillon.
- 150s. Unit Operations Laboratory. Operation and testing of chemical engineering equipment. Laboratory work and reports. Prerequisite: Course 101. 1 credit. Mr. Ruth.
- 151f,su. Chemical Manufacture (Inorganic). Manufacture of technical products on a scale large enough to afford data for the determination of operating conditions and costs of manufacture. Use of semi-plant scale equipment. Technical trade journals used. Laboratory. Prerequisite: Course 101. 3 or more credits. Mr. Montonna, Mr. McMillen.
- 152w,su. Chemical Manufacture (Organic). Similar to 151 but covering the organic unit processes. Laboratory. Prerequisite: Course 101. 3 or more credits. Mr. Montonna, Mr. McMillen.

- 153f-154w-155s-156su. Special Laboratory Problems. Investigations on chemical engineering equipment and its use in the manufacture of special chemical products on a semi-works scale. Prerequisites: Courses 151, 152. 3 or more credits. Mr. Montonna.
- 160f. Intermediates and Dyestuffs Laboratory. Manufacture of intermediates and dyestuffs using semi-works equipment. Operations on sulfonation, hydroxylation, nitration, reduction, alkylation, diazotization, coupling, etc. Laboratory. Prerequisites: Courses 132, 152, and preceded or accompanied by 134. 3 or more credits. Mr. Montonna.
- 168w. Petroleum and Petroleum Products. Technology and testing of petroleum and petroleum products. Prerequisite: Anal. Chem. 9. 3 credits. Mr. Stoppel.
- 176f-177w. Applied Electrochemistry. Application of the electric current to chemical processes. Laws and phenomena of electrochemistry, batteries, electroplating, electric furnace construction and operation, and electrochemical products. Class and laboratory work. Prerequisite: Phys. Chem. 103. 4 credits per quarter. Mr. Montillon.
- 179s. Applied Electro-organic Chemistry. The more recent development in the manufacture of inorganic and organic products. Lectures and recitations. Laboratory optional. Prerequisite: Course 176-177. 3 credits. Mr. Mann.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 201f-202w-203s. Seminar. Presentation and discussion of papers concerning the newer developments in chemical engineering. 1 credit per quarter. Mr. Mann.
- 205f-206w-207s. Advanced Process Problems. An extended study of the principles of chemical engineering and their application to industrial problems, together with a survey of the literature. Open to graduate students only. Prerequisites: Courses 102, 103, 104. 2 credits per quarter. (Not offered in 1935-36.)
- 208f-209w-210s. Advanced Chemical Engineering. An extended study of the principles of chemical engineering and their applications to industrial problems, together with surveys of the literature. Prerequisite: Course 104. 2 credits per quarter. Mr. Montillon.
- 301f-302w-303s. Research in Chemical Engineering. Unit operations, applied electrochemistry and electric furnace work, and chemical manufacture. Credits arranged. Mr. Mann, Mr. Montillon, Mr. Montonna, Mr. Stoppel, Mr. Ruth.

CHEMISTRY

Professor and Director Samuel C. Lind.

The work in the School of Chemistry is organized in five divisions or branches, namely, Inorganic, Analytical, Organic, and Physical Chemistry, and Chemical Engineering.

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

Prerequisites.—(a) A branch of chemistry as a *major* subject: All candidates who choose chemistry as a major subject for an advanced degree must offer the following courses or their equivalent as prerequisites: at least 12 quarter credits in general inorganic chemistry and qualitative analysis, at least 10 credits in quantitative analysis, and at least one year of organic chemistry. All candidates must present at least one year of college physics and one year of college mathematics. (b) Chemistry or a branch of chemistry as a *minor* subject: Students may not select two branches of chemistry as major and minor subject except with the approval of the graduate faculty in the School of Chemistry.

Students whose major work lies in another field and who desire to minor in chemistry must present as preparation prerequisite at least 12 credits of general inorganic chemistry and qualitative analysis, and 5 credits of quantitative analysis or 5 credits of organic chemistry.

The choice of the particular courses to be presented in fulfillment of a minor in graduate work will be made after consultation with the student's adviser.

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

Examinations.—The written and oral preliminary examinations in chemistry for the Doctor's degree will be given at only four periods during each year. Normally, these will be during the first two weeks of each regular quarter and of the first term of the summer quarter. The exact schedule will be announced at the beginning of each quarter.

CHEMISTRY, ANALYTICAL

Professor Izaak M. Kolthoff; Associate Professor I. William Geiger; Assistant Professor Landon A. Sarver.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 101w-102s. Quantitative Analysis. Discussion of the general principles, methods, and procedure of quantitative analysis, both gravimetric and volumetric. Typical problems are assigned and attention is given to proper laboratory practice. Prerequisite: Inorg. Chem. 13. 5 credits per quarter. Mr. Geiger.
- 103w. Exact Gas Analysis. Prerequisites: Courses 1, 2. 1 or 2 credits. Mr. Sandell.
- 104s. Microchemistry. The properties and identification of crystals under the microscope, qualitative and quantitative microchemistry, inorganic, organic, and applied fields. Prerequisites: Courses 1, 2. 3 credits. Mr. Sandell.
- 105w. Polarizing Microscope. Its use and application to chemistry. Identification of substances. Prerequisite: Phys. Chem. 101. 3 credits. Mr. Sandell.
- 106f-107w-108s. General Technical Analysis. Includes any one of several of such topics as textiles and paper, paint and varnishes, asphalt and tars,

- boiler waters, soaps, edible oils and fats, and various other food materials and food products depending on the number of credits. Mr. Sandell.
- 109f,w,s. Rock Analysis. Laboratory course covering the technique of rock analysis. Eight laboratory hours per week. Prerequisites: Courses 1, 2. 3 credits. Mr. Ellestad, Mr. Willman.
- 110f-111w-112s. Food Analysis. Course including the chemical analysis of the various food materials and food products and the detection of food adulterations. Course in methods of analysis. Prerequisites: Courses 1, 2. 3 credits per quarter. Mr. Sandell.
- 123f,su-124w,su-125s. Advanced Analytical Chemistry. Systematic survey by general lectures with typical procedures selected for laboratory practice. Drill in application of modern chemical theory to analytical problems. Prerequisites: Courses 1, 2, or by permission. 3 credits. Mr. Sarver.
- 130f. Chemistry of Foods. Course in the origin, composition, and manufacture of foods. Systems of food inspection, legal food standards, and adulteration. 3 credits. Mr. Sandell.
- 131f. Applications of Indicators in Neutralization Reactions and p_h Determinations. Prerequisites: Courses 1, 2, and Phys. Chem. 103. 3 credits. Mr. Kolthoff.
- 132w. Electrometric Measurements and Titrations. Application of potentiometric and conductometric methods in analytical work. Prerequisites: Courses 1, 2, and Phys. Chem. 103. 3 credits. Mr. Kolthoff.
- 134f-135w-136s. Seminar: Modern Problems in Analytical Chemistry. Prerequisites: Courses 1, 2, and Phys. Chem. 103. 1 credit per quarter. Mr. Kolthoff.
- 137s. Advanced Volumetric Analysis. Prerequisite: Course 131. 3 credits. Mr. Kolthoff.
- 138s. Advanced Gravimetric Analysis. Course in the formation, properties of and coprecipitation with ionic lattices. Prerequisite: Phys. Chem. 103. 2 to 3 credits. Mr. Kolthoff.
- 140w. Water Analysis. Analysis of potable water with interpretation of results. Prerequisites: Courses 1, 2. 2 credits. Mr. Sandell.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 201f-202w-203s. Selected Topics in Analytical Chemistry. Credits arranged. Lect. and lab. Mr. Kolthoff.
- 204s. Modern Theories on Acidity and Basicity. Prerequisite: Phys. Chem. 103. 2 credits. Mr. Kolthoff.
- 301f-302w-303s. Research in Quantitative Analysis. Credits arranged. Mr. Kolthoff, Mr. Geiger, Mr. Sarver, Mr. Sandell.

CHEMISTRY, INORGANIC

Professors M. Cannon Sneed, Lloyd H. Reyerson; Associate Professors Lillian Cohen, George Glockler; Assistant Professors Hervey H. Barber, Gladstone B. Heisig, Norville C. Pervier, Henry N. Stephens.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 101s. History of Chemistry. The theories of chemistry from the period of the ancients, with particular emphasis on modern theories and laws. Prerequisite: Org. Chem. 52 or permission of instructor. 2 credits. Miss Cohen.
- 102w,su. Advanced Qualitative Analysis. Includes an analysis of minerals, alloys, paints, and the methods of detecting some of the rarer elements. Prerequisites: Anal. Chem. 1, 2. 2 or 3 credits. Mr. Sneed.
- 103f-104w-105s. Advanced Inorganic Chemistry. A discussion of the periodic system and the chemistry of the elements and their compounds and of special subjects of inorganic chemistry such as valency, oxidation and reduction, complex ions, etc. Prerequisites: Anal. Chem. 1, 2, Org. Chem. 52. 3 credits per quarter. Mr. Sneed.
- 106f-107w-108s. Theories of Inorganic Chemistry. Theory of valency, electron conception and octet theory of G. N. Lewis, geometrical aspects, co-ordination theory, and modern theories of chemical combination. Prerequisite: Phys. Chem. 103 or by permission. 3 credits per quarter. Mr. Glockler.
- 109w-110s. Synthetic Inorganic Chemistry. Methods of preparation and purification of inorganic compounds of special interest. Current literature. Prerequisite: Course 13. 3 to 5 credits per quarter. Mr. Heisig.
- 115su. Commercial Products and Their Analysis. Study of current commercial products, their composition and methods of analysis. Prerequisites: Anal. Chem. 1, 2. Mr. Barber.
- 134f-135w-136s. Seminar: Modern Problems in Inorganic Chemistry. Prerequisites: Anal. Chem. 1, 2, and Phys. Chem. 103. 1 credit. Mr. Sneed.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 301f,su-302w-303s. Research in Inorganic Chemistry. Credits arranged. Mr. Sneed, Mr. Reyerson, Mr. Heisig.

CHEMISTRY, ORGANIC

Professor Lee I. Smith; Associate Professor Walter M. Lauer; Assistant Professors C. Frederick Koelsch, Henry N. Stephens.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 105f-106w-107s. Advanced Organic Chemistry. An advanced descriptive course covering the field of organic chemistry, together with an introduction to the literature of organic chemistry. Prerequisite: Course 153 or equiv. 3 credits per quarter. Mr. Smith.
- 110f.‡ Organic Qualitative Analysis. Reactions of typical functional groups, identification of pure organic compounds, separation and identification of pure organic compounds, separation and identification of constituents of mixture. Prerequisite: Course 153 or equiv. 5 credits. Mr. Koelsch.
- 130s. Organic Quantitative Analysis. Methods of proximate and ultimate analysis of organic compounds, with special attention to semi-micro

‡ A charge of \$10 is made to cover special chemicals in this course.

- methods. Prerequisites: Course 153, and Anal. Chem. 1, 2. 2 or 3 credits. Mr. Lauer.
- 139f,w,s. Advanced Organic Chemistry Laboratory Work. Selected laboratory problems of an advanced nature, including some original work. Students are urged to take this course during the winter quarter; permission of the instructor is required to take it at any other time. Prerequisite: Course 153. 2 to 5 credits. Mr. Thompson.
- 141f. Reagents in Organic Chemistry. Discussion of typical reagents used in organic reactions; their limits of applicability, methods of use, and types of substances with which they react. Prerequisite: Course 153. 3 credits. Mr. Koelsch.
- 142w-143s. The Chemistry of Natural Products. Discussion of the organic chemistry of important classes of natural products. Prerequisite: Course 153. 3 credits. Mr. Lauer, Mr. Thompson.
- 153s. Elementary Organic Chemistry. Discussion of the important classes of organic compounds, both aliphatic and aromatic, together with some heterocyclic compounds. Prerequisites: Courses 51, 52. 5 credits. Mr. Smith, Mr. Lauer.
- 156s. Elementary Organic Chemistry. Discussion of the important classes of organic compounds, both aliphatic and aromatic, together with some heterocyclic compounds. Prerequisites: Courses 54, 55. 3 credits. Mr. Smith, Mr. Lauer.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 201f-202w-203s. Organic Chemistry Seminar. One hour per week. One credit. Required of all students taking research in organic chemistry. Mr. Smith, Mr. Lauer, Mr. Koelsch, Mr. Thompson.
- 205f-206w. Theoretical Organic Chemistry. Structure, reaction mechanisms, relation of physical properties to constitution, and other topics of a theoretical nature. Prerequisite: Course 107. 3 credits per quarter. (Not offered in 1935-36.)
- 212s. Physico-Organic Chemistry. Contributions made to organic chemistry by kinetic and equilibrium studies of organic reactions, including mechanisms of catalytic and ionotropic reactions; and an introduction to the current electronic formations of organic reactions. Prerequisites: Course 107, Phys. Chem. 103, and calculus, or by permission of the instructor. 4 credits. (Not offered in 1935-36.)
- 301f-302w-303s. Research in Organic Chemistry. Credits arranged. Mr. Smith, Mr. Lauer, Mr. Koelsch, Mr. Stephens, Mr. Thompson.

CHEMISTRY, PHYSICAL

Professors Frank H. MacDougall, Samuel C. Lind, Izaak M. Kolthoff, Lloyd H. Reyerson; Associate Professor George Glockler; Assistant Professor Robert S. Livingston.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 101f-102w-103s. Physical Chemistry. A general survey of the subject. Three lectures and one recitation. Laboratory work three or six hours per week. Prerequisites: two years college chemistry, one year college physics. 3, 4, or 5 credits, depending on the amount of laboratory work. Mr. MacDougall, Mr. Livingston.
- 105w. Application of Higher Mathematics to Chemical Problems. Prerequisites: integral calculus and permission of the instructor. 3 credits. Mr. MacDougall.
- 106su-107su. Physical Chemistry. Courses 106 and 107 when completed are equivalent to 101-102-103. $4\frac{1}{2}$, 6, or 7 credits depending on amount of laboratory. Mr. Livingston.
- 110f. Physical Chemistry. Three credits. Mr. Glockler.
- 116f-117w-118s. Advanced Physical Chemistry. Three lectures and one recitation. Laboratory work for one three-hour period may be taken if desired. Prerequisites: Course 103 and calculus. 3 credits per quarter, or 4 with laboratory. Mr. Glockler.
- 128f-129w-130s. Colloid Chemistry. Prerequisite: Course 103. 2 credits per quarter. Mr. Reyerson.
- 131f-132w-133s. Colloid Chemistry Laboratory. Credits and hours arranged. Must be preceded or accompanied by Course 128, 129, or 130. Mr. Reyerson.
- 161f-162w. Radioactivity. Discovery; theory of atomic disintegration; properties, transformations, and preparation of radioactive elements; properties and effects of alpha, beta, and gamma rays; radioactive and non-radioactive isotopes. Prerequisite: Course 103. 2 credits per quarter. Mr. Lind.
- 171su. Elements of Radioactivity. 2 credits. Mr. Lind.
- 175s. Photochemistry. History, development, and present status of photochemistry. Prerequisites: Optics and Course 103. 3 credits. Mr. Lind.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 201f-202w-203s. Thermodynamics and Chemistry. A detailed study of the principles of thermodynamics and their application to physical and chemical phenomena. Prerequisites: Course 103 and calculus. 4 credits per quarter. Mr. MacDougall.
- 204f-205w-206s. Kinetic Theory and Atomistics. Kinetic theory of gases and liquids, crystal structure, structure of atom, quantum theory. Prerequisites: Course 103 and calculus. 4 credits per quarter. Mr. MacDougall. (Not offered in 1935-36.)
- 211f-212w-213s. Advanced Physical Chemistry Laboratory. To accompany or follow any of the advanced courses in physical chemistry. Prerequisite: Course 103. Credits arranged. Mr. MacDougall.
- 221f-222w-223s. Colloid Seminar. 1 credit per quarter. Mr. Reyerson.
- 251f-252w-253s. Physical Chemistry Seminar. For students taking advanced courses in physical chemistry. 1 credit. Mr. MacDougall.

- 264f,w,s. Radioactivity Laboratory. Use and standardization of electroscopes, radioactive measurements, and quantitative determination of radium in ores, minerals, waters, and plant products. 1 or 2 credits. Must be preceded or accompanied by Radioactivity 161. Mr. Lind.
- 271f-272w-273s. Chemical Activation. (Seminar 1 hour per week for graduate students.) Current theories of chemical activation, including photochemical excitation, gaseous ionization, and the kinetics of cluster and of chain reactions. Prerequisites: physics and physical chemistry. 1 credit per quarter. Mr. Lind.
- 301f-302w-303s. Research in Physical Chemistry. Including work in electrochemistry, photo and radio chemistry, and colloids. Credits arranged. Mr. Lind, Mr. MacDougall, Mr. Kolthoff, Mr. Reyerson, Mr. Glockler.

See also History of Science, page 95.

CHILD WELFARE

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

Prerequisites.—For graduate work in the Institute of Child Welfare, students are normally expected to have had the equivalent of an undergraduate major in either psychology, sociology, education, or home economics. Aside from or including the major, the student normally is expected to have had at least 10 hours in psychology, 8 hours in sociology, and 3 hours in statistics. In special cases or where the background lies in other fields, such as nursing or medicine, adjustments may be made.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 130f-131w. Child Development. Development of motor, linguistic, and intellectual skills. Development of emotion, personality, social reactions, interests, and abilities. Lectures, readings in the experimental literature, and reports. Prerequisite: 12 credits in psychology or educational psychology. 2 or 4 credits. Mr. Anderson.
- 133f-134w. Observational and Experimental Methods. The various methods and techniques such as growth records, mental tests, ratings, controlled observations, etc., used in the experimental study of the young child. Practical exercises and problems on institute records and data. Prerequisites: 10 credits in psychology or educational psychology, including Ed. Psy. 60 or equiv. and permission of instructor. 4 credits. Miss Goodenough.
- 140f. Behavior Problems. Nature and origin of behavior difficulties. Emphasis upon young children and the relation between early behavior trends and later maladjustment. Prerequisite: 10 credits in psychology, educational psychology, or sociology. 2 credits. Miss Goodenough, Miss McGinnis.
- 141w-142s. Practicum in Behavior Problems. Clinic and field work in the

- study and treatment of behavior problems. Prerequisite: Course 140. Credits arranged. Miss Goodenough, Miss McGinnis.
- 170f. Parent Education. History and survey of present programs in parent education and adult education. Analysis of child development and training literature in relation to the preparation of materials for study groups. Lectures, discussions, and reports. Prerequisite: 15 credits in child welfare, psychology, education, or sociology. 3 credits. Miss McGinnis.
- 171w. Technique of Parent Education. Methods of teaching adults. Organization and administration of study groups. Demonstration lessons and observations. Prerequisite: Course 170. 2 credits. Miss McGinnis.
- 172s. Field Work in Parent Education. Lesson plans, observations, and field work. Prerequisites: Courses 170, 171, and permission of instructor. Credits arranged. Miss McGinnis.
- 190w-191s. Mental Examination of Preschool Children. A study of the methods used in testing young children together with practice in such testing. Prerequisite: Ed. Psy. 143-144-145 or 134-135-136, or equivalent, and permission of instructor. 3 or 6 credits. Miss Goodenough.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 230f-231w-232s. Seminar in Child Development. Reviews of current literature, discussion of fundamental problems, and reports on research. Meetings in alternate weeks. Attendance of graduate students who are candidates for degrees is required. Prerequisite: permission of instructor. 3 credits. Mr. Anderson.
- 233f-234w-235s. Research in Child Development. Credits arranged. Mr. Anderson, Miss Goodenough.
- 240w-241s. Seminar in Behavior Problems. Discussion of case records, causative factors, treatment. Meetings in alternate weeks. 1 credit each quarter. Miss Goodenough, Miss McGinnis.
- 250w. Nursery School Education. Discussion of historical background and current practices, fundamental problems and theory, problems of administration and organization. Prerequisite: permission of instructor. 3 credits. Mrs. Foster.
- 260w. Seminar on Physical Growth. Survey of the growth of the human body and its systems from early fetal life to maturity. Same as Anat. 160. Credit cannot be received for both Anat. 160 and C.W. 260. 2 credits. Dr. Boyd.
- 261f-262w-263s. Statistical and Laboratory Work on Physical Growth. Prerequisite: C.W. 260. Same as Anat. 161-162-163. Credit cannot be received for both Anat. 161-162-163 and C.W. 261-262-263. Credits arranged. Dr. Boyd.
- 270f-271w-272s. Readings in Child Development. Independent readings and reports in any field such as physical growth, health problems, mental development, social behavior, nursery school theory, parent education, etc., which meet the approval of the listed instructors. Credits arranged. Mr. Anderson, Mrs. Foster, Miss Goodenough, Miss McGinnis, Dr. Boyd.

CIVIL ENGINEERING

Professors Frederic H. Bass, Alvin S. Cutler, Fred C. Lang, Frederick M. Mann, John I. Parcel; Associate Professors Chester A. Hughes, John V. Martenis, Joseph A. Wise; Assistant Professor Leonard F. Boon.

SURVEYING

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 109f,w,s. Cadastral Surveying. Study of the newer methods of accurate surveys of property with geodetic control and with co-ordinates of property monuments. Prerequisite: Course 16. 2 credits. Mr. Boon.
- 110f,w,s. Errors in Surveying. Study of the sources, importance, and reduction of errors in surveying. Prerequisite: Course 23. 2 credits. Mr. Boon.
- 111f,w,s. Methods of Computation. Study of the methods used in various problems in precise and geodetic surveys and distribution of errors. Prerequisite: Course 110. 2 credits. Mr. Boon.

RAILWAY ENGINEERING

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 121f. Railway Engineering. Train resistance, ruling and momentum grades, curvature, distance, rise and fall as factors in location and operation of railroads. Train loading, acceleration, retardation; locomotives and equipment. Operating costs governing grade revision. Prerequisite: Course 22. 3 credits. Mr. Cutler.
- 122w. Railway Engineering. Lectures, office work, and field inspection. Design and operation of various types of yards and terminals, and terminal facilities, including the hump, engine house, coal and water station. Signaling and interlocking. Prerequisite: Course 22. 3 credits. Mr. Cutler.
- 123s. Railway Engineering. Design and construction of railroad buildings and structures; culverts, wooden trestles, switches, cross-overs, crossing frogs, etc. Earthwork computation, estimates and reports. Distribution of material by mass diagram. Prerequisite: Course 22. 3 credits. Mr. Cutler.
- 124w. Transportation. Development of railway and inland waterway transport, railway regulation and control with special reference to the 1920 Railway Transportation Act, geographical, financial, and rate grouping of railways, Interstate Commerce Commission method of accounting, cost and value of service, present systems, and organization. Prerequisite: Course 22. 3 credits. Mr. Cutler.
- 125s. Transportation. Specific illustrative problems: Twin City and Mississippi Valley traffic situation, Mississippi River experiment, New York Barge Canal, Great Lakes traffic, Panama Canal status. Prerequisite: Course 121. 3 credits. Mr. Cutler.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 221f-222w-223s. Railway Administration. Analysis of railway organization and methods of management and operation. Special problems. Prerequisite: Course 122. 3 credits per quarter. Mr. Cutler.
- 224f. Railway Terminals and Yards. Continuation of Course 123. 3 credits. Mr. Cutler.

STRUCTURAL ENGINEERING

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 131w-132s. Bridge Analysis and Design. Stresses in cantilevers, arches, and continuous bridges. Design and detail of typical bridge structure. Prerequisite: Course 134. 2 credits per quarter. Mr. Parcel.
- 134f. Statically Intermediate Structures. Theory of deflections and statically indeterminate stresses and their application to continuous girders, frames, swing bridges, and redundant members. Prerequisites: Course 33, M.&M. 128. 3 credits. Mr. Parcel.
- 135s. Advanced Reinforced Concrete Design. Analysis of structures as rigid frames. Application to reinforced concrete buildings. Effect of temperature and shrinkage. Effect of settlement of foundations. Rigid frame bridges. Prerequisite: Course 142. 4 credits. Mr. Wise.
- 137f,w,s. Structural Laboratory. Theoretical and experimental analysis of structural members and models. Prerequisites: Courses 134, 141. 2 credits. Mr. C. A. Hughes.
- 141f. Reinforced Concrete. Principles of reinforced concrete. Theory of beams, slabs, and columns and the application to ordinary structures. Prerequisite: Course M.&M. 128. 3 credits. Mr. Wise.
- 142w. Reinforced Concrete Design. Continuation of 141 with especial emphasis on the practical features of the design of buildings, bridges, retaining walls, etc. Prerequisite: Course 141. 3 credits. Mr. Wise.
- 143s. Reinforced Concrete Arches. Analysis and design of reinforced concrete arches. Prerequisites: Courses 134, 142. 3 credits. Mr. Wise.
- 146f,w,s. Plain Concrete. Theory of design and control of concrete mixtures. Practice in control tests of concrete and concrete materials. Lectures and laboratory work. Prerequisite: M.&M. 141. 3 credits. Mr. C. A. Hughes.
- 147w. Foundations. Design and construction of footings, cofferdams, and caissons for bridges and buildings. Piers and abutments. Underpinning of buildings. Exploration and testing of foundation sites. Excavation and removal of materials from foundation site. Prerequisites: Course 33, M.&M. 128. 2 credits. Mr. Wise.
- 148f-149w-150s. Advanced Concrete. Short research problems in concrete. Prerequisite: Course 146. 2 credits per quarter. Mr. C. A. Hughes.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 234f-235w-236s. Advanced Theory of Structures. Application of the theory of indeterminate stresses to the more complex problems of structural

analysis. Continuous and swing bridges, simple and multiple arch and suspension systems, wind stresses in tall building frames, secondary stresses. Prerequisites: Courses 132, 142. 3 and 5 credits per quarter. Mr. Wise.

237f-238w-239s. Advanced Structural Laboratory. Special problems. Prerequisite: Course 137. 3 to 5 credits per quarter. Mr. C. A. Hughes.

245f-246w-247s. Seminar. Special topics in the higher theory of structures. Prerequisites: Courses 134, 142. 3 to 6 credits per quarter. Mr. Parcel.

HIGHWAY ENGINEERING

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

154w. Soils Laboratory. Laboratory study of properties of soils which pertain to their stability and credit. Mr. Lang.

156w. Highway Transport. Development, economic field, relation to other forms of transportation. Highway transport surveys, economics of location, economics of selection of type of surface, effect of vehicle on road and road on vehicle. Prerequisite: Course 52. 3 credits. Mr. Lang.

157s. Highway Transport. Motor vehicle as a common carrier, analysis of road legislation, taxation. Principles of successful operation. Selling motor transportation. Prerequisite: Course 156. 3 credits. Mr. Lang.

COURSES PRIMARILY FOR GRADUATE STUDENTS

251s. Highway Laboratory. Investigations in co-operation with State Highway Department. Prerequisite: Course 52. 3 to 5 credits. Mr. Lang.

252s. Highway Design. Preparing of a plan and specification for short sections of highway and city streets, also making estimates of materials and cost. Prerequisite: Course 52. 3 to 5 credits. Mr. Lang.

HYDRAULIC, MUNICIPAL, AND SANITARY ENGINEERING

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

161f. Hydrology. Rainfall, evaporation, transpiration, percolation, run-off. Flood and low water of streams. Storage for use in water supply, water power, irrigation, and navigation. Mass curves and frequency curves. 3 credits. Mr. Bass.

162w-163s. Water Supply and Sewerage. Sources of water supply; quality of water. Methods of testing, collection, distribution, and purification of water. Selection of pumping machinery and motive power. Sewer systems and sewage disposal works. Prerequisite: M.&M.129. 3 credits per quarter. Mr. Bass.

164f,s. Water Power. Types of low, medium, and high-head developments. Details of developments. Dams. Turbine settings and characteristics. Prerequisite: M.&M. 129. 3 credits. Mr. Bass.

171w. Building Sanitation. Location and orientation of buildings; lighting, ventilation, water supply, plumbing, sewage, and refuse disposal. Prerequisite: sr. arch. and grads. only. 2 credits. Mr. Bass, Mr. Martenis.

172s. City Planning. Physical elements of the city; topography, drainage, geology. Public works and structures. Internal and external transportation. Zoning. Subsurface structures. Esthetic features of the city. Prerequisite: Course 52. 3 to 5 credits. Mr. Bass, Mr. Mann.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 261f-262w. Water and Sewage Purification. Design of water purification and sewage disposal works. Prerequisite: Course 163. 3 to 5 credits per quarter. Mr. Bass.
- 263s. Hydraulic Engineering Problems. Special hydraulic problems in laboratory, drafting room, and field. Prerequisite: Course 164. 3 to 5 credits.
- 280f-281w-282s. Civil Engineering Research. Original work in concrete, structural steel, hydraulics, municipal or transportation problems. Investigations, reports, tests, designs. Prerequisite: by permission. 5 credits per quarter. Mr. Bass, Mr. Cutler, Mr. Lang, Mr. Parcel.

CLASSICAL LANGUAGES

Professor Marbury B. Ogle, Assistant Professor Robert V. Cram, Lecturer Francis D'Arms.

GREEK

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. Prerequisite: Course 53. 3 credits. Mr. D'Arms.
- 106w. Advanced Drama. Aeschylus, Sophocles, or Aristophanes. Special attention given to the development of the drama, and to the literary form and dramatic representation of the plays read. Three times a week. Prerequisite: Course 53 or 105 or equivalent. 3 credits. Mr. D'Arms.
- 107w. Advanced Prose. Selections from Plutarch or Lucian. Alternates with Course 106. Prerequisite: Course 51-52 or 51-53 or 52-53. Mr. D'Arms.
- 108s. Advanced Epic Poetry. A course of rapid reading in the *Iliad* or the *Odyssey*. Three times a week. Prerequisite: Course 105 or 106. 3 credits. Mr. D'Arms.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 201f-202w-203s. Oratory (advanced). A study of the development of oratorical style among the Greeks; selected readings. Twice weekly, one, two, or three quarters. Mr. Savage.
- 204f-205w-206s. 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.

- 207f-208w-209s. Seminar in Philosophy or Oratory. Once a week, one, two, or three quarters. Mr. Savage.
- 210f-211w-212s. History (advanced). Selected readings from Greek historians. Once a week, one, two, or three quarters. Alternates with 207-208-209. Mr. Savage.

LATIN

Prerequisites.—Any four of Courses 21-73, and 6 credits in addition selected from the one hundred series. A reading knowledge of French, German, or Greek is required of candidates for the Master's degree.

The degree of master of arts: For a major in Latin, any nine-credit sequence in the two hundred series, and in addition one course each quarter selected from Courses 121-133 or 241-242-243; ordinarily this latter will be required in addition to the other two hundred sequence. The student will be expected to choose for his thesis some problem connected with one of these courses. Besides, a minor is to be carried throughout the year in one of the following departments: Comparative Philology, English, German, Greek, History, Romance Languages, or Scandinavian. For a minor in Latin, any nine-credit sequence in the two hundred series or one course each quarter selected from Courses 121-133.

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

Caesar: A considerable portion of the Gallic War and the Civil War.

Catullus: All except LXIII-LXVIII.

Cicero: Fourteen orations (e.g., Roscius Amerinus, Verres Actio Prima, Manilian Law, 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, V, VII, VIII, X, XI.

Livy: Books I, II, XXI, XXII.

Lucretius: Books I-V.

Martial: At least one half.

Ovid: About four thousand verses of the *Metamorphoses*.

Plautus: *Amphitruo*, *Aulularia*, *Captivi*, *Menaechmi*, *Miles Gloriosus*, *Mossellaria*, *Rudens*, *Trinummus*.

Pliny the Younger: At least one half.

Quintilian: Book X, Ch. I.

Suetonius: Iulius, Augustus, Tiberius, Nero, Domitian.

Tacitus: *Annals* I-VI or XI-XVI.

Terence: *Adelphoe*, *Andria*, *Hautontimorumenus*, *Phormio*.

Vergil: All except the minor poems.

A preliminary written examination upon these authors and upon the history of Roman literature will be given in addition to the general written preliminary upon the graduate courses in the major completed at that time.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 121f. Advanced Vergil. *Eclogues*, *Georgics*, and *Aeneid*. Prerequisites: any two of the courses with numbers between 50 and 100. 3 credits. Mr. Ogle.
- 131f. Juvenal. Selected Satires. Prerequisites: any two of the courses with numbers between 50 and 100. 3 credits. (Not offered in 1935-36.)
- 133s. Vulgar Latin. Development of Latin into Romance. Prerequisites: for advanced students of either Latin or Romance with the consent of the instructor. 3 credits. Mr. Ogle.
- 142w. Tacitus. Readings in the *Annales* and *Historiae*. Prerequisites: any two of the courses numbered between 50 and 100. 3 credits. (Not offered in 1935-36.)
- 151f. Advanced Cicero. Prerequisites: any two of the courses with numbers between 50 and 100. 3 credits. (Not offered in 1935-36.)
- 152w. Lucretius. Prerequisites: any two of the courses with numbers between 50 and 100. 3 credits. Mr. Ogle.
- 153s. Classical Literary Tradition. Prerequisites: consent of the instructor. 3 credits. (Not offered in 1935-36.)
- 171f,172w,173s. Independent Reading Course. Prerequisite: open to students of exceptional ability with the consent of the department. 9 credits.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 201f-202w-203s. Graduate Seminar: Cicero. 9 credits. (Not offered in 1935-36.)
- 211f-212w-213s. Graduate Seminar: The Latin Epic. 9 credits. (Not offered in 1935-36.)
- 221f-222w-223s. Graduate Seminar: Lyric Poetry. 9 credits. Mr. Ogle.
- 231f-232w-233s. Graduate Seminar: Latin Historiography. 9 credits. (Not offered in 1935-36.)
- 241f-242w-243s. Graduate Seminar: Introduction to Classical Philology. 9 credits. Mr. Cram.

DAIRY HUSBANDRY

Professors James B. Fitch, Willes B. Combs, Harold Macy, Associate Professor William E. Petersen.

Students taking major work in dairy husbandry for a Master's degree may be exempted from the language requirement.

Students desiring major work in dairy production should make arrangements with the Division of Dairy Husbandry previous to registration.

Prerequisites.—For a major in *production* the adviser must be satisfied that the student has had sufficient preparation in chemistry, genetics, and animal physiology; for a major in *dairy products*, bacteriology, chemistry, physics, and economics; for a major in *dairy bacteriology*, chemistry, bacteriology, and dairy products.

When the preparation appears inadequate the adviser may require that additional courses be taken to make up the deficiencies. With the approval of the adviser, certain courses in agricultural biochemistry, bacteriology, genetics, and animal husbandry may be accepted as part of the major.

Due to the limitation of available animals and the cost of animal experiments, students desiring a major in dairy production are expected to make arrangements previous to enrolment.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 101f. Milk Production. Problems of the dairy farmer. Three credits. Mr. Fitch.
- 102w. Dairy Bacteriology. Lectures, assignments, laboratory work. Types of milk organisms, relation of the bacteria of milk to dairy manufacturers and to public health, the bacteriology of dairy products. 3 credits. Mr. Macy.
- 103w. Dairy Stock Feeding. Application of the principles of nutrition to special problems of feeding the dairy cow and growing the young animals. 3 credits. Mr. Fitch.
- 104s. Dairy Stock Selection. Practice in comparative judging; selection and valuation; visits to purebred herds. 3 credits. Mr. Petersen.
- 105f-106w-107s. Seminar. Special investigations and study of selected topics. Reports on assigned subjects and reviews of recent scientific investigations. 1 credit each quarter. Mr. Fitch, Mr. Macy.
- 110w. Dairy Products III. Similar to Course 111f with special application to ice cream. 3 credits. Mr. Combs.
- 111f. Dairy Products I. The chemical, bacteriological, and economic problems in the manufacture and marketing of butter. 3 credits. Mr. Combs, Mr. Coulter.
- 112s. Dairy Products II. Similar to Course 111f with special application to cheese, condensed and powdered milk. 3 credits. Mr. Combs, Mr. Coulter.
- 113s. Technical Control. Chemical and bacteriological laboratory methods used in technical control of milk and its products. 3 credits. Mr. Macy, Mr. Coulter.
- 115s. Advanced Dairy Bacteriology. Investigations of specific problems in the bacteriology of milk and dairy products. Prerequisites: Course 2 or equiv., Course 111 or 112. 3 credits. Mr. Macy.
- 116s. Milk Secretion. Lecture assignments covering the anatomy and physiology of milk secretion and factors influencing the quality and quantity of milk. Prerequisites: Physiol. 9 cred. and Agr. Biochem. 103. 3 credits. Mr. Petersen.

- 117s. Dairy Cattle Breeding. Application of the principles of genetics to the improvement of dairy cattle. Evaluation of breeding animals and formulation of breeding plans. Prerequisites: Courses 101, 104, Agron. 31. 3 credits. Mr. Petersen.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 202f-203w-204s-208su-210su. Research in Dairy Husbandry. Facilities offered for study and investigation of subjects pertaining to dairy cattle. Students are allowed to assist at times with investigations under way in the experiment station. Arranged to meet the needs of the individual student. Open in the summer quarter only to those who have had preliminary graduate work. Mr. Fitch, Mr. Petersen, Mr. Gullickson.
- 205f-206w-207s-209su-211su. Research in Dairy Manufacturing. Opportunity and facilities are offered for study and investigation of problems concerning dairy products. The work is arranged to meet the needs of the individual student. Open in the summer quarter only to those who have had preliminary graduate work. Mr. Combs, Mr. Coulter.
- 212f,213w,215su,216su. Research in Dairy Bacteriology. Opportunity and facilities are offered for investigation and advanced study of problems involving the bacteriology and mycology of milk and dairy products. Open in the summer quarter only to those who have had preliminary graduate work. Mr. Macy.

ECONOMICS

Professors Russell A. Stevenson, Roy G. Blakey, George Filipetti, Frederick B. Garver, Alvin H. Hansen, Arthur W. Marget, Bruce D. Mudgett, J. Warren Stehman, Roland S. Vaile; Associate Professors Ernest A. Heilman, John J. Reighard, Clare L. Rotzel; Assistant Professors Arthur M. Borak, Ralph Cassady, Ernestine C. Donaldson, Richard L. Kozelka, Walter R. Myers, Harry J. Ostlund, Emerson P. Schmidt, Robert M. Weidenhammer.

GENERAL ECONOMICS AND BUSINESS ADMINISTRATION

Prerequisites.—Candidates for the Master's or Doctor's degree majoring in economics must present a minimum of 18 quarter credits of undergraduate economics which include courses in money and banking, principles of economics, accounting, and statistics. Where Economics 1 (Business Organization: Production), Economics 2 (Business Organization: Marketing), and Economics 4 (Principles of Economics) have been included in the undergraduate program a minimum of 27 quarter credits of undergraduate economics is required for a major in economics. Candidates for a postgraduate degree in economics must present evidence of satisfactory undergraduate scholarship in economics before final acceptance as candidates for the degree.

Minors.—For the Master's degree, where a minor is taken in economics, 9 quarter credits is usually considered as the minimum requirement subject to approval of the candidate's major department. Subject to approval of

the Executive Committee of the Graduate School, a major and minor 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.

Majors.—Candidates majoring in economics must have their programs approved by the Graduate Committee of the department before they may be considered as candidates for an advanced degree. All candidates for an advanced degree must include Economics 103-104, or Economics 203-204, or the equivalent. For the Master's degree a minimum of 18 quarter credits is required for the major in economics provided such minimum is acceptable in the program as approved. Ordinarily a seminar course should also be included in the student's major program. For the Doctor's degree the Graduate Committee may specify particular courses in the candidate's three-year program and therefore the specific requirements of credit hours are determined in each individual case. Candidates for the Doctor's degree are urged to complete the requirements for the Master's degree before being considered as candidates for the doctorate and should include two seminar courses in economic theory in their programs.

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, statistics, and labor.

Economics

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

NOTE.—The following courses in other departments carry credit also in Economics: History: 180-181-182, Topics in Economic History; 221-222-223, Graduate Seminar in Economic History. Political Science: 107, Recent Social Legislation; 109, Government and Business.

- 103f-104w. Advanced Economics: Competition, Monopoly, and Inequality of Incomes. Six credits. Mr. Schmidt.
- 105s. History of Economic Ideas: The Classical Economists. 3 credits. Mr. Garver.
- 106s. History of Economic Ideas: The Critics of the Classical Economists. 3 credits. Mr. Hansen.
- 113w-114s. Theory of Statistics. 6 credits. Mr. Mudgett.
- 124w. Comparative Banking—British Systems. 3 credits. Mr. Myers.
- 125s. Comparative Banking—European Systems. 3 credits. Mr. Myers.
- 127s. Comparative Banking—South American Systems. 3 credits. Mr. Myers.
- 141f,w,s. Monetary and Banking Policy. 3 credits. Mr. Marget, Mr. Myers.
- 149f,w,s. Business Cycles. 3 credits. Mr. Marget, Mr. Myers.
- 154s. Public Utilities. 3 credits. Mr. Schmidt.
- 160w. The Modern Corporation. 3 credits. Mr. Stehman.
- 161f,w,s. Labor Problems and Trade Unionism. 3 credits. Mr. Hansen.
- 162w. Labor Movements. 3 credits. Mr. Hansen.

- 163w. Economic Aspects of Population and Immigration. Mr. Hansen.
 164s. Labor Legislation and Social Insurance. 3 credits. Mr. Schmidt.
 166f. International Economic Problems. 3 credits. Mr. Hansen.
 172f. Economics of Transportation. 3 credits. Mr. Schmidt.
 176f,s. International Commercial Policies. 3 credits. Mr. Blakey.
 191f-192w. Public Finance. 6 credits. Mr. Blakey.
 193s. State and Local Taxation. 3 credits. Mr. Blakey.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 203f-204w. Seminar in Economic Theory. 6 credits. Mr. Garver.
 206s. Seminar in Market Prices. 3 credits. Mr. Vaile.
 215s. Mathematical Economics. 3 credits. Mr. Mudgett.
 243f-244w. Seminar in Money and Banking. 6 credits. Mr. Marget.
 248f-249w. Seminar in Unemployment and Business Cycles. 6 credits. Mr. Hansen.

Business Administration

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 100f,w,s. Report Writing. 1 credit. Mr. Heilman.
 101f-102w. Advanced General Economics. 6 credits. Mr. Garver, Mr. Mudgett, Mr. Schmidt.
 101w-102s. Advanced General Economics. 6 credits. Mr. Garver.
 109w,s. Business Policy. 3 credits.
 112f,w,s. Business Statistics. 3 credits. Mr. Mudgett, Mr. Kozelka.
 130f,s. Cost Accounting. General survey. 3 credits. Mr. Ostlund.
 132w. Cost Accounting. 3 credits. Mr. Ostlund.
 133s. Cost Accounting Methods. 3 credits. Mr. Ostlund.
 134f. Income Tax Accounting. 3 credits. Mr. Reighard.
 135f. Auditing and Public Accounting. 3 credits. Mr. Reighard.
 136s. Internal Auditing. 3 credits. Mr. Reighard.
 138f. Accounting Practice and Procedure. 5 credits. Mr. Heilman.
 139f,w,s. Advanced General Accounting. 3 credits. Mr. Heilman.
 142f,w,s. Money and Banking—Advanced Course. 3 credits. Mr. Marget, Mr. Myers.
 145s. Foreign Exchange. 3 credits. Mr. Myers.
 146f. Investments. 3 credits. Mr. Weidenhammer.
 147f. Bank Administration. 3 credits. Mr. Myers.
 148w. The Securities Market. 3 credits. Mr. Weidenhammer.
 155f,w,s. Corporation Finance. 3 credits. Mr. Stehman.
 156f. Finance Management. 3 credits. Mr. Stehman.
 165f,w,s. The Economics of Public Utilities. 3 credits. Mr. Garver, Mr. Schmidt.
 167w. Personnel Administration. 3 credits.
 168s. Advanced Personnel Administration. 3 credits.
 177w. Foreign Trade. 3 credits. Mr. Blakey.
 180f-181w-182s. Seminars for Seniors and Graduates.* Intensive study of problems in respective fields of specialization.

* For list of subjects, see page 58.

| No. | Title | Credits | Instructor |
|-----|-----------------------|---------|---|
| A. | Accounting* | 6 | Mr. Reighard, winter; Mr. Stevenson, spring |
| B. | Business Finance* | 6 | Mr. Myers, winter; Mr. Marget, spring |
| C. | Marketing | 9 | Mr. Vaile, fall and winter; Mr. Cassidy, spring |
| D. | Personnel Management | 9 | |
| E. | Secretarial Practice* | 6 | Miss Donaldson |
| F. | Statistics | 9 | Mr. Mudgett |
| G. | Production Management | 9 | Mr. Filipetti |
| H. | Insurance§ | 3 | |

* Winter and spring only.

§ Spring only.

183f,w,s. Senior Practice Course. Credits arranged. Members of the staff.

184s. Scientific Management in Industry. 3 credits. Mr. Filipetti.

194f-195w-196s. Advanced Advertising Procedure. 3 credits. Mr. Vaile.

AGRICULTURAL ECONOMICS¶

Professors O. B. Jesness, Andrew Boss, Warren C. Waite; Associate Professors Edwin C. Johnson, George A. Pond; Assistant Professors Rex W. Cox, Lewis F. Garey.

Prerequisites.—For major work 18 quarter credits consisting of courses acceptable to the student's adviser. Further courses may be required if in the opinion of the adviser this is necessary.

Majors and minors.—The thesis may be in any field of agricultural economics (marketing, farm management, economics of agricultural production, agricultural prices, farm finance, land economics). Candidates will be expected to take work in the different fields, the program depending upon the field of specialization. With the approval of the adviser, certain courses in general economics and business administration may be accepted as major work. The minor may be in general economics.

Language requirement.—Candidates for the Master's degree in agricultural economics may be exempted from the requirement of a reading knowledge of a foreign language.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

102w. Farm Management: Organization. The business side of farming with emphasis on farm organization and equipment. 3 credits. Mr. Garey.

103s. Farm Management: Operation. A continuation of 102 with special attention to farm operation. Prerequisite: Course 102. 3 credits. Mr. Garey.

104s. Types of Farming. A study of types of farming and of prevailing farm practices in the principal agricultural production areas. Prerequisites: Courses 102, 103, or equiv. 3 credits. Mr. Boss.

110f-111w. Economics of Agricultural Production. The principles of production economics elaborated in terms of the production of the major farm products and producing areas. Economic geography of agriculture. National production policies. 6 credits. Mr. Johnson.

¶ For courses in General Economics and Business Administration, see Economics.

- 126f,s. Economics of Consumption. Formulation of the economic principles relating to choice between different uses of income and time and energy of individuals and family organizations. 3 credits. Mr. Waite.
- 131w. Market Prices. Analysis of the price making process as it works out in the market places where the major farm products are sold. Market quotations and price quoting. 3 credits. Mr. Waite.
- 135s. Methods of Price Analysis. Statistical technique involved in analyzing seasonal and year-to-year movements in prices of farm products. Interpretation of results. 3 credits. Mr. Waite.
- 140f. Marketing Organization: Staples. Principles of production economics applied to the organization of markets and marketing organization for the grains, tobacco, cotton, and wool. Especial attention to co-operative organization. 3 credits. Mr. Johnson, Mr. Cox.
- 141w. Marketing Organization: Dairy and Poultry Products. 3 credits. Mr. Jesness.
- 142s. Marketing Organization: Fruits and Vegetables. 2 credits. Mr. Cox.
- 143w. Marketing Organization: Livestock and Meats. 3 credits. Mr. Johnson, Mr. Cox.
- 144f. Co-operative Organization. 3 credits. Mr. Jesness.
- 150s. Advanced Farm Finance. 3 credits. Mr. Johnson.
- 170s. Land Economics. 3 credits. Mr. Johnson.
- 190f. Agricultural Statistics. Intended for beginning graduate students who have had no course in the elements of statistical method. 3 credits. Mr. Cox.
- 191w. Advanced Agricultural Statistics. 3 credits. Mr. Waite.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 200f-201w-202s. General Seminar in Agricultural Economics.* Credits as Mr. Jesness and staff.
- 203f-204w. Current Problems and Literature. No credits. Required of all majors in agricultural economics. Mr. Jesness.
- 206s. Seminar in Agricultural Policy. A study of economic problems of agriculture and policies adopted by governmental, agricultural, and individual agencies toward such problems. 3 credits. Mr. Jesness.
- 220s. Farm Surveys. An intensive study of the factors entering into farm organization. Special emphasis on selection, assembling, validity, and analysis of data. Attention given to studies in local production areas. 3 credits. Mr. Garey.
- 221f. Farm Organization Studies. A seminar study of the principles involved in the analysis of farm organization data and the computation of farm costs. Attention will be given to methods used in collecting and compiling these data with special emphasis on farm records and accounts as a basis for farm organization study. 3 credits. Mr. Pond.

* Under this head are arranged special seminars on subjects suited to the needs of the particular groups of graduate students, or on subjects upon which members of the staff are doing work at the time.

- 223f-224w. Systems of Farming. A seminar course, including an intensive study of the factors determining the various systems of farming, and production areas, with emphasis on specific types of farming. 3 to 6 credits. Mr. Boss, Mr. Garey.
- 225w-226s. Advanced Farm Organization. Analysis of farm organization and the application of survey factors and cost factors in organizing the business of farming. 3 to 6 credits. Mr. Boss, Mr. Pond.
- 230f,w,s. Research Problems in Farm Organization and Operation. A study of methods of conducting research work and analyzing problems in farm organization and operation. Students will be assigned to individual research problems or to special phases of research work being conducted by members of the staff. Reports covering progress of work and analysis of findings required as a basis for credit. 3 to 9 credits. Mr. Boss, Mr. Pond.
- 237w. Seminar in Research Methods in Price Analysis. A survey and analysis of the various types of research projects being worked upon in the field of prices of farm products. 3 credits. Mr. Waite.
- 240s. Seminar in the Marketing of Cereals. 3 credits. Mr. Jesness.
- 241f. Seminar in the Marketing of Livestock and Livestock Products. 3 credits. Mr. Jesness, Mr. Johnson.
- 244w. Seminar in Co-operative Marketing. 3 credits. Mr. Jesness.
- 246f. Seminar in Economics of Consumption. Mr. Waite.
- 247f. Seminar in Research Methods in Marketing. 3 credits. Mr. Jesness.
- 265f. Seminar in Agricultural Taxation. 3 credits.

EDUCATION

Professors Harold Benjamin, Charles W. Boardman, Leo J. Brueckner, Harl R. Douglass, Fred Engelhardt, Albert M. Field, Melvin E. Haggerty, August C. Krey, Wylle B. McNeal, Wilford S. Miller, Wesley E. Peik, Homer J. Smith; Associate Professors Clara M. Brown, Alvin C. Eurich, Palmer O. Johnson, Dora V. Smith, Edgar B. Wesley; Assistant Professors Herbert A. Carroll, James G. Umstatted, Marvin J. Van Wagenen.

Prerequisites.—For major work at least six quarter credits in psychology and in addition to this a total of not less than 18 quarter credits of undergraduate work in education, which shall include Ed. 51, 52, 53, and Ed. Psy. 60 or equivalent. For minor work at least six quarter credits in psychology and in addition to this, a total of not less than 18 quarter credits of undergraduate work in education. Credit for seminar courses is not allowed.

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

MAJORS AND MINORS

Major and minor work for advanced degrees may be arranged from courses listed below under the following groupings:

Doctor's Degree

Major.—Majors may be designated as follows:

1. Educational administration and supervision.
2. Educational psychology.
3. Education. (Under this designation the student, with the approval of his adviser, may select a group of courses from among those listed below, excluding the field of his minor, centering about his special interest in education. The following are typical centers of interest: agricultural education, elementary education, history of education, home economics education, industrial education, techniques of instruction, secondary education, higher education.)

Minor.—Minors may be designated as follows:

1. Any other field of study offered in the University of Minnesota in which satisfactory courses of graduate character are available and which is obviously related to the major subject.
2. Students majoring in fields other than education may choose education or any of its subdivisions enumerated above as a minor when it appears that a minor is appropriately related to the major field.

Master's Degree

Major.—Majors may be chosen as follows:

1. Educational administration and supervision.
2. Educational psychology.
3. Education. (Under this designation the student, with the approval of his adviser, may select a group of courses from among those listed below, excluding the field of his minor, centering about his special interest in education. The following are typical centers of interest: agricultural education, elementary education, history of education, home economics education, industrial education, techniques of instruction, secondary education, higher education.)

Minor.—Minors may be chosen as follows:

1. Educational administration and supervision.
2. Educational psychology.
3. Education. (Under this designation the student, with the approval of his instructor, may select a group of courses from those listed, excluding the field of his major, centering about his special interest in education. Typical centers of interest are listed above under Major.)
4. Any other field of study offered at the University of Minnesota in which satisfactory courses of graduate character are available and which is obviously related to the major field.
5. Students majoring in fields other than education may choose education or any of its subdivisions enumerated above as a minor when it appears that such a minor is appropriately related to the major field.

Program of classes.—For the schedule of classes for the year, including hours and place see Combined Class Schedule Bulletin, Education section. For descriptions of prerequisite courses see the College of Education Bulletin.

GENERAL COURSES

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- Ed.104s. Adult Education. An examination of the main lines of development in the field of adult education, with special attention to principles of adult learning, methods of teaching adults, and the organization of adult education programs. 2 credits. Mr. Benjamin.
- Ed.133f. Guidance in Secondary Schools. Basic principles and current practices in educational and vocational guidance in junior and senior high schools. Application of principles through case discussions. 2 credits. Miss Edwards.
- Ed.135w. Teaching of Occupations. A course for teachers of occupations classes in secondary schools. Stresses content, sources of material, distribution of occupations, vocational trends, and evaluation of occupational studies. Prerequisite: 9 credits in education. 2 credits. Miss Edwards.
- Ed.199su. Organization and Supervision of Vocational Education. A general course to consider objectives, methods, operation, and supervision of vocational education in the public schools, with special emphasis on agricultural education. Especially for superintendents, principals, and supervisors of vocational education. Prerequisite: Ed.T.15 or equiv. 3 credits. Mr. Field.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- Ed.208w. Methods in Educational Research. A study of the methods employed in the investigation and report of educational problems. Designed to aid students in the preparation of theses. Suggested for all candidates for degrees. 2 credits. Mr. Johnson.
- Ed.228f-229w-230s. Problems of College Education. Problems of student personnel, of college curricula and instruction, of organization and administration. 6 credits. Mr. Haggerty.

ADMINISTRATION AND SUPERVISION

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- Ed.Ad.113w. High School Curriculum. A study of principles and of methods for the selection and organization of subject-matter for courses; the organization of curricula; contemporary viewpoints and curriculum issues; reorganization trends; typical research findings by subjects. Prerequisites: 10 hrs. in education including Ed. 51. 2 credits. Mr. Peik.
- Ed.Ad.115w. Organization of the Elementary School. Problems relating to the organization for instruction and classification of pupils in elemen-

- tary schools with critical examination of current practices. Prerequisite: 10 credits in education. 2 credits. Mr. Engelhardt.
- Ed.Ad.119f. The Elementary School Curriculum. A study of the principles underlying the selection and organization of subject-matter for courses in the elementary school; survey of the methods, problems, and the findings of research by subjects. Prerequisites: 9 hrs. in education. 3 credits. Mr. Peik.
- Ed.Ad.119T-120T. Elementary School Curriculum. (Same as above for teachers.) 4 credits. (Not offered in 1935-36.)
- Ed.Ad.121w. Educational Advising of Women and Girls. A course designed to acquaint students with the problems of educational advising of young women and girls, particularly those of high school age. Students admitted to the course through conference with instructor. Prerequisite: 15 cred. in education and psychology. 3 credits. Miss Blitz.
- Ed.Ad.123w. Supervision of High School Instruction. The present status of high school supervision; its proper scope and function. A course combining consideration of principles and their application to improving high school instruction in the academic and special subjects. Prerequisite: 10 hrs. in education. 3 credits. Mr. Boardman.
- Ed.Ad.124w. Public School Administration. The organization, administration, and general support of public schools in states and local school districts. Prerequisite: 10 hrs. in education. 3 credits. Mr. Engelhardt.
- Ed.Ad.125w. Techniques in Administration. Standard practices regarding child accounting problems, records and reports; procedures having to do with personnel and school board relations and rules and regulations; standard office practices, including textbook and supply management. Prerequisite: Ed.Ad.124. 3 credits. (Not offered in 1935-36.)
- Ed.Ad.126s. School Plant Management. Plant program planning and financing, including operation and maintenance of public school buildings. Prerequisite: Ed.Ad. 124. 3 credits. Mr. Englehardt.
- Ed.Ad.128w,s. Special Problems in Educational Administration. This course is designed primarily for superintendents and principals qualified to make intensive studies of specific problems related to the administration of a school system. Prerequisite: Ed.Ad. 124, 125, 126 or equiv. 1 or 2 credits. Mr. Engelhardt.
- Ed.Ad.150f.‡ Supervision and Improvement of Instruction. An analysis of the functions and duties of a supervisor as related to the improvement of instruction; specific supervisory technique; objective analysis of classroom activity; concrete applications to present-day problems; case studies. Prerequisite: Ed. 63 or equiv. 3 credits. Mr. Brueckner.
- Ed.Ad.151w.‡ Diagnosis and Remedial Instruction in the Elementary School. Objective evaluation of the results of teaching; diagnosis of pupil difficulty; remedial work; tests as aids to teaching; following up a testing program. Prerequisite: Ed.Ad. 150 or equiv. 3 credits. Mr. Brueckner.

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

- Ed.Ad.152w. Supervision—The Adjustment of Schools to Individual Differences. The adaptation of the school, the curriculum, and classroom procedures to the abilities and interests of pupils. Prerequisite: 15 hrs. in education. 2 credits. (Not offered in 1935-36.)
- Ed.Ad.153f. Supervision of English in the Elementary Schools. Improvement of instruction in language, grammar, spelling, and handwriting; the results of scientific investigation; use of standardized and informal tests; remedial work. Prerequisite: Ed. 63 or equivalent. 2 credits. Miss Smith.
- Ed.Ad.154s. Supervision of Social Sciences in the Elementary Schools. The scientific work being done on the course of study in geography, history, science, and related fields; improvement of instruction in social sciences in the elementary schools. Prerequisite: Ed. 63 or equiv. 2 credits. (Offered alternate years. Not offered in 1935-36.)
- Ed.Ad.155f. Supervision of Arithmetic in the Elementary Schools. Locating supervisory needs; enrichment of instruction; selection, organization, gradation of the curriculum; diagnostic and remedial teaching; recent trends and research. Prerequisite: Ed. 63 or equiv. 2 credits. (Not offered in 1935-36. See Ed.T. 148 and 149.)
- Ed.Ad.156.‡ Practice Supervision—Group Problems and Field Work. Instructional and supervisory problems studied with the help of direct classroom visitation in university demonstration schools and schools in the Twin Cities, followed by conferences with teachers and supplemented with research in the literature. Prerequisite: 15 hrs. in education, and permission of instructor. 3 credits. Mr. Peik, Mr. Cooper.
- Ed.Ad.157f,w,s.‡ Practice in Supervision. Individual research on special supervisory problems, especially intended for supervisors in service. Prerequisite: consent of instructor. 3 credits a quarter. Mr. Brueckner, Mr. Cooper.
- Ed.Ad.158f,w,s. Organization for Supervision. The organization and the administration of a public school system for supervision, treating specifically the delegation and co-ordination of the supervisory responsibilities of all staff members associated in these activities. (Not offered in 1935-36.)
- Ed.Ad.159w. Supervision and Teaching of Reading. The improvement of supervision and instruction in reading; by supervisors, principals, and faculties. Prerequisite: 15 hrs. in education. Mr. Peik.
- Ed.Ad.160s.‡ Supervision of Elementary Subjects. An overview course for giving supervisor and superintendent information as to recent trends in elementary education. Prerequisite: Ed.Ad. 150. 2 credits. Mr. Brueckner.
- Ed.Ad.161f. Special Problems in School Supervision. Intended primarily for graduate students majoring in supervision and others qualified to make intensive studies of specific problems related to school supervision. Prerequisite: 10 credits in education. 2 credits. Mr. Brueckner.

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

- Ed.Ad.162f. The Significance of Progressive Education. A survey of the progressive education movement and its effects on curriculum, methods, organization, and supervision. 2 credits.
- Ed.Ad.163. Recent Research in Arithmetic Instruction. A study of recent research in curriculum, gradation of subject-matter, methods, materials, and supervision of arithmetic. Prerequisite: Ed.Ad. 156 or Ed.T. 148 or 149 or equivalent. (Not offered in 1935-36.)
- Ed.Ad.164s. Recent Research in Educational Diagnosis. A study of recent research in the methods of diagnosis in education, and the techniques of preventive and remedial teaching. Prerequisite: Ed.Ad. 151 or equivalent. 2 credits. Mr. Brueckner.
- Ed.Ad.165. Recent Literature in Supervision. A study of recent research on problems of elementary school supervision. 2 credits. (Not offered in 1935-36.)
- Ed.Ad.167f. The Junior High School. Sources of the movement; purposes, functions, and limitations; types of reorganization; fundamental problems of reorganization; reorganization of subject-matter. Prerequisite: 10 hrs. in education, including Ed. 51. 2 credits. Mr. Douglass.
- Ed.Ad.169f. Extra-curricular Activities. Types of activities in junior and senior high schools; aims and values; practices in organizing, administering, and supervising; methods of evaluation. Prerequisite: 10 hrs. in education, including Ed. 51. 3 credits. Mr. Benjamin.
- Ed.Ad.172s. Curriculum and Course of Study Construction. A practicum course. A study of, and practice in, the techniques employed at elementary, secondary, and higher education levels. Class projects and individual projects according to needs, interests, level, and specialization. Thoro exploration of one field by each student. Prerequisite: 15 hrs. in education. 2 credits. Mr. Peik.
- Ed.Ad.175s. Financial Aspects of Public School Business Administration. Financial program planning, budgeting accounting, cost finding, income and expenditure control; and the preparation and analysis of financial reports. Prerequisites: Ed.Ad. 124, 125. 3 credits. Mr. Engelhardt.
- Ed.Ad.178f. School Surveys. A study of the literature and methods of school surveys, as a basis for the investigation of practical problems in school administration and supervision. 3 credits. Mr. Engelhardt.
- Ed.Ad.180f,w,s,‡ Practice in High School Administration. Practical experience in problems of administration, pupil personnel, curriculum administration, extra-curricular activities, staff problems, program and schedule making, etc. Consult instructor before registering. Prerequisite: 10 hrs. in education including Ed.Ad. 65. 2 credits a quarter. Mr. Boardman.
- Ed.Ad.184f. Supervision of Practice Teaching. A course primarily for teachers engaged in the direction of practice teachers in secondary education. 2 credits. Mr. Boardman.

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

- Ed.Ad.185f. The Professional Education of Teachers. A study of the present status and of the problems that relate to the institutional training of teachers for public schools and higher education. Prerequisite: 15 hrs. in education. 2 credits. Mr. Peik.
- Ed.Ad.186f,w,s. Individual Problems in Teacher Training. Planned for those who have a special interest in this field. An intensive study of specific problems. Consult instructor before enrolling. Prerequisite: Ed.Ad. 185 or consent of instructor. 2 credits. Mr. Peik.
- Ed.Ad.187s. Instruction and Administration in Teachers Colleges. In this course emphasis is placed on the historical development, the present status, and the prospects of future development. An intensive study is made of curricula, departmental organization, and practice teaching. Emphasis is placed also on the supervision of instruction. Prerequisite: 15 hrs. in education. 2 credits. Mr. Peik.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- Ed.Ad.206w-207s. Seminar in Educational Administration. No credit. Mr. Engelhardt.
- Ed.Ad.218f-219w-220s. Seminar in Secondary School Problems. No credit. Mr. Benjamin, Mr. Boardman, Mr. Douglass.
- Ed.Ad.225f-226w-227s. Seminar in Elementary School Problems. No credit. Mr. Brueckner, Mr. Peik.
- Ed.Ad.264f-265s. High School Administration. Organization of secondary school units; housing; selection and assigning of the staff; schedule making; public relations and publicity; organization of guidance and of extra-curricular activities; pupil, equipment, and internal fund accounting and related problems of administration; government; problems related to instruction. Prerequisite: 10 hrs. in education including Ed. 51. 2 credits a quarter. Mr. Douglass.
- Ed.Ad.270f,w,s. Special Problems in Secondary Education. Primarily for those at work in high schools who are qualified to make intensive studies. Consult instructor before registering. Prerequisite: 10 hrs. in education including Ed. 51. 2 credits. Mr. Douglass.

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

- Agr.Ed.135f. The Curriculum in Vocational Agriculture. A study of curriculum organization, determination of subject-matter, organization of subject-matter, job analysis, course construction, texts, and references. Prerequisite: Course 11. 3 credits. Mr. Field.
- Agr.Ed.141w,s. Supervised Practice in Vocational Agriculture. A special methods course dealing with the selection, planning, supervising, and summarizing of the practical work in agriculture. Special emphasis

- on the problem method of teaching and the use of the farm and community for teaching purposes. Prerequisite: Course 11. 3 credits. Mr. Field.
- Agr.Ed.144w. Course Organization and Instruction for the Individual in Vocational Agriculture. Subject-matter content for the individual should be based on farm activities. Individuals should progress according to abilities and needs. Accepting these principles, this course includes selection and organization of content, administration, and teaching technique. Prerequisite: Course 11. 2 credits. Mr. Field.
- Agr.Ed.154f,w. Rural Education and Community Leadership. The rural school as a community center, and ways and means of organizing educational and recreational activities, such as clubs, festivals, fairs, and other desirable features of rural community life. Prerequisite: Course 11. 2 credits. Mr. Field.
- Agr.Ed.161w. Vocational Education in Agriculture. A study of the principles developed and established in agricultural education. The principles developed in other vocational education and their relation to agricultural education. Prerequisites: 11, 181, 182, 183. 3 credits.
- Agr.Ed.162s. The Basis of Vocational Teaching Technique. A course which includes an analysis of the philosophical, psychological, and other bases of teaching technique from the viewpoint of the teacher of vocational agriculture. Prerequisites: Courses 11, 181, 182, 183. 3 credits.
- Agr.Ed.171f,w,s. Problems in Procedure. For agriculture teachers. Emphasizes working out problems in detail in order that the processes as formulated can be used in teaching the following year by those enrolled. Discussions, readings, papers, laboratory. Prerequisites: 42, 182, or equivalent teaching experience. 3 credits. Mr. Field.
- Agr.Ed.181f. Teaching Agriculture. Observations of class work, apprentice teaching, curriculum organization, farm practice, and the use of farm and community for teaching purposes. Prerequisite: Course 11. 5 credits. Mr. Field.
- Agr.Ed.182w. Teaching Agriculture. Special methods course dealing with conducting a high school agriculture department. Fundamentals of method of teaching as related to teaching agriculture in the high school. Organizing subject-matter. Selection and manipulation of devices. Prerequisite: same as for 181. 5 credits. Mr. Field.
- Agr.Ed.183s. Teaching Agriculture. Organization and administration of agriculture in secondary schools including all-day, part-time, and evening school instruction. Special emphasis on equipment, text and reference books, extension work, and organizations. Prerequisite: same as for 181. 5 credits. Mr. Field.
- Agr.Ed.191f-192w-193s. Seminar in Agricultural Education. Critical studies of important problems in agricultural education; opportunity for individual investigation and research; review and interpretation of current educational literature. 6 credits. Mr. Field.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- Agr.Ed.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. 1 to 2 credits per quarter. Mr. Field.
- Agr.Ed.221f-222w-223s-224su. Graduate Problems. Making investigations, gathering data, and formulating plans regarding agricultural education. 3 credits per quarter. Mr. Field.
- Agr.Ed.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. 2 credits. Mr. Field.
- Agr.Ed.242w,s. Organization and Administration of Teacher Training for Vocational Agriculture. Development of teacher training institutions, agricultural college curricula, professional needs of high school teachers, professional courses and their content, equipment, itinerant teacher training, practice teaching, teacher evaluation. 2 credits. Mr. Field.
- Agr.Ed.243su. Organization and Administration of Teacher Training for Vocational Agriculture. Same as Course 242 with the addition of concrete studies of specific institutions. Not open to students having credit for 242. 3 credits. Mr. Field.

ART EDUCATION

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- ArtEd.153s. Design for the Consumer. Problems of house planning and decoration, and furnishing. Subject-matter appropriate for art teaching in high schools and colleges. Emphasis on art principles; art history; original research problems and applications. Prerequisites: ArtEd. 1-2-3, 20, 21, 22, or 50, 51, and 7, 8, 9 and one course in Fine Arts prerequisite or parallel or permission of the instructor. Mr. Hilpert.
- ArtEd.154. Design for the Consumer. Problems of costume selection, and designing; settings and costumes in stage design. Prerequisites: same as for 153. (Not offered in 1935-36.)
- ArtEd.189. Application of Esthetic Theories in Public School Art Education. Prerequisites: 9 cred. in drawing, 9 cred. in design. 3 credits. (Not offered in 1935-36.)

EDUCATIONAL PSYCHOLOGY

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- Ed.Psy.111Tf-112Tw. Educational Measurements in the Elementary School. The typical educational problems involving educational scales and standard tests. Nature of tests, methods of use, analysis of results obtained, and programs of remedial educational procedure based on the results of the tests. For teachers. Prerequisite: Ed. 51 or equiv. 4 credits. Mr. Van Wagenen.

- Ed.Psy.111s. Educational Measurements in the Elementary School. Same as above. 3 credits. Mr. Van Wagenen.
- Ed.Psy.113f-114w-115s. Psychology of Elementary School Subjects. A discussion of the research studies in the field of the psychology of elementary school subjects. Prerequisite: 10 cred. in education and psychology. 2 credits a quarter. Mr. Van Wagenen.
- Ed.Psy.116f. Advanced Statistical Methods in Education. Prerequisite: Ed.Psy. 60 or equiv. 3 credits. Mr. Johnson.
- Ed.Psy.117w-118s. Advanced Statistical Methods in Education. A survey of statistical studies in education with special reference to the methods employed and the reliability of the results obtained. Prerequisite: Ed.Psy. 60 or equiv. 4 credits. Mr. Van Wagenen.
- Ed.Psy.133. Systematic Educational Psychology. Advanced course covering the field of psychology as related to education. Prerequisite: 15 credits in education and psychology. 4 credits. (Not offered in 1935-36.)
- Ed.Psy.134f. Mental Tests. A laboratory study of group mental tests for all school levels with special emphasis upon their reliability and validity as instruments for educational guidance. Prerequisites: Ed. 51 and 60 or equiv. 2 credits. Mr. Eurich.
- Ed.Psy.135w-136s. Problems in Mental Testing. A study of the practical problems in administration and use of group mental tests. Prerequisites: Ed. 51 and 60 or equiv. and 134. 4 credits. Mr. Eurich.
- Ed.Psy.138f-139w.† Experimental Educational Psychology. A laboratory course designed to train students in the use of experimental methods in the study of educational problems, particularly in the field of the psychology of learning. It is suggested that this course supplement either 133 or 190, 191, 192, 193-194. Prerequisite: Ed. 51 or equivalent. 4 credits.
- Ed.Psy.141. Psychology of Speech Disorders. (Not offered in 1935-36.)
- Ed.Psy.143f-144w.† Individual Mental Examination. For teachers of sub-normal children. Demonstration and practice in mental diagnosis. Careful study will be made of different groups and systems of mental tests, and other clinical methods with discussion of general theory involved. Prerequisites: Ed. 51 and 134, permission of instructor. 4 credits.
- Ed.Psy.145s. Special Problems in the Field of Individual Mental Testing. Prerequisite: Ed.Psy. 143-144. 2 credits.
- Ed.Psy.146w-147s.† Child Guidance. Specific problems in school adjustment dependent upon physical and emotional factors of the child, the home, and the environment. Presentation by clinical case records. Prerequisite: 15 credits in psychology and education. 4 credits. Mr. Chamberlain.
- Ed.Psy.149f-150w†-151s. Psychoeducational Clinic. Conducted in co-operation with existing clinics and agencies in the Twin Cities. Students will receive practice in giving psychological examinations, in case study, and in scientific interpretation of data. Prerequisites: Ed.Psy. 134, 135-136, 144 and 145 or 184, 111, permission of instructor. 2 to 6 credits. Mr. Eurich.

- Ed.Psy.153f-154w-155s. Research Problems. Intended for properly prepared students who desire to pursue special investigation in the field of educational psychology. Mr. Haggerty, Mr. Miller, Mr. Eurich, Mr. Carroll, Mr. Van Wageningen.
- Ed.Psy.157s. Psychology of Child Development. The physical, mental, social, and emotional development of children from birth to adolescence. Prerequisite: 6 credits in psychology. 2 credits. Mr. Carroll.
- Ed.Psy.158s. Psychology of Adolescence. A study of the physical and mental changes that characterize the transition from childhood to adult life. Implications for educational guidance during the period of secondary education. Prerequisite: Ed. 51 or equiv. 2 credits. Miss Edwards.
- Ed.Psy.159. Psychology of Personality. Theoretical basis. Survey of methods for the measurement and study of character and the emotions. Relation to school success and other factors in the school situation. Genetic development of personality traits in childhood and adolescence. Prerequisite: Ed.Psy. 51 or equiv. 2 credits. (Not offered in 1935-36.)
- Ed.Psy.180w. Esthetics in Education. An objective approach to the existence, causes, and methods of dealing with individual difference in esthetic abilities. Prerequisites: 15 credits in education and psychology. 2 credits. Mr. Carroll.
- Ed.Psy.181f,w,s. Practice in Personnel Work. Course designed to give properly qualified students practical experience in the use of psychological and related methods in dealing with school children. Prerequisites: satisfactory preparation in psychology and education and approval of adviser. Mr. Haggerty, Miss Edwards.
- Ed.Psy.183f. Psychology of Gifted Children. A study of the physical and mental traits of gifted children and the methods of their education. Prerequisite: Ed. 51 or equiv. 2 credits. Mr. Carroll.
- Ed.Psy.184s. Mental Deficiency. Survey of mental deficiency in children and adults. Physical traits, including study of brain defects, causes and heredity; psychology of mental deficiency; social problems of feeble-mindedness. Subjects treated with reference to the training of defectives. Prerequisite: Ed. 51 or equiv. 2 credits.
- Ed.Psy.189f. The Human Organism. The development of the human organism in relation to educational practice. Prerequisite: permission of instructor. 3 credits.
- Ed.Psy.190f. Original Nature of Man. Advanced work in genetic psychology, man's unlearned behavior, and inherited capacities. Prerequisites: Ed. 51 and 60 or equiv. and permission of instructor. 3 credits. Mr. Miller.
- Ed.Psy.191w. Individual Differences. A study of group and individual differences and their relations to educational practice. Prerequisites: Ed. 51 and 60 and permission of instructor. 3 credits. Mr. Miller.
- Ed.Psy.192s. Recent Literature in Educational Psychology. Readings and reports on problems in educational psychology. Prerequisites: Ed. 51 and 60 and permission of instructor. 3 credits. Mr. Miller.

- Ed.Psy.193w-194s. Psychology of Learning. A study of the experiments in learning in the laboratory and in the classroom. Prerequisite: 12 credits in psychology and educational psychology. 4 credits.
- Ed.Psy.193T. Psychology of Learning. Same as 193-194. For teachers and administrators. 2 credits. (Not offered in 1935-36.)
- Ed.Psy.197-198-199. Problems in Subnormality. Phases of subnormality studied intensively. Review of important literature and original investigation. Students required to make reports on assigned topics and submit a paper on some problem at the close of the quarter. 6 credits. (Not offered in 1935-36.)

COURSE PRIMARILY FOR GRADUATE STUDENTS

- Ed.Psy.201f-202w-203s. Seminar in Educational Psychology. A research course for graduate students. Required of all students writing theses in educational psychology. Does not carry credit as course work. Mr. Haggerty, Mr. Miller, Mr. Eurich, Mr. Carroll, Mr. Van Wagenen.

HISTORY AND PHILOSOPHY OF EDUCATION

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- H.Ed.101f. Historical Foundations of Modern Education. Historical analysis and interpretation of the more important elements in modern education derived from the Greeks, Romans, the Middle Ages, and the Renaissance. Prerequisite: 6 credits in psychology. 3 credits. Miss Alexander.
- H.Ed.102w. History of Modern Secondary and Higher Education. A historical study of the origin, aims, growth of existing types of European and American secondary schools. Prerequisite: 6 credits in psychology. 3 credits. Miss Alexander.
- H.Ed.103s. History of Modern Elementary Education. The institutions, theories, and problems of modern elementary education in the light of their history. Emphasis upon the rise of state systems and upon the history of modern educational reform. Not open to students who have had H.Ed. 1. Prerequisite: 6 credits in psychology. 3 credits. Miss Alexander.
- H.Ed.131w. Comparative School Systems. A survey of existing school systems in foreign countries. Prerequisite: 9 credits in education. 2 credits. Mr. Benjamin.
- H.Ed.140f-141w-142s. Problems in the History of Education. Historical investigation of educational problems. Prerequisite: permission of instructor. Mr. Krey, Mr. Wesley.
- H.Ed.187f-188w-189s. Special Problems in Educational Sociology. The sociological foundations of educational theory. Lectures, readings, and problems. Prerequisite: permission of instructor. 2 credits a quarter. (Not offered in 1935-36.)

HOME ECONOMICS EDUCATION

See Home Economics, p. 99.

INDUSTRIAL EDUCATION

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- Ind.101w. Tests in Industrial Subjects. Acquaintance with such available tests of aptitude and achievement as are useful in industrial education; application of known techniques in remedial teaching to the work of shop and drawing teachers. Critical evaluation and planning. Prerequisite: Ed. 51. 2 credits. Mr. Smith.
- Ind.103. Instructional Aids. Prerequisite: Ind. 40. 2 credits. (Not offered in 1935-36.)
- Ind.105. Industrial Education. For superintendents, principals, and teachers not specializing in the field named; general and vocational phases considered; objectives, administration and supervision; programs and practices; laws, rulings, and standards for aid; significant literature; how to judge teachers, courses, and methods in the special field. 3 credits. (Not offered in 1935-36.)
- Ind.110w. Guidance in the Schools. The history of the educational and vocational guidance movement; typical public school means and methods; collection and use of occupational information; duties of the counsellor; organization and relationships. Prerequisite: Ed. 51. 2 credits. Mr. Smith.
- Ind.150f-151w-152s. Problems in Vocational Education. Survey of printed reports and theses; critical analysis; selection of thesis problems; formulation of work plans; reports of progress; organization and presentation. Full year assumed. Graduates only. 6 credits. Mr. Smith.
- Ind.170f. Day Industrial Schools. National, state, and local organization and types; buildings and equipment; promotion and advertising; cooperative relationships; teaching staff; pupil guidance, training, and placement. Prerequisite: Ind. 60, 61. 2 credits. Mr. Craigo.
- Ind.171w. Evening Industrial Schools. Development of the after-training of adults; agencies and scope of the movement; national and state legislation; qualifications of instructors; problems and difficulties; records and certification, fees and charges; buildings, equipment, and instruction facilities. Prerequisite: Ind. 170. 2 credits. Mr. Bass.
- Ind.172s. Part Time Education. A study of the new movement for part time education; social and economic background; organization of classes, study of special student groups, courses of study; typical schools; comparative state legislation and plans. Prerequisites: Ind. 170, 171. 2 credits. Mr. Smith.

PUBLIC SCHOOL MUSIC

- Mu.Ed.101s. Tests and Measurements in Music. Evaluation and application of the various ability and achievement tests in music with methods of use, analysis, and prognosis. A survey and evaluation of studies in the field of music testing. Prerequisite: permission of instructor. 2 credits. Mr. Jones.

THEORY AND PRACTICE OF TEACHING
COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

NOTE.—The following courses listed under Educational Administration and Supervision emphasize to a large extent the theory and practice of teaching and may be used for that purpose; Ed.Ad. 153, 154, 155, and 159.

- Ed.T.110s. Measurement in Secondary Education. The application of educational measurements to the solution of the problems of high school instruction. Analysis of the specific learning processes involved in the various high school subjects; a critical survey of the means of diagnosing and alleviating high school pupils' learning difficulties; the use of educational measurements in improving high school teaching. Prerequisite: Ed.Psy. 51. 2 credits. Mr. Carroll.
- Ed.T.122s. Literature for Adolescents. A background for pupil guidance in extensive reading in junior and senior high schools; analysis of studies of adolescent choices in literature; principles of selection; critical reading in broad field of literary, biographical, historical, scientific, and vocational interests of boys and girls. Prerequisite: Ed. 53 or jr.-sr. high school teaching experience. 2 credits. Miss Smith.
- Ed.T.143-144.‡‡ The Teaching of Reading. A study of the objectives, the materials, and teaching procedures in lower, intermediate, and upper grades in the light of the contributions of research; survey of current practices and curricula; class and individual projects; observation of reading techniques and materials in the demonstration school. Prerequisites: 9 hrs. in education including Ed.Psy. 51. 4 credits. Mr. Carroll. (Not offered in 1935-36. See Ed.Ad. 159.)
- Ed.T.164f-165w-166s.§‡ Clinical Methods and Practice in Speech Pathology. Prerequisite: Ed.Psy. 143-144, Speech 1, 2, 3, 61, 67, 162, and permission of instructor. 9 credits. Mr. Bryngelson.
- Ed.T.181w.‡ Foundations of Elementary School Methods. A survey of the current philosophy and research which form the bases for improvement of elementary school instruction. Observation in the demonstration school. Prerequisite: 9 credits in education. 3 credits. Mr. Peik.
- Ed.T.181T-182T.‡ Foundations of Elementary School Methods. (Same as Ed.T. 181 above for teachers.) 3 credits. (Not offered in 1935-36.)
- Ed.T.188s.‡ Advanced Course in Methods of Teaching Modern Languages. An advanced course of the seminar type in methods of teaching modern foreign languages. Designed primarily for experienced teachers and graduate students. Lectures, readings, discussion. Prerequisite: Ed.T. 76-77-78 or equiv. 2 credits. Mrs. Sundeen.
- Ed.T.191s.‡ Advanced Course in the Teaching and Supervision of Secondary School Mathematics. Evaluation of present practices in methods and content of junior and senior high school mathematics. Prerequisite: 53 or permission of instructor. 2 credits. Mr. Kinney.

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

§ Passing the qualifying examination is prerequisite to this course.

- Ed.T.193s. Foundations of Secondary School Methods. A study of the investigations which form the bases of the technique of high school instruction and the application of their results to subject-matter and to classroom procedure. Each member will work primarily in the field of his teaching choice, with a final synthesis by the class as a whole. Prerequisite: Ed. 53. 3 credits. Mr. Johnson.
- Ed.T.194f.‡ Advanced Course in Methods of Teaching English. Evaluation of present practices in methods and content of junior and senior high school English courses in the light of the known results of scientific investigations in that field. Prerequisite: Ed.T. 52-53-54 or equiv. 2 credits. Miss Smith.
- Ed.T.196w-197s.‡ Special Problems in Techniques of Secondary School Instruction. Opportunity is given in this course to work upon special research problems in the field of the student's individual choice under personal guidance of instructors in the given field. Individual conferences will replace class meetings throughout the course. Prerequisites: Ed. 53, Ed.Psy. 60 or equiv. 2 credits a quarter. Mr. Johnson, Miss Smith, Mr. Wesley, Mr. Kinney.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- Ed.T.201f-202w-203s.‡ Advanced Course in Methods of Teaching History and Social Studies. Consent of the instructor is necessary. 2 credits per quarter. Mr. Krey, Mr. Wesley.
- Ed.T.222f-223w-224s. Seminar in the Technique of High School Instruction. No credit. Required of students working on theses. Mr. Benjamin, Mr. Johnson, Miss Smith, Mr. Wesley, Mr. Umstatt.
- See also Ed.T. 228-229-230 under General Courses, page 62.

For graduate courses in the theory and practice of teaching in special subjects see the respective departmental course descriptions.

ELECTRICAL ENGINEERING

Professors John M. Bryant, William T. Ryan; Associate Professors Henry E. Hartig, Elmer W. Johnson, John H. Kuhlmann, James S. Webb; Assistant Professor Milo E. Todd.

Prerequisites.—For major work, E.E. 121 to 126 or their equivalent; for minor work, 6 credits in physics, integral calculus, and one of the following: E.E. 38, 45, 48, or 125.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 111f-113w-115s. Junior Electrical Engineering. Prerequisites: Courses 11, 13, 15. 5 credits per quarter. Mr. Johnson, Mr. Caverley, Mr. Todd.
- 112f-114w-116s. Junior Electrical Engineering Laboratory. Experimental study of alternating current circuits and machinery. To be taken with Course 111-113-115. 2 credits per quarter.

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

- 121f-123w-125s. Senior Electrical Engineering. Theory of alternating and direct current machinery. Prerequisites: Courses 115, 116. 3 credits per quarter. Mr. Bryant, Mr. Johnson, Mr. Caverley.
- 122f-124w-126s. Senior Electrical Engineering Laboratory. Operating characteristics of alternating and direct current machinery. To be taken with Course 121-123-125. 2 credits per quarter.
- 127f-128w-129s. Transient Electrical Phenomena. Mathematical study of electric circuits during sudden changes of conditions. Classical and operational methods of analysis applied to electric circuits and machines, and use of the oscillograph in the analysis of these problems. Prerequisites: Courses 121, 123, 125, or reg. in 121, 123, 125. 3 credits per quarter. Mr. Bryant, Mr. Johnson.
- 132f-134w-136s. Electrical Design. The design of direct current generators and motors, alternating current transformers, generators and synchronous motors. Prerequisite: for 132, Course 115; for 134 and 136, Course 121. 2 credits per quarter. Mr. Kuhlmann.
- 138f-139w-140s. Slow Transients. Short-circuit currents in power networks, unbalanced loads in polyphase circuits, transformers and motors, harmonics, stability of power systems under steady state conditions. Application of relay, oil circuit breakers, and lightning arresters to power systems for protection of apparatus and service. Prerequisite: registration in Courses 121, 123, or 125. 3 credits per quarter. Mr. Bryant, Mr. Johnson, Mr. Caverley.
- 156s. Vacuum Tube and Control Devices. Two, three, four, and five electrode vacuum tubes. Thyration, kenotron, grid glow, photo-electric tubes, etc. Theoretical study of apparatus and circuits with demonstrations. 2 credits. Mr. Hartig, Mr. Webb.
- 173f-174w-175s. High Voltage Engineering. Study of insulation and generating equipment for high voltage; measurements of electrical quantities at high voltage; surges, and surge proof equipment. Prerequisite: senior or graduate standing. 2 or 3 credits.
- 183f-184w-185s. Special Electrical Laboratory. Efficiency tests and special problems. Prerequisite: Course 116. Credits arranged.
- 191f-192w-193s. Seminar. Weekly discussion of current electrical periodicals. Prerequisite: Course 111. 1 or 2 credits per quarter.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 211f-212w-213s. Advanced Circuit Analysis. Circuit analysis using Heaviside's *Operational Calculus*. Prerequisite: M.&M. 151. 2 credits per quarter. Mr. Hartig.
- 227f-228w-229s. Transients in Electrical Machinery and Transmission Lines. Theoretical and laboratory study of transients in electric power machinery and of lightning surges and lightning protection. Prerequisites: Courses 127, 128, 129. 3 credits per quarter. Mr. Bryant.
- 232f-234w-236s. Electrical Design. Special problems. Prerequisites: Courses 132, 134, 136. Credits as arranged. Mr. Kuhlmann.
- 275f-276w-277s. Electrical Engineering Research. Investigation of special problems in laboratory or library. Prerequisite: graduate standing.

- 2 to 6 credits per quarter. Mr. Bryant, Mr. Ryan, Mr. Hartig, Mr. Kuhlmann, Mr. Johnson, Mr. Webb, Mr. Caverley, Mr. Todd.
- 284f-285w-286s. Precise Electrical Engineering Measurements. Measurements of resistance, voltage, current, self-induction, and capacity; standardization of measuring instruments. Prerequisite: Course 122. 2 credits per quarter. Mr. Todd.
- 291f-292w-293s. Graduate Seminar. Discussions of problems and results of research work. Prerequisite: Course 126. 1 credit per quarter.

ELECTRIC POWER

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 141f. Central Stations. Electric power generating stations and distributing systems. Load diagrams. Selection of prime movers and units. Cost of electrical energy. Methods of charging. Maintenance of plants. Prerequisite: registration in Course 121. 3 credits. Mr. Ryan.
- 142w. Electrical Transmission. Consideration involved in the designing and building of transmission lines. Kelvin's law and its limitations. Transmission line as a mechanical structure. Lightning arresters. Prerequisite: registration in Course 123. 3 credits. Mr. Ryan.
- 144w. Railway Electrical Engineering. Principles of mechanics applied to electric train movement. Prerequisite: Course 42, 45, 48, or 115. 2 credits. Mr. Johnson.
- 145s. Steam Railroad Electrification. Reasons of electrification. Study of European and American systems. Results of electrification. Prerequisite: Course 144. 2 credits. Mr. Johnson.
- 151f. Illuminating Engineering. Nature of light. Laws of vision, principles of illumination, photometry, sources of light, and their characteristics. Lighting equipment. Illumination requirements and calculation for various fields of use. Prerequisite: Physics 43. 2 credits. Mr. Johnson.
- 152f. Photometric Laboratory. Photometer practice. Distribution curves of lamps and reflectors. Measurement of lighting installations. To be taken with Course 151. 1 credit. Mr. Johnson.
- 153w-154s. Illumination Problems. Illumination design and specifications applied to problems in street, residence, industrial, commercial, and other kinds of lighting. Prerequisite: Course 151. 2 credits per quarter. Mr. Johnson.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 237s. Power Transmission Line Design. Preparation of detailed plans and specifications for the construction of high voltage transmission lines and distributing systems. Prerequisites: Courses 134, 142. 3 credits. Mr. Ryan.
- 251w-253s. Illuminating Engineering. Lectures and laboratory work. Methods of determining location, kind, and quality of lights for obtaining desired illumination. Prerequisite: Course 151. 2 credits per quarter. Mr. Johnson.

ELECTRIC COMMUNICATION

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 161f-162w-163s. Radio Communication. Theoretical and laboratory study of radio transmitting and receiving circuits and apparatus. Amplifiers, detectors, oscillators. Electromagnetic waves in free space and on antenna systems. Prerequisite: registration in Courses 121, 123, 125. 3 credits per quarter. Mr. Webb.
- 164f-165w-166s. Electric Communication. Telephone circuits at audio and carrier frequencies. Theoretical and laboratory study of circuits having distributed constants. Use of hyperbolic functions. Wave filters, balancing networks, equalizers, repeaters. Prerequisite: Course 66. 3 credits per quarter. Mr. Hartig.
- 181s. Communication Frequency Measurements. Vector treatment of networks. Bridge circuits for measuring of resistance, inductance, and capacity at audio and carrier frequencies. Prerequisite: Course 126. 2 credits. Mr. Hartig.
- 187f-188w-189s. Special Communication Laboratory. Special problems in electrical communication. Open by permission to qualified students. Includes weekly seminar meeting. 1 to 2 credits per quarter. Mr. Hartig.
- 194f-195w-196s. Vacuum Tube Applications. A study of commercial thermionic vacuum, vapor, and gas discharge tubes including an extensive survey and detailed study of their scientific and industrial applications. Registration open to graduates and seniors in electrical engineering by permission. 3 credits per quarter. Mr. Hartig.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 215f-216w-217s. Electronics. Theoretical and laboratory study of the following subjects with aspects of their engineering applications. Electron emission from hot bodies, Richardson's equation, Langmuir-Childs equation, secondary electron emission, ionization and resonance potentials, external and internal photoelectric effect, positive ion emission, shot effect, discharge of electricity through gases, "getter" action, Barkhausen-Kurtz effect, ionization due to radioactivities, etc., Heaviside layer as a reflecting and refracting medium, long period echo effect, electron waves, vacuum gauges, vacuum technique, etc. Registration by permission of instructor. 2 credits per quarter. Mr. Webb.
- 261f-263w-265s. Advanced Radio Communication. Theoretical study of the transmission of electromagnetic waves. Design and testing of radio transmitting and receiving apparatus. Theory of electron tubes and their use in radio circuits. High frequency measurements. Taken with Course 262-264-266. 2 credits per quarter; registration by permission. Mr. Webb.
- 262f-264w-266s. Advanced Radio Laboratory. Special problems in radio laboratory and station, usually taken in connection with Course 261-

- 263-265. For students specializing in electrical communication. 1 or more credits per quarter; registration by permission. Mr. Webb.
- 267f-268w-269s. Telephone Transmission. Advanced transmission theory at communication frequencies. Class and laboratory. 2 or 3 credits; registration by permission. Mr. Hartig.
- 270f. Radio Transmission. Design and operation of modern transmitting equipment, with special emphasis on broadcast transmission. Permission of instructor. 2 credits. Mr. Webb.
- 271w. Radio Receiver Design. Detailed study of the problems arising in broadcast receiver design. Permission of instructor. 2 credits. Mr. Webb.
- 272f-273w-274s. Electromechanical Vibrating Systems and Engineering Acoustics. Theoretical discussion of the production of sound by electrically driven vibrating systems, sound transmission, reflection, absorption. Laboratory study of vibrating systems, pipes, horns, absorbing materials, sound pressure, articulation, reverberation, resonance, sound filters. Prerequisite: M.&M. 151. 2 credits. Mr. Hartig.
- 281w-282s. Advanced High Frequency Measurements. Vector treatment of circuit networks. Bridge circuits for the measurement of resistance, inductance, and capacity at audio and radio frequencies. Prerequisite: Course 126. 2 credits per quarter. Mr. Webb.
- 287f-288w-289s. Advanced Communication Laboratory and Seminar. Special problems in communication. Study and discussion of current articles on communication. 2 or 3 credits; registration by permission. Mr. Hartig.

ENGINEERING

Professors John M. Bryant, William T. Ryan.

See also Aeronautical, Agricultural, Chemical, Civil, Electrical, Mechanical, and Mining and Petroleum Engineering, and Architecture.

GENERAL

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- G.E.111s. Valuation of Public Utility Properties. Factors affecting value, depreciation, taxation, and regulation of public utility properties. Elements of engineering economics; cost analysis, economic investigations, rate making. 3 credits. Mr. Ryan.
- G.E.112f-113w-114s. Rates for Public Utility Properties. Determination of the rate base and depreciation amount for transportation, gas, water, electric power and telephone utilities operating expenses, the rate structure for particular utilities, service and discrimination. Open only to senior and graduate students in engineering and to properly qualified students in economics and business administration. 3 credits per quarter. Mr. Bryant.

ENGLISH

Professors Cecil A. Moore,* Joseph W. Beach, J. Douglas Bush, Martin B. Ruud, Elmer E. Stoll, Joseph M. Thomas; Associate Professor G. Tremaine McDowell;* Assistant Professors Muriel B. Carr, William P. Dunn, James T. Hillhouse, Elizabeth Jackson,§ Charles W. Nichols, Anna H. Phelan.

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

Before the acceptance of his subject for a thesis, a candidate for the degree of M.A. or Ph.D. must have given evidence to the department that he speaks and writes English with propriety.

REQUIREMENTS FOR THE DEGREE OF MASTER OF ARTS

1. *Prerequisite*.—(1) For major work, not less than 27 credits hours in English literature, 12 of which must be of Senior College grade, including satisfactory courses in Chaucer and Shakespeare; for minor work, not less than 27 credit hours in English literature, including courses in Shakespeare. (2) Unless special exception is made upon petition to the department, the candidate is required to have a reading knowledge of one of the following languages: French, German, Latin, Greek.

2. The minimum requirement of 18 credits in the major is interpreted to mean 18 credits in subjects listed below as "Courses in English." If the candidate has not previously had an elementary course in Old English, this subject must be included in his program of graduate study.

3. Before taking the oral examination, the candidate is given a written examination on the history of English literature.

In addition to the option of electing work in some other related field for a minor for the Master's degree, the candidate may select courses from one of the following groups as a minor:

a. *Philology*, including English 100 (Old English), 102 (Old English Poetry), 103 (Beowulf), 141-142-143 (Historical Grammar), 160 (History of the English Language), 165 (Historical Study of Modern English), and any other philological courses in other language departments which may be approved by the Department of English.

b. *Comparative Literature*, including Dante in English, Arthurian Romances, Metrical Romances, Pre-Elizabethan Drama, Medieval Drama (seminar), Modern Drama, and courses in foreign literature in other departments.

c. *American Literature*, including all graduate courses in that subject.

REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

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

* Absent on leave.

§ Exchange professor at University of Hawaii for year 1935-36.

date may select as his major subject either the Early English or the Modern English period.

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

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

4. The candidate is required to have a reading knowledge of *two* of the following foreign languages: French, German, Latin, Greek.

5. 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.

6. Candidates who have not already taken the comprehensive written examination given to M.A. candidates must take it before coming up for the preliminary oral examination.

COURSES IN ENGLISH

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 100f. Old English. Old English prose and poetry. The relation to modern English is particularly emphasized. Prerequisite: 6 credits above 50. 4 credits. Mr. Ruud.
- 101f. Middle English. An outline of Middle English grammar, including the interpretation of selected texts. Prerequisites: Courses 75 and 100. 2 credits. Mr. Ruud. (Not offered in 1935-36.)
- 102w. Old English Poetry. Critical reading of poems. Prerequisites: Course 100 and 2 additional credits above 50. 3 credits. Mr. Ruud.
- 103s. Beowulf. An introduction to the Old English poem, with reading of considerable portion of the text. Prerequisite: Course 100. 3 credits. Mr. Ruud.
- 105w-106s.† Eighteenth-Century Poetry. From Pope to Burns, with special reference to the rise and growth of romanticism. Prerequisite: 6 credits above 50. 6 credits. Mr. Hillhouse.
- 107w-108s.† Eighteenth-Century Prose. Special study of fiction and the essay. Prerequisite: 6 credits above 50. 6 credits. Mr. Moore. (Not offered in 1935-36.)
- 109f-110w.† The Romantic Poets of the Nineteenth Century. From Wordsworth to Keats. Prerequisite: 6 credits above 50. 6 credits. Mr. Beach.
- 111f-112w.† Seventeenth-Century Prose. General survey of the prose of the century to 1660. Prerequisite: 6 credits above 50. 6 credits. Mr. Bush.
- 123f-124w-125s.† The Technique of the Novel. Special studies in novels of the late nineteenth and twentieth centuries, with particular regard to structure. Prerequisite: 6 credits above 50 and permission of the instructor. 9 credits. Mr. Beach.

- 126w-127s. Drama, 1660-1880. Prerequisite: 6 credits above 50. 6 credits. Mr. Hillhouse, Mr. Nichols.
- 129s. Modern Drama. Contemporary drama from 1870 to the present. Prerequisite: 6 credits above 50, including Course 55-56. 4 credits. Mr. Stoll.
- 133f. Ballads. A study of a large number of traditional ballads, English and foreign, and of ballad style and origins. Prerequisite: 6 credits above 50. 3 credits. Mr. Ruud.
- 135w. Spenser. A study of his poems. Prerequisite: 6 credits above 50. 3 credits. Mr. Stoll.
- 136s. Advanced Shakespeare. Shakespeare's development traced to the end. A careful analysis of four plays. Problems in the interpretation of Shakespeare's dramatic methods. Prerequisite: 6 credits above 50, including Course 55-56. 4 credits. Mr. Stoll.
- 140s. Advanced Chaucer. The more important poems (except those read in Course 75). The treatment will be primarily literary and historical, linguistic proficiency being presumed. Prerequisite: 6 credits above 50, including Course 75. 4 credits. Mr. Ruud.
- 141-142-143. Historical Grammar of the English Language. This course is identical with Comparative Philology 141-142-143. Prerequisite: 6 credits above 50, including Course 75 or 81-82. 6 credits. (Not offered in 1935-36.)
- 146f-147w. The Metrical Romances. The more important Middle English romances of the non-Arthurian cycles. Prerequisites: 6 credits above 50, including Course 75 or 81-82. 6 credits. Miss Carr. (Not offered in 1935-36.)
- 148f-149w. Arthurian Romances. An introduction to the great stories of love and chivalry connected with King Arthur and the Round Table. Prerequisite: 6 credits above 50, including Course 75 or 81-82. 6 credits. Miss Carr.
150. Victorian Poetry. The poetry of the Victorian era, aside from Browning's and Tennyson's. The principal names are: Matthew Arnold, the Rossettis, Fitzgerald, Morris, Swinburne, and Meredith. Prerequisite: 6 credits above 50. 4 credits. Mr. Stoll. (Not offered in 1935-36.)
- 151s. Recent Poetry. Poetry in England and America since the death of Queen Victoria. The main tradition and tendencies now prevailing. Prerequisite: 6 credits above 50. 4 credits. Mr. Beach.
- 152f. Pre-Elizabethan Drama. The late medieval and the Renaissance drama, moralities, interludes, and farces up through the earlier years of the Elizabethan period. Prerequisite: 6 credits above 50, including Course 55-56. 3 credits. Mr. Bush. (Not offered in 1935-36.)
- 153f. Seventeenth-Century Lyrists. Prerequisite: 6 credits above 50. 4 credits. Mr. Moore. (Not offered in 1935-36.)
- 154w-155s. The American Novel. The history of the American novel from the beginning to the present. Prerequisite: Course 73-74. 6 credits. Mr. McDowell. (Not offered in 1935-36.)

- 156f. *The American Drama*. Survey of American drama in the eighteenth and nineteenth centuries. Prerequisite: 6 credits above 50, including Course 73-74. 3 credits. Mr. Nichols. (Not offered in 1935-36.)
- 157-158. *Elizabethan Non-Dramatic Literature*. A survey of prose and poetry, 1558-1603. Prerequisite: 6 credits above 50, including Course 51 or 70 or 55-56 or 170. 6 credits. Mr. Bush. (Not offered in 1935-36.)
- 159s. *Colonial Literature in America*. Covers the period from 1608 to 1783. Prerequisite: 6 credits above 50, including Course 73-74. 3 credits. Mr. Nichols.
160. *History of the English Language*. Prerequisite: Course 100. 2 credits. (Not offered in 1935-36.)
- 162f. *Restoration Literature*. Prerequisite: 6 credits above 50. 4 credits. Mr. Moore. (Not offered in 1935-36.)
- 164s. *Dante in English*. See Italian 164s. 3 credits.
- 165w. *The Historical Study of Modern English*. Prerequisite: 6 credits above 50. 3 credits. Mr. Ruud.
- 168s. *English Literary Criticism*. A historical sketch, with special reference to Aristotle, Sir Philip Sidney, Dryden, Dr. Johnson, Coleridge, Arnold, T. S. Eliot. Prerequisite: 6 credits above 50. 3 credits. Mr. Bush.
- 169f. *Browning and Tennyson*. Most of the time will be spent on Browning. Prerequisite: 6 credits above 50. 4 credits. Mr. Stoll.
- 170w. *Elizabethan Drama*. Elizabethan dramatic art aside from Shakespeare's. Special attention to the art of the chief writers—Marlowe, Jonson, Beaumont and Fletcher, Webster, and Massinger. Prerequisite: 6 credits above 50 including Course 55-56. 4 credits. Mr. Stoll.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 217f-218w-219s. *Restoration Drama*. Nine credits. Mr. Stoll. (Not offered in 1935-36.)
- 220f-221w-222s. *Medieval Drama*. A study of the beginnings of the modern drama in the liturgy of the church and its development to the great vernacular cycles. 9 credits. Mr. Ruud.
- 225-226-227. *Elizabethan Drama*. Elizabethan and Jacobean dramatists, from Lyly to Shirley. Problems assigned may involve Shakespeare, and in general his contemporaries will be studied less for their own sakes than for the light they shed upon him. 9 credits. Mr. Stoll. (Not offered in 1935-36.)
- 228f-229w-230s. *Eighteenth-Century Novel*. The rise and development of the novel as a form of literature; the use made of the novel as a medium of religious, social, and political theory. 9 credits. Mr. Moore. (Not offered in 1935-36.)
- 231f-232w-233s. *Shakespeare's Tragic and Comic Art*. 9 credits. Mr. Stoll.
- 234f-235w-236s. *Middle English Alliterative Poetry*. A literary and linguistic study of selected Middle English alliterative poems. 9 credits. Mr. Ruud. (Not offered in 1935-36.)

- 237f-238w-239s. Chaucer. A study of some of the important problems in the Chaucer canon and in the works of Chaucer. 9 credits. Mr. Ruud. (Not offered in 1935-36.)
- 240f-241w-242s. *The Canterbury Tales*. 9 credits. Mr. Ruud. (Not offered in 1935-36.)
- 243f-244w-245s. Non-Dramatic Literature of the Sixteenth Century. The Renaissance in England; prose and poetry, with special attention to Spenser and his contemporaries. 9 credits. Mr. Bush. (Not offered in 1935-36.)
- 246f-247w-248s. American Literature from 1783 to 1832. 9 credits. (Not offered in 1935-36.)
- 250f-251w-252s. Classical Backgrounds of Nineteenth-Century Literature. Classical influences upon poetry from Wordsworth to the present: the prose of Landor, Arnold, and others. 9 credits. Mr. Bush.
- 253f-254w-255s. Studies in Hawthorne, Poe, and Emerson. 9 credits. Mr. McDowell. (Not offered in 1935-36.)
- 256f-257w-258s. Spenser and Milton. Reading of the poetry in full and a good deal of Milton's prose. The two poets will be studied as the great English exponents of Renaissance ideas and ideals. 9 credits. Mr. Bush. (Not offered in 1935-36.)
- 259f-260w-261s. The Victorian Period of the English Novel. The Gothic romances and the Revolutionary novel, the realistic novel of national manners, and Jane Austen. Sir Walter Scott and the more important later romancers. (Not offered in 1935-36.)

ENTOMOLOGY AND ECONOMIC ZOOLOGY

Professors William A. Riley, Arthur G. Ruggles, Maurice C. Tanquary; Associate Professors Alexander A. Granovsky, Julian G. Leach, Clarence E. Mickel; Assistant Professors Samuel Eddy, Harold H. Shepard.

Prerequisites.—Eighteen credits in zoology and entomology.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 117f-118w-119s. General Ecology. General animal ecology. Frequent field trips. Lectures, laboratory, and field work. Mr. Eddy.
- 120s. General Ecology of Insects. General ecology with special emphasis on its application in insect control. 3 credits. Mr. Hodson.
- 124su. Advanced Ecology. Similar to Course 120 with special field work. 3 or more credits. Mr. Hodson.
- 125f-126w-127s. Advanced General Entomology. Morphology and classification of insects with lectures on the history of entomology. Lectures and laboratory. 9 credits. Mr. Mickel.
- 139f-140w. Histology and Development of Insects. Lectures and laboratory work on the histology, embryonic and postembryonic development of insects. Individual work along these lines is available to properly qualified students under Course 197. 6 credits. Mr. Riley.

- 141f-142w. Insects in Relation to Plant Diseases. A study of the principal insect vectors and their habits; types of insect injuries affecting health of plants; modes of insect transmission and dissemination of plant diseases; the methods of rearing and handling the carriers. Of interest to students in entomology, plant pathology, horticulture, forestry, and agronomy. Prerequisites: entomology or plant pathology. 8 credits or consent of instructors. 6 credits. Mr. Granovsky, Mr. Leach.
- 144w-145s-146s. Animal Parasites and Parasitism. Lectures and laboratory work. Second term devoted primarily to the relation of insects to diseases of man and animals. 9 credits. Mr. Riley.
160. General Forest Entomology. Lectures, laboratory, and library work treating of the life history, habits, and ecological relationships of insects that affect trees and forest products. (Not offered in 1935-36.)
- 175f. Insecticides and Their Action. Special studies of insecticides. Lectures and laboratory. 4 credits. Mr. Shepard.
- 176w-177s. Advanced Economic Entomology. A study of the principles of insect control and the history of economic entomology. Lectures. 3 credits per quarter. Mr. Ruggles.
- 197f,w,s,su. Introduction to Research. Preparation for investigational work in lines of entomology, parasitology, insect and plant diseases, or economic zoology. Summer work should be planned when possible. Mr. Granovsky, ecology; Mr. Riley, parasitology, insect morphology; Mr. Ruggles, general economic entomology; Mr. Tanquary, apiculture; Mr. King, economic vertebrate zoology; Mr. Mickel, systematic entomology; Mr. Shepard, insecticides.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 201-204. Research in Entomology. Mr. Riley, Mr. Granovsky, Mr. Mickel.
- 205-208. Research in Economic Entomology. Mr. Ruggles.
- 209-212. Research in Economic Vertebrate Zoology. Mr. King.
- 261-264. Research in Parasitology and Medical Entomology. Mr. Riley.
- 265-268. Research in Insecticides. Mr. Shepard.
- 269-272. Research in Apiculture. Mr. Tanquary.

FARM MANAGEMENT AND AGRICULTURAL ECONOMICS

For courses and staff see Agricultural Economics, page 58.

FINE ARTS

Assistant Professor David M. Robb.

- 201f-202w-203s. A limited number of graduate students will be accepted for advanced study and reading under personal guidance. This work will be concerned with the history of art during historical periods, in various countries including the United States and with the genesis and development of art types, tendencies, and schools in architecture and the fine arts. Prerequisites: 18 quarter credits in Senior College in history of art or permission of the instructor. 3 credits per quarter. Mr. Robb.

FORESTRY

Professors Henry Schmitz, John H. Allison, Edward G. Cheyney, Raphael Zon; Assistant Professors Randolph M. Brown, Louis W. Rees.

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

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

The choice in subject must be made by the candidate and approved by the chief of the division and the 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. 3 credits. Mr. Rees.
- 111f-112w. Advanced Forest Mensuration. Continuation of Course 111 with special emphasis on the application of alinement charts and correlation in forest mensuration. Consent of instructor necessary. Mr. Brown.
- 113f. Wood Pulps and Papers. A detailed study of production of wood pulp and paper products. Lectures, reading, reports. Prerequisites: Course 33-34, Chem. 3 or 10. 3 credits. Mr. Allison.
- 114f-115w. Mechanical and Physical Properties of Wood. Derivation and application of the formulas used in determining stresses in wood. Laboratory methods in timber physics. Lectures, reading, laboratory, and reports. Prerequisite: Course 33-34. 6 credits. Mr. Rees.
- 116s. Mechanical and Physical Properties of Wood. Study of the physical properties of wood. Shrinkage, relation of strength to moisture content, etc., and their bearing on wood utilization. Laboratory, reading, and reports. Prerequisite: Course 33-34. 3 credits. Mr. Rees.
- 119w. Advanced Wood Structure I. The microtechnique of woody tissues. Lectures, reading, and laboratory work. Prerequisite: Course 33-34. 3 credits. Mr. Rees.
- 120s. Advanced Wood Structure II. Advanced study of the anatomy of woody plants. Reading, laboratory, and reports. Prerequisite: Course 33-34. 3 credits. Mr. Rees.
- 125s. Wood Preservation. Lectures and collateral reading upon the history, development, and methods of wood preservation. Different systems now in use and preservatives used. 3 credits. Mr. Schmitz.
- 126f. Silvics. The fundamentals forming the basis of silviculture with special attention to the silvics of the important tree species. Lectures, readings, and required papers. 3 credits. Mr. Cheyney.
- 127w. Silviculture. A study of the general principles underlying the art of silviculture, and a brief study of the European methods as applied to American conditions. 3 credits. Mr. Cheyney.

- 128s. Silvicultural Laboratory. Nursery practice and field planting. Field investigations and planting plans. Seed collecting, extracting, and storing. Dairy nursery and field work. Cloquet Forest Experiment Station. Mr. Cheyney.
- 129f. American Silvicultural Practice. A study of the silvicultural methods now being employed in the United States and the probable results of the application of other European methods. Lectures, references, and discussion. 3 credits. Mr. Cheyney.
- 130f. Forest Valuation. The business of forest management. A study of the different factors entering into the valuation of forest property. 5 credits. Mr. Allison.
- 131w. Forest Policy and Administration. The policy of the United States and the states toward the utilization of the public forest resources. Policy of other owners toward forest resources controlled by them. Administration of the national and state forests. 5 credits. Mr. Allison.
- 132s. Forest Regulation Laboratory. Field work. The collection of the data necessary to work up a forest working plan. Includes the making of the timber estimates, growth studies, and maps, necessary to a forest working plan. Cloquet Forest Experiment Station. 6 credits. Mr. Allison.
- 136f. Forest Economics. The place of the forest in the productive utilization of land; past and present markets and source of supply of timber and timber products, particularly with reference to the present situation in North America. 3 credits. Mr. Allison.
- 137w. Seeding and Planting. A study of the principles of seeding and planting and the various methods of nursery practice in the different regions of the United States. 3 credits. Mr. Cheyney.
- 140f. Forest Working Plans. A study of methods of regulating and allotting the cut from a forest under management. Preparation of a working plan. Lectures and reports. 3 credits. Mr. Allison.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 201-202. Research Problems in the Science and Practice of Silviculture. Mr. Cheyney.
- 203-204. Research Problems in Forest Management and Working Plans. Mr. Allison.
- 205-206. Research Problems in Forest Economics. Mr. Allison.
- 207f-208w-209s. Research Problems in Wood Technology. Mr. Rees.
- 210f-211w-212s. Special Problems in Forest Research and Research Methods. Mr. Zon.
- 213f-214w-215s. Special Problems in Forest Utilization. Mr. Schmitz, Mr. Rees.
- 216f-217w. Forestry Seminar. Mr. Schmitz.
- 218f-219w. Research Problems in Forest Mensuration. Mr. Brown.

GEOGRAPHY

Professor Darrell H. Davis; Assistant Professors Ralph H. Brown, Richard Hartshorne.

Prerequisites.—For major work, Courses 1-2 or 11, 41, and 5 additional credits in geography, Economics 6-7, and Geology 1 or 8. For minor work, 10 credits in the department.

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

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 101w. Geography of Europe. A study of the various European countries and their economic development. Prerequisite: 20 credits in social science, to include 10 credits in geography. 3 credits. Mr. Hartshorne.
- 102f. Trade Routes and Trade Centers. A study of the major land and ocean routes, ports and interior trade centers, and the nature and significance of the traffic. Prerequisite: Course 41. 3 credits. Mr. Hartshorne.
- 110f. Geography of South America. A study of the major geographic regions of South America, with emphasis upon the economic activities and their geographic basis. Prerequisite: 20 credits in social science, to include Course 11 or 41. 3 credits. Mr. Brown.
- 111w. Cartography and Graphic Representation. The construction and use of maps and graphs. Prerequisite: 10 credits in Senior College work in geography, geology, history, or other subjects in which the use of maps is necessary. 3 credits. Mr. Dicken.
- 120s. Geography of Asia. Areal differentiation in the major geographic regions of Asia. Special consideration of China, Japan, and India. Prerequisite: 20 credits in social science, to include Course 11 or 41. 3 credits. Mr. Davis.
- 133w. Climatology. Weather and climate in their relation to man and his activities. Prerequisite: Course 11. 3 credits. Mr. Brown.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 235s. Geography of Minnesota. A regional economic study of the state. The basis for existing industry and city development will receive special consideration. Prerequisite: 12 credits in geography, or 20 credits in social science to include at least 9 credits in geography. Permission of instructor necessary. 3 credits. Mr. Dicken.
- 241f.s. Field Course in Geography. A consideration of the problems of field work, illustrated by field trips. Prerequisite: 18 credits in geography. 3 credits. Mr. Davis.
- 251f-252w-253s. Seminar in Geography. A survey of current literature with reports and discussion on assigned topics. Prerequisite: 20 credits in geography or permission of instructor. 3 credits. Mr. Davis and staff.
- 301f,w,s. Research Problems in Geography. Credits arranged. Mr. Davis, Mr. Brown, Mr. Hartshorne.

GEOLOGY AND MINERALOGY

Professors William H. Emmons, Frank F. Grout, Clinton R. Stauffer;
Associate Professors John W. Gruner, George M. Schwartz, George
A. Thiel.

Prerequisites.—For major work in geology: Elementary courses in geology, such as Courses 1 and 2, or their equivalent; Mineralogy 23 and 24; General Chemistry, such as Courses 1, 2 and 3, or equivalent. In addition, for those specializing in mineralogy, petrography, and economic geology, elementary physics, such as Courses 3 and 4, or equivalent, is required; and for those specializing in paleontology or stratigraphy, Index Fossils (Course 91-92-93) and Elementary Zoology, such as Courses 1 and 2, or their equivalent, are required. Students who have not had the necessary prerequisites may take them without credit along with other work for which they are prepared.

Whatever field of special interest is pursued, it is expected that the student registering for the doctorate in this department will take some courses in each of the major divisions of geology, if he has not already had them, and those conducting the preliminary examination will assume that this has been done.

A student selecting some branch of geology as a major will not be allowed to select general geology as a minor. It is always preferable that the minor be taken outside of the major department.

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

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 101f. Sedimentation. The origin of sedimentary rocks and their primary structures; interpretation of sediments in relation to paleogeography. Lectures and assigned readings. 3 credits. Mr. Thiel.
- 102w-103s. Micropaleontology. The study and classification of Foraminifera, diatoms, and other small fossil organisms and their use for purposes of correlation in oil fields. 3 credit hours of laboratory work. Open to students who have had Geology 11 or 91, and 105. Mr. Stauffer.
- 105f. Elements of Rock Study. The occurrence and genesis of rocks; their mineral and chemical composition and classification; their structure, texture, and alteration. Prerequisite: Course 24. Mr. Grout.
- 106w. Petrography. The identification and study of minerals and rocks by optical methods; the study of igneous rocks, crystalline schists, and metamorphic rocks. The origin and classification of rocks. Prerequisite: Course 105. 3 credits. Mr. Grout.
- 107f-108w-109s. Paleontologic Practice. The collection, preparation, and study of materials, with a view to gaining a working knowledge of groups of fossils, and the use of literature. Prerequisite: Course 91-92-93. 9 credits. Mr. Stauffer.

- 110f. Economic Geology. A study of non-metallic minerals of economic value and discussions of geologic guides to prospecting for these deposits. 3 credits. Mr. Schwartz.
- 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 11, 105. 3 credits. Mr. Emmons.
- 112w. Geology of Petroleum. The first part treats of deposits of metals, giving special attention to those outside of the United States. The second half deals with the nature, origin, and distribution of petroleum and with the various oil fields of the world. Prerequisite: Course 111. 3 credits. Mr. Emmons.
- 113s. Problems in Ore Deposits. Field excursions, map work, lectures on field and laboratory methods. Prerequisite: Course 112. 3 credits. Mr. Emmons.
- 119f. Physiography of the United States. The development of the surface features of the United States as affected by the rock structure and geologic history. Description and genetic analysis. Prerequisite: Course 2 or 3. 3 credits. Mr. Dutton.
- 121f. Crystallography. The symmetry relations in the thirty-two crystal classes. Crystal drawings and measurements. Projections and mathematical calculations. Prerequisites: Mathematics 7 and Inorg. Chem. 6-7-8 or 9-10. 3 credits. Mr. Gruner.
- 124w-125s. Structural and Metamorphic Geology. The conditions, processes, and results of metamorphism; structural features resulting from deformation under varying conditions of load. Prerequisites: Courses 2, 3, or 11 and 105. 6 credits. Mr. Schwartz.
- 131f-132w-133s. Advanced Petrology. Advanced optical methods. Criteria for rapid identification of the common rock clans. Regional and genetic studies. Petrographic reports. Prerequisite: Course 106. 9 credits. Mr. Grout.
- 137f. Testing Economic Minerals. Laboratory tests of coal, clay, oil, building stone, and metallic ores. Prerequisites: Courses 2, 3, or 11 and 105. 3 credits. Mr. Gruner.
- 140w-141s. Applied Petrography. Determination of ore and gangue minerals, microscopic studies of paragenesis of ores and other mineral associations. Practical problems in mining and geology. Prerequisite: Course 131. 6 credits. Mr. Grout.
- 144w-145s. Interpretation of Geologic Maps. Methods of geological examination; study and problems in construction and interpretation of geologic maps. Prerequisites: Course 2, 3, or 11 and 124. 6 credits. Mr. Dutton.
- 149s. Methods of Field Geology. General methods of field work necessary for Course 150. Mr. Schwartz.
- 150s.* Field Geology. Detailed, systematic work, conforming to official surveys. Reports to be written week before college opens. For pre-

* A maximum of 8 credits will be granted after field report is completed.

- requisites see members of the department. Credits arranged. Mr. Emmons, Mr. Gruner, Mr. Schwartz, Mr. Dutton.
- 151f-152w-153s. Advanced General Geology. Geologic processes and their results; development of the North American continent. Prerequisite: Course 2, 3, or 11. 9 credits. Mr. Stauffer.
- 161w. Crystal Structure. Study of point groups and space groups. Diffraction of X rays by crystals. Interpretation of powder and Laue diagrams. Prerequisites: Course 121, elementary physics, and analytical geometry. 3 credits. Mr. Gruner.
- 166f-167w. Mineralography. Methods of studying opaque minerals and application of the methods to problems in ore genesis and history. Prerequisites: Courses 111, 131. 6 credits. Mr. Schwartz.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 211f-212w-213s. Advanced Paleontology. Selected groups of fossils. Class work supplemented by reference reading and thesis. 9 credits. Mr. Stauffer.
214. Seminar in Ore Deposits. 3 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. 3 credits. Mr. Emmons.
- 216s. Geology and Ore Deposits of the Eastern Hemisphere. Prerequisites same as for Course 215. 3 credits. Mr. Emmons.
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 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, Mr. Gruner, Mr. Schwartz, Mr. Thiel.
- 251-252. Original Problems. Morphology and physical measurements of minerals. 3 credits each. Mr. Gruner.
- 253-254. Research Course in Ore Deposits. Methods of Course 243-244 applied to ore deposits. 3 credits each. Mr. Emmons, Mr. Grout, Mr. Gruner, Mr. Schwartz.
- 263-264. Research Course in Petrology. Methods of Course 243-244 applied to petrology. 3 credits each. Mr. Emmons, Mr. Grout.

GERMAN

Professors Samuel Kroesch, Oscar C. Burkhard; Associate Professor George F. Lussky; Assistant Professors James Davies, Frederick L. Pfeiffer.

Prerequisites.—For major work, 27 Senior College quarter credits or equivalent. For minor work, 18 Senior College quarter credits or equivalent.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 107su. Historical German Grammar. Phonology, inflection, word formation, syntax. Intended primarily for prospective teachers of German. 3 credits. Mr. Kroesch.
- 108s. 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. 3 credits. Mr. Kroesch.
- 115f-116w-117s. Middle High German Literature. Heldenepos, Höfisches Epos, Minnesang. 9 credits. Mr. Kroesch.
- 120f-121w-122s.† Proseminar: History of German Literature. This course provides the necessary background for graduate work in German literature, and serves as an introduction to bibliography, methodology, and literary criticism. Required of all graduate majors in German. 9 credits.
- 120f. German Literature through the Reformation Period. Mr. Kroesch.
- 121w. The Seventeenth and Eighteenth Centuries. Mr. Lussky.
- 122s. The Nineteenth Century. Mr. Pfeiffer.
- 140f-141w-142s. Early High German Literature, 1500-1700. 9 credits. Mr. Lussky.
- 143f-144w-145s. The Classical Period. I. Schiller; II. Goethe. 9 credits. Mr. Lussky.
- 150f-151w-152s. Die Novelle. A study of the technique and development. Assigned readings and reports. 9 credits. Mr. Burkhard.
- 153f-154w-155s. Studies in German Literature of the Nineteenth Century. I. Dorfgeschichte; II. Austrian Drama; III. Realism. 9 credits. Mr. Burkhard.
- 160f-161w-162s. Lyric Poetry of the Eighteenth and Nineteenth Centuries. 9 credits. Mr. Davies.
- 163f-164w-165s. German and English Literary Relations in the Sixteenth, Seventeenth, and Eighteenth Centuries. 9 credits. Mr. Davies.
- 173f-174w-175s. The Modern Novel: Impressionism, Expressionism, and "Neue Sachlichkeit." 9 credits. Mr. Pfeiffer.
- 180f-181w-182s. The Romantic School in Germany. 9 credits. Mr. Pfeiffer.
- 183f-184w-185s. Gottfried Keller and Conrad Ferdinand Meyer. 9 credits. Mr. Pfeiffer.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 202f-203w. Gothic. The course is designed as an introduction to Germanic linguistics and to a comparative study of the Indo-European language. 6 credits. Mr. Kroesch.
- 204s. Old Saxon. The Heliand. Three credits. Mr. Kroesch.
- 209f-210w-211s. Old High German. Alternates with Course 215-216-217. The older High German dialects serve as a basis for a study of historical German grammar. 9 credits. Mr. Kroesch.

- 215f-216w-217s. Middle High German. Phonology, morphology, and syntax. 9 credits. Mr. Kroesch.
- 218f-219w-220s. Seminar. Prerequisite: A good knowledge of at least two Germanic dialects. Comparative grammar of the Indo-European languages with special reference to the principal German dialects. Investigations in the comparative phonology, syntax, and semantics of these dialects. 6 or 9 credits. Mr. Kroesch.
- 253f-254w-255s. Nineteenth Century Drama: Kleist, Grillparzer, Hebbel. 9 credits. Mr. Burkhard.

GREEK

For courses and staff see Classical Languages, page 51.

HISTORY

Professors Lester Burrell Shippee, Guy Stanton Ford, Alfred L. Burt, Herbert Heaton, August Charles Krey, Albert Beebe White; Associate Professors Theodore C. Blegen, Lawrence D. Steefel, George M. Stephenson, Assistant Professors Harold Deutsch, Ernest Osgood, Faith Thompson, Alice F. Tyler, David H. Willson.

Prerequisites.—Of the four fields in which general survey courses in history are usually given, namely, ancient, American, English, and European, students entering upon graduate work in history will usually be expected to have covered two or three courses, with credit not exceeding 18 hours. For the other 9 hours, they should have a more advanced course in one of these fields and a second course in some field of history in which intensive work is done with the beginnings of investigation. In meeting these requirements consideration will be given to work done from the historical point of view in others of the social sciences, especially political science. The department attaches much importance to adequate preparation in the foreign languages, which may be used by the student in the course of advanced and research work. Except in very unusual cases, where the nature of the field studied calls for another language, French and German are the best tools; adequate reading knowledge of one of these should be demonstrated not later than the close of the first term in which the student is registered for an advanced degree.

REQUIREMENTS FOR THE DEGREE OF MASTER OF ARTS

Candidates for the Master's degree with a major in history shall select from the appended list two fields in which to do their work; for example, Group C, 1 and Group D, 1. While course work may be expected to cover some portion of the selected fields, and perhaps material outside them, the student is expected to prepare himself by reading to stand examination on the fields rather than on courses. The thesis subject will fall within one of the selected fields. The selection of fields should be made in consultation with an adviser in the department.

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|--------------------------------------|---|
| <i>Group A</i> | <i>Group D</i> |
| 1. The Old Orient | 1. American History to 1789 |
| 2. Greece | 2. The United States, 1789-1865 |
| 3. Rome | 3. The United States since 1865 |
| <i>Group B</i> | 4. Economic History of the United States, 1790-1860 |
| 1. Europe, 395-1300 | 5. Economic History of the United States since 1860 |
| 2. England to 1485 | <i>Group E</i> |
| 3. Renaissance and Reformation | 1. Asia since 476 |
| 4. Economic History, 1300-1600 | 2. European Colonies and Dependencies |
| <i>Group C</i> | 3. Latin America |
| 1. England since 1485 | 4. Canadian History |
| 2. Europe, 1559-1789 | |
| 3. Europe, 1789 to present | |
| 4. Economic History, 1600 to present | |

Prior to registration prospective candidates for the M.A. degree with a major in history must consult an adviser and be prepared to take an examination covering the fields to be selected for presentation. This examination is calculated to demonstrate that the candidate has a grounding in these fields sufficient to warrant carrying graduate work therein; such grounding should be at least equivalent to that provided by a Senior College course in the field. Students unable to demonstrate the possession of such grounding must register for, and carry without graduate credit, Senior College courses which will supply the deficiencies.

REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

Candidates will be expected to fulfill the general requirements as given in this bulletin, pp. 14-18.

Preliminary Examination

For a major in history, the candidate shall choose five fields from those listed above. At least one period or field shall be chosen from groups A or B and at least one from groups C or D. Three of these fields including that containing the subject of the proposed thesis must be related. The selection of these fields must be made in consultation with, and subject to the approval of, the chairman of the candidate's examination committee. These selections shall be reported by the adviser to the chairman of the History Department. In exceptional cases, the department may approve fields not included in the list.

The preliminary examination will cover the minor and four of the periods or fields chosen for the major. That field in which the candidate intends to do special work shall be reserved for the final examination. The scope of this reserved field shall be indicated to the department and approved by it at the time when the candidate is certified for the preliminary examination. Only in exceptional cases shall it cover less than one of the five fields selected from the above list.

Final Examination

In this examination, taken after the successful completion of the preliminary examination and the acceptance of the candidate's thesis, the emphasis shall be placed upon testing the highly detailed knowledge of the student in his special subject. It shall cover that subject reserved in the preliminary examination, and, under the rules of the Graduate School, is given by the same committee that sat in the preliminary examination. This examination includes the usual defense of the thesis, its methods, results and contribution to the field investigated.

GENERAL REQUIREMENT

201f-202w-203s. Historical Bibliography and Criticism. Required of candidates for advanced degrees in history who do not present evidence of similar training elsewhere. (S I; 339 Lib.) Mr. Ford, Mr. White, and others.

Courses numbered 150 to 200 are open to seniors and graduates; prerequisites are the appropriate survey courses (see courses numbered 50 to 100 in Bulletin of the Combined Class Schedule). Graduate students who do not present the appropriate survey courses or their equivalent are required to carry such courses without credit; in cases where such procedure is feasible the student may register for the courses numbered above 149 and also attend the meetings of the appropriate survey course, being therein held responsible for class exercises and examinations if the instructor and major adviser consider it advisable.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

150f-151w-152s.† Topics in Ancient European History. Mr. Deutsch. (Not offered in 1935-36.)

153f-154w-155s.† Topics in Medieval European History. One or more of the following topics will be studied in small groups: Break-up of Roman Empire; the Crusades; Empire and Papacy; Rise of Feudalism; Feudal Institutions; European Migrations; Rise of National States; Intellectual Development; the Renaissance; the Reformation; Rise of Towns, etc. 9 credits. Mr. Krey, Miss Thompson.

156f-157w-158s.† Topics in Modern European History. One or more of such topics as the following will be studied in small groups: Age of Louis XIV; the Eighteenth Century; French Revolution and Empire; Restoration and Revolution; Second French Empire; Making of Italy and Germany; International Relations, 1871-1914; Europe since 1914; the Eastern Question; Modern Russia, etc. 9 credits. Mr. Steefel, Mr. Deutsch, Mr. Willson.

170f-171w-172s.† Topics in English History. One or more of such topics as the following will be studied in small groups: Beginnings of Parliament; Legal History (Anglo-Saxon Law, the Age of Glanvill, of Bracton, of Edward II, etc.); Local Self-Government in Medieval England; Parliament and Administration in the Fourteenth Century; Antiquarianism and Political Theorists; the Tudors and Stuarts; Eng-

- land in the Nineteenth Century; British India; etc. 9 credits. Mr. White, Miss Thompson, Mr. Willson.
- 176f-177w-178s.† Topics in Canadian History. 9 credits. Mr. Burt.
- 180f-181w-182s.† Topics in Economic History. 9 credits. Mr. Heaton.
- 190f-191w-192s.† Topics in American History. Such topics as the Colonies, the Revolution and Making of the Constitution, Political Parties, Civil War and Reconstruction; Immigration; the West; History of Minnesota; American Agriculture and Rural Life, American Diplomacy, Recent American Development; etc. 9 credits. Mr. Shippee, Mr. Blegen, Mr. Stephenson, Mr. Osgood, Mrs. Tyler.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 204f-205w-206s.† Seminar in Medieval History. 9 credits. Mr. Heaton, Mr. Krey, Mr. White.
- 208f-209w-210s.† Seminar in American History. Required of graduate students whose major field is American history. The first term will be principally occupied with bibliography and technical topics. Selected fields in American history will be studied in other terms. 9 credits. Mr. Shippee, Mr. Blegen, Mr. Stephenson.
- 221f-222w-223s.† Seminar in Economic History. 9 credits. Mr. Heaton.
- 224f-225w-226s.† Seminar in Modern European History. 9 credits. Mr. Steefel, Mr. Deutsch.

HISTORY OF SCIENCE

Richard E. Scammon, Distinguished Professor in the Graduate School.

190f-191w-192s. History of Science. Professor Scammon will give a course in the social history of science. Open to qualified graduate and senior college students in any field of scientific or historical specialization. Conferences, readings, and occasional lectures. Consult Professor Scammon before registering. This course may count as major or minor on approval of the students' adviser in the Graduate School. Credits arranged. Mr. Scammon.

HOME ECONOMICS

Professor Wylle B. McNeal; Associate Professors Alice Biester, Clara M. Brown, Alice M. Child, Harriet Goldstein, Jane Leichsenring, Marion Weller; Assistant Professor Ethel Phelps.

Prerequisites.—Students desiring to major in Home Economics must present undergraduate subject-matter credits in certain of the following: social sciences, physical sciences, biological sciences, art and education—which shall be satisfactory to the adviser under whose direction the major work is to be done. In addition the student must have adequate undergraduate training in that field of Home Economics in which she wishes to specialize.

Students majoring in Home Economics for a Master's or a Doctor's degree and those minoring in this division for the Doctor's degree must include either Course 209, 279, 289, or 299 in the study program.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 102f,s. Advanced Textiles. An intensive study of textile materials with special reference to the following: nature of the raw materials; economic, chemical, and physical applications involved in their manufacture and use; methods and significance of physical testing. Prerequisites: H.E. 3, Agr. Biochem. 4, Agr. Econ. 3 or parallel. 3 credits. Miss Phelps.
- 107w. Textile Analysis. Problems and application of quantitative methods in textile analysis with special reference to establishing standards for fabrics. Prerequisites: Course 102, Agr. Biochem. 2. 3 credits. Miss Phelps.
- 115w. Clothing Economics. A study of those aspects of clothing which directly or indirectly affect the consumer. Prerequisites: H.E. 15, Agr. Econ. 3. 2 credits. Miss Weller.
- 120f,w,s (formerly 150). Art History and Appreciation. The historical development of painting, sculpture, architecture, decoration, furniture, and costumes, studied with special emphasis on design and influence upon modern styles. Prerequisite: Course 51 or permission of instructor. 3 credits. Miss H. Goldstein, Miss V. Goldstein.
- 122w (formerly 152). Advanced Interior Design. Special problems of small house decoration, involving execution of elevation drawings. Studies and reports on topics of historical and practical interest. Actual materials used as far as possible. Prerequisites: Courses 53, 131 (180), 150 (120), or permission of instructor. 3 credits. Miss H. Goldstein.
- 125s (formerly 154). Advanced Costume Design. Study of figure construction. Relation of color and texture to dress design. Studies and reports on assigned topics. Laboratory work with fabrics. Designs in pencil and water colors. Prerequisites: Courses 13, 53, 55 recommended. 3 credits. Mrs. Mathieson.
- 142f,w,s (formerly 182). Experimental Cookery. An intensive study of problems in foods and food preparation with individual laboratory problems. Prerequisite: Course 80. 3 credits. Miss Child, Mrs. Niles.
- 143f,w (formerly 183). Experimental Cookery. An intensive study of problems in foods and food preparation with individual laboratory problems. Prerequisite: Course 80. 5 credits.
- 146s (formerly 186). Special Food Problems. Individual problems in foods and food preparation. Prerequisite: Course 182 (142). 3 credits. Miss Child.
- 147s (formerly 187). Special Food Problems. The same as Course 146 with additional problems. Prerequisites: Course 182 (142), Ag. Biochem. 2. 5 credits. Miss Child.
- 163s. Institution Management Problems. Problems affecting the efficient administration of the institution; departmental organization, operation,

- maintenance; employment problems; business policies. Field trips to various types of institutions. Prerequisites: Courses 61, 63. 3 credits. Miss Dunning.
- 170w,s. Nutrition of the Family. The fundamental principles of human nutrition as applied to the feeding of individuals and groups under conditions of health. Prerequisites: Courses 70, 80, Agr. Biochem. 4, Physiol. 4. 3 credits. Miss Biester, Miss Hunt.
- 171f,w,s. Child Nutrition. Lectures, discussions, and field work dealing with the principles of child nutrition and with the formation of desired food habits. Prerequisites: Course 170, H.E.Ed. 40. 3 credits. Miss Leichsenring.
- 173s. Nutrition in Disease. A study of the fundamental principles involved in using diet in the treatment of certain diseases. Prerequisites: Courses 170, 175. 3 credits. Miss Hunt.
- 175f,w. Nutrition II. Metabolism, including work on tissues, blood, milk, and urine. Prerequisite: Course 73. 4 credits. Miss Biester, Miss Hunt.
- 176w. Advanced Nutrition. Selected quantitative methods applicable to investigations relating to digestion and metabolism. Prerequisites: Course 73, Agr. Biochem. 2. 4 credits. Miss Biester.
- 177s. Digestion and Metabolism. An intensive study of problems relating to digestion and metabolism involving lectures, reading, demonstrations, and laboratory work. Prerequisites: Course 175. 3 credits. Miss Leichsenring.
- 178f,w,s. Clinical Problems in Nutrition. The application of nutrition information to problems in health and disease involving assigned readings, discussions, and experience in a clinic or with case work. Prerequisites: 71 or parallel, 75 or parallel, 170 or parallel, 175. 2 credits. Limited to 8. Miss Hunt.
- 179w,s. Readings in Nutrition. A course designed to give intensive experience in the use of nutrition books and periodicals, involving assigned readings, oral and written reports. Prerequisite: Course 170. 2 credits. Miss Biester, Miss Leichsenring.
- 180f,w,s (formerly 131). Home Planning and Furnishing. Study of the small house which aims at more intelligent planning in building and furnishing. House plans, kitchen arrangements, and equipment of house studied from homemaker's point of view, economy, convenience, and beauty. Prerequisite: Course 53. 5 credits. Miss H. Goldstein, Miss V. Goldstein.
- 185f,w,s (formerly 135). Family Relationships. A consideration of the factors that promote security, stability, and satisfaction in the immediate family group; and the responsibilities of the family in its relationship to community life. Prerequisites: 34 or parallel; H.E.Ed. 40. 2 credits. Miss Studley.
- 186s (formerly 136). Problems in Income Management. An intensive study of problems relating to individual and family budgets. Readings, dis-

- cussions, and field work. Prerequisites: H.E. 34 or parallel, 35, 170, Agr. Econ. 126 or parallel. 3 credits. Miss Studley.
- 195s. Development of Home Economics. A discussion of the development of home economics with emphasis upon current problems. 2 credits. Miss McNeal.

COURSES PRIMARILY FOR GRADUATE STUDENTS

202. Animal Fibers. An advanced course dealing with the structure, composition, chemical and physical properties, and special problems of manufacture of wool and silk in relation to their use. Prerequisites: Quant. Chem. 5 cred., Org. Chem. 5 or 6 cred., Adv. Textiles 3 cred. 2 credits. Miss Phelps.
- 204f. Plant and Manufactured Fibers. Study of the structure, composition, physical and chemical properties, and special problems of manufacture of cotton, flax, artificial silk and certain minor fibers in relation to their use. Prerequisites: Bot. 5 cred., Quant. Chem. 5 cred., Org. Chem. 5 or 6 cred., Adv. Textiles 3 cred. 2 credits. Miss Phelps.
- 208f (formerly 210). Microanalysis of Textile Fibers. Laboratory applications of histological and microchemical methods in the study of textile materials. Prerequisites: Bot. 5 cred., Biol. Sci. 10 cred., Org. Chem. 5 or 6 cred., Textile Analysis 3 cred. 2 or 3 credits. Miss Phelps.
- 209f,w,s. Seminar in Textiles and Clothing. Reviews and interpretations of the literature of this field, emphasizing recent advances and involving individual assignments and oral or written reports. Registration with permission of the instructor. 1 credit. Miss Phelps.
- 249w (formerly 289). Seminar in Foods. Reviews and interpretations of the literature in the field of foods and experimental food preparation involving individual assignments and oral or written reports. Permission of the instructor. 1 or 2 credits. Miss Child.
- 270f-271w. Principles of Human Nutrition. An advanced course dealing with certain aspects of digestion, metabolism, excretion, and food requirements under various conditions. Prerequisites: Courses 170, 175. 3 credits each quarter. Miss Biester, Miss Leichsenring.
- 279f,w,s. Seminar in Nutrition. Reviews and interpretations of the literature of this field, emphasizing recent advances and involving individual assignments and oral or written reports. Permission of the instructor. 1 credit. Miss Biester, Miss Leichsenring.
- 295f,w-296s. Home Economics Problems. Opportunity is offered for the investigation of selected problems in home economics in fields such as foods, nutrition, textiles, home management, and related art. Permission of instructor. 1 to 5 credits. Miss Biester, Miss Clara Brown, Miss Child, Miss H. Goldstein, Miss Leichsenring, Miss Phelps, Miss Studley.
- 299f,w,s. Home Economics Seminar. A critical study of recent advances in home economics, involving outside reading and oral or written reports. Permission of instructor. 1 credit. Miss McNeal, Miss H. Goldstein, Miss Studley.

HOME ECONOMICS EDUCATION

Professor Wylle B. McNeal, Associate Professor Clara M. Brown.

Prerequisites.—For a minor adequate preparation in psychology, educational psychology, education, and home economics must be presented.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 192af,w (formerly 142a). Educational Measurement in Home Economics. Problems of measurement in home economics; home economics tests and scales; construction and evaluation of objective tests. Prerequisite: Course 42. 2 credits. Miss Clara Brown.
- 192bw (formerly 142b). Educational Measurement in Home Economics. A continuation of Course 192a, dealing with methods of interpretation and utilization of test data. Prerequisite: Course 142a (192a). 2 credits. Miss Clara Brown.
- 193w,s (formerly 143). Home Economics Curricula. The objectives of home economics in junior and senior high schools; recent surveys and other investigations used in determining curriculum content; home economics courses of study. Prerequisite: Course 42 or parallel. 2 credits. Miss Clara Brown, Miss Rose.
- 197s (formerly 147). Organization and Methods for Related Art Teaching. Organization of a related art course and methods of teaching art principles as applied to familiar objects and processes. Prerequisites: Courses 53, 131 (180) or parallel. 3 credits. Miss H. Goldstein.
- 199f,w,s (formerly 149). Research Problems. A study of the methods used in collection, treatment, and interpretation of data in the field of home economics. Permission of instructor. Credits arranged. Miss Clara Brown.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 292f,w,s (formerly 242). Problems in Home Economics Education. Current problems in home economics education will be studied. Required of all candidates minoring in home economics education. 1 credit. Graduates only. Miss McNeal, Miss Brown, Miss Rose.
- 293f,w,s (formerly 245). Seminar in Home Economics Education. A research course for graduate students. Required of all students writing theses in Home Economics Education. Does not carry credit as course work.

HORTICULTURE

Professors William H. Alderman, Wilfred G. Brierley, Rodney B. Harvey; Associate Professor Fred A. Krantz; Assistant Professors Troy M. Currence, Lewis E. Longley, Arthur N. Wilcox.

Prerequisites.—For major work, 15 credits; for minor work, 9 quarter credits in department in addition to 2 years in botany and 1 in entomology.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 107f. Orchard Management. A detailed study of the various operations in orchards and berry fields. Operating costs and profits. Lectures, laboratory, and individual problems. Prerequisite: Course 6. 3 credits. Mr. Brierley. (Not offered in 1935-36.))
- 110w. Horticultural Crop Breeding. Applied genetics is emphasized. Methods of breeding each of the important horticultural crops with special attention to experiment station investigations and to the methods used by plant breeders. Prerequisite: Agron. 131. 3 credits. Mr. Wilcox.
- 111f. Systematic Pomology. A study of fruit varieties. Lectures, laboratory, and a survey of the literature. Prerequisites: Course 6 and Bot. 10 credits. Mr. Brierley.
- 121w. Small Fruit Culture. Cultural practices for each of the small fruits; botanic relationship; history of commercial development. Lectures, problems, and survey of literature. Prerequisites: Course 6 and Bot. 10 credits. Mr. Brierley.
- 135f. Truck Crops and Potatoes I. Truck crop production as an applied science. The crop or the plant is used as the unit of consideration and the sciences used to explain cultural practices and plant behavior. Prerequisites: Course 32 and Bot. 10 credits. 3 credits. Mr. Currence.
- 137w. Truck Crops and Potatoes II. Continuation of Course 135. Prerequisites: Course 32 and Bot. 10 credits. 3 credits. Mr. Krantz.
- 153w. Conservatory Plants and Florists' Flowers. A systematic study of the plants adapted to growing in conservatories and homes, and also of florists' cut flowers and potted plants. Lectures, laboratory, and field trips to greenhouses. 3 credits. Mr. Longley.
- 175f,w,s. Landscape Problems. The planning and planting of home properties for the city and country. Lectures, field trips, and reports. 3 credits per quarter. Mr. Longley.
- 176s. Landscape Construction. Construction and maintenance of turf for lawns, golf courses, and other play areas; garden architecture, grading, planting and care, costs of construction. Lectures, field trips, and reports. 3 credits. Mr. Longley.
- 190f-191w-192s. Special Problems. A study of problems based upon the work given in the preceding courses. 2 to 4 credits per quarter. Horticultural staff.
- 193f-194w. Horticultural Seminar. Reports and discussions of problems and investigational work. Required of graduate students. Prerequisite: 9 credits in horticulture. 1 credit per quarter. Horticultural staff.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 242w. Horticultural Crop Breeding Topics. A survey of the recent researches in the breeding of horticultural crops. 2 credits. Mr. Krantz, Mr. Wilcox.
- 243f-244w. Advanced Topics in Horticulture. A critical analysis of recent research on horticultural crops. 3 credits per quarter. Mr. Alderman, Mr. Brierley, Mr. Harvey, Mr. Currence, Mr. Longley.

245f-246w. Growth Factors in Crop Production. An analysis of growth and environmental factors as applied to crop plants. 2 credits per quarter. Mr. Harvey.

JOURNALISM

Professor Ralph D. Casey.

Prerequisites.—A total of 27 quarter credits in journalism and English, distributed as follows:

In journalism, a minimum of 15 credits including reporting, copy reading, and newspaper make-up, and special feature articles. In English, additional credits to make up the 27 credits, including a sophomore English composition course. Freshman composition will not satisfy the requirement. A reading knowledge of at least one foreign language.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

Fees.—A typewriter fee of \$1 is charged each quarter to all students registered for one or more journalism courses other than Journalism 5.

- 101w. Reporting of Public Affairs. A review of city, county, state, and national government as a background for reporting. Advanced practice in the writing of news stories. Prerequisites: Course 51-52 and 10 credits in political science. 3 credits. Mr. Ford.
- 103s. Literary Aspects of Journalism. A study of the best journalistic work of such writers as Kipling, Sir Philip Gibbs, Richard Harding Davis, Ambrose Bierce, William Allen White, Will Irwin, Ben Hecht, Don Marquis, etc. Lectures, outside reading, and some practice in writing. Prerequisite: English 21-22 or 22-23. 3 credits. Mr. Ford.
- 109w-110s. History of Journalism. A study of the evolution of the newspaper in England and the United States with special reference to the problems of present-day journalism. Prerequisite: Course 15. 6 credits. Mr. Ford.
- 111f. Foreign News Sources. An examination of foreign news and the methods by which it is obtained and prepared for American readers. The importance of foreign news, the methods of correspondents in various countries, the newspapers in those countries, and some of the factors affecting the news from these countries considered. This is not a course for training foreign correspondents but is intended to help the reader understand the background of foreign news. Prerequisites: Course 41 or 51 and one history or political science course in international relations, or permission of instructor. Mr. Casey.
- 112w. Current Newspaper Problems. A study of contemporary matters of importance in journalistic fields, such as the growth of the chain newspapers, the radio in its relation to the newspaper, the professionalization of journalism, changing news values, and ethics of journalism. Prerequisite: Course 110 or 111. 3 credits. Mr. Casey.
- 114w. The Influence of the Newspaper. Influences of the newspaper upon the attitudes, opinions, moral standards, taste, written and spoken Eng-

- lish, and standards of living of readers. Prerequisite: Course 15 or 41. 3 credits. Mr. Charnley.
- 130f-131w-132s. The Press and Public Opinion. Research dealing with the various ways in which newspapers and magazines attempt to influence public opinion. A study of the technique and effectiveness of these methods. Prerequisite: 20 credits in sociology, psychology, or political science. 9 credits. Mr. Casey.
- 140f-141w-142s. Contemporary Affairs. A study of important state, national, and world problems about which the newspaper man must be informed and concerning which he must serve as interpreter. The course will aim to unify the separate social studies which students have had in other departments of the University, with a view to the focusing of these studies on contemporary questions. Prerequisites: Course 109-110 and 20 credits in social science. 9 credits. Mr. Casey, Mr. Charnley.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 210f,w,s. Research in Newspaper Problems. Individual research in either historical or contemporary phases of newspaper, magazine, or advertising fields. Prerequisite: consent of department. 2 credits. Mr. Casey.

LATIN

For courses and staff see Classical Languages—Latin, page 52.

LIBRARY METHODS

Professor Frank K. Walter.

With the approval of the adviser the following course may be counted toward any major or minor:

- Lib.Meth. 126s.‡ Subject Bibliography. National and subject bibliographies of important countries. Special emphasis on works of research value and research methods. Prerequisite: senior or graduate standing, reading knowledge of French or German and some experience in research or bibliographic study or projects. 3 credits. Mr. Walter.

MATHEMATICS AND MECHANICS

Professors William L. Hart, Raymond W. Brink, William E. Brooke, William H. Bussey, Hans H. Dalaker, Dunham Jackson, William H. Kirchner, George C. Priestler, Lorenz G. Straub; Associate Professors Willem J. Luyten, Royal R. Shumway, Anthony L. Underhill, Hugh B. Wilcox; Assistant Professors Elizabeth Carlson, Gladys E. C. Gibbens, Edward L. Hill.

Professor Dalaker is chairman and Professor Underhill is secretary of the group. Students majoring in mathematics and mechanics should consult one or the other.

‡ A fee of \$3 per credit is charged for this course in lieu of tuition.

Prerequisites.—For major work 10 credits in calculus and 14 other credits in non-Junior College courses.

Students may also consult the Bulletin of the College of Engineering and the Combined Class Schedule.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 106f. Differential Equations. 3 credits. Mr. Underhill.
 107w-108s. Advanced Calculus. 3 credits per quarter. Mr. Underhill.
 109f. Theory of Numbers. 3 credits. Mr. Bussey.
 115w. Differential Geometry. 3 credits. Mr. Underhill.
 118f-119w-120s. Vectors and Matrices. 3 credits per quarter. Mr. Jackson.
 121f-122w-123s. Mathematical Theory of Statistics. 3 credits per quarter. Mr. Jackson.
 127f,w,s. Technical Mechanics. 5 credits. Mr. Wilcox.
 128f,w,s. Strength of Materials. 5 credits. Mr. Priester.
 130f. Open Channel Flow. Theory of uniform and varied flow in open channels, with practical applications to the design of hydraulic structures; hydraulic similitude; computations for drawdown curves, back-water curves, hydraulic jump, measuring flumes, submerged weirs, etc. Prerequisites: Courses 129 and 143. 3 credits. Mr. Straub.
 132w-133s-134f. Advanced Hydraulic Problems. Special problems in hydraulic design. Prerequisite: 130 or registration in 130 or by special permission. 2 credits per quarter. Mr. Straub.
 140s. Projective Geometry. 3 credits. Miss Gibbens.
 144f-145w-146s. Topics in Mathematical Analysis. 3 credits per quarter. Mr. Jackson. (Not offered in 1935-36.)
 150f,w,s. Differential Equations. Prerequisite: Course 25. 3 credits.
 151f-152w-153s. Advanced Calculus with Applications. Prerequisite: Course 25. 3 credits per quarter. Mr. Dalaker.
 154f-155w-156s. Vector Analysis with Applications. Prerequisite: Course 26. 3 credits per quarter. Mr. Brooke.
 161f-162w-163s. Advanced Technical Mechanics. 3 credits per quarter. Mr. Wilcox.
 164f-165w-166s. Operational Methods and Operational Calculus. Prerequisite: Course 151 or permission of instructor. 3 credits per quarter. Mr. Scherberg.
 180f-181w-182s. Advanced Strength of Materials. 3 credits per quarter. Mr. Priester.
 184f-185w-186s. Advanced Testing Materials Laboratory. 2 credits per quarter. Mr. Priester.
 191w. Hydraulic Motors and Pumps. Study of the hydraulic theory of the ram, impulse wheel, reaction turbine, and centrifugal pump. Prerequisite: Course 129. 3 credits. Mr. Straub.
 192s. Natural and Artificial Waterways. Wave motion, tides, ship resistance, transportation of sediment. Control and regulation of rivers, design of ship canals, locks, dry docks, movable dam, harbors. Prerequisite: Course 129 and preferably 130. 3 credits. Mr. Straub.

- 193w. Hydraulic Measurements. Detailed study of the current meter, Venturi meter, weir, orifice, Parshall flume, traveling screen, chemical method of gauging, etc. Prerequisite: 129. 3 credits. Mr. Straub.
- 194f-195w-196s. Advanced Hydraulics Laboratory. Special experimental studies concerning the characteristics of turbines, pumps, etc. Hydraulic models. Prerequisite: Courses 129 and 143. 2 credits per quarter. Mr. Straub.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 206f-207w-208s. Theory of Functions of Real and Complex Variables. 3 credits per quarter. Mr. Brink.
- 248f-249w-250s. Reading and Research. Competent students will be assisted in independent reading and reports by members of the department. 1 to 3 credits per quarter.

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 there is sufficient demand for them.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 102f-103w-104s. Advanced Analytic and Synthetic Geometry.
114. The Mathematics of Small Vibrations.
131. Advanced Algebraic Theory.
142. Theory of Invariants.
149. Introduction of Group Theory.
- 157f-158w-159s. Determinants and Solid Analytical Geometry.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 221f-222w-223s. Calculus of Variations.
251. Theory of Functions of Infinitely Many Variables.
- 254f-255w-256s. Modern Analysis (based on Whittaker and Watson's Text).
- 261f-262w-263s. Functions of a Complex Variable.
- 264f-265w-266s. Advanced Topics in Functions of a Complex Variable.
- 267f-268w-269s. Advanced Dynamics. Vol. I Routh's *Rigid Dynamics*.
- 271f-272w-273s. Theory of Linear Differential and Integral Equations.
- 274f-275w-276s. Dynamics of a Particle.
- 277f-278w-279s. Advanced Statics.
- 281f-282w-283s. Hydrodynamics.
- 284f-285w-286s. Advanced Hydrodynamics.
- 294f-295w-296s. Theory of Elasticity.
- 297w-298s. Vibration Problems.
- The Theory of Numbers.
- The Galois Theory of Equations.
- Higher Plane Curves.
- The Calculus of Finite Difference.
- Modern Theories of Integration.
- Advanced Descriptive Geometry.
- Perspective.
- Fourier's Series and Spherical Harmonics.

Advanced Analytic Geometry of Space.
 Elliptic Functions and Integrals with Application.
 Limits and Series.

The following courses given in the Department of Physics and the Department of Astronomy may count for credit in this department.

Physics 201f,203w,205s
 207f-209w-211s
 221f-223w-225s

Astronomy 111f,112w,113s.

MECHANICAL ENGINEERING

Professors John R. DuPriest, Frank B. Rowley, Charles F. Shoop; Associate Professors Charles A. Koepke, John V. Martenis, Burton J. Robertson; Assistant Professors Axel B. Algren, Arthur R. Ford.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 121f. Machine Design. Spur, bevel, and worm gears; flywheels and pulleys; rotating discs; belt and rope transmission; force and shrink fits; critical speeds; lubrication. Prerequisite: Course 24. 2 credits. Mr. J. J. Ryan.
- 122w-123s. Mechanical Engineering Design. Machine elements as applied to complete machines. Mathematical theory of lubrication; vibration analysis; stress analysis by photo-elastic methods. Study of materials for special purposes, high temperatures, etc. Prerequisite: Course 121. 2 credits per quarter. Mr. J. J. Ryan.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 221f-222w-223s. Advanced Mechanical Engineering Design. Prerequisite: Course 121. 3 credits per quarter. Mr. DuPriest, Mr. Martenis, Mr. J. J. Ryan.

STEAM ENGINEERING

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 141f,w. Power Plant Engineering. Theory, practice, and economics relating to prime movers and steam generating equipment of the modern power plant, including auxiliary units such as condensers, heaters, purifiers, pumps, fans, piping, etc. Prerequisite: Course 32. 3 credits. Mr. Shoop.
- 144w. Steam Turbines. Theory and practice applied to various types. Thermodynamics and mechanical analysis of problems involved in the design of nozzles, blades, rotors, etc. Condition of operation; systems of transmission; lubrication; economy; field of service. Laboratory investigation. Prerequisite: Course 32. 3 credits. Mr. Shoop.
- 145w. Applied Thermodynamics. Laws of heat transmission, mean temperature difference, in condensers, boilers, brine coils, feed water heaters. Treatment of cooling towers, accumulators, multiple stills, stage evaporators, vapor refrigeration; air compressors, multi staging, intercooling, etc. Prerequisites: Courses 32, 35. 3 credits. Mr. Shoop.

- 146s. Fuels and Combustion. Fuels: classification and analysis. Hand and stoker treatment; regulation. Pulverized and liquid fuels. Types of burners, controls. Combustion: generation of heat; furnace gases; stratification; flame way; smoke prevention. Furnaces. Prerequisite: Course 141. 3 credits. Mr. Shoop.
- 147w. Design of Steam Machinery. Piping systems, furnace and gas passage dimensions, stokers, oil, gas, and pulverized fuel burners, superheaters, feed water heaters, and pumps, air pre-heaters, automatic controls, chimneys, etc. Prerequisite: Course 141 or reg. in 141. 2 credits. Mr. Shoop.
- 148s. Design of Power Plant Units. Treatment of condensers, air pumps, cooling towers, stage evaporators, reheaters, etc. Prerequisite: Course 147. 2 credits. Mr. Shoop.
- 149f,w,s. Advanced Steam Laboratory. Tests of steam turbines, uniflow and compound steam engines, condensers, evaporators, and vacuum pumps. Tests of compound steam pump. Air compressor, boiler, superheater, and power plant. Studies of fluid flow meters and air-conditioning apparatus. Prerequisite: Courses 32, 35, and 141 or reg. in 141. 2 credits. Mr. Shoop.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 241s. Advanced Thermodynamics. Reversible changes of state and efflux of wet and superheated vapors. Flow of compressible fluids in mains, moving channels, into receivers, and communicating vessels. Gas mixtures, critical points, liquefaction. Power plant cycles: regenerative, reheating, and bleeding. Prerequisite: Course 145. 3 credits. Mr. Shoop.
- 242f-243w. Power Plant Design. Problems, designs, and estimates for power plants and central stations. Selection of motive powers, relative advantages of steam, producers, and gas plants. Choice of engines and boilers; pumps, piping, and accessories. Prerequisite: Course 148. 2 credits per quarter. Mr. Shoop.
- 244s. Power Plant Management. Operation and maintenance of boilers, engines, steam turbines, and accessory apparatus. Smoke prevention, lubricants and lubrication. Power plant finance. Daily logs and power costs. Study of recent power researches. Prerequisite: Course 141. 3 credits. Mr. Shoop.

INTERNAL COMBUSTION ENGINES

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 150f,w. Internal Combustion Engines. Study of real gas cycles, combustion, fuels. Construction and performance. Characteristics of Otto, Diesel, and compression-ignition engines. Carburetion, fuel injection, cooling, lubrication. Auxiliary systems. Prerequisite: Course 31. 3 credits. Mr. Robertson.
- 151w. Advanced Internal Combustion Engines. Special reference to automobile, truck, and airplane engines. Theoretical consideration of fuels,

- combustion, detonation, lubrication, etc. Prerequisite: Course 150. 3 credits. Mr. Robertson.
- 152s. High Speed Engine Testing. Use of modern research instruments and methods of testing. Experiments showing effect of fuel mixture, distribution, spark timing, etc., upon general engine performance. Prerequisite: Course 159. 2 credits. Mr. Robertson.
- 153s. Automobile Fleet Maintenance. Study of available types of motor coaches and trucks, their design features from a maintenance viewpoint, a survey of service depot requirements with a study of fleet service methods and maintenance practice. Prerequisite: Course 150. 3 credits. Mr. Robertson.
- 154w. Design of Airplane Engines. Study of the designs of radial and in-line aircraft engines. Drawing room problems, including graphical and analytical calculations of stresses in moving parts. Combined polar diagrams of bearing loads, etc. Prerequisite: Courses 27, 150. 2 credits. Mr. Robertson, Mr. Ford.
- 156w,s-157s. Design of Internal Combustion Engines. Detailed study of design of automotive and stationary engines. Problems, including calculation of cylinders, bearing loads, stresses in moving parts, and valve mechanisms. Prerequisites: Courses 121, 150 for 156, 154 or 156 for 157. 2 credits. Mr. Robertson, Mr. Ford.
- 158s. Aero Engine Testing. The use of modern instruments for testing gasoline and Diesel aircraft engines. The use of dynamometers and torque stands in determining engine performance. Prerequisite: Course 150. 2 credits. Mr. Robertson.
- 159f,w,s. Internal Combustion Engine Laboratory. Tests of gasoline, semi-Diesel and Diesel engines. Power plant units and automotive engines. Prerequisite: Course 150 or reg. in 150. 2 credits. Mr. Robertson, Mr. Ford.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 250f,w,s. Dynamics of High Speed Engines. Advanced study of inertia forces; balancing high speed multi-cylinder engines; engine torque analysis; torsional vibration, etc. Conferences, assigned readings, and problems. Prerequisite: Courses 121, 150. 3 credits. Mr. Robertson, Mr. Ford.
- 251f-252w-253s. Automobile and Motor Truck Design. Theory and design of the automobile, motor truck engine and chassis, complete design of engine, transmission, and chassis. 2 credits per quarter. Mr. Robertson.
- 254w,s. Engine Service Management. Instruments and methods used in servicing or reconditioning automobile and airplane engines. Causes of mechanical failure and wear. Permissible tolerance in worn parts. Lubrication and ignition service. Prerequisite: Course 151. 3 credits. Mr. Robertson, Mr. Ford.
- 255f-256w-257s. Automobile Testing Research. Dynamometer and road tests including over-all efficiency of cars at various speeds, fuel con-

- sumption, effect of road surface on traction, efficiencies, and general performances. Special research problems. Prerequisites: Courses 55 or 159. 2 credits per quarter. Mr. Robertson.
- 258s. Motor Truck and Bus Transportation. Problems involving motor truck transportation, capacity of trucks, trailers, drawbar pull. Efficiencies. Effect of road surface. Freight handling. Analysis of costs of truck operation and maintenance. Relative costs of transportation. Prerequisite: Course 152. 3 credits. Mr. Robertson.
- 259w,s. Diesel Engines. An advanced course in the theory, design, operation, and economics of the Diesel engine. Lectures and assigned readings. Prerequisite: Course 150. 3 credits. Mr. Robertson.

HEATING, VENTILATION, AND REFRIGERATION

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 160f. Heating and Ventilation. Principles of heating, ventilation, and air conditioning. Warm air, steam, hot water, vapor, vacuum, and fan systems of heating; pipe systems; heat regulation. Ventilation and air conditioning, synthetic air chart, central station heating. Prerequisites: Courses 31 and M.&M. 127, 129. 3 credits. Mr. Rowley.
- 164s. Heating and Ventilation. (Arch.) Principles of heating, ventilation, and air conditioning. Heating systems; furnaces, steam, hot water, vapor, vacuum and fan blast. Piping systems. Ventilation and air conditioning and methods of control. Prerequisite: Course M.&M. 92. 2 credits. Mr. Rowley.
- 165w. Advanced Heating, Ventilation, and Air Conditioning. Requirements for comfort and health and industrial processes. Thermodynamics of air vapor mixtures. Heating, cooling, humidification, dehumidification. Atmospheric impurities, sources, classifications, methods of elimination. Air supply and distribution. Methods of control and application. Prerequisite: Course 160. 3 credits. Mr. Rowley.
- 166s. Refrigeration. Principles of refrigeration. Various types of refrigerating machines, refrigerants, applications to ice making, cold storage, and air conditioning. Prerequisite: Course 32. 3 credits. Mr. Rowley, Mr. Algren.
- 167s. Advanced Heating, Ventilation, and Air Conditioning. Special problems including air conditioning, heat transfer, heating and cooling loads, solar radiation, etc. Equipment and test methods. Prerequisite: Course 160. 3 credits. Mr. Rowley.
- 168w. Heating and Ventilation Design. Design, selection, and arrangement of equipment for various types of heating and ventilating systems. Prerequisite: Course 160. 2 credits. Mr. Algren.
- 169f,w,s. Heating and Ventilation Laboratory. Tests of heating, ventilating, and air conditioning equipment. The determination of air qualities as required for comfort and for specific industries. Tests and studies of complete installation. Prerequisites: Courses 35, 160 or reg. in 160. 2 credits. Mr. Algren.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 265f,w,s. Advanced Heating, Ventilation, and Air Conditioning. Taken in connection with research work in the laboratory. Prerequisite: Course 160. Credits arranged. Mr. Rowley.
- 267w. Mechanical Equipment of Buildings. Selection of heating, ventilating, cooling, and plumbing systems for various types of buildings. Piping layouts, for fire protection, air, gas, and vacuum cleaning systems, elevators. Designs and layout of equipment. Prerequisites: Courses 160, Phys. 43. Mr. Martenis.

INDUSTRIAL ENGINEERING

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 170s. Tool Design and Construction. Tools, jigs, dies, and fixtures for manufacturing interchangeable parts. Prerequisites: Courses 71, 171. 3 credits. Mr. Koepke.
- 171f,w. Production Control. 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. Conveying, handling, and stores control. Fatigue elimination. Prerequisite: Course 71. 3 credits. Mr. Koepke.
- 172w. Industrial Plants. Factory organization and construction for economical manufacture. Organization of the industry. Location and type of buildings, power development. Layout of plant. Routing systems and machine layout. Heating and ventilating requirements. Lighting. Sanitation. Distribution of power. Welfare features. Lectures, recitations, and laboratory. Prerequisite: Course 171. 3 credits. Mr. Koepke.
- 173s. Industrial Management. General principles. Taylor system; wage, bonus, and profit sharing systems. Maintenance and depreciation. Purchasing. Allocation of cost, overhead, and machine burden. Graphical representation. Prerequisite: Course 172. 3 credits. Mr. Koepke.
- 174f,w,s. 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. Prerequisites: Courses 71, 171 or reg. in 171. 2 credits. Mr. Koepke.
- 175w. Materials Handling. Equipment and facilities necessary for economical transportation and storage of materials and parts during the process of manufacture; factors affecting capital invested in inventory, hand and power trucks, conveyors, elevators, hoists, cranes, arrangement of stores, checking and issuing materials. Prerequisite: Course 172 or reg. in 172. 2 credits. Mr. Koepke.
- 179s. Industrial Relations. Labor administration. Foreman training. Training the worker; job analysis. Employment and turnover; the human element, service departments. Stabilization of labor. Lectures, reading,

shop visits, and reports. Prerequisite: Course 171. 3 credits. Mr. Koepke.

COURSES PRIMARILY FOR GRADUATE STUDENTS

277f-278w-279s. Industrial Engineering Problems. Special investigations of practical problems and suggested methods of procedure. Lectures, assigned reading, shop visits, and reports. Prerequisites: Courses 173, 174. Credits ar. Mr. Koepke.

GENERAL

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 189s. Hydraulic Machinery. Theory of operation, design, construction, and regulation of water turbines. Turbine testing; characteristics, selection of type. Cost of turbines and water power. Prerequisite: Course M.&M. 129. 3 credits.
- 190f-191w-192s. Seminar. Reading of assigned articles in current technical press. Classroom presentation of principal features of assigned articles. 1 credit per quarter. Mr. DuPriest.
- 194w,s. Advanced Engineering Problems. Opportunity will be offered for carrying on special investigations in the various fields of mechanical engineering. 2 credits. Registration by permission of the division chief in charge of work.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 281f. Railway Technology. Systematic course of visits to the various railroad shops in the vicinity to study locomotive details and classifications. Locomotive practice. Prerequisites: Course M.&M. 127, 128, 129. 1 credit. Mr. Martenis.
- 282f-283w-284s. Locomotive Design and Construction. Locomotive details. Design of boiler, cylinders, frame, springs, trucks, axles, wheels, running gear, equalizing arrangements, valve gears, lubrication. Lectures, assigned reading, and drafting. Prerequisite: Course 281. 3 credits. Mr. Martenis.
- 290f-291w-292s. Mechanical Engineering Research. Investigations in connection with lubrication, fuels, furnaces, boilers, steam engines, turbines, gas engines, heating and ventilation, industrial and other engineering problems. Credits arranged. Mr. DuPriest, Mr. Rowley, Mr. Shoop, Mr. Koepke, Mr. Martenis, Mr. Robertson.

MEDICAL SOCIAL WORK

For statement of prerequisites and of graduate courses and staff, see Sociology, page 140.

See also History of Science, page 95.

MEDICINE

(Including Divisions of General Medicine, Dermatology and Syphilology, Nervous and Mental Diseases and Neurology)

The graduate work in the Department of Medicine is designed to offer opportunities for gifted men and women to prepare themselves for the practice of internal medicine or any of its subdivisions as a specialty. It also aims to guide its fellows in research in these fields and to give them a start in university teaching. Prospective fellows who have had no special work in addition to that of the ordinary undergraduate courses will profit greatly from some special work. While work in any one of the fundamental subjects might be of value, physiology, biochemistry, bacteriology, and pathology at the present are of the greatest importance. Work in any of these subjects might be further continued during the work in medicine to meet the requirements for a minor subject. Such work may also be done in pharmacology. For fellows specializing in nervous and mental diseases work in anatomy or psychology might be of special value as a minor. Work can also be arranged in the Department of Ophthalmology and Otolaryngology for fellows working in nervous and mental diseases, thus giving special opportunity to study lesions of the eye occurring in systemic disorders.

For staff and courses of study offered, see Graduate Medical School Bulletin.

See also History of Science, page 95.

METALLOGRAPHY

Professor Ralph L. Dowdell.

Prerequisites.—For major work, adequate preparation in the sciences fundamental to metallography (chemistry, physics, geology, technical subjects), the general requirements being fulfilled. For minor work, the prerequisites to the courses to be pursued.

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

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 150f. Metallography for Electrical Engineers. Principles of metallography, including pyrometry, thermal analysis, constitution diagrams, microscopic and photomicrographic technique; study of typical alloys with special reference to electrical resistance, conductivity, magnets, etc. Laboratory work and demonstrations. Two lectures, three laboratory hours per week. 3 credits. Mr. Forsyth.
- 151w. Advanced Metallography for Electrical Engineers. Continuation of 150. Two lectures, three laboratory hours per week. Prerequisite: Course 150. 3 credits. Mr. Forsyth.
- 152f. Metallography for Aeronautical Engineers. Principles of metallography; metallography of iron and steel with special reference to alloy

- steels, and light alloys used in airplane construction. Laboratory work and demonstrations. Open to senior aeronautical engineers. 3 credits. Mr. Dowdell, Mr. Jerabek.
- 153f-154w-155s. Metallography. (Long course for metallurgical engineers.) Theory of metallic alloys. Metallographic technique. Properties of metals and alloys. Metallography of iron and steel and commercial alloys. Technical metallography. Three lectures, four laboratory hours per week each quarter. Prerequisites: Chem. 9, Phys. 43 or Mech. 53. 5 credits per quarter. Mr. Forsyth.
- 156w. Metallography for Mechanical Engineers. Similar to 150 but specially arranged for students in mechanical engineering. Two lectures, three laboratory hours per week. 3 credits. Mr. Dowdell.
- 157s. Advanced Metallography for Mechanical Engineers. Continuation of 156. Two lectures, three laboratory hours per week. Prerequisite: Course 156. 3 credits. Mr. Dowdell.
- 160f. Metallography for Chemical Students. Metallography, including constitution diagrams, preparation and standardization of thermocouples, preparation and thermal analysis of alloys, their microscopic examination and photomicroscopy; typical alloy systems such as iron-carbon (steel and cast iron); some nonferrous alloys. Prerequisite: Anal. Chem. 1, 2. Two lectures and three laboratory hours per week. 3 credits. Mr. Jerabek.
- 161w. Advanced Metallography for Chemical Students. Metallography and heat treatment of iron and steel, including alloy steels, commercial uses of various steels, and engineering specifications. Prerequisite: Course 160. Two lectures and three laboratory hours per week. 3 credits. Mr. Jerabek.
- 162s. Advanced Metallography for Chemical Students. Metallography of the nonferrous metals with a study of the constitution diagrams, properties, and uses of important commercial alloys. Prerequisite: Course 160. Two lectures and three laboratory hours per week. 3 credits. Mr. Jerabek.
- 163f. Advanced Metallography. Seminar work on recent advances in metallography. Lectures and recitations, with outside reading and special reports. May be accompanied by laboratory work. Prerequisite: 6 credits in metallography. Credits arranged. Mr. Dowdell.
- 164w. Advanced Metallography. Advanced consideration of the structures, properties, and uses of metals and alloys. May be accompanied by laboratory work. Prerequisite: 6 credits in metallography. Credits arranged. Mr. Dowdell.
- 165s. Advanced Metallography. Technical metallography as applied to the automotive industry. Lectures and special reports. May be accompanied by laboratory work. Prerequisite: 6 credits in metallography. Credits arranged. Mr. Dowdell.
- 166f-167w-168s. Laboratory. Laboratory work on special problems in ferrous, nonferrous, and X-ray metallography. Credits arranged. Mr. Dowdell.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 201f-202w-203s. Advanced Metallography for Graduate Students. Seminar. Credits arranged. Mr. Dowdell.
- 204f-205w-206s. Metallographic Research. Special research problems in metallography. Credits arranged. Mr. Dowdell.

METALLURGY

Professors Peter Christianson, Levi B. Pease.

Prerequisites.—Elements in physics and chemistry.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 104w. Metallurgy of Pig Iron and Wrought Iron. General underlying principle of iron ore reduction, including construction, operation, and regulation of the iron blast furnace together with direct reduction of iron ore and refining products in the hearth and puddling furnaces. Prerequisite: General Metallurgy 3. Three lectures and one consultation hour per week. 3 credits. Mr. Christianson.
- 105s. Metallurgy of Steel. General principles involved in the refining and purification of pig iron and scrap into various grades of steel. Three lectures and one consultation hour per week. 3 credits. Mr. Christianson.
- 106f. Metallurgy of Base Metals. Lead, copper, zinc. Consideration of methods and principles involved in roasting, smelting, and refining base metals. Hydrometallurgy and electrolytic refining. Four lectures per week. 4 credits. Mr. Pease.
- 107w. Metallurgy of Base Metals. Continuation of Course 106f. Four lectures per week. 4 credits. Mr. Pease.
- 108s. Metallurgy of the Precious Metals. Principles involved and methods used in the extraction of gold, silver, and other precious metals. Cyanidation, amalgamation, and refining. Four lectures per week. 4 credits. Mr. Pease.
- 110f-111w. Ore Dressing. General principles involved in the crushing, sizing, gravity separation, flotation, and magnetic concentration of ores. 3 credits. Mr. Pease, Mr. Searles.
- 112f-113w-114s. Ore Dressing Laboratory. Practical examination of ores. Operation of laboratory ore dressing equipment. Laboratory concentration of common ores. 2 credits. Laboratory and conference. Mr. Pease, Mr. Searles.
- 117w. Advanced Metallurgy. Metallurgical calculations to determine heat balance and heat distribution in furnaces. Four lectures and six laboratory hours per week. 4 credits. Mr. Christianson.
- 118s. Advanced Metallurgy. Designs of furnaces together with laboratory work. Consultations. Mr. Christianson.
- 123f. Electrometallurgy. Application of electricity to the production of heat for the smelting of ores and refining of metals. Relative cost of fuel and electric heating; also relative efficiencies of fuel and electric furnaces. Construction of high temperature furnaces and operation of

commercial plants. Three lectures and one consultation hour per week. 3 credits. Mr. Christianson, Mr. Searles.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 204f-205w-206s. Thesis Courses for Graduate Students. Intended primarily for research work. Credits arranged. Mr. Christianson, Mr. Pease.
 207-208-209. Special Problems in Metallurgy. Seminar work on metallurgical problems. Credits arranged. Mr. Christianson, Mr. Pease.
 210-211-212. Special Problems in Advanced Metallurgy. Intended primarily for research work. Credits arranged. Mr. Christianson, Mr. Pease.

MINING AND PETROLEUM ENGINEERING

Professors Peter Christianson, Edward W. Davis, Walter H. Parker, Levi B. Pease.

Prerequisites.—Candidates for the degree of master of science in mining or petroleum engineering must have completed an undergraduate course of study, the substantial equivalent of that required for graduation in the School of Mines and Metallurgy of the University of Minnesota. The basic courses in mathematics through Calculus; Mechanics; Strength of Materials; Hydraulics; General and Mine Surveying; a geologic sequence including General Geology, Mineralogy, Rock Study, Petrography, Economic Geology, and Ore Deposits; chemistry through Quantitative Analysis; Assaying and General Metallurgy must be included. In addition candidates for the degree of master of science in mining engineering must have included in their undergraduate course, Ore Dressing, Exploration, Development and Mining Methods. Candidates for the degree of master of science in petroleum engineering must have included additional geology so as to have a foundation in Sedimentation, Structural and Metamorphic Geology and Paleontology; Oil Field Exploration, Development and Production Methods. In all cases, before registering for advanced courses the necessary prerequisites will be required.

Exemption from the language requirement may be made in individual cases.

MINING

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 112f-113w-114s. Mine Plant. Discussion of the machinery and appurtenances employed in the equipment of mines. Air compression, rock drills, mechanical features of hoisting, pumping, ventilation, underground transportation. Electricity applied to mining. 18 credits. Mr. Comstock.
 131f. Exploration. Location of mineral lands, prospecting, exploration, boring, explosives, drilling, blasting, and timber treating. Five lectures per week. 4 credits. Mr. Trengove.
 132w. Tunneling. Tunneling, drifting, shaft sinking, raising, and mining methods. Five lectures per week. 4 credits. Mr. Parker, Mr. Trengove.

- 134s. Mining Methods. Underground mining methods and support of underground excavations. Five lectures per week until May 1. 3 credits. Mr. Parker.
- 141f. Mine Examinations and Contracts. Mine examinations, sampling, and mining reports. Amortization. Contracts and specifications. Corporations, capitalization, stocks, and bonds. Five lectures per week. 4 credits. Mr. Parker.
- 143w. Coal Mining and Mining Law. Coal mining methods. Mechanization and coal preparation. Mine gases. Accident prevention. State mining codes. Compensation laws. Mining law and court interpretations. Taxation. Five lectures per week. 4 credits. Mr. Parker.
- 145s. Placer and Quarries. Placer, hydraulic mining, and dredging. Quarries. Five lectures per week until May 1. 4 credits. Mr. Parker.
- 151-152-153. Special Problems in Mining. Seminar work on mining problems. Credits arranged. Mr. Parker.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 201-202-203. Special Problems in Mining. Seminar work on mining problems. Credits arranged. Mr. Parker.
204. Advanced Mine Examinations. Mathematical principles necessary for a complete evaluation of a mine. Mathematical and economic principles involved in the valuation of mine plant involving obsolescence, replacement of equipment and structures, etc. Mathematical, economic, and ore dressing principles involved in the valuation of an ore deposit. 5 credits. Mr. Comstock, Mr. Parker.
205. Gold Mine Valuation. Application of the principles and methods developed in Course 204 to the valuation of a gold mine. 5 credits. Mr. Parker, Mr. Pease.
206. Copper Mine Valuation. Application of the principles and methods developed in Course 204 to the valuation of a copper mine. 5 credits. Mr. Parker.
207. Iron Mine Valuation. Application of the principles and methods developed in Course 204 to the valuation of an iron mine. 5 credits. Mr. Christianson, Mr. Parker.
208. Lead-Zinc Mine Valuation. Application of the principles and methods developed in Course 204 to the valuation of a lead-zinc mine. 5 credits. Mr. Parker, Mr. Pease.
209. Valuation of Mine of Nonmetallics. Application of the principles and methods developed in Course 204 to the valuation of a mine of nonmetallics. 5 credits. Mr. Christianson, Mr. Parker.
210. Field Course in Mining. Detailed study of the actual operations, accounts, ore treatment, etc. of a mine. To be arranged with individual students upon application to the department. This may be carried on during a summer. A detailed written report will be required.
211. Applied Ore Testing. Ore testing as applied to mine production of some particular ore deposits. 5 credits. Mr. Christianson, Mr. Parker.

212. Applied Ore Dressing. Ore dressing as applied to yearly production and segregation of ore shipments of some particular mine. 5 credits. Mr. Davis, Mr. Parker.
213. Applied Ore Estimating. Estimating ore reserves with the object of determining life and value of mine. 5 credits. Mr. Parker.
- 214-215-216. Special Problems in Mining Economics. Intended primarily for research. Credits arranged. Mr. Parker.

PETROLEUM ENGINEERING

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 131f. Exploration. Location of oil lands, methods of drilling, explosives, blasting, timber treating. Five lectures per week. 4 credits. Mr. Trengove.
- 132w. Oil Field Development. Aerial surveys, geophysical prospecting, oil and gas production. Five lectures per week. 4 credits. Mr. Parker.
- 134w. Oil Field Equipment. Mechanical features of drilling equipment, gas lift, pumping, natural gasoline extraction. Special devices for abnormal conditions. Two lectures per week. 2 credits. Mr. Comstock.
- 138s. Oil Field Mapping. Twelve hours a week until May 1. 3 credits. Mr. Trengove.
- 141f. Administration. Reports, amortization, corporations, capitalization, stocks and bonds, leases, contracts and specifications. Five lectures per week. 4 credits. Mr. Parker.
- 142w. Administration. Accident prevention, state codes, compensation laws, taxation, proration and unitization, production decline. Five lectures per week. 4 credits. Mr. Parker.
- 151s. Petroleum Refining. Distillation and purification processes used in the production of commercial products from crude petroleum. Five lectures a week until May 1. 2 credits. Mr. Christianson.
- 155-156-157. Special Problems in Petroleum Engineering. Seminar work on petroleum problems. Credits arranged. Mr. Comstock, Mr. Parker.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 201-202-203. Seminar Work on Petroleum Problems. Credits arranged. Mr. Comstock, Mr. Parker.
204. Advanced Oil Lease Valuation. Mathematical principles necessary for a complete evaluation of an oil lease. Mathematical and economic principles involved in the valuation of plant and equipment involving obsolescence, replacement of equipment and structures, etc. Mathematical economics and refining principles involved in the valuation of a pool. 5 credits. Mr. Christianson, Mr. Comstock, Mr. Parker.
205. Applied Lease Valuation. Application of the principles and methods developed in Course 204 to the valuation of a specific oil lease. 5 credits. Mr. Christianson, Mr. Comstock.
206. Field Course in Petroleum Engineering. A detailed study of the actual operations, accounts, crude oil treatment, etc. of an oil field lease. To be arranged with individual students upon application to the depart-

ment. This may be carried on during a summer. A detailed written report will be required.

207. Crude Oil Emulsions. A study of the methods of dehydration. Lectures and laboratory work. 5 credits. Mr. Christianson, Mr. Comstock.
208-209-210. Special problems in petroleum economics intended primarily for research. Credits arranged. Mr. Comstock, Mr. Parker.

OBSTETRICS AND GYNECOLOGY

For staff and courses of study offered, see Graduate Medical School Bulletin.

OPHTHALMOLOGY AND OTO-LARYNGOLOGY

For staff and courses of study offered, see Graduate Medical School Bulletin.

PATHOLOGY

A. Courses Offered at the Medical School

Professors Elexious T. Bell, Benjamin J. Clawson; Associate Professors James Shearer McCartney, Jr., John Franklin Noble.

Graduate students who desire to take their major work in pathology must present credits for the equivalent of the first two years' work of the Medical School of this University. They must also have a reading knowledge of German.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 104f,w,s,su. Autopsies. The average number of post-mortems available is about 175 per month or about 2,100 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.
- 107f. Advanced Pathology. Diagnosis of tumors.
- 107aw. Advanced Pathology. Diagnosis of tumors.
- 107bw. Advanced Pathology. Diseases of the heart.
- 107s. Advanced Pathology. Diseases of the kidney.
- 107su. Advanced Pathology. Each student is assigned a problem on which surgical or post-mortem material is available. Hours to be arranged. Students registering in the winter quarter may take both portions, or either, indicating by the days and hours.
- 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. One hour per week. Dr. Bell.
- 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.

COURSES PRIMARILY FOR GRADUATE STUDENTS

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 arranged.

B. Courses Offered in the Mayo Foundation

Professors Louis B. Wilson, William C. MacCarty, Thomas Byrd Magath, Frank C. Mann, Harold E. Robertson, Arthur H. Sanford; Associate Professors Jesse L. Bollman, Albert C. Broders, James W. Kernohan; Assistant Professors William H. Feldman, Carl F. Schlotthauer; Instructors Donald C. Beaver, William L. A. Wellbrock.

Opportunities for advanced work in pathology are offered in four different sections in the Mayo Foundation, as follows:

M101. Clinical Pathology. Dr. Magath, Dr. Sanford.

Work in this section includes diagnostic work in the laboratories of gastrology, urinalysis, serology, bacteriology, parasitology, and clinical chemistry. Graduate students in these clinical laboratories may learn the technique of accepted diagnostic procedure. 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.

M102. Pathologic Anatomy. Dr. Robertson, Mr. Kernohan, Dr. Beaver.

Post-mortem examinations are made in sufficient numbers to provide active work for approximately eight 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.

M103. Surgical Pathology. Dr. MacCarty, Dr. Broders, Dr. Wellbrock.

The laboratories of surgical pathology receive immediately all tissue removed at operation. It is studied both grossly and microscopically. The minimum residence in this service is six months, during which time opportunity is given to study a large amount of operative material in conjunction with clinical histories. Besides the routine diagnostic work fellows are expected to begin to carry along in these laboratories some piece of pathologic research.

M104. Experimental Pathology and Comparative Pathology. Dr. Mann, Dr. Bollman, Dr. Feldman, Dr. Schlotthauer.

Work in this section consists of research in problems of pathology involving the use of experimental animals.

COURSES PRIMARILY FOR GRADUATE STUDENTS

M263f,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.

M264f,w,s,su. Parasitology. Routine clinical and special research in parasitology, examination of stools, study of internal parasites. Dr. Magath.

M265f-w,w-s,s-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. Bacteriology of necropsy material. Research problems. Weekly seminars. Dr. Robertson, Mr. Kernohan, Dr. Beaver.

M266f-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. Bacteriology of surgical material. Research problems. Daily demonstrations and discussions. Dr. MacCarty, Dr. Broders, Dr. Wellbrock.

M267f,w,s,su. Research Work on Assigned Problems in Experimental Pathology. Dr. Mann, Dr. Bollman.

M268f,w,s,su. Research Work on Assigned Problems in Comparative Pathology. Dr. Feldman, Dr. Schlotthauer.

In addition to the above, students majoring in pathology may do research work in biophysics, physiologic chemistry, experimental physiology, or bacteriology. For details, see these departments.

See also History of Science, page 95.

PEDIATRICS

For staff and courses of study offered, see Graduate Medical School Bulletin.

PHARMACOLOGY AND THERAPEUTICS

A. Courses Offered at the Medical School

Professor Arthur D. Hirschfelder; Associate Professors Raymond N. Bieter, Edgar D. Brown; Assistant Professor Harold N. G. Wright.

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.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 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. Bieter, Dr. Brown, Dr. Wright.
- 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. Bieter, Dr. Brown, Dr. Wright.
- 105su,w. General Pharmacology, in continuation. Lectures on narcotic, soporific, 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. Bieter.
- 106f. General Pharmacology, in continuation. Lectures on the salts of the metals, antiseptics, antisyphilitic drugs, chemotherapy, etc. 33 hours; 3 credits. Dr. Hirschfelder, Dr. Bieter, Dr. Brown.
- 108su,f. Prescription Writing. The principles of prescription writing. Fifth year. 11 hours; 1 credit. 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. Bieter, Dr. Brown, Dr. Wright.
- 110f,w,s. Poisons. Their detection, actions, and antidotes. 66 hours; 2 credits. Dr. Brown.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 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. Bieter, Dr. Brown, Dr. Wright.
- 204f,w,s. Advanced Pharmacology. With collateral readings. Limited to six advanced students. 11 hours; 1 credit. Hours arranged. Staff.
- 205w. General Discussions in Pharmacology. With collateral readings. Hours and credits to be arranged. Dr. Hirschfelder, Dr. Bieter, Dr. Brown, Dr. Wright.

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.

See also History of Science, page 95.

PHILOSOPHY

Professors Norman Wilde, David F. Swenson; Associate Professor George P. Conger.

Prerequisites.—For a major, 18 credits; for a minor, 9 credits.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 100f. History of Religions. Prerequisite: 8 credits. 3 credits. Mr. Conger.
- 101w. Psychology of Religion. Prerequisite: 8 credits. 3 credits. Mr. Conger.
- 102s. Philosophy of Religion. Prerequisite: 8 credits. 3 credits. Mr. Conger.
- 103f. Esthetics. Prerequisite: 8 credits. 3 credits. (Alternates with 104.) Mr. Swenson.
104. History of Esthetic Theory. Prerequisite: 8 credits. 3 credits. (Not offered in 1935-36.) Mr. Swenson.
- 105f. Fundamental Philosophies of Life. Prerequisite: 8 credits. 3 credits. Mr. Swenson.
- 108f-109w-110s. History of Ethics. Prerequisite: 20 credits in any social science or 8 credits in philosophy. 6 credits.
- 115w. Contemporary Philosophy. Prerequisite: 8 credits including Philosophy 50 or 52. 3 credits. Mr. Conger.
120. Scandinavian Philosophy. Prerequisite: 8 credits. 3 credits. (Not offered in 1935-36.) Mr. Swenson.
124. Political and Social Ethics. Prerequisite: 20 credits in any social science, or 8 credits in philosophy. 5 credits. (Not offered in 1935-36.)
- 129w. Development of Political Thought. Prerequisite: 8 credits in philosophy, or 18 credits in any social science. 5 credits. Mr. Wilde.
- 135w-136s. Philosophy of Plato. Prerequisite: 8 credits including 50. 6 credits. Mr. Swenson.
- 141s. Metaphysics. Prerequisite: 8 credits. 5 credits. Mr. Conger.
- 147-148. Advanced Logic. Prerequisite: 8 credits, including Philosophy 2. 6 credits. (Not offered in 1935-36.)
- 151f-152w. Nineteenth Century Philosophy. Prerequisite: 8 credits in philosophy, including 52. 6 credits. Mr. Castell.
- 161f-162w-163s. Seminar in Philosophy. Individual investigation, topics to be determined after consultation with the department. Prerequisite: 20 credits in philosophy and consent of instructor. 9 credits. Mr. Wilde, Mr. Swenson, Mr. Conger, Mr. Castell.

PHYSICS

Professors Henry A. Erikson, Louallen F. Miller, John T. Tate, Anthony Zeleny; Associate Professors J. William Buchta, Joseph Valasek; Assistant Professor Edward L. Hill.

Prerequisites.—For major work, differential and integral calculus and two years of physics of college grade. For minor work, one year of college physics.

A student majoring in physics is required to take Courses 101-103-105 and 52 unless excused by the department upon satisfactory evidence at entrance. A course of general reading as outlined by the department in each case is also advised.

For the Master's degree a reading knowledge of French or German is required. It is desirable that this requirement be fulfilled before graduate work is begun. For the Ph.D. degree a reading knowledge of both French and German is required.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 101f-103w-105s. Theoretical Physics. An analytical survey of fundamental principles of mechanics, sound, heat, light, electricity, and magnetism designed to supplement the general courses and to prepare students for more specialized courses. Five lectures a week. Prerequisites: 12 credits in physics, Math. 51. 5 credits per quarter. Mr. Tate.
- 107f-109w-111s. Modern Physics. A survey of the newer developments in physics. Prerequisites: Math. 51, 12 credits in physics. 3 credits per quarter. Mr. Buchta.
- 108f-110w-112s.‡ Modern Experimental Physics. An experimental study of outstanding effects in modern physics. Prerequisite: Course 144. 3 credits per quarter. Mr. Erikson.
- 113w. Intermediate Acoustics. The mechanics of vibrating systems and wave motion. The production, propagation, analysis, and reception of sound. Prerequisites: Math. 51, 15 credits in physics, including Phys. 13. 3 credits. Mr. Buchta.
- 114f-116w-118s. Elementary Physical Investigation. The experimental or theoretical study of physical phenomena the nature or laws of which are not as yet understood. Prerequisites: Course 104, Math. 51. The work in this course requires the submission of a written report on the work accomplished. 3 credits. Staff.
- 115f-117w-119s. Problems Course. The work of this course consists entirely in solving problems and exercises designed to give practice in the mathematical analysis of physical problems. Prerequisites: Course 105, Math. 51. 3 credits per quarter. Mr. Buchta.
- 124s.‡ Pyrometry. A theoretical and experimental study of different principles involved in temperature measurement, covering standardization and calibration with some practical considerations. Prerequisites: Courses 23, 24. 3 credits. Mr. Miller.

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

- 126f,s,‡ Advanced Heat. A theoretical and experimental study of heat phenomena such as comparative calorimetric methods, temperature regulators, ratio of specific heats of gases, conductivities and radiation. Prerequisites: Courses 23, 24. 3 credits. Mr. Miller.
- 134f,w,‡ Experimental Optics. Special experimental work in spectrometry, optical instruments, photometry, absorption, polarized light. Two three-hour laboratory periods a week. Prerequisite: Course 34. 3 credits. Mr. Valasek.
- 136w,s,‡ Spectrum Analysis. An experimental course dealing with the measurement of wave lengths, intensities, and absorption coefficients in the infra-red, visible, and ultra-violet regions of the spectrum. Two three-hour laboratory periods a week. Prerequisite: Course 34. 3 credits. Mr. Valasek.
- 144f,‡ Electricity Measurements. Devoted mainly to the study of potentiometer methods, capacity, inductance, magnetic flux. 3 credits. See the Bulletin of the College of Engineering and Architecture. Mr. Zeleny.
- 146w,‡ Advanced Electricity Measurements. Precision measurements of electromotive force, current, resistance, capacity, inductance, and magnetic flux. Use of apparatus of highest precision. Three two-hour laboratory periods a week. Prerequisite: Course 144. 3 credits. Mr. Zeleny.
- 148s,‡ Radioactivity. An analytical study of the theories and methods of investigation supplemented by laboratory technique. Those pursuing this course should continue with Chemistry 151, Radiochemistry. Prerequisites: Courses 43 and 44. 3 credits. Mr. Erikson.
- 152f. X Rays. A study of the nature and production of X rays. Prerequisites: Courses 43 and 44. 3 credits. Mr. Valasek.
- 154w,s,‡ X-Ray Spectroscopy. Theory of diffraction of X rays by crystals. Emission and absorption spectra. Theory and systemization of X ray spectra. Satellites of diagram lines. Effects of chemical combination. Lectures combined with laboratory work. Prerequisites: Course 152, Math. 51. 3 credits. Mr. Valasek.

COURSES PRIMARILY FOR GRADUATE STUDENTS

Physics 101-103-105 and Mathematics 51 are prerequisites for all the graduate courses listed below. A reading knowledge of German is highly desirable and may be presumed in certain phases of the work, particularly that of the seminars.

The major work of the graduate division is embodied in various seminars in which the emphasis is placed on problems and developments in fields of current interest in experimental and theoretical physics. Individual study of the literature, together with reports and discussions, will form the basis of the work. The choice of topics for study will vary from year to year.

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

Course 201-203-205 consists of advanced work principally in classical mathematical physics in extension of the general survey given in 101-103-105.

- 201f. Analytical Dynamics, Elasticity, and Hydrodynamics. D'Alembert's principle, Lagrange's equations, variational principles. Wave propagation in solid and fluid elastic media; vibrations of strings and plates; general theory of small vibrations in discrete and continuous media. Applications to the theory of sound. 5 hours a week. Mr. Hill.
- 203w. Electrodynamics and Optics. General field equations; electron theory and the special theory of relativity. Reduction to macroscopic field equations. Molecular theory of dielectrics; dia-, para-, and ferro-magnetism. General mathematical theory of the optical behavior of isotropic, anisotropic, and metallic media. 5 hours a week. Mr. Hill.
- 205s. Statistical Mechanics and Thermodynamics. Classical theory of statistical mechanics and advanced kinetic theory. Brownian movements; specific heats of gases and solids; crystal physics from the molecular viewpoint. Three laws of thermodynamics, phase rule, equations of state, thermodynamic potentials with applications to homogeneous and heterogeneous substances. Statistical interpretation of thermodynamics; chemical constant theory. 5 hours a week. Mr. Hill.
- 207f-209w-211s. Seminar in Contemporary Experimental Physics. Study and discussions of fields of major interest and importance: internal and external photoelectric effect, thermionic emission, electron scattering, and ionization of atoms and molecules. Radioactivity and problems of nuclear physics; cosmic rays, etc. Mr. Tate, Mr. Buchta.
- 215f-217w-219s. Seminar in Spectroscopy. Problems of X-ray spectroscopy, X rays and crystal structure analysis. Line and band spectra. Mr. Valasek.
- 221f-223w-225s. Seminar in Contemporary Theoretical Physics. Study of the literature and problems of modern physical theories, primarily of quantum mechanics and its applications to atomic and molecular structure, theory of radioactivity, etc. Quantum statistics, theory of radiation, metallic conduction; theory of valence. Mr. Hill.

The following courses will be offered provided at any time there is sufficient demand for them:

- Applied Electricity—Theory of Electrical Circuits.
 The Partial Differential Equations of Mathematical Physics.
 Advanced Topics in Electron Theory and the Special Theory of Relativity.
 The General Theory of Relativity.
 Advanced Quantum Theory.
 Advanced Hydrodynamics and Theory of Sound.

See also History of Science, page 95.

PHYSIOLOGY AND PHYSIOLOGIC CHEMISTRY

A. Courses Offered in the Medical School

Professors Elias P. Lyon, Head, Jesse F. McClendon, Frederick H. Scott, Karl W. Stenstrom; Assistant Professors Allan Hemingway, Joseph T. King.

The Department of Physiology is well equipped for the various types of physiologic investigation. The library facilities are good.

For a major or minor in physiology, good courses in general zoology, general chemistry, organic chemistry, and college physics, are prerequisites. Physical chemistry is desirable.

For a major or minor in physiologic chemistry, physics, general chemistry, organic chemistry, and physical chemistry are prerequisite, quantitative chemistry, physiology, and zoology are desirable.

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.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 100f,su-101w,su. Physiologic Chemistry. The components of the animal body; foods, digestion, the excreta, and metabolism. Prerequisites: physics, organic chemistry. 222 hours; 13 credits. Mr. McClendon, Mr. Hemingway, Mr. Cavett.
- 103su,f. Physiology of Muscle, Nerve, Blood, Circulation, Respiration, Digestion, Excretion, and Metabolism. Fourth year medical students and others. Prerequisites: organic chemistry and zoology. 132 hours; 9 credits. Mr. Scott, Dr. Lyon, Dr. King, and others.
- 104w,su. Physiology of the Nervous System and Special Senses. Fourth year medical students and others. Prerequisite: Course 103 or organic chemistry and neurology. 88 hours; 6 credits. Mr. Scott, Dr. Lyon, Dr. King, and others.
- 105f. Roentgen Rays, Light, and Radium. The physical and physiological basis of physical therapy. Fifth year medical students. 11 hours; 1 credit. Mr. Stenstrom.
- 109w. Seminar in Physiology of the Senses. For graduate and medical students. Prerequisite: Course 104 or equivalent. 11 hours; 1 credit. Dr. Lyon.
- 113su,f,w,s. 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 reading. May be taken one or more quarters. Prerequisites: Courses 103, 104, or equivalent. 66 hours; 3 credits each quarter or arranged. Mr. Scott, Dr. King.

- 114w-115s. Applied Physiology. The interpretation of symptoms and signs of abnormal function. Prerequisites: Courses 103, 104, or equivalent. 3 credits each quarter.
- 116f. Tissue Culture Theory. Two lectures. Hours arranged; 2 credits. Dr. King.
- 117w. Tissue Culture Laboratory. Limit 4 students. Prerequisite: 116f. Hours arranged; 3 credits. Dr. King.
- 135f,w,s. Conference on Physiology, with qualified students. 11 hours; 1 credit. Mr. Scott.
- 153f,w,s,su. Problems in Physiologic Chemistry. Special work arranged with qualified students. May be taken one or more quarters. Prerequisite: Course 100-101. Hours and credits arranged. Mr. McClendon, Mr. Hemingway, Mr. Cavett.
- 154f. Seminar in Temperature Regulation and Water Balance. 11 hours; 1 credit. Mr. Hemingway.
- 155f,156w,157s. Pathological Chemistry. Blood chemistry of diabetes and nephritis. Basal metabolism, deficiency diseases. Prerequisite: Course 100-101. 66 hours; 3 credits each quarter. Mr. Cavett.
- 163f,164w,165s. Physical Chemistry and Biophysics in Biology and Medicine. Prerequisite: Course 100-101 or Biochemistry 112. 3 credits per quarter. Mr. Hemingway.
- 166f,167w,168s. Laboratory Work Related to Courses 163, 164, 165. Credits arranged. Mr. Hemingway.
- 170f,w,s,su. Problems in Biophysics. Special work arranged with qualified students. Mr. Stenstrom, Mr. Nurnberger.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 201f,w,s,su. Seminar in Physiology and Pharmacology. For instructors and advanced students. 11 hours; 1 credit. Dr. Hirschfelder, Mr. Scott, and staff.
- 203f,w,s,su. Research in Physiology. Hours and credits arranged. Mr. Scott, Dr. King.
- 204f,w,s,su. Research in the Physics and Physiology of Radiation. Hours and credits arranged. Mr. Stenstrom, Mr. Nurnberger.
- 205f,w,s,su. Research in Physiologic Chemistry. Hours and credits arranged. Mr. McClendon, Mr. Hemingway.

EXPERIMENTAL PHYSIOLOGY

B. Course Offered in the Mayo Foundation

Professor Frank C. Mann; Associate Professors Jesse L. Bollman, George M. Higgins; Assistant Professor Hiram E. Essex.

Work in this section consists of research in problems of experimental physiology.

- M271f,w,s,su. Research Work on Assigned Problems in Experimental Physiology. Dr. Mann, Dr. Bollman, Dr. Higgins, Dr. Essex.

PHYSIOLOGIC CHEMISTRY

B. Course Offered in the Mayo Foundation

Professor Edward C. Kendall; Associate Professor Arnold E. Osterberg; Assistant Professors Mildred Adams, Harold L. Mason, Marschelle H. Power; Instructors Bernard F. McKenzie, Charles S. Myers.

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 Departments of Biochemistry to a limited number of well-prepared fellows.

M272f,w,s,su. Physiologic Chemistry. Research work in problems related to metabolism and the chemistry of the blood; includes training in the use of methods of organic and inorganic analysis. Dr. Kendall, Dr. Osterberg.

In addition to the above, students majoring in physiologic chemistry may carry on research work in experimental physiology. For details, see that department.

See also History of Science, page 95.

PLANT BREEDING

Plant breeding may be elected as a field for either major or minor work. For prerequisites for specialization and statement of courses of study see announcement under Agronomy and Plant Genetics.

PLANT PATHOLOGY AND BOTANY

Professors Edward M. Freeman, Elvin C. Stakman; Associate Professors Jonas J. Christensen, Julian G. Leach.

NOTE.—For courses in botany including plant physiology see also Department of Botany.

Prerequisites.—The minimum requirement is (a) three years (27 credits) in the plant sciences; (b) general bacteriology one quarter (4 credits) or some equivalent; (c) one year (9 credits) in plant pathology—preferably two years (18 credits), including mycology.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

105f-106w-107s. Mycology. Morphology, taxonomy, and biology of fungi. Lectures, laboratory, and field work. Prerequisite: Botany 1 or 10. 9 to 15 credits. Mr. Freeman, Miss Dossall.

110w. Principles of Pathology. A systematic consideration of the basic factors governing the development of plant diseases. Prerequisites: Course 1 or 10 and Bact. 41. 3 credits. Mr. Stakman, Mr. Allison.

- 111w. Diseases of Field Crops. Symptomatology, etiology, and practical methods of control. Laboratory, lecture, and greenhouse work. Prerequisite: Course 1 or 10. 3 credits. Mr. J. J. Christensen.
112. Diseases of Fruit and Vegetable Crops. Especially those important in Minnesota. Laboratory, lecture, and field work. Prerequisite: Course 1 or 10. 3 credits. Mr. Leach, Mr. Eide. (Not offered in 1935-36.)
- 114w. Advanced Forest Pathology. Wood rots, including a study of the deterioration of wood products caused by fungi. Lectures and laboratory work. Prerequisite: Course 1 or 10. 3 credits. Mr. Stakman, Mr. C. Christensen.
118. Bacterial Diseases of Plants. Bacteria as plant pathogens; representative types with particular reference to the technique used in studying bacterial diseases of plants. Lectures, laboratory, and greenhouse work. Prerequisite: Course 1 or 10. 3 credits. Mr. Leach. (Not offered in 1935-36.)
- 119s. Principles of Plant Disease Control. A general consideration of principles and practices in controlling plant diseases. Lectures, demonstrations, and reference work. Prerequisite: Course 1 or 10. 3 credits. Mr. Leach, Mr. Eide.
- 141f-142w. Insects in Relation to Plant Diseases. A study of the principal insect vectors and their habits; types of insect injuries affecting health of plants; modes of insect transmission and dissemination of plant disease; methods of rearing and handling insect vectors. Prerequisite: 8 credits in ent. or plant path. Six credits. Mr. Granovsky, Mr. Leach.
- 143f. Methods. Theoretical and practical consideration of methods used in mycological and pathological research. Prerequisite: Course 1 or 10. Three credits. Mr. Allison, Mr. Eide, Miss Hart.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 203f-204w-205s. Research in Plant Pathology. Special assignment of work in laboratory and field problems in pathological research. Mr. Freeman, Mr. Stakman, Mr. J. J. Christensen, Mr. Leach, Miss Dossdall.
- 207f-208w-209s. Research in Mycology. Research work along following suggested lines; taxonomy of natural groups; fungous flora of particular regions, localities, or habitats; investigation of fungi involved in special industrial or natural processes; morphology or physiology of special forms. Prerequisite: Course 105-106-107. For minor or major. 3 credits per quarter. Mr. Freeman, Mr. Stakman, Miss Dossdall.
- 211w. History of Plant Pathology. Development of important mycological and pathological researches; historical basis of modern science of plant pathology. 2 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. Mr. Stakman, Mr. J. J. Christensen.
- 215f. Genetics of Plant Pathogenes. A study of physiologic specialization, sexuality, hybridization, mutation, and similar phenomena in plant patho-

genes, with particular emphasis on practical implications. Prerequisites: Course 1 or 10 and Agron. and Pl. Gen. 131. Mr. Stakman, Mr. J. J. Christensen.

See also History of Science, page 95.

PLANT PHYSIOLOGY AND AGRICULTURAL BOTANY

Professor Rodney B. Harvey.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 160w. Plant Microchemistry. The localization, identification, and function of plant constituents. Lecture, demonstration, and laboratory. Prerequisite: organic chemistry or phytochemistry. Lecture, 3 credits; laboratory, 2 credits. Mr. Harvey, Mr. Landon.
- 161w. Transport, Storage, and Ripening of Fruits and Vegetables. The effects of temperature, respiration, packing, etc., on storage life. Prerequisite: Plant Physiol., 5 credits. 3 credits. Mr. Harvey.
- 162w. Physiological Relations of Crop Plants to Temperature. A graduate course covering in detail hardiness and general temperature effects. Readings and translations. Prerequisite: Phys. 23. 3 credits. Mr. Harvey.
- 163s. Applied Plant Physiology. A general discussion of plant physiology as applied to the food industries and to agriculture and forestry. Lectures and demonstrations. Prerequisites: Plant Physiol., 3 credits; Organic Chemistry, 5 credits. 3 credits. Mr. Harvey, Mr. Landon.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 250s. Research Methods in Applied Plant Physiology. Advanced research methods of analysis and physical measurements applied in Physiology. Laboratory and lecture. 3 to 5 credits. Mr. Harvey, Mr. Landon.
- 251f-252w-253s. Seminar in Applied Plant Physiology. 1 credit. Mr. Harvey.
- 254f-255w-256s-257su. Research Problems in Applied Plant Physiology. Special assignment of work in applied plant physiology. Mr. Harvey.
- 258f-259w. Growth Factors in Crop Plants. A lecture and reading course covering genetic physiology, the initiation of growth, growth rate, and effect of the environment on growth. Prerequisite: cytology and genetics. 2 credits per quarter. Mr. Harvey.

See also History of Science, page 95.

POLITICAL SCIENCE

Professors William Anderson, Oliver P. Field, Harold S. Quigley, Lloyd M. Short, Jeremiah S. Young; Associate Professors Thomas S. Barclay, Clarence C. Ludwig; Assistant Professors Benjamin E. Lippincott, Lennox A. Mills, Joseph R. Starr.

REQUIREMENTS FOR THE M.A. DEGREE

For requirements not stated here, see pp. 8-12.

Prerequisites.—For major work, 18 credits, for minor work, 12 credits, or their equivalent, in political science.

Course requirements.—Eighteen hours in major subjects in addition to 176-177 (Scope and Methods of Political Science); 9 hours in minor subjects.

A candidate with a major in political science is expected to choose two fields from among the following:

1. Public Law
2. Comparative Modern Government
3. Political Theory (including the history of theory)
4. American Government and Politics
5. Local Government
6. International Law and Relations

He should choose one field outside of political science for a minor. The minor field should be related to the major or be calculated to support it. A reading knowledge of French or German is required.

Examinations.—Final written examinations will be given upon the major, also an oral examination upon the thesis and the major and minor fields.

REQUIREMENTS FOR THE PH.D. DEGREE

For requirements not stated here, see pp. 14-18.

Prerequisites.—For major work, 18 credits, for minor work, 12 credits, or their equivalent, in political science.

The character of the work for the doctorate requires that a candidate exhibit a grasp of fields of knowledge rather than of specific courses. A candidate will choose, in consultation with his major advisers, four major fields from among those listed above, and such minor fields as may be acceptable to his major and minor advisers. Course 176-177 (Scope and Methods of Political Science) is required of all majors. The division of work between the major and the minor may be adjusted somewhat to suit individual cases. The work done for the M.A. degree may be applied toward the Ph.D. A reading knowledge of French and German is required.

Examinations.—The preliminary examinations will cover the minor fields, and the major fields other than the field of the thesis. Except in unusual circumstances, no general written examination will be required in the minor fields. The final examination will, as a rule, be limited to the thesis and the field in which it is written. The candidate will be expected in the preliminary examinations to show a comprehensive knowledge of facts and principles, and the literature of his chosen fields; in the final examination he will be expected to defend his thesis and to show a detailed knowledge of his special field of research.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

101-102-103.† Constitutional Law. I. Constitutional amendment; national-state relations; national judiciary; powers of Congress; taxation; interstate commerce. II. The executive; foreign relations; military affairs;

- territories; interstate relations. III. Government and the individual; freedom of speech; ex post facto laws; obligation of contracts; due process of law; equal protection of laws. 9 credits. (Not offered in 1935-36.)
- 107f. Recent Social Legislation. Governmental powers and methods used for social legislation, state and national; peace and security; safety and health; public morals; semisocial economic relations; social insurance; minimum wage; city planning; police power restrictions on the use of private property. 3 credits. Mr. Young.
- 108f. Legislative Organization and Procedure. A study of the structure and functioning of legislative bodies, including such topics as bicameralism, the committee system, party leadership, the caucus, parliamentary procedure, limitations on debate, legislative councils, bill drafting bureaus, and reference services. Mr. Short.
- 109f. Government and Business. Governmental powers; restraint of trade and manipulation of prices; protection of debtors; business affected with a public interest; combinations of laborers; corporation; compulsory benefits; conservation of natural resources; vested rights; confiscatory legislation. 3 credits. Mr. Young.
111. Law of Public Utilities. See announcement of Law School.
- 113-114.† Topics in Administrative Law. I. Election, appointment, status, compensation, and discharge of civil officers and employees of government. II. Official powers; construction of powers; discretion; enforcement of administrative orders; judicial remedies against abuse of official authority. 6 credits. (Not offered in 1935-36.)
- 115s. The American Constitution. A study in the economic, social and political background of the great cases and important episodes that have arisen under the Constitution of the United States, and of the relation of these cases and episodes to present-day problems under the Constitution. Mr. Barclay.
- 116-117†-118. Local Government and Administration. A survey of local government, urban and rural, in the United States and selected foreign countries. Status, organization, powers, and methods. Finances, and such services as police, health, education, housing, city planning, and public utilities. 9 credits. Mr. Anderson.
119. Jurisprudence. See announcement of Law School.
- 120f. Municipal Functions. A general survey of functions. Three credits. Mr. Ludwig.
- 121w. Municipal Administration. A general survey of administration, with special emphasis upon such topics as administrative organization, personnel, and finance. 3 credits. Mr. Ludwig.
- 122s. Topics in Municipal Administration. Intensive consideration of selected topics: public works, police, public relations, etc. 3 credits. Mr. Ludwig.
- 131w-132s.† Principles of Public Administration. Sources of administra-

- tive power; administrative areas and organization; the budget; purchasing; public service as a career. 6 credits. Mr. Short.
133. Problems of Public Administration. Special problems relating to finance, education, safety, health, welfare, commerce, labor, and conservation of natural resources. 3 credits. (Not offered in 1935-36.)
- 145f. British Political Parties. Recent political history; the policies, composition, organization, activities, and functions of the existing political parties; suffrage, elections, and related subjects; selected constitutional problems related to political parties. 3 credits. Mr. Starr.
- 146w. Continental European Political Parties. Intensive study of political parties in France, Italy, Germany, and Soviet Russia; recent political history; the policies, composition, organization, activities, and functions of the existing political parties; suffrage, elections, and related subjects. 3 credits. Mr. Starr.
- 147s. American Political Parties. The policies, composition, organization, activities, and functions of the political parties of today; suffrage, elections, and related subjects; evaluation of the political party as a force in American government. 3 credits. Mr. Starr.
148. European Dictatorships. Description and evaluation of contemporary absolute government, especially in Soviet Russia, Italy, and Germany; organization and policies of political parties. 3 credits. (Not offered in 1935-36.)
- 149-150.† Government and Politics of the British Empire. The imperial relationship; status and government of the self-governing dominions, the crown colonies, and India. 6 credits. (Not offered in 1935-36.)
151. Problems in the British Empire. Intensive study of some phase of British imperial affairs. 3 credits. (Not offered in 1935-36.)
- 153s. Far Eastern Government and Politics. The constitutional development of Japan and China; government, parties, and political problems. 3 credits. Mr. Quigley.
- 161-162.† Recent Political Thought. Present-day schools of political thought compared: ideas concerning sovereignty and liberty, state functions, representative government, and democracy; analysis of socialism, communism, syndicalism, and fascism. 6 credits. (Not offered in 1935-36.)
163. Topics in American Political Thought. Stress to be laid on current American political ideas. 3 credits. (Not offered in 1935-36.)
- 165w. Development of Political Thought. See Philosophy 129. 5 credits. Mr. Wilde.
169. Problems in Democracy. Problems of individual and class differences; public opinion; dictatorship; expert knowledge; and leadership. 3 credits. (Not offered in 1935-36.)
- 176f-177w.† Scope and Methods of Political Science. The field of political science; relation to other studies; types of approach; research methods and technique; bibliography. Problems of teaching at the college level. Required of all candidates for postgraduate degrees in political science. 3 credits. Mr. Anderson.

- 181f-182w.† International Law. Nature, sources, and sanctions of international law. The laws of peace, war, and neutrality. 6 credits. Mr. Quigley.
- 183s. International Organization. The structure of the older international community and of the League of Nations; procedure in the formation of international policy; international legislation and administration, the settlement of international disputes; sanctions. 3 credits. Mr. Quigley.
- 191f-192w.† Far Eastern Diplomacy. The international relations of China from the earliest period; early contacts between Japan and China; the policy of exclusion gradually overcome by western powers; the opening of the Far East in the nineteenth century; the "open door" policy; the Great War and the revision of treaties; the present situation. 6 credits. Mr. Quigley.
- 195f-196w.† Colonial Government and Administration. The economic and political factors in colonization; forms of government; administrative organization, personnel, and problems; commercial policies; mandates under the League of Nations. 6 credits. Mr. Mills.
- 197s. Problems in Colonial Administration. 3 credits. Mr. Mills.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 201f-202w-203s.† Seminar in American Government and Politics. Mr. Anderson, Mr. Short.
- 211f-212w-213s.† Seminar in Public Law. Mr. Anderson, Mr. Barclay.
- 221f-222w-223s.† Seminar in Comparative Modern Government. Mr. Quigley, Mr. Mills, Mr. Starr.
- 231f-232w-233s.† Seminar in Political Theory. Mr. Anderson, Mr. Lippincott.
- 241f-242w-243s.† Seminar in Local Government. Mr. Anderson, Mr. Ludwig.
- 251f-252w-253s.† Seminar in International Law and Relations. Mr. Quigley, Mr. Mills.

PREVENTIVE MEDICINE AND PUBLIC HEALTH

A. Courses Offered at the Medical School

Professors Harold S. Diehl, Albert H. Chesley, J. Arthur Myers; Associate Professor Ruth E. Boynton; Assistant Professors Eula B. Butzerin, Orianna McDaniel, Harold A. Whittaker.

Inquiries concerning other work in public health should be addressed to the director, Dr. H. S. Diehl, Health Service, University of Minnesota.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 100s. Preventive Medicine and General Hygiene. (Medical students.) Prerequisites: bacteriology, physiology. 36 hours; 3 credits. Dr. Diehl, Dr. Myers, Dr. O'Brien.
- 101f,w,s,su. Public Health Administrative and Field Work. Demonstrations of health agencies at work. Groups of 10 to 18 (medical students) for 6 weeks. Prerequisite: 100. 18 hours; 2 credits. Staff.

- 102w. 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 Bact. 101-102; Anal. Chem. 1-2 or 7 and Organ. Chem. 1-2 or 51, 52, 53; Physics 3, 13, 23, 33, 43. Credits arranged. Mr. Whitaker.
- 103s. Public Health Bacteriology. Modern methods of a public health laboratory in making diagnoses; in the preparation of vaccines, and in research. Prerequisites: Bacteriology 101-102, 116. Credits arranged. Dr. McDaniel.
- 104f,w,s. Epidemiology. Lectures on principles and methods of epidemiological investigation. Analysis of data; methods of reaching conclusions; individual field work; collateral reading. Open only to graduate medical students. Credits arranged. Dr. Chesley, Dr. McDaniel.
- 106f,w,s. Public Health Administration. Organization of state, municipal, and voluntary health activities; preparation of budgets; procedures in enforcing quarantine; in correcting insanitary conditions; in controlling tuberculosis and venereal diseases; special fields of public health work, such as mental hygiene, tuberculosis control, school health work, etc. Prerequisite: 53 or 101. Credits arranged. Dr. Diehl, Dr. Chesley.
- 107s. Sanitary Surveys. Conferences, practical field work and report on a specified survey. Of particular value to practitioners who may be called upon to serve as local health officers. Prerequisite: 53 or 100. 2 credits. Dr. Diehl.
- 171f,172w. Advanced Problems in Public Health Nursing.
173. Advanced Field Work in Public Health Nursing.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 200f,w,s. Research. Opportunities will be offered by the University and by the various co-ordinated organizations for qualified students to pursue research work. Dr. Diehl and staff.
- 210f,w,s. Seminar in Preventive Medicine and Public Health. Staff.

PUBLIC HEALTH NURSING

A. Courses Offered at the Medical School

Eula B. Butzerin, Director, Course in Public Health Nursing

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 171f,172w. Advanced Problems in Public Health Nursing.
173. Advanced Field Work in Public Health Nursing.

ADDITIONAL COURSES

Other courses offered in this and the Graduate Medical School Bulletin which contribute to work in public health:

| Department | Course No. | Title | Instructor |
|-----------------------|------------|--|-----------------|
| Anatomy | 160 | Seminar in Human Growth..... | Dr. Boyd |
| Bacteriology | 101-102 | Medical Bacteriology..... | Dr. Larson |
| Bacteriology | 114 | Higher Bacteria..... | Dr. Henrici |
| Bacteriology | 116 | Immunity | Dr. Larson |
| Bacteriology | 150-151 | Advanced Bacteriology..... | Dr. Henrici |
| Botany | 101 | Biometric Principles..... | Mr. Treloar |
| Child Welfare | 130-131 | Child Development..... | Mr. Anderson |
| Child Welfare | 190-191 | Mental Examination of Preschool Children | Miss Goodenough |
| Physiology | 114-115 | Applied Physiology..... | |
| Physiology | 201 | Seminar in Physiology..... | Dr. Lyon |
| Psychology | 144-145 | Abnormal Psychology..... | Mr. Bird |
| Hydraulic Engineering | 161 | Hydrology | Mr. Bass |
| Municipal Engineering | 162-163 | Water Supply and Sewerage | Mr. Bass |
| Sanitary Engineering | 261-262 | Water and Sewage Purification.... | Mr. Bass |
| Sociology | 100 | Social Psychology..... | Mr. Chapin |
| Zoology | 107-108 | Protozoology | Mr. Turner |
| Zoology | 144-145- | | |
| | 146 | Animal Parasites and Parasitism... | Mr. Riley |

See also History of Science, page 95.

PSYCHOLOGY

Professors Donald G. Paterson, John E. Anderson, Charles Bird, Richard M. Elliott; Associate Professor Miles A. Tinker; Assistant Professors William T. Heron, Kate Hevner.

Prerequisites.—For either major or minor work, 12 credits.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 101f-102w†-103s. Experimental Psychology. The theory and technique of the leading methods of experimental investigation in human psychology. Individual research problems in the second and third quarters. One lecture, four laboratory hours per week. 3 credits per quarter. Mr. Tinker.
- 108f. Systems of Psychology. A comparative study of the problems, methods, and viewpoints of modern psychology. Credits arranged. Mr. Elliott.
- 114w-115s.† Human Behavior. An analysis of the background, development, and organization of human behavior. Consciousness and purposes are treated as properties of the living body. 6 credits. Mr. Elliott. (114 only, offered in 1935-36.)
- 130s. Vocational Psychology. Psychology of individual differences in intelligence, aptitudes, interests, and training, with special reference to vocational guidance. 2 credits. Mr. Paterson.
- 144f-145w.† Abnormal Psychology. Normal and abnormal behavior contrasted. Varieties of maladjustment as illustrated in criminality, de-

- iciency, fanaticism, and insanity. Stress will be laid on the inadequacies of personality as shown in everyday life. 6 credits. Mr. Bird.
- 151f-152w†-153s. *Animal Psychology*. Vertebrate behavior is emphasized. A critical study of the literature, and of the relationship between animal and human psychology. Individual investigation of special problems in the second and third quarters. 3 credits per quarter. Mr. Heron.
- 160f. *Psychology in Personnel Work*. Psychology as applied to the selection and retention of a stabilized personnel. The standardized interview; principles and technique of employment tests; methods of judging character qualities; the rating scale; personnel classification methods. 3 credits. Mr. Longstaff.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 200f-201w-202s.† *History of Psychology I*. Origin and development of scientific psychology. Men, schools, and methods. Emphasis on the experimental period, 1860 to the present. Open to advanced students with permission of instructor. 1 credit per quarter. Mr. Tinker.
- 203f-204w-205s.† *History of Psychology II*. Psychology in America. Development of laboratories, departments, apparatus, texts, and journals. Present status. Open to advanced students with permission of instructor. 1 credit per quarter. Mr. Tinker.
- 206f-207w-208s. *Research in Animal Behavior*. Mr. Heron.
- 210f-211w-212s. *Research Problems*. Laboratory investigations. Open to graduate students only. Mr. Paterson, Mr. Anderson, Mr. Bird, Mr. Elliott, Mr. Tinker, Mr. Heron, Miss Hevner.
- 215f-216w-217s.† *Seminar in Psychology*. A basic seminar required of candidates for the Ph.D. degree with majors in psychology who have completed one year of graduate study. Program based on a syllabus of required and optional readings prepared during the previous year. Lectures, reports of reading and research, and discussions. 4 credits per quarter. Mr. Paterson, Mr. Bird, Mr. Elliott, Mr. Tinker, Mr. Heron, Miss Hevner.
- 225f,w,s.† *Seminar in Contemporary Research*. Discussion of the problems of psychology and related sciences and reports of research projects. Monthly meetings attended by the department staff and graduate students majoring in psychology. Open for credit to candidates for the Ph.D. degree who have completed one year of graduate study. 2 credits. Mr. Elliott and others.
- 240s. *Seminar in Social Psychology*. An evaluation of investigations into social behavior and of fundamental concepts. Lectures and discussions. Open to graduate students in psychology and the social sciences. 3 credits. Mr. Bird.
- 250f-251w-252s. *Topics in Psychology*. Independent reading, tutorial conferences, and reports in any field of psychology, such as the psychology of sensation, reaction time, perception of space, Gestalt psychology, differential psychology, social and political behavior, personnel psychology, esthetics, human and animal learning, etc., which meets the

approval of one of the listed instructors. The chairman of the department will, if requested, assist the student in selecting the most appropriate instructor to guide reading in a particular field. Credits arranged. Mr. Paterson, Mr. Bird, Mr. Elliott, Mr. Tinker, Mr. Heron, Miss Hevner.

295f-296w. Seminar in Individual Differences. Advanced students meet for reports and discussion of contemporary trends in the psychology of individual differences and applied psychology. 3 credits. Mr. Paterson.

ROMANCE LANGUAGES

Professors Everett W. Olmsted, Francis B. Barton, Irville C. LeCompte, Colbert Searles, Edward H. Sirich; Associate Professors Carlos V. Arjona, Raymond L. Grismer; Assistant Professor Elizabeth Nissen.

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 a knowledge of Latin equivalent to at least two years of high school Latin; a reading knowledge of a second Romance language, and, by the end of the first year of graduate work, a reading knowledge of German.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

FRENCH

- 103f-104w-105s.† French Syntax and Composition. Special studies in characteristic problems of French syntax. 3 credits. Mr. Barton.
- 115f. French Literature: Seventeenth Century: Formation of the Classic Ideal. 4 credits. Mr. Searles.
- 116w. French Literature: Seventeenth Century: Molière, Racine, LaFontaine. 4 credits. Mr. Searles.
- 117s. French Literature: Seventeenth Century: Moral and Didactic Literature. 4 credits. Mr. Searles.
- 118f-119w-120s. French Literature: Eighteenth Century. First quarter, beginnings of the philosophic movement, Bayle, Montesquieu, Diderot; second quarter, Voltaire; third quarter, Rousseau, the theater, the novel. 9 credits. Mr. Sirich.
- 121f-122w-123s. French Literature: Sixteenth Century. First quarter, the Rhétoriciens, Marot, Rabelais; second quarter, the Pléiade; third quarter, Montaigne, Amyot. 9 credits. Mr. Olmsted. (Not offered in 1935-36.)
130. French Romantic Poetry. Mr. Clefton. (Not offered in 1935-36.)
- 131f. Parnassian Poetry. 3 credits. Mr. Clefton.
- 132w. Baudelaire, Verlaine, and the Symbolists. 3 credits. Mr. LeCompte.
- 141f-142w.† Eighteenth Century Dramatic Literature. 6 credits. Mr. Olmsted.
- 143s. Romantic Drama. 3 credits. Mr. Olmsted.

144. French Dramatic Literature: 1843-1890. (Not offered in 1935-36.) Mr. Olmsted.
145. *Le Théâtre Libre*. (Not offered 1935-36.) Mr. Olmsted.
146. Contemporary Dramatic Literature. (Not offered in 1935-36.) Mr. Olmsted.
- 153s. Contemporary French Lyric Poetry. 3 credits. Mr. LeCompte.
- 156w. French Realistic Novel. 3 credits. Mr. Minault.
157. Modern Novel: Bourget, France, Loti. (Not offered in 1935-36.) Mr. Minault.
- 158s. Contemporary French Novel. 3 credits. Mr. Minault.
- 171f-172w-173s.† History of French Language. Lectures and illustrative texts giving the development of the French language from its origins to the nineteenth century. Especially intended for prospective teachers. 3 credits. Mr. LeCompte.

ITALIAN

- 159f-160w. Dante. *The Divina Commedia*. (Alternates with 161-162.) 6 credits. Miss Nissen.
- 161-162. The Sixteenth Century. Reading of texts and study of literary influences. (Not offered in 1935-36.) Miss Nissen.
- 164s. Dante (in English). Lectures, reading, and discussion of the *New Life*, and parts of the *Divine Comedy*. 3 credits. Miss Nissen.

SPANISH

- 110f-111w-112s. Spanish Literature: Nineteenth Century. 9 credits. Mr. Arjona.
- 115-116-117. Spanish Literature: Seventeenth Century. First quarter, the drama; second quarter, the novel; third quarter, lyric and epic poetry. Alternates with 155-156-157. 9 credits. (Not offered in 1935-36.) Mr. Arjona.
- 120-121. The Ballad. 6 credits. (Not offered in 1935-36.) Mr. Grismer.
- 155f-156w-157s. Spanish Literature: Sixteenth Century. First quarter, the drama; second quarter, Cervantes and the novel; third quarter, poetry, the mystics. Alternates with 115-116-117. 9 credits. Mr. Grismer.
- 174f-175w-176s. Contemporary Spanish Literature. First quarter, the drama; second quarter, the novel; third quarter, poetry. 6 credits. Mr. Arjona.

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. 6 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. 6 credits. Mr. LeCompte.

- 207f-208w-209s. Old Provençal. Reading in early Provençal literature with special attention to the poetry of the troubadours. 6 credits. Mr. LeCompte.
- 222f-223w-224s. French Seminar. Classical period. 6 credits. Mr. Searles, Mr. Sirich.
- 225-226-227. French Seminar. Modern period. Mr. Barton.
- 230-231-232. Research Methods and Material. 3 credits. (Not offered in 1935-36.)
- 241f-242w-243s. Old Spanish Philology. 6 credits. Mr. Grismer.
- 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. 6 credits. Mr. Olmsted.
- 250f-251w-252s. Spanish Seminar. 6 credits.
- 259f-260w-261s. Research in Romance Languages. Credit depends upon amount of work accomplished.

SCANDINAVIAN

Professor 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 Danish, Norwegian, or Swedish.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 101f-102w-103s. Modern Norwegian Literature. From 1814 to the present day. Prerequisite: Course 4-5. 9 credits. Mr. Madsen.
- 104f. Modern Scandinavian History. Prerequisites: Courses 10-11-12 or 4-5, or 15 credits in history. 3 credits. Knowledge of Scandinavian not required. Mr. Stomberg.
- 107f-108w-109s. Modern Swedish Literature. The Swedish novel. Prerequisite: Course 10-11. 9 credits. Mr. Stomberg.
110. Ibsen. Prerequisite: Course 101-102-103. 3 credits. (Not offered in 1935-36.)
- 111-112-113. Old Norse (Icelandic). Grammar and reading. 6 credits. (Not offered in 1935-36.)
- 114f. Strindberg. Prerequisite: Course 107-108-109. 3 credits. Mr. Stomberg.
117. Earlier Norwegian Literature. Prerequisite: Course 4-5. 5 credits. (Not offered in 1935-36.)

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 201f-202w-203s. Seminar in the History of the Scandinavian Languages. 9 credits. Mr. Stomberg.
- 209f-210w-211s. Seminar in Modern Swedish Literature. 9 credits. Mr. Stomberg.
- 215f-216w-217s. Seminar in Norwegian Literature.

SOCIOLOGY AND SOCIAL WORK

Professors F. Stuart Chapin, Clifford Kirkpatrick, Robert W. Murchie, Wilson D. Wallis (Anthropology), Malcolm M. Willey; Associate Professors Anne F. Fenlason, Gertrude Vaile, George B. Vold; Assistant Professors Elizabeth G. Gardiner, Elio D. Monachesi, Calvin F. Schmid; Lecturer Monica K. Doyle.

Prerequisites—In sociology: for major work, 18 quarter credits; for minor work, 12 credits. For the professional course in graduate social work consult special departmental bulletin.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 100f. Social Psychology. Primarily for sociology students. The social attitudes; their development and modification under social pressure; the interactions of individuals and groups. Mr. Kirkpatrick.
- 101f. Social Organization. The organization and structure of social groups; the basic culture patterns of economic, political, and social institutions. Integration and disintegration of social groups and institutions. Essentials of social dynamics. Mr. Chapin.
- 102s. Social Control and Criminal Behavior. A consideration of criminal behavior in relation to the breakdown of social control. Mr. Vold.
- 103w. Sociology of Conflict. Types of social conflict and their rôle in social life. Mr. Vold.
- 104f.* Principles of Sociology. An introductory course for graduate students. Mr. Monachesi.
- 109f,w.* The Field of Social Work. An introductory course for graduate students. Mrs. Doyle.
- 110f. Rural Organization. A study of social organization as it affects living conditions in small towns and rural districts. Especially designed for rural social workers and specialists in rural sociology or agricultural economics. Mr. Murchie.
- 112s. The Rural Social Survey. A course dealing with the methods and content of rural social research. All methods of investigation are analyzed. Especially designed for those interested in social research under Purnell or similar funds. Mr. Murchie.
- 114w. Rural Social Institutions. A detailed study of the problems of organization and efficiency of selected rural institutions, especially religious, educational, civic, and recreational. For advanced students. Lectures, discussions, reports. Mr. Murchie.
- 115w. Religion As a Social Institution. The origin and function of religion viewed as a culture pattern in relation to social processes and social organization. Mr. Kirkpatrick.
- 116w. The Newspaper As a Social Institution. A study of the social rôle

* Primarily for graduate students but mature students who are not graduates may be admitted with consent of adviser in social work. This also applies to sociology courses 109, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 152, 153-154-155, 156-157-158.

of the newspaper in the United States, with special reference to the social changes that have influenced the press, and the corresponding influences of the press upon social life. Mr. Willey.

- 119f,s. The Family. The evolution of the family; development of family unity or disunity; the rôles of the several members of the family; methods of investigation of the family. Mr. Kirkpatrick.
- 120f. Social Life and Cultural Change. A history of the theories of progress and a critique of the idea of progress. Mr. Wallis.
- 122w. Advanced Statistical Methods. The analysis and interpretation of social data by application of the theory of errors, the theory of probability, the theory of sampling, partial correlation, and the analysis of time series. Mr. Chapin.
- 123f. Methods of Social Investigation. The nature of scientific method; the problems of sociology; specific methods of investigation of social phenomena. Mr. Schmid.
- 125f.* Principles of Group Work. Miss Mead.
- 126s.* Technique of Leadership in Group Work. An advanced course for prospective executives in settlements and program agencies. Miss Mead.
- 127s.* Legal Aspects of Social Work. A course designed to provide a proper understanding of the legal aspects of social case problems. Mr. Finke.
- 128s.* Principles of Administration, Publicity, and Finance Applied to Social Work. A technical study of methods of organizing charitable agencies, of financing them, and of making the public aware of their work. Lectures and practice work.
- 129f,w.* Principles of Social Case Work. A study of the purposes, problems, and processes of generic social case work, including a study of the relationships between the individual and the social worker and community as contributory to the treatment of the problems presented. Mrs. Fenlason.
- 130s.* Advanced Case Work. A study of some of the wider aspects of social case work. Mrs. Fenlason.
- 131s.* Rural Social Work. Primarily a course for students wishing to specialize in social work in the rural field. Miss Vaile.
- 132w.* Juvenile Courts and Probation. The historical, legal, and social aspects of juvenile courts and probation. A critical survey of juvenile court and probation work based upon a consideration of the nature of delinquent behavior, its "causes," its modification, and its prevention. Mr. Monachesi.
- 133w.* Social Case Work in Health Problems. A course open only to students who are properly grounded in case work. Miss Gardiner.
- 134s.* Legal Protection of the Child. A study of the relation of law to child welfare. A survey of existing children's protective legislation, of its administration, and its future development. Mr. Waite.

* Primarily for graduate students but mature students who are not graduates may be admitted with consent of adviser in social work. This also applies to sociology courses 109, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 152, 153-154-155, 156-157-158.

- 135f,w,s.*‡ Field Practice in Social Work for Children. Mrs. Fenlason, Miss Vaile, Mrs. Doyle.
- 136f.* Essentials of Medicine for Social Workers. A discussion of diseases most often encountered in social work, with a consideration of their social implications. Miss Gardiner.
- 137f.* The History and Theory of Social Work. A consideration of the historical backgrounds of the modern social work movement and the evolution of the theory underlying it. Miss Gardiner.
- 138w.* Case Work with Children. A study of the principles and methods of case work in the children's field.
- 139s.* Psychiatric Problems in Social Case Work. A study of the intellectual and emotional factors in human adjustment and their significance in case work.
- 140w. History of Social Theory. A rapid survey of the leading social theories from the time of the Greeks with special reference to the more recent developments of sociology. The theories are related to their social backgrounds. Mr. Wallis.
- 141s. Communication Agencies and Social Life. The development of the modern communication network, with special attention to agencies of mass impression and their influence upon social attitudes, opinion, and behavior.
- 152f,w.* Public Welfare Administration. Deals with the history of public welfare administration and special problems of state and county administration of public welfare activities. Miss Vaile.
- 153f,w,s*‡-154f,w,s*‡-155f,w,s.*‡ Field Training in Case Work. May be taken in specialized fields of child welfare and medical, as well as family, work. Mrs. Fenlason, Miss Vaile, Miss Gardiner, Mrs. Doyle.
- 156f,w,s*‡-157f,w,s*‡-158f,w,s.*‡ Field Training in Group Work. Miss Vaile, Miss Mead.
- 160s. Population Problems. Mr. Schmid.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 200f-201w-202s. Seminar in Applied Sociology. Mr. Kirkpatrick.
- 203f-204w-205s. Seminar in Social Theory. Staff.
- 206f-207w-208s. Seminar: Statistical Theory in Relation to Social Theory and Practice. Mr. Chapin.
- 209f-210w-211s. Seminar: The Theory of Social Evolution: The Cultural Approach to Sociology. (Instructors in the introductory course are required to take this seminar in the fall quarter.)
- 215f-216w-217s. Seminar in Rural Sociology. Mr. Murchie.
- 218f-219w-220s. Seminar in Social Work. Mrs. Fenlason, Miss Vaile, Miss Gardiner, Mr. Monachesi, Miss Mead.

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‡ A fee of \$3.50 per quarter is charged for this course.

- 221f‡-222w‡-223s.‡ Graduate Field Training. Twelve hours per week each semester. Staff.
- 224f-225w-226s. Medical Social Work. Principles and methods of medical social case work. Interrelations within medical institutions and with the community. The organization and development of social work in hospitals and dispensaries, its trends and scope. Open only to full-time students who wish to specialize in medical social work. Three hours a week. Miss Gardiner.
- 227f‡-228w‡-229s.‡ Advanced Graduate Field Training. Twelve hours a week each quarter. Miss Vaile, Miss Gardiner.

SOILS

Professors Frederick J. Alway, Clayton O. Rost; Assistant Professor Paul R. McMiller.

Prerequisites.—For major work, at least two years of work in chemistry, including both quantitative analysis and organic chemistry, and one year of work in general physics. 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

- 101w. Chemical Analysis of Soils. A laboratory course in the chemical analysis of soils including the determination of replaceable bases. Prerequisites: Course 6 and Quantitative Analysis. 3 to 5 credits. Mr. Rost.
- 102f,w,s. Special Problems in Soils. Individual laboratory or field work upon some special soil problem in soil physics, or soil chemistry. Arrangements must be made in advance. Prerequisite: Course 101 or 108. Credits, according to amount of work. Mr. Alway, Mr. Rost.
- 103s. Soil Erosion. Causes and types of erosion; relation of erosion to soil type; principles of control of erosion, by tillage, contour cultivation, strip farming, choice of crops and terracing; conservation of moisture and plant nutrients; relation of forests to erosion control. Prerequisite: Course 6. 2 credits. Lectures and field observation. Mr. Rost.
- 104f. Soil Surveying. Principles of soil surveying with field practice in the preparation of soil maps. Prerequisite: Course 108. 3 credits. Mr. McMiller.
- 107w. Fertilizers. Development of the use of commercial fertilizers. Their sources, preparation, composition, combination, and uses. Lectures and laboratory work. Prerequisite: Course 6. 3 credits. Mr. Rost.
- 108w. Physical Properties of Soils. The determination of physical constants of soils, including mechanical composition. Prerequisite: Course 6. 3 credits. Mr. McMiller.

* Primarily for graduate students but mature students who are not graduates may be admitted with consent of adviser in social work. This also applies to sociology courses 109, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 152, 153-154-155, 156-157-158.

‡ A fee of \$3.50 per quarter is charged for this course.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 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. 1 credit. Mr. Alway.

SPEECH

Professor Frank M. Rarig; Assistant Professors Bryng Bryngelson, A. Dale Riley; Instructor Franklin H. Knowler.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 101f-102w.† Advanced Speech Composition. Structure and oral style. Psychology of persuasion. Briefing. Critical study of models. Written speeches. Reports. Prerequisites: Courses 41-42-43 or 45-46; Psy. 1-2; 10 credits in soc. sci. 6 credits. Mr. Rarig.
- 105s. Theory of Reading and Acting. The forms of literature; literature regarded as an art; psychology of creative imagination; speech elements in literature; technique governing use of auditory and visual symbols. Collateral readings, speech problems, reports, term papers. Prerequisites: Courses 41-42-43 or 45-46; 81-82-83; Psy. 1-2. 3 credits. Mr. Rarig.
- 111f‡-112w‡-113s.‡ Stage Direction. An advanced course in the practice and theory of stage direction, including esthetics of the theater, analysis of the play, casting, centering attention, rhythm, reading, climaxes, organization for production, the unified whole. Prerequisite: Course 91-92-93. 9 credits. Mr. Riley.
- 115f-116w-117s. Playwriting and Production. Theory and practice of writing and producing plays. Composition of the play from the elementary scenario to the completed dialog. Registration limited to ten students. Prerequisites: Course 71-72-73 and permission of instructor. 6 credits. Mr. Riley.
- 121w‡-122s.‡‡ Advanced Speech Problems. Factors determining the behavior of speakers and audiences. Prerequisites: Course 41-42-43 or 45-46; Psy. 1-2. Recommended: Psy. 114-115; Anat. 4. 6 credits. Mr. Knowler.
- 141‡-142‡-143.‡ Voice Science. The study of the voice mechanism and of vocal sound; methods of analysis and synthesis. The study of hearing. Experimental methods applied in individual research projects. Readings, reports, experiments. Prerequisites: Course 41-42-43; Psy. 1-2 and 4-5 or 7. 9 credits. (Not offered in 1935-36.)

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

- 151su. The Teaching of Speech. Orientation in problems of speech education. History, applications of psychology; objectives, programs, and methods; direction of extra-curricular activities; evaluation of texts. Mr. Knower.
- 162w-163s. †‡ Speech Pathology. The physiological and psychological aspects of organic and functional speech problems. Theories of stuttering. Diagnoses, case histories, and treatment of speech cases. Observation of clinical diagnosis and treatment. Prerequisites: Courses 41-42-43 or 45-46; 61, 67; Psy. 1-2 and permission of instructor. 6 credits. Mr. Bryngelson.
- 191‡-192‡-193. ‡ Technical Stage Problems. Advanced problems in design and construction; stage management, color effects, and wiring. Special problems assigned to individual students. Mr. Riley, Mr. Lee.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 207f-208w-209s. Seminar in Orators. A critical study of the great English and American orators. One historical period each quarter. Prerequisites: Courses 41-42-43 or 45-46; 101-102; Psy. 1-2; 140; 10 credits in soc. sci. 6 credits. Mr. Rarig.
- 261f-262w-263s. Seminar in Speech Pathology. A study and critical analysis of current literature in the field of speech pathology. Thesis problems. New theories and clinical procedures. Specific cases for group study. Prerequisites: Courses 41-42-43 or 45-46; 61; 67; 121-122; 162-163; Psy. 1-2. 6 credits. Mr. Bryngelson.
- 291f-292w-293s. Research and Thesis. Open to graduate students who are engaged in thesis projects. 6 credits. Mr. Rarig, Mr. Bryngelson, Mr. Riley, Mr. Knower.

SURGERY

(Including divisions of General Surgery, Neurosurgery, Experimental Surgery, Orthopedic Surgery, Urology, Proctology, Anesthesia, and Dental Surgery)

For staff and courses of study offered, see Graduate Medical School Bulletin.

VETERINARY MEDICINE

Professor Clifford P. Fitch.

Prerequisites.—For major work, 12 credits; for minor work, 6 credits in the department.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 101w-102s. Advanced Anatomy of Domestic Animals. Advanced study of the structures involved in the type, conformation, and nutrition of the common farm animals. Dissection of farm animals, including a study

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

- of the osseous, muscular, and other principal anatomical structures. 6 credits. Mr. Kernkamp.
- 103w-104s.† Advanced Comparative Physiology. An advanced course in physiology of the domestic animals, including laboratory work with special emphasis on animal nutrition. Credits arranged. (Not offered in 1935-36.)

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 205f-206w-207s-208su. Veterinary Pathology and Bacteriology. Advanced problems. Specially adapted to meet the needs of graduate students. Offered as major or minor work. Credits arranged. Mr. Fitch.
- See also History of Science, page 95.

ZOOLOGY

Professors Dwight E. Minnich, William A. Riley, Jerry E. Wodsedalek; Associate Professors Clarence E. Mickel, Adolph R. Ringoen; Assistant Professors Samuel Eddy, Clarence P. Oliver.

Prerequisites.—For major work, Course 1-2-3, and at least 18 credits of advanced work approved by the department; for minor work, Course 1-2-3 or the equivalent.

COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 100f,101w,102s. Zoological Techniques. The content of this course is subject to the direction of the major adviser. Credits arranged, not to exceed 9.
- 107f-108w.† Protozoology. A survey of the Protozoa, with special reference to their structure and life histories. Lectures, laboratory, reading. 6 credits. Mr. Turner.
- 109f-110w-111s. Physiology. A survey of animal behavior from the physiological viewpoint including the physiology of sense organs, nervous systems, muscles, glands, etc. Lectures, laboratory, reading. 9 credits. Mr. Minnich.
- 117f-118w-119s. Animal Ecology. Ecology of animals with special reference to insects. Lectures, laboratory, assigned reading, and field excursion. 9 credits. Mr. Eddy, Mr. Hodson.
- 125f-126w-127s. Advanced Entomology. Morphology and classification of insects, with lectures on the history of entomology. 9 credits. Mr. Mickel.
- 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. 9 credits. Mr. Riley.

- 148f-149w-150s. Histology and Organology. Comparative study of the microscopic structure of tissues, and organs. Textbooks, lectures, laboratory. 9 credits. Mr. Ringoen.
- 160-161. Cytology. A survey of cell structure and behavior with special reference to genetic cytology. Lectures, reading, and laboratory work. 6 credits. (Not offered in 1935-36.) Mr. Wodsedalek.
- 170f-171w. Advanced Genetics. General laws involved in heredity and variation, with deviations from and practical applications of the laws. Textbooks, lectures, laboratory. 6 credits. Mr. Oliver.
- 181w-182s. Comparative Embryology. A survey of the principles of animal development dealing with fundamental invertebrate and vertebrate types. Lectures, reference, and laboratory work. 6 credits. Mr. Ringoen.
- 197f-198w-199s. Problems. Advanced work in some special line. 5 or more credits. Mr. Minnich, Mr. Riley, Mr. Wodsedalek, Mr. Mickel, Mr. Ringoen, Mr. Eddy, Mr. Oliver.

COURSES PRIMARILY FOR GRADUATE STUDENTS

- 201-204. Research in Entomology. Mr. Riley.
- 205-208, 209-212, 265-268. See Entomology and Economic Zoology.
- 211-213. Research in Ecology. Mr. Eddy.
- 217-219. Research in Physiology. Mr. Minnich.
- 229-231. Research in Animal Histology. Mr. Ringoen.
- 233-235. Research in Embryology. Mr. Ringoen.
- 237-239. Research in Animal Cytology. Mr. Wodsedalek.
- 251-253. Research in Animal Genetics. Mr. Oliver.
- 261-263. Research in Animal Parasitology. Mr. Riley.

See also History of Science page 95.

INDEX

| | Page | | Page |
|------------------------------------|-------|----------------------------------|---------|
| Admission | 3-4 | Graduate work in law..... | 6-7 |
| Aeronautical Engineering | 19-20 | Graduate work in medicine.... | 6 |
| Agricultural Biochemistry | 20-23 | Graduate work in the summer | |
| Agricultural Economics | 58-60 | quarter | 5 |
| Agricultural Education | 66-68 | Greek | 51-52 |
| Agricultural Engineering | 23 | History | 92-95 |
| Agronomy and Plant Genetics.... | 23-25 | History of Science..... | 95 |
| Anatomy | 25-27 | Home Economics | 95-99 |
| Animal Genetics | 28 | Home Economics Education.... | 99 |
| Animal Husbandry | 27-28 | Horticulture | 99-101 |
| Anthropology | 29 | Journalism | 101-102 |
| Architecture | 29-31 | Latin | 52-53 |
| Astronomy | 31 | Library Methods | 102 |
| Bacteriology and Immunology .. | 31-33 | Mathematics and Mechanics.... | 102-105 |
| Biometry | 33 | Mechanical Engineering | 105-110 |
| Biophysics | 34 | Medical Social Work..... | 110 |
| Botany | 35-37 | Medicine | 111 |
| Chemical Engineering | 37-40 | Metallography | 111-13 |
| Chemistry | 40-46 | Metallurgy | 113-14 |
| Child Welfare | 46-47 | Mining and Petroleum Engineer- | |
| Civil Engineering | 48-51 | ing | 114-17 |
| Classical Languages | 51-53 | Obstetrics and Gynecology.... | 117 |
| Dairy Husbandry | 53-55 | Ophthalmology and Oto-Laryn- | |
| Degrees— | | gology | 117 |
| Doctor's degree | 14-18 | Organization | 3 |
| Engineer degrees | 12-14 | Pathology | 117-19 |
| Master of laws degree..... | 6-7 | Pediatrics | 119 |
| Master of science degree in en- | | Pharmacology and Therapeutics. | 119-21 |
| gineering or architecture... 12-14 | | Philosophy | 121 |
| Master of science degree in | | Physics | 122-24 |
| psychometrics | 8 | Physiology and Physiologic Chem- | |
| Master's degree | 8-12 | istry | 125-27 |
| Economics | 55-60 | Plant Breeding | 127 |
| Education | 60-74 | Plant Pathology and Botany.... | 127-29 |
| Educational Psychology | 68-71 | Plant Physiology and Agricul- | |
| Electrical Engineering | 74-78 | tural Botany | 129 |
| Engineering | 78 | Political Science | 129-33 |
| English | 79-83 | Preventive Medicine and Public | |
| Entomology and Economic Zool- | | Health | 133-35 |
| ogy | 83-84 | Psychology | 135-37 |
| Farm Management and Agricul- | | Public Health Nursing..... | 134 |
| tural Economics | 84 | Romance Languages | 137-39 |
| Fees | 4 | Scandinavian | 139 |
| Fellowships and scholarships ... | 4-5 | Sociology and Social Work | 140-43 |
| Fine Arts | 84 | Soils | 143-44 |
| Forestry | 85-86 | Speech | 144-45 |
| Geography | 87 | Surgery | 145 |
| Geology and Mineralogy..... | 88-90 | Veterinary Medicine | 145-46 |
| German | 90-92 | Zoology | 146-47 |
| Graduate Social Work..... | 7-8 | | |
| Graduate work by undergrad- | | | |
| ates | 6 | | |