COURSES OF INSTRUCTION

Note—In the following outline of courses, the length of a course and the quarter or quarters in which it is given are indicated immediately after its title. Courses numbered from 11 to 99 are offered to undergraduates only; those numbered from 101 to 199 are offered to both undergraduates and graduates; those numbered from 201 to 299 are offered to graduates only. Courses which are repeated in the summer quarter are so marked. There are, however, special summer quarter courses which do not appear in this outline. These will be found listed in the summer quarter bulletin. This outline is as nearly complete as it is possible to make it and it affords the student information which is necessary in arranging his course. When the student has decided upon his major course, he is expected to follow closely the work which is outlined as the required course in that line of study or research. Except where otherwise noted, the ranking professor in each department is chairman of that department.

The University reserves the right to withdraw any course for which less than five students are enrolled before the opening of the course. Such courses may be given only in special cases and with the written approval of the President.

Candidates for a degree of Bachelor of Arts in the College of Arts and Sciences must complete 186 credits of University work, of which not more than one-fourth may be of "D" grade. Of these not less than 93 credits must be in the College of Arts and Sciences. Not more than 27 credits in music will be counted toward graduation.

CURRICULUM IN ARTS AND SCIENCES.

The College of Arts and Sciences aims primarily to give the student a liberal education while at the same time giving him special training in some chosen field of work. For this purpose it has adopted a flexible curriculum. The student must select a major department in which he must obtain from forty to fifty-five credits, and he must also get acquainted with the other fields of liberal education. For this purpose the student is required to take courses in each of the larger divisions included under Liberal Arts.

If a student pursues in high school the courses advised for those preparing to enter the University, the required courses will be very few. If he does not pursue the courses advised for high school students preparing to enter the University he will have to take University courses equivalent to the high school courses which he lacks. One unit of high school work is regarded as equivalent to eight credits of University work. The required courses in the College of Arts and Sciences are classed as follows:
A. Courses required either in high school or in college but which are recommended for high school:
1. English Composition and Literature; 3 units or 24 credits.
2. Foreign Languages; 2 units or 16 credits in one language.
3. Biology, Chemistry, Geology, Mathematics, Physics; 3 units or 24 credits.
4. Economics, History, Political Science, and Sociology; 2 units or 16 credits.

B. In addition to the subjects recommended for high school, all candidates for a baccalaureate degree must meet in the University the requirements listed below.
1. Physical Education, 6 quarters (6 credits) required of all freshmen and sophomores less than 27 years of age, unless excused for cause.
2. Military Drill, 6 quarters (6 credits) required of all freshmen and sophomore men who are less than 27 years of age, unless excused for cause.
3. College Education, 1 quarter required of all freshmen.
4. English, 2 quarters (8 credits). The first quarter devoted to work in composition must be taken in the freshmen year and the second quarter in the sophomore year, normally in the corresponding quarter. A student making a grade of C or better in the first quarter of required English Composition, shall be excused from the second quarter providing that he submits during the quarter preceding normal election of the second quarter of English Composition, three papers which are satisfactory to the English Department.
5. Foreign Language, two quarters (10 credits) in the same language offered from high school. Students who offer three entrance units in one language are required to take only one quarter (5 credits) in the University, and those who have completed four entrance units in one language are exempt from further language requirements in the University.
6. Biology, Botany, Chemistry, Mathematics, Physics, 3 quarters (12 credits). The combined sciences for high school and the University must include not less than two different sciences of this group. In each of these two sciences the student must offer not less than one unit or eight credits. In the University the student must complete not less than eight credits in some one of the sciences of this group.
7. Economics, History, Political Science, Sociology, 2 quarters (8 credits).
8. English Literature, Philosophy, Psychology, 2 quarters (8 credits).
MAJOR-DEPARTMENT ELECTIVES

Not later than the junior year, every student must choose a major department. This department may command from 40 to 55 credits of the student's time. Not more than 65 credits in any department may be counted for graduation. Juniors and seniors must plan their course of study with the advice of their major professors.

FREE ELECTIVES

The remainder of the 186 required credits are free electives. Until choice of a major department is made, a student's electives are subject to the advice of an appointed faculty adviser; after this choice, the head of the department selected becomes the adviser.

REGISTRATION

Regular students in the College of Arts and Sciences are required to follow a curriculum so that they will normally complete all the required courses and restricted electives before the end of their junior year.

FRESHMAN REGISTRATION

All students are required during their freshman year to take the following work:
1. Physical Education, 3 credits.
2. Military Drill (for men), 3 credits.
3. College Education, 1 credit.
4. In addition to Physical Education, Military Drill, and College Education, freshmen in regular standing are required to take at least two different courses selected from Group B on page 52. During one quarter of the freshman year the student must carry a course in Freshman English. During any one quarter freshmen will not be allowed to carry more than three courses in addition to Physical Education, Military Science, and College Education.

SOPHOMORE REGISTRATION

All students are required during their sophomore year to meet the following requirements:
1. Physical Education, 3 credits.
2. Military Drill (for men), 3 credits.
3. At least one subject selected from Group B, page 52.

During any one quarter of the sophomore year a student will not be allowed to carry more than four courses in addition to Physical Education and Military Science.

Juniors and Seniors must carry at all times at least one subject selected from Group B until all requirements are completed.

GENERAL STATEMENT OF MAXIMUM AND MINIMUM REGISTRATION

Sixteen credits (in addition to required Physical Education and Military Science) is the usual maximum registration and 10 credits (in addition to required Physical Education and Military Science) is the minimum.

Students who during the previous quarter have received grades of "A" or "B" in one-half of their work and who have received no grade lower than "C" may register for 18 credits (in addition to Physical Education and Military Science); students who have received a condition or failure in any course during the preceding quarter may register for 15 credits only (in addition to required Physical Education and Military Science). Courses for which no credit is given toward a degree are assigned a rating for the operation of this rule.

Students wishing to enroll for more or less than the number of credits allowed by the above regulations must obtain the approval of their adviser and of the Dean of Men or the Dean of Women.
BIOLOGY

Professor, Morton J. Elrod. Assistant Professors, John X. Neuman, Humphrey G. Owen.

Students who do major work in biology must take courses in the department to the extent of 45 credit hours. They must have a reading knowledge of German or French, or preferably, of both. They must complete one year of botany and one year of chemistry, and must have historical and dynamic geology. See page 105 for suggested course for students preparing to study medicine.

For Undergraduates

11. Elementary Zoology. 3 Q. Autumn, winter and spring. 12 cr. Fee $2.50 per quarter. Open to all students. Introduction to the study of animals, dealing with their anatomy, distribution and habits. Textbooks, lectures, library references and laboratory work, the latter requiring one-half of the time. Field excursions. Attention to local fauna. Mr. Elrod, Mr. Owen, Mr. Neuman, and others.

12. Forest Zoology. 1 Q. Winter. 5 credits. Fee $2.50. Prepared for students in the School of Forestry. Mr. Elrod, Mr. Owen.


16. Protozoology. 1 Q. Winter. 4 cr. Fee $2.50. Prerequisite, one year of Botany or Zoology. A study of the life histories of various protozoans, their structure, habits, reproduction, distribution, their relation to animals and man as producing diseases. Mr. Elrod or Mr. Owen.

17. Entomology. 1 Q. Spring; summer. 5 cr. each quarter. Fee $2.50 per quarter. Open to all students. Insects, including their structure, classification, distribution, benefits and injuries, and their relation to animals and man through diseases. Mr. Owen.

19. General Bacteriology. 1 Q. Autumn; winter. 4 cr. each quarter. Fee $2.50 per quarter. Prerequisite, General Chemistry, and either Botany or Zoology. This course is planned specially to meet the wants of the students in the School of Pharmacy and the department of Home Economics. It will be specially serviceable to students preparing for medicine or other technical work. Mr. Neuman.

20. Eugenics. 1 Q. Autumn. 3 cr. Students entering this course should have a knowledge of the fundamental principles of Botany or Zoology. A discussion of the fundamental principals involved in the better development of man and animals. Lectures, textbook and library. Mr. Elrod, Mr. Owen, Mr. Neuman.
21. Histology. 1 Q. Autumn; winter. 4 cr. each quarter. Fee $2.50 per quarter. Prerequisite, Zoology 11. Practical course in the technique of sectioning, staining and mounting organisms and tissues. Two lectures or recitations and two laboratory periods. Mr. Elrod.

22. Embryology. 1 Q. Autumn. 5 cr. Fee $2.50. Prerequisite, Zoology 11. The course deals with the early development of animals, with special reference to the chick. Three lectures and recitations and two laboratory periods. Mr. Owen.

23. Comparative Anatomy. 1 Q. Winter; spring. 5 cr. Fee $2.50. Prerequisite, Zoology 11. Planned for students in Physical Education, and for those who wish to enter Medicine. One-half the work is in the laboratory, or two periods a week for the two quarters. Mr. Elrod.

24. Physiology of the Human Body. 1 Q. Autumn; winter. 4 cr. each quarter. Fee $2.50 per quarter. Open to all students, but a year of Elementary Botany or Zoology is essential in preparation. Dealing with the structure and function of the parts and organs of the human body. Planned to meet the requirements of teachers, students of Physical Education, Home Economics and Pharmacy, and those wishing a course of general information. Two lectures or recitations and two laboratory periods per week. Mr. Neuman.

25. Teaching Biology. 1 Q. Spring. 3 cr. Lectures and discussions dealing with the various methods of presenting the subject, selections of apparatus preparing a laboratory, selecting a library, and the various topics that come to the teacher for solution. This course, together with the similar courses offered in Botany and Geology, may be advantageously taken as a year's course in the teaching of the natural sciences. Mr. Elrod, Mr. Owen.

26. General Hygiene. 1 Q. Winter. 3 cr. An informational course for all students, dealing with the subject as related to the individual, the community and the state. The lectures and discussions relate to such subjects as bacterial and protozoan diseases, food, exercise, sleep, ventilation, drainage, disinfectants, and quarantine. Students entering this course will find an elementary knowledge of chemistry and zoology essential. Mr. Neuman.

For Undergraduates and Graduates.

115. Evolution. 1 Q. Autumn. 3 cr. Prerequisite: One year of Botany or Zoology. Lectures and assigned readings. Deals with the facts supporting the doctrine of Evolution, and touches upon the various ideas and theories advanced at different times, by different men. Mr. Owen.

118. Entomology, Advanced. 1 Q. to 4 Q. Autumn, winter, spring and summer. Credit to be arranged. Fee $2.50 per quarter. Prerequisite: Entomology 17. Intended for those who may wish to make advanced study in insects. Individual work will predominate, the student
taking special groups of insects or special insect problems. Mr. Owen or Mr. Elrod.

120. Bacteriology, Advanced. 1 Q. Autumn; spring. 3 or more credits. Fee $5. Prerequisite: Bacteriology 19, Immunology, serology, and animal experimentation. Practical application of the laboratory to clinical diagnosis. Lectures and laboratory.

122. Histology, Advanced. 1 Q. Winter. 4 cr. Fee $2.50. Follows Histology 21, with special reference to tissue structure and to pathology. Special work and special problems may be taken up by students individually. Mr. Elrod.

129. Biological Seminar. 3 Q. Autumn, winter and spring. 3 cr. Required of students majoring in Biology, and open to others of approved ability. Reviews of current literature for the purpose of giving a comprehensive survey of the trend of thought and study in biological fields. Special investigations in special work, with reports. Mr. Elrod, Mr. Owen, Mr. Neuman.

131. Research. 1 Q. to 4 Q. Autumn, winter, spring or summer. Opportunity will be given graduate students and others of sufficient fitness to pursue original investigations within the facilities of the department as to laboratories and material. Details will be arranged with individual students. Credit and time to be arranged. Mr. Elrod, Mr. Owen, Mr. Neuman.

For Graduates

201. Research. 4 Q. Autumn, winter, spring and summer quarters. Credits variable. Courses for students will be outlined to meet individual needs and requirements. The Biological Station at Flathead Lake affords exceptional opportunity for investigations.

Biological Station

A station for instruction and research, located at Yellow bay on the east shore of Flathead lake. The University owns 89 acres here with nearly a mile and a half of shore line; the institution is owner also of 40 acres on Wild Horse island and 40 acres on Bull island. The Flathead Lake Bird Reservation consists of two islands donated to the state as a bird reserve. These islands are under the control of the station, protected by state law. All of this land is for biological use. The station is accessible by a good automobile road or by boat from either end of the lake, connecting with both Great Northern and Northern Pacific trains.

The building equipment of the station consists of a substantial brick laboratory, a log dining building, a kitchen and a group of sleeping tents. The station has, also, a good equipment of boats and launches, with the collecting apparatus and laboratory instruments necessary for research work.
The station is located in virgin forest between the lake and the Mission mountains, which rise to an altitude of 8,500 feet at this point. Forest, lake, and mountains afford an attractive and, to a great extent, an unexplored field for biological research.

It is the purpose of the biological station to provide opportunity for field work of a sort which cannot be done in the routine of a university program. Instruction is limited to prescribed work for beginners but qualified students may select their own lines of research.

Students are required to pay a matriculation fee of $10. An additional fee of $5 is required for the use of scientific apparatus and boats. Meals are furnished at cost.

Credit for equivalent university work is given.

Special investigation and research work may be undertaken by those qualified to work independently. Every encouragement will be given in the direction of profitable research and in the publication of results.

Those who need special apparatus should notify the director before coming. Investigators may make arrangements for longer period than the regular session.

Students who are beginning research, or who work under direction, are recommended to choose subjects in the following fields:

- The morphology, taxonomy and distribution of fresh water algae and of parasitic fungi.
- The fishes and insects.
- The protozoa and entomostraca.

Those students prepared to undertake investigations with self-devised plans and methods will find the following fields fruitful:

In morphology there is abundant material of many forms. Many species almost entirely unknown to science are to be had.

In taxonomy many groups are yet in confusion, both land and water species. Insects, worms, crustacea, algae, fungi, and flowering plants present many opportunities for the investigators. Much important study is delayed by the inadequate taxonomy.

In parasites the field is almost untouched.

In embryology the season is just right for some fishes, and for the entomostracea. In other groups it probably is good.

In ecology there are many habitats for study. The field is good. Varying geological formations and climatic areas give wide range for work.

In cytology there is good material, but special attention must be given in advance to equipment for slide preparation.

In geographical distribution for most of the species only a beginning has been made. The field is large.

In bacteriology the field is open, but facilities at the station are lacking.

The courses offered give special preparation for teaching either Botany or Zoology in secondary schools or colleges. The work as out-
BIOLOGICAL STATION

lined and planned consists largely of field work, dealing with the animals and plants of the locality. By this plan actual training in field courses is given, fitting the methods of advanced biological teaching as used at the present time.

Description of Courses

For the season 1918 the following courses were offered:

S51. Systematic Botany—Plant analysis and field ecology. The classification and distribution of the flowering plants of the region. Most of the trees and shrubs of the northwest region are found close to the station.

S65. Systematic Mycology; Morphology, Ecology and Taxonomy—The study of the forms of the region, including those found in the main lake, in ponds, and in the streams will be undertaken in this course.

S11. Invertebrate Morphology—A study of types and of groups of animals of the locality. This will include protozoa, sponges, hydra, molluscs, worms and insects.

S13. Animal Ecology—A study of the conditions of life in the lake and ponds, the number and distribution of lake animals, their habits and habitats, their reactions to stimuli under normal and artificial conditions.

S17. Entomology—A course dealing with insects, particularly with those of the region.

S14. Land Animals—Special reference to the animal communities of the ponds, prairies and forests, dealing particularly with vertebrates. The localities for study include the lake shore, the prairies, the orchards, the deep woods, the open ponds, the swamps, the mountain ridges, the talus slopes, and the high summits.
BOTANY

PROFESSOR, J. E. KIRKWOOD (on leave). ASSISTANT PROFESSOR, PAUL W. GRAFF. INSTRUCTOR, KARL C. HYDE.

Those who do major work in this department must take courses in the department sufficient to total from 40 to 50 credits, the distribution to be determined with reference to the needs of the individual student with certain definite aims in view. In addition Chemistry 11, Geology 11, and Zoology 11 are required, together with at least one year of French.

For Undergraduates

11. General Botany. 2 or 3 Q. Autumn, winter, and spring. 12 cr. a quarter. Open to all undergraduate students, and fulfills the science requirement for graduation. A course which may be begun with any of the three quarters, giving a general survey of the field of botany, and reviewing the development of the plant kingdom. Field work in the spring quarter. Mr. Kirkwood, Mr. Graff, Mr. Hyde.

12. Elementary Plant Structures and Physiology. 1 Q. Autumn. 3 cr. The study of plants from the standpoint of the formation, movement, and storage of foods and their various products. Primarily for students in the School of Pharmacy. Mr. Hyde.

13. Plant Genetics. 1 Q. Autumn. 3 cr. A study of the laws of inheritance in the plant world as developed from scientific investigations. A brief historical treatment of the work of Lamarck, Mendel, Darwin, Weismann, De Vries, and others, and a study of the application of genetics to the improvement of varieties. Mr. Graff.

14. Economic Botany. 1 Q. Autumn. 5 cr. A study of plants from the standpoint of economic products; the origin and growth of textile fibres, foods, condiments, etc. Primarily for students in the Department of Home Economics. Mr. Kirkwood.

15. History of Botany. 1 Q. Spring. 3 cr. Lectures on the development of botanical science from the early times to the present; tracing its beginning, growth, and the origin of its several subsiences. Mr. Graff.

17. The Teaching of Botany. 1 Q. Winter. 3 cr. Lectures and discussions for those preparing to teach the subject. Among these will be included methods of presentation, the preparation of simple experiments and apparatus for the classroom, and the collection and preservation of plant materials for illustration and study. Mr. Graff.

Note: This course, together with the similar courses of the same number offered in Geology and Zoology may be advantageously taken as a year's course in the teaching of the natural sciences.


22. Plant Physiology. 1 Q. Winter. 5 cr. Prerequisite, 11.
An experimental study of living plants. Special attention is devoted to the relations of plants to soil, light, air, etc., and their reactions to various influences which affect them in nature. Mr. Kirkwood.

25. Rural Botany. 1 Q. Winter. 4 cr. Repeated in the summer quarter. Deals with the botanical aspects of agriculture; plant growth, propagation, relation to the soil, source and historic development of our economic products. A course for those who expect to teach agriculture in the schools of the state. Mr. Graff.

31. Forest Pathology. 1 Q. Spring. 5 cr. Prerequisite, 11. A study of the agencies of disease and decay of trees and structural timbers. Lectures, laboratory, and field work. Mr. Graff.

63. Dendrology. 1 Q. Autumn and winter. 8 cr. Prerequisite, 11. A study of the classification, and distribution of the principal forest trees of the United States and Canada. Mr. Kirkwood.


F2. Range Plants. 1 Q. Winter. No cr. A study of the grazing, and poisonous plants of the range for short course students of the Ranger School. Mr. Graff.

For Undergraduates and Graduates.

141. Comparative Morphology. 2 Q. Winter and spring. 10 cr. Prerequisite, 11. Devoted especially to the study of life histories of typical plants of the larger natural groups. Mr. Kirkwood.

151. Ecology. 1 Q. Autumn. 5 cr. Prerequisite, 11 and 21. The relation of vegetation to soil, climate, etc., and the biological relations of the principal species of given areas. Mr. Kirkwood.

161. Systematic Botany. Given in any quarter of the year separately or continuously. Cr. variable. Prerequisite, 11. Classification of the flowering plants, especially of Montana. Field trips in season are an important part of the work. Instruction also in the methods of collecting, preserving, and mounting plants. Mr. Kirkwood, Mr. Graff.

165. Systematic Mycology. 1 Q. Autumn. 5 cr. Prerequisite, 11. A study of the classification, relationships, and habits of the fungi. Lectures, laboratory, and field work. Mr. Graff.

166. Systematic Mycology. 1 Q. Spring. 5 cr. Prerequisite 11. A study of the classification, relationships, and habits of the Algae. Lectures, laboratory, and field work. Mr. Graff.

171. Seminar in Botany. 3 Q. Autumn, winter, and spring. 9 cr. Open only to senior major and graduate students in botany. Reviews of the current literature of botany; introduction to the journals and methods of bibliographical research. Mr. Kirkwood.

For Graduates.

201. Research. Any quarter. Credits variable. Work on selected problems to meet the individual needs and requirements. Exceptional opportunity is offered by the location of the University for work on innumerable problems in Ecology, Morphology, Mycology and Systematic Botany. Mr. Kirkwood, Mr. Graff.
BUSINESS ADMINISTRATION

See School of Business Administration, page 109.
CHEMISTRY

Professor, R. H. Jesse, Jr. Associate Professor, W. G. Bateman. Assistant Professor, J. W. Howard. Instructor, H. O. Urey.

Those who do major work in this department are required to have a minimum of 54 credits in Chemistry, which must include: General Chemistry, 12 credits; Qualitative Analysis, 10 credits; Quantitative Analysis, 7 to 10 credits; Organic Chemistry, 10 credits; Physical Chemistry, 10 credits. In addition a major student in Chemistry should have acquired by the time of his graduation a reading knowledge of French and German and a working knowledge of English Composition, College Physics, Algebra, Trigonometry, Analytic Geometry, Calculus, and Elementary Mineralogy.

When an individual elects simultaneously two or more courses in Chemistry, he must pay in full for the course with the highest fee and deposit, but only one-half the fee and one-half the deposit for the other courses.

For Undergraduates

11. General Chemistry. 3 Q. Autumn, winter, and spring. Continuous. 15 cr. Fee, $3 a quarter; breakage deposit, $2 a quarter. The fundamental laws of chemistry; the properties and relations of the more common elements and of their compounds. Open to all students. Mr. Jesse, Mr. Urey, and three assistants.

13. Inorganic Chemistry and Qualitative Analysis. 3 Q. Autumn, winter, and spring. Continuous. 15 cr. Fee, $3 a quarter; breakage deposit, $2 a quarter. The fundamental laws of chemistry; the properties and relations of the non-metallic and metallic elements; theory and methods of inorganic qualitative analysis. Students who are deficient may be dropped at any time, at the judgment of the instructor, into Chemistry 11. Open only to those who have studied chemistry for one year in high school. Mr. Bateman.

15a. Qualitative Analysis. 1 Q. Autumn. 5 cr. Fee, $4; breakage deposit, $3. The theory of, and the methods for the detection and separation of the principal inorganic basic and acidic ions. Prerequisite, Chemistry 11. Mr. Bateman.

15b. Qualitative Analysis. 1 Q. Winter. 5 cr. Fee, $4; breakage deposit, $3. A continuation of course 15a. Prerequisite, Chemistry 13, or 15a. Mr. Bateman.

17. Quantitative Analysis. 1 Q. Autumn; spring. 5 cr. Fee, $4; breakage deposit, $3. Introduction to quantitative gravimetric and volumetric methods. Prerequisite, Chemistry 13 or 15a. Mr. Jesse.
18. **Fire Assaying.** 1 Q. Spring. 3 cr. Fee $6. Sampling and grinding of ores; fire assay for gold, silver, and lead. Prerequisite, Chemistry 15a. Mr. Jesse.

19. **Organic Chemistry.** 1 Q. Winter. 5 cr. Fee, $4; breakage deposit, $3. Briefer survey of the field of organic chemistry. Intended for students of Pharmacy, Medicine, and Home Economics. Prerequisite, Chemistry 11. Mr. Howard.

**For Undergraduates and Graduates**

101. **The Carbon Compounds.** 2 Q. Autumn and winter. Continuous. 10 cr. Fee, $4 a quarter; breakage deposit, $3 a quarter. A detailed and systematic study of organic chemistry. Intended for students who elect chemistry as a major. Prerequisites, Chemistry 11. Mr. Howard.

102. **Organic Qualitative Analysis.** 1 Q. Spring. 2 cr. Fee, $4; breakage deposit, $3. Systematic methods of identification of pure organic compounds and mixtures; general class reactions of organic chemistry. Prerequisite, Chemistry 101. Mr. Howard.

103. **Physiological Chemistry.** 1 Q. Spring. 5 or 6 cr. Fee, $4; breakage deposit, $3. Chemistry of the human body; blood, bile, urine, feces, milk, etc. Prerequisite, Chemistry 101. Mr. Bateman.

104. **Chemistry and Analysis of Foods.** 1 Q. Autumn. 3 cr. Fee, $4; breakage deposit, $3. Chemical aspects of foods; their manufacture, value, preservation and adulteration; analysis and testing of food stuffs for quality and purity. Prerequisite, Chemistry 17 and 19. Mr. Howard.

105. **Textile Chemistry.** 1 Q. Spring. 3 cr. Fee, $4. Microscopic study of textile fibers; chemical analysis of fabrics; dyeing and laundering. Prerequisite, Chemistry 19. Mr. Bateman.

106. **Physical Chemistry.** 2 Q. Autumn and winter. Continuous. 10 cr. Fee, $4 a quarter; breakage deposit, $3 a quarter. The more important methods, results, and problems of theoretical chemistry. Prerequisites, Chemistry 17 and 101, college physics. A knowledge of calculus is very desirable. Mr. Jesse.

107. **History of Chemical Theories.** 2 Q. Autumn and winter. Continuous. 6 cr. Present status and value of chemical theories through an examination of their origin and development. Prerequisites, Chemistry 11 and 101, and a reading knowledge of German. Messrs. Bateman, Jesse, Howard and Urey.

108. **Electrochemistry.** 1 Q. Spring. 3 cr. Lectures on theoretical and applied electrochemistry. Prerequisite, Chemistry 106. Mr. Jesse.

109. **Industrial Chemistry.** 2 Q. Winter and spring. 10 cr. The chemistry of industrial and engineering materials and the discussion of technical chemical processes. Prerequisite, Chemistry 17 and 101. Mr. Howard and Mr. Urey.
111. **Technical Analysis.** 1 Q. Autumn; winter; spring. 2 to 4 cr. Fee, $4 a quarter; breakage deposit, $3 a quarter. Analysis of various materials of commercial importance. The work is varied according to the needs and tastes of the individual. Mr. Jesse and Mr. Urey.

113. **Journal Club.** 3 Q. Autumn, winter and spring. 3 cr. Presentation and discussion of current journal literature by upper classmen and the departmental staff. This course may again be elected for credit in a following year. Prerequisite, Chemistry 17, 101, and a reading knowledge of German and French. Messrs. Jesse, Bateman, Howard and Urey.

**For Graduates**

200. **Advanced Courses and Research.** The department is prepared to arrange for properly qualified students advanced and research courses in: Inorganic, analytical, organic, physical, or industrial chemistry and in biochemistry.
ECONOMICS

PROFESSORS SHIRLEY J. COON, J. H. UNDERWOOD, (Chairman). INSTRUCTOR, J. MAURICE DEITRICH.

A minimum of 45 credits constitutes a major in this department. The distribution is determined as far as possible with reference to the needs of the individual student. Minor work is advised in history, modern languages and mathematics. Biology and psychology are advised as preliminary to sociology.

11. Economic Resources. 1 Q. Autumn. 5 cr. Open to freshmen. Natural resources and economic geography of the principal countries of the world. Mr. Deitrich.

12. Resources and Industries of the United States. 1 Q. Winter. 5 cr. Open to freshmen. Descriptive studies designed as a foundation for the further study of economics. Mr. Deitrich.

13. Economic History of the United States. 1 Q. Spring. 5 cr. Open to freshmen. The industrial development and financial policies of the United States from the colonial period to the present time. Mr. Deitrich.

14. Principles of Economics. 2 Q. Autumn, winter; winter, spring. 8 cr. Open to sophomores. Mr. Coon and Mr. Deitrich.

For Graduates and Undergraduates.

101. Money and Banking. 2 Q. Autumn, winter. 6 cr. Prerequisite, Economics 14. Theory and history of money and banking; banking methods and legislation affecting banking; domestic exchange; federal reserve system; interrelations of banking and business. Mr. Deitrich.

103. Foreign Trade and Exchange. 1 Q. Spring. 3 cr. Prerequisite, Economics 14. Investigation and development of foreign markets, the machinery of foreign trade; operation of a foreign trade organization, foreign credits and collections, foreign exchange and international banking. Mr. Deitrich.


127. Transportation. 1 Q. Spring. 5 cr. Alternates with Economics 129. Prerequisite, Economics 14. Development of American Transportation systems; the economic characteristics of railroads; rate making; discrimination; the Interstate Commerce act and later acts and their interpretation and results. Mr. Coon.

131. Labor Problems. 1 Q. Autumn. 3 cr. Prerequisite, Economics 14. General survey of the main forces and factors which give rise to modern labor conditions; poverty, child labor, unemployment, wages, hours of work; distribution of income; social progress, the philosophy, policies and methods of organized labor; labor legislation; arbitration; and social insurance. Mr. Coon.

171. Property and Distribution. 1 Q. Autumn. 3 cr. Prerequisite, Economics 14. Application of economic principles to the study of the property system; the distribution of incomes and property to the various members and classes of society. Mr. Underwood.

173. Co-operative Movements. 1 Q. Winter. 3 cr. Prerequisite, Economics 14. Contemporary organizations of labor, capital or the state for the co-operative production and distribution of goods; cooperation in credit. Mr. Underwood.

175. Social Theories. 1 Q. Spring. 3 cr. Alternate years. Not given in 1920-21. The examination of proposals for social reorganization in the light of economic and sociological science. Mr. Underwood.

181. Economic and Social Problems. 3 Q. Autumn, winter and spring. 3 to 9 cr. Prerequisite, Economics 14 and the permission of the department; researches in the application of economic science to contemporary political and social problems. Mr. Underwood.

SOCIOLOGY

161. Sociology. 2 Q. Autumn, winter. 8 cr. Open to sophomores. Evolution of social interests and institutions; social control; social policy. Mr. Underwood.

163. Social Progress. 1 Q. Spring. 3 cr. Prerequisite, Sociology 161. Movements and changes in society. Mr. Underwood.

165. Philanthropy and Remedial Social Work. 3 Q. Autumn, winter and spring. 9 or 12 cr. Open to qualified sophomores. Mr. ———.

167. Institutions of Social Service. 1 Q. Spring. 3 cr. The agencies of constructive social services by persons, corporations and other organizations. Mr. Underwood.
EDUCATION

PROFESSORS, FREEMAN DAUGHTERS, EDWARD O. SISSON (Chairman). ASSISTANT PROFESSOR, WALTER R. AMES.

Students desiring to prepare for educational administration as principals and superintendents should do major work in Education. Those desiring to become teachers of special subjects should do major work in departments offering such special subjects. Those who do major work in Education, in addition to the requirements for the University Certificate of Qualification to Teach, will be required to take courses 134, 150, 158, and 162.

The course in General Psychology or its equivalent is a prerequisite to all courses in Education.

Courses marked with an asterisk (*) are required for the Certificate of Qualification to Teach.

10 College Education. 1 Q. Autumn. 1 c. Required of all freshmen. Given by the President, the Deans of Men and Women and others.

For Undergraduates and Graduates

*114. History of Education. 1 Q. Autumn. 6 cr. Open to junior and senior students. Mr. Daughters.

*118. Principles of Education. 1 Q. Winter; summer. 3 cr. Open to junior and senior students. Mr. Sisson.

*119. Educational Psychology. 1 Q. Spring; summer. 3 cr. Open to junior and senior students. Mr. Ames.

*122. The High School. 1 Q. Autumn; summer. 5 cr. For senior students. History, organization, management, and problems of the high school; the psychology of adolescence and the formation of character. Mr. Daughters.

*126. Observation and Teaching. 2 Q. Winter and spring. 6 cr. on Certificate only. Time to be arranged. Prerequisite, 21 credits in Education. Systematic observation of classroom work; weekly conferences; preparation of lesson plans and teaching under the supervision of the department of Education and critic teachers, carried on in cooperation with the Missoula County High School. Mr. Daughters and Mr. Ames.

*130. School Hygiene. 1 Q. Winter; summer. 3 crs. For junior, senior and advanced students. Hygienic aspects of school architecture and equipment, of instruction, and of the physical and mental life of the school child. Mr. Daughters.

134. School Supervision. 1 Q. Winter, spring or summer. 3 cr. Open to junior and senior students. Prerequisite, Education 118 and 119. Instruction—its quality, technique, rating, and the improvement
of teachers. Also discipline, classroom management, supervised study, and the measurement of educational products. Mr. Ames.

150. Educational Administration. 2 Q. Autumn and winter. 6 cr. Primarily for graduate and advanced students. Mr. Daughters.

154. Pedagogical Seminar. 2 Q. Autumn and winter. Credit and time to be arranged. Designed for graduate and advanced students of education. Topics will be selected for original investigation and due consideration will be given to current technical literature. Conducted by Messrs. Sisson, Daughters, and Ames.

158. Educational Sociology. 1 Q. Spring. 3 cr. Open to all junior and senior students. Elementary course dealing with the social aspects of education, the relation of the school and society, institutional adjustment and change, and the curriculum. Mr. Daughters.

162. Problems in Elementary Education. 1 Q. Winter. 5 cr. Open to all students in Education. The elementary school, its history, organization, management, curriculum and types of teaching; its special problems; the kindergarten and such other features as should be familiar to an administrator or supervisor. Mr. Daughters and Mr. Ames.

166. History of American Education. 1 Q. Autumn or spring. 5 cr. Open only to graduate or advanced students. Mr. Daughters.

For Graduates

270. Educational Psychology. 3 Q. Autumn, winter and spring. 9 cr. Open only to graduate and advanced students. Prerequisites, the courses in General Psychology and Education 119. This course is more advanced and will cover a wide range of literature, much of it technical, in the field of Educational Psychology. Mr. Ames.

275. History of Education. Advanced Course. 3 Q. Autumn, winter and spring. 12 cr. Open only to graduate and advanced students. Prerequisite, Education 114. The History of Education, with emphasis upon sources. It will supplement, and, at the same time, be far more thorough than Education 114. Mr. Daughters.

For details regarding the University Certificate of Qualification to Teach, see pages 47-49.
ENGLISH

PROFESSORS, FRANCES CORBIN, HAROLD G. MERRIAM (Chairman). ASSISTANT PROFESSORS, SIDNEY HAYES COX, ELLEN M. Geyer, ANDERS ORBECK. INSTRUCTORS, EDMUND L. FREEMAN, EUGENE R. ORMSBEE. ASSISTANT, VERA T. WIRTH.

Those who do major work in this department are required to take a minimum of 45 hours in addition to 11ab. Courses 27 ab, 57 a or 57b, 30, 193abc, and 199 are required of all major students. Course 27ab should be taken in the freshman or sophomore year. Those who desire also to secure a teacher's certificate must take in addition course 90.

These regulations apply to students of the class of 1922 and subsequent classes. Regulations for students of the classes of 1920 and 1921 are stated in the catalog for 1918-19.

All students who major in English are advised to take two years of a foreign language, and at least one course in each of the subjects history, psychology, and sociology. A course in the history and appreciation of art is also recommended.

Courses open to freshmen are numbered 10-29, to sophomores 30-59, to juniors and seniors, 60-89, to seniors only 90-99, and to both undergraduates and graduates 100-200.

Composition

F. Ranger School English. 1 Q. Winter. 3 cr. Practice in writing elementary English. Writing of letters and forestry reports.

A. Sub-Freshman Composition. 3 Q. Fall; winter; spring. No cr. For students whose work is consistently below the standard of Freshman Composition. It is a course intended to aid such students. Attendance is voluntary, but once a student has entered the course he must attend classes until his standard of work justifies withdrawal. Attendance is in addition to attendance in Freshman Composition.

11a. Freshman Composition. 1 Q. Autumn; winter; spring. 4 cr. The English faculty.

11b. Freshman Composition. 1 Q. Autumn; winter; spring. 4 cr. The English faculty.

English 11ab is required of all students.

English 11a is to be taken in the freshman year. It studies development of personal ideas and the gathering and organization of material for the writing of papers. Study of words and syntax is involved.

English 11b is normally to be taken in the corresponding quarter of the sophomore year. During the quarter preceding election of English 11b, students are to submit to the English Department papers written for courses other than composition. If the English of these papers is good, if the student's English is satisfactory to the instructors
of the courses he is taking, and if the student has made a grade of C in English 11a, he will be excused from the requirement of English 11b.

17. Essays and Essay Writing. 1 Q. Spring. 4 cr. Prerequisite, English 11a. Primarily for freshmen and sophomores; upperclassmen admitted only with the consent of the instructor. A study and practice course. Survey of the historical development of the familiar essay in England; study of contemporaneous essays and practice in essay writing. Mr. Freeman.

30. Advanced Composition. 1 Q. Autumn; spring. 4 cr. Required of students who major in English and those who desire the teacher's certificate in English. Open to sophomores who made a grade of A in English 11a. A study of the various forms of expository writing. On the average two essays a week will be required. Mr. Orbeck.

31. Business Composition. 1 Q. Winter. 4 cr. Open to sophomores; students who have not taken English 11b must consult with the instructor before election. A course in composition designed to meet the special needs of students in professional courses.

32. Story Writing. 1 Q. Spring. 4 cr. Open to sophomores after consultation with the instructor. Practice in writing narrative and intensive study of representative short stories. Miss Geyer.

60. Writing of Dramatic Sketches. 1 Q. Autumn. Given in 1920-21, and in alternate years. 3 cr. The student should have taken English 32; other students admitted with the consent of the instructor. A study of the nature of dramatic effects; telling a story under the conditions of drama. The course leads into the writing of the one-act play.

160abc. Creative Writing. 3 Q. Autumn; winter; spring. 6 cr. Prerequisite, English 30 and one of the courses, English 17, 32, or 60. Practice in writing literary types, with instruction in literary conception and execution. Mr. Merriam.

Public Speaking

20a. Elementary Public Speaking. 1 Q. Autumn; spring. 4 cr. A course in extemporaneous speaking, placing equal emphasis on the matter and the manner of one's talk. Text-study of how to construct a speech. Analysis of representative speeches, and weekly practice by members of the class.

20b. Public Speaking. 1 Q. Winter. 4 cr. Prerequisite, English, 20a; other students admitted with the consent of the instructor. Advanced work in extemporaneous and prepared speeches, building on the work of English 20a.

53a. Argumentation. 1 Q. Autumn. 3 cr. English 20ab is recommended to students who look forward to election of this course. Critical study, with practice, in principles of argumentation and debate. Brief-drawing and argumentative composition, with study of rules of
evidence, fallacies of argument, and debate tactics. Floor-work in the second half of the quarter. Mr. Freeman.

53b. Practice Debate. 1 Q. Winter. 2 cr. Prerequisite, English 53a. A floor-work course designed for debaters and law students. Debates held each class session. Textbooks used only for collateral reading. Mr. Freeman.

54. Public Address. 1 Q. Autumn. 4 cr. Prerequisite, English 20a or English 53a. A study of advanced principles of public discussion, analysis of famous speeches and orations, and particular attention to finished composition and delivery of speeches.

40. Story Telling. 1 Q. Spring. 2 cr. Study and practice of the effective telling of stories to children. Story telling as a community force. Offered each year.

41. Dramatic Presentation. 1 Q. Winter. 3 cr. Offered in 1920-21, and in alternate years. It is desirable that the student who elects this course shall have had English 27ab. Study of the staging of plays. Mr. Merriam.

61. Pageantry. 1 Q. Winter. 4 cr. Before electing this course a student should have taken English 41, or English 60, or both. Offered in 1921-22, and in alternate years.

Literature and Language

26. The English Bible. 1 Q. Spring. 4 cr. Literary types; qualities of thought, feeling, and style; careful study of three selected books. Miss Corbin.

27ab. General Literature. 2 Q. Autumn and winter. 8 cr. This course should be taken in the freshman or sophomore year. Study of the aims and values of literature, and of the various literary types. Each type is studied in its nature and growth. The course is fundamental to later courses in special periods and particular forms. Mr. Merriam.

29ab. American Literature. 2 Q. Autumn and winter. 10 cr. Open to freshmen. The study of American thought and feeling as reflected in our literature. Special attention is paid to the greater writers of the nineteenth century, as Emerson, Hawthorne, Poe, and Whitman. Miss Corbin.

55ab. Contemporary Literature. 2 Q. Winter and Spring. 8 cr. First Quarter: A study of the social aspects of significant modern literature, 1870 to date. Mr. Orbeck. Second Quarter: A study of philosophic, scientific, and artistic aspects of modern literature, 1870 to date. Mr. Orbeck.

57ab. Shakespeare. 2 Q. Autumn and winter. 10 cr. First Quarter: A chronological study of the plays of Shakespeare. Mr. Orbeck. Second Quarter: An intensive study of Hamlet, King Lear, Antony and
Cleopatra, Othello, As You Like It, The Tempest. Three or four of these plays will be studied. Miss Corbin.

73. Spirit of the Renaissance in English Literature. 1 Q. Winter. 4 cr. Offered in 1920-21, and in alternate years. Prerequisite, any course in English literature. A study of the spirit of the new learning and feeling as expressed in the works of Wyatt, Surrey, Ascham, Lyly, Spenser, and Sidney. The Universities, the libraries, the song books, the literature of travel. Miss Geyer.

74. Literary Tendencies in the Seventeenth Century. 1 Q. Spring. 4 cr. Prerequisite, any course in English literature. Offered in 1920-21, and in alternate years. Cavalier lyricists; religious poets of the time; Milton; Bunyan; the pulpit prose; the antiquaries. Mr. Merriam.

75. English Novelists. 1 Q. Autumn. 4 cr. Students who elect this course should have taken English 27ab. Offered in 1920-21, and in alternate years. A course designed to develop a sense of prose style, some critical standards for fiction, and an intelligent interest in and sympathy with all sorts of people, by the reading and discussion of novels by Fielding, Jane Austen, Thackeray, Eliot, and Trollope. Mr. Cox.

76. Masters of Fiction. 1 Q. Winter. 4 cr. Although it is not a prerequisite, English 27ab should precede this course. Offered in 1920-21, and in alternate years. Study of novels, either of the past or of the present, by the great novelists of the world. In 1920, an analytical reading and discussion of representative novels by Balzac, Flaubert, Hugo, Tolstoi, Turgeneff, Howells, James, and Meredith. Mr. Cox.

77. Modern Drama. 1 Q. Spring. 4 cr. Prerequisite, English 27ab. Offered in 1921-22, and in alternate years.

80. Literary Thought of the Eighteenth Century. 1 Q. Autumn. 4 cr. Prerequisite, any course in English literature. Offered in 1921-22, and in alternate years.

81. Chief Romantic Poets. 1 Q. Winter. 4 cr. Prerequisite, any sophomore or junior course in English literature. Offered in 1921-22, and in alternate years.

82. Tennyson and Browning. 1 Q. Spring. 4 cr. Prerequisite, any sophomore or junior course in English literature. Offered in 1921-22, and in alternate years.

87. History of the English Language. 1 Q. Spring. 3 cr. Prerequisite, four quarters of English literature. Offered in 1920-21, and in alternate years. Consideration of the growth of English speech, and the development of modern English grammar. Mr. Orbeck.

90. Teaching English. 1 Q. Spring. 4 cr. Methods of teaching literature and composition in the high school. The instruction in course of study will refer specifically to Montana. Miss Geyer.

164. Chaucer. 1 Q. Spring. 4 cr. Prerequisite, any sophomore
or junior course in English literature. Offered in 1920-21, and in alternate years. Reading, for understanding and enjoyment, of much of Chaucer's work. Study of political, religious, and social background, the language and literary material that Chaucer had to work with, his English and versification, his understanding of human nature. Mr. Cox.

165. Middle English Literature. 1 Q. Autumn. 4 cr. Prerequisite, any sophomore course in literature. Offered in 1920-21, and in alternate years. Brief survey of metrical romances; more extended consideration of the beginnings of English prose in the fourteenth and fifteenth centuries. "Travels of Sir John Mandeville"; Wycliff; Caxton, "Piers Plowman," and other social and political verse; song collections; religious drama. Miss Geyer.

178. Tragedy. 1 Q. Autumn. 5 cr. Prerequisite, English 27ab. Offered in 1921-22, and in alternate years.

179. Comedy. 1 Q. Winter. 5 cr. Prerequisite, English 27ab and 178. Offered in 1921-22, and in alternate years.

192. Studies in Major Writers. 1 Q. Autumn. 3 cr. May be elected only by seniors, with the consent of the instructor. One writer is studied intensively. The subject and the instructor change from year to year. For 1919-20, Byron, Mr. Orbeck. For 1920-21, Wordsworth, Miss Corbin.

193abc. Literary Currents of the Nineteenth Century. 3 Q. Autumn; winter; spring. 6 cr. Open to seniors only. Required of all English majors. The course aims at understanding of the thought and feeling of the nineteenth century, especially as a background to the life and literature of our own day. The English faculty.

194. Influence of the Classics on English Literature. 1 Q. Autumn. 3 cr. Offered in 1921-22, and in alternate years.

 Those who do major work in this department are required to complete 45 credits.

11. **History and Appreciation of Art.** 1 Q. Autumn; winter. 4 cr. A general survey of the development of painting, sculpture and architectural from the beginning to the present time. The course is intended to develop the understanding and appreciation of art. Miss ——

17. **Advertising.** 1 Q. Autumn; winter. 2 cr. Presenting the theory and methods of applying art in a practical way; originating posters, folders and booklets for commercial purposes; explaining the technical problems of photographic plate work of color and line for production. The work is closely associated with the School of Journalism. Mr. Schwalm.

19. **Artistic Anatomy.** 1 Q. Winter; spring. 6 cr. Prerequisite, courses 21-22. For those who propose to take advanced work in art, such as illustration, mural decoration and painting of the figures. Given every other year. Mr. Schwalm.

21. **Elementary Drawing.** Study in charcoal of cast and still life; outdoor sketching and work from the model. Given in the summer quarter. Miss ——

23. **Advanced Drawing and Painting.** 3 Q. Autumn; winter; spring. 2-3 cr. Prerequisite, courses 21-22. Process and principles of drawing and painting in oils and water color; work from model and outdoor sketching. Given in the summer quarter. Mr. Schwalm.

25. **Illustration.** 1 Q. 2 cr. Prerequisite, courses 21-22. Students do practical illustrations for books, newspapers and magazines; special attention will be given to pictorial composition and methods of reproduction. Mr. Schwalm.

27. **Cartooning.** 1 Q. Autumn. 2 cr. Prerequisite, courses 23-24. A course in practical training; work is identical with that done by artists on a daily newspaper. The work is closely associated with the School of Journalism. Mr. Schwalm.

30. **Teachers’ Course.** 1 Q. Winter; spring. 5 cr. Open to advanced students only. Primarily intended for students who wish to teach or supervise drawing in public schools. The course takes up construction work, design, color, clay modeling, object and nature drawing and methods as applied in public school art work. Miss ——

31. **Design.** 2 Q. Autumn; winter. 2 cr. A study of the natural flowers with theory and practice in the principle of artistic arrangement. Course is arranged so that the designs may be applied in Handicraft courses. Given in the summer quarter. Mr. Schwalm.