Nebraska Wesleyan University

Chemistry

Catalog

2013-2014

About the Program

The Bachelor of Arts degree is for those who want a core of chemistry courses with a broader background in the liberal arts. The Bachelor of Science degree is for those who wish to emphasize their study of chemistry.

Students interested in chemical engineering can participate in the Engineering Dual-Degree Program described in the Department of Physics and Astronomy section of this catalog.

A program of study emphasizing a strong background in chemistry is available for students planning a future in medicine.

The Department of Chemistry is on the approved list of the American Chemical Society (ACS). Approval is received after an examination of curriculum, laboratory facilities, library, and staff of the department by the Committee on Professional Training of the ACS.

Students who wish to be certified as having met the minimum requirements of the American Chemical Society for professional training must complete two semesters of advanced work based on concepts and techniques developed in the “core curriculum” (those courses required for the Bachelor of Science degree in Chemistry, excluding Chemistry 293 and 295). Chemistry 252 and certain projects in Chemistry 295 will satisfy this requirement as will advanced courses in mathematics and physics. Students wishing to be certified must work closely with the department chair in developing their program of study.

Majors, Minors & Degrees

Majors

1. Biochemistry and Molecular Biology (B.S.)
2. Chemistry (B.A.)
3. Chemistry (B.S.)

Minors

1. Chemistry

Courses

CHEM 010 Chemistry and the Human Environment

4 hours

A course designed to acquaint non-science majors with some fundamental concepts of chemistry. The course emphasizes the role of chemistry in understanding the interaction of modern society with the environment. Credit will not be given for both CHEM 051 Chemical Principles and CHEM 010 Chemistry and the Human Environment.

Three lectures per week.

One 3-hour lab per week.

CHEM 041 Forensic Chemistry

4 hours

A course designed to acquaint students with fundamental concepts of chemistry. The course emphasizes the role of chemistry in the science of solving crimes. Topics include forensic laboratory ethics, evidence collection and preservation, chemical evidence, drug chemistry, arson investigation, chemistry of explosions, poisons, and DNA analysis.

Three lectures per week.

One 3-hour lab per week.

CHEM 042 General Chemistry

3 hours

This course will provide an introduction to inorganic chemistry, organic chemistry and biochemistry. Major topics in inorganic chemistry will include: atomic structure, compounds and bonds, chemical equations and stoichiometry, gas laws, solutions, acids and bases, and major hydrocarbons and their derivatives. Major topics in organic chemistry and biochemistry will include: alkanes and their derivatives, carbohydrates, lipids, proteins, nucleic acids, enzymes and chemistry of cell metabolism.

CHEM 051 Chemical Principles

3 hours

A study of fundamental principles of chemistry including structures of atoms and molecules, periodicity, stoichiometry, reactions, solutions, gases, and thermochemistry.

Three classes per week.

CHEM 051L Chemical Principles Laboratory

1 hours

Laboratory supporting Chemical Principles.

One 3-hour lab per week.

Pre or corequisite: CHEM 051 Chemical Principles.

CHEM 090 Selected Topic

1-4 hours

A course designed to treat subject matter not covered in other departmental courses. The title, content, and credit will be determined by current mutual interests of students and faculty.

CHEM 100 Introduction to Research

1 hours

An introduction to experimental research.
One 3-hour lab per week. Pass/Fail Only.

Prerequisite(s): Permission of the instructor.

(Normally offered each spring semester.)

CHEM 112 Chemical Principles II

3 hours

A continuation of Chemical Principles I. Topics include reaction kinetics, aqueous equilibria, thermodynamics (Entropy and Gibbs Free Energy), electrochemistry, colligative properties, nuclear and coordination chemistry, and the solid state.

Prerequisite(s): CHEM 051 Chemical Principles and CHEM 051L Chemical Principles Laboratory with grades of "C-" or better.

CHEM 112L Chemical Principles II Lab

1 hour

A laboratory supporting Chemistry CHEM 112 Chemical Principles II.

One 3-hour lab per week.

CHEM 120 Organic Chemistry I

3 hours

A surey of the structure and reactions of carbon-containing molecules, with emphasis on compounds of biological interest.

Three lectures per week.

Prerequisite(s): CHEM 051 Chemical Principles and CHEM 051L Chemical Principles Laboratory with a grade of "C" or better.

CHEM 120L Organic Chemistry I Laboratory

1 hours

A laboratory supporting CHEM 120 Organic Chemistry I .

One 3-hour lab per week.

One 1-hour pre-lab lecture per week.

Corequisite: CHEM 120 Organic Chemistry I .

CHEM 121 Organic Chemistry II: Synthesis and Mechanisms

3 hours

A continuation of CHEM 120 Organic Chemistry I . A study of reactions of importance in the synthesis and biosynthesis of carbon compounds, including reaction mechanisms and spectroscopic methods for the determination of structures.

Three lectures per week.

Prerequisite(s): CHEM 120 Organic Chemistry I and CHEM 120L Organic Chemistry I Laboratory with grades of "C-" or better.

CHEM 121L Organic Chemistry II Laboratory

1 hours

A laboratory supporting CHEM 121 Organic Chemistry II: Synthesis and Mechanisms.

One 3- to 4-hour lab per week.

One 1-hour pre-lab lecture per week.

Corequisite(s): CHEM 121 Organic Chemistry II: Synthesis and Mechanisms.

CHEM 122 Analytical and Inorganic Chemistry

3 hours

An introduction to certain aspects of analytical inorganic chemistry. Analytical topics include the general subject of chemical equilibrium in solution, and the classical methods of chemical analysis. Inorganic topics include descriptive inorganic chemistry, coordination chemistry, and the solid state.

Prerequisite(s): CHEM 051 Chemical Principles and CHEM 051L Chemical Principles Laboratory with grades of "C-" or better.

CHEM 122L Analytical and Inorganic Chemistry Laboratory

1 hours

A laboratory designed to support CHEM 122 Analytical and Inorganic Chemistry. Laboratory work is divided between quantitative chemical analysis and inorganic reactions.

One 3- to 4-hour lab per week.

CHEM 130 Organic Chemistry III: Intermediate Organic Chemistry

2 hours

Reactions, mechanisms, and the application of the infrared, 1H NMR, 13C NMR, UV/Visible, and mass spectrometry to molecular structure determination are presented. Emphasis is placed on the interpretation of spectra to determine structures of organic molecules. The laboratory involves synthesis, the use of the spectrometer, and problem solving with discussion groups.

One lecture and one 3-hour lab per week.

Prerequisite(s): CHEM 121 Organic Chemistry II: Synthesis and Mechanisms.

CHEM 190 Selected Topics

1-5 hours

A course designed to treat subject matter not covered in other departmental courses or to provide advanced study of subject matter introduced in other courses. The title, content, and credit will be determined by current mutual interests of students and faculty.

Prerequisite(s): Permission of department chair. Other prerequisites to be determined.

CHEM 195 Independent Study

1-12 hours

Individual laboratory project in chemistry of biochemistry. Independent Study may not duplicate courses described in the catalog.

Prerequisite(s): Permission of the department chair.

CHEM 196 Special Projects

1-3 hours

Supervised work on an approved project involving subject matter not included in any of the standard courses. Projects are normally developed individually but may be arranged for organized groups. Registration should designate the area of work.

Prerequisite(s): Permission of department chair.

CHEM 221 Physical Chemistry I, Thermodynamics and Kinetics

3 hours

An introduction to physical chemistry consisting of fundamentals of chemical thermodynamics, chemical and physical equilibrium, and chemical kinetics presented using a calculus-based mathematical treatment.

Three lectures per week.

Prerequisite(s): CHEM 122 Analytical and Inorganic Chemistry and MATH 105 Calculus I.

CHEM 221L Physical Chemistry Laboratory

1 hours

Laboratory exercises in the measurement of physical and chemical properties of chemical systems. This course is designed to accompany CHEM 221 Physical Chemistry I, Thermodynamics and Kinetics.

One 3-hour lab per week.

Prerequisite(s): CHEM 122 Analytical and Inorganic Chemistry and CHEM 122L Analytical and Inorganic Chemistry Laboratory.

Corequisite: CHEM 221 Physical Chemistry I, Thermodynamics and Kinetics.

(Normally offered each fall semester.)

CHEM 222 Physical Chemistry II, Quantum Chemistry and Spectroscopy

3 hours

An introduction to quantum chemistry and an exploration of the theoretical concepts of selected spectroscopic techniques presented using a calculus-based, mathematical treatment.

Three lectures per week.

Prerequisite(s): CHEM 121 Organic Chemistry II: Synthesis and Mechanisms and MATH 106 Calculus II.

CHEM 222L Physical Chemistry Laboratory

1 hours

Continuation of CHEM 221L Physical Chemistry Laboratory. The course is designed to accompany CHEM 222 Physical Chemistry II, Quantum Chemistry and Spectroscopy.

One 3-hour lab per week.

Prerequisite(s): CHEM 121 Organic Chemistry II: Synthesis and Mechanisms and CHEM 121L Organic Chemistry II Laboratory.

Corequisite: CHEM 222 Physical Chemistry II, Quantum Chemistry and Spectroscopy.

(Normally offered each spring semester.)

CHEM 231 Inorganic Chemistry

3 hours

A survey of inorganic systems including a study of periodic trends, bonding and structure, coordination compounds, nonaqueous solvents and properties of some elements. The laboratory work consists of the preparation of assigned inorganic compounds that provide experience in some synthetic techniques.

Three lectures per week.

One 3- to 4-hour lab per week: CHEM 231L Inorganic Chemistry Lab

Prerequisite(s): CHEM 221 Physical Chemistry I, Thermodynamics and Kinetics.

(Normally offered each spring semester.)

CHEM 231L Inorganic Chemistry Lab

1 hour

One-credit laboratory for CHEM 231 Inorganic Chemistry.

CHEM 242 Instrumental Methods of Analysis

4 hours

The theory and applications of modern instrumental methods of chemical analysis.

Two lectures per week.

Two 3-hour labs per week.

Prerequisite(s): CHEM 121 Organic Chemistry II: Synthesis and Mechanisms.
Recommended: PHYS 121 Electronic Measurements.

(Normally offered each spring semester.)

CHEM 252 Advanced Organic Chemistry

4 hours

Topics presented in this course are reaction mechanisms, modern synthetic methodology, and the application of molecular modelling computational methods to organic chemistry. The laboratory work includes syntheses illustrative of special techniques, experiments concerned with the determination of reaction mechanisms, use of molecular modelling and molecular orbital computational programs, and research simulation.

Two lectures and two 3-hour labs per week.

Prerequisite(s): CHEM 221 Physical Chemistry I, Thermodynamics and Kinetics. MATH 106 Calculus II strongly recommended.

CHEM 255 Biochemistry

3 hours

A comprehensive introduction to the field of biochemistry that will stress the role of molecular structure and reactivity in determining biological function. The course will emphasize biochemical problem solving by the application of basic chemical principles.

Three lectures per week.

Prerequisite(s): CHEM 122 Analytical and Inorganic Chemistry with a grade of "C" or better. A basic biology background is strongly recommended.

(Normally offered each fall semester.)

CHEM 256 Advanced Biochemistry

3 hours

An advanced study of selected areas of biochemistry that will include enzyme kinetics, enzyme reaction mechanisms, DNA-protein interactions, rational drug design, metal ions in biology, and other topics. In addition, the use of advanced chemical and

biochemical principles in biotechnology will be explored.

Three lectures per week.

Prerequisite(s): CHEM 255 Biochemistry or BIO 281 Biochemistry.

CHEM 258 Biochemical Methods

1 hours

An introduction to biochemical methods used to isolate and characterize biomolecules from natural sources. A variety of analytical and physical methods, including UV-visible and NMR spectroscopies, will be used to determine structural features and to measure functional properties of the isolated biomolecules.

One 3-hour lab per week.

Corequisite(s): CHEM 255 Biochemistry or BIO 281 Biochemistry.

(Normally offered each fall semester.)

CHEM 290 Selected Topics

1-5 hours

A course designed to treat subject matter not covered in other departmental courses or to provide advanced study of subject matter not introduced in other courses. The title, content, and credit will be determined by current mutual interests of students and faculty.

Prerequisite(s): To be determined.

CHEM 293 Chemistry Seminar

1 hours

Reading, study, and discussion of one or more major topics in chemistry with significant implications for the broader society. Students will search the chemical literature, and will make both oral and written presentations.

One lecture per week.

Prerequisite(s): Upper-division standing and a major declared in the natural sciences division or permission of the instructor.

(Normally offered each fall semester.)

CHEM 295 Independent Study

1 hours

Individual laboratory research project for qualified chemistry majors. A formal project report is required. Independent study may not duplicate courses described in the catalog.

Prerequisite(s): Approval of the department chair.

CHEM 296 Special Projects

1 hours

Supervised work at the senior level on an appropriate project involving subject matter not included in any of the standard courses. Registration should designate the area of work. A formal project report is required.

Prerequisite(s): Approval of the Department Chair.