Nebraska Wesleyan University

Chemistry

Catalog

2014-2015

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. Chemical Engineering students complete either a B.A. or B.S. degree in Chemistry at NWU and any remaining engineering program requirements at one of our participating schools of engineering.

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 CHEM 4980 Chemistry Seminar and CHEM 3950 Independent Study or CHEM 4950 Independent Study). CHEM 4050 Advanced Organic Chemistry and certain projects in CHEM 3950 Independent Study or CHEM 4950 Independent Study 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 1010 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 three-hour lab per week.

CHEM 1020 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 1110 Chemical Principles I and CHEM 1020 Chemistry and the Human Environment.
Three lectures per week.
One three-hour lab per week.

CHEM 1040 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.
This course is only offered in University College.

CHEM 1110 Chemical Principles I

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 1110L Chemical Principles I Laboratory

1 hour

Laboratory supporting Chemical Principles I.
One three-hour lab per week.
Pre or corequisite(s): CHEM 1110 Chemical Principles I

CHEM 1120 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 1110 Chemical Principles I and CHEM 1110L Chemical Principles I Laboratory with grades of "C-" or better.

CHEM 1120L Chemical Principles II Laboratory

1 hour

A laboratory supporting CHEM 1120 Chemical Principles II.
One 3-hour lab per week.
Corequisite(s): CHEM 1120 Chemical Principles II

CHEM 1500 Introduction to Research

1 hour

An introduction to experimental research.
One 3-hour lab per week.
Prerequisite(s): Permission of the instructor.
(Normally offered each spring semester.)

CHEM 1900 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 1950 Independent Study

1-2 hours

Individual laboratory project in chemistry or biochemistry. Independent Study may not duplicate courses described in the catalog.
Prerequisite(s): Permission of the department chair.

CHEM 1960 Special Projects

1-2 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 2100 Organic Chemistry I

3 hours

A survey of the structure and reactions of carbon-containing molecules, with emphasis on compounds of biological interest.
Three lectures per week.
Prerequisite(s): CHEM 1110 Chemical Principles I and CHEM 1110L Chemical Principles I Laboratory with a grade of "C" or better.

CHEM 2100L Organic Chemistry I Laboratory

1 hour

A laboratory supporting CHEM 2100 Organic Chemistry I .
One 3-hour lab per week.
One 1-hour pre-lab lecture per week.
Corequisite(s): CHEM 2100 Organic Chemistry I .

CHEM 2110 Organic Chemistry II: Synthesis and Mechanisms

3 hours

A continuation of CHEM 2100 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 2100 Organic Chemistry I and CHEM 2100L Organic Chemistry I Laboratory with grades of "C-" or better.

CHEM 2110L Organic Chemistry II Laboratory

1 hour

A laboratory supporting CHEM 2110 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 2110 Organic Chemistry II: Synthesis and Mechanisms.

CHEM 2900 Selected Topics

1-2 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 2950 Independent Study

1-2 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 2960 Special Projects

1-2 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 2999 Experiential Learning

0 hours

This course number corresponds to the "exploratory" level of experiential learning required in the Archway liberal education curriculum. Experiential learning is a process through which students expand, deepen, integrate, and apply knowledge and skills acquired in the classroom or laboratory. All experiential learning credit assumes the student is intentional about the experience, is adequately prepared for it, is taking initiative, making decisions, and assuming responsibility, and will reflect meaningfully on the learning that takes place. Instructors or sponsors are expected to create experiential learning opportunities that are authentic, and to monitor and assess the activities. The student must complete at least 20 hours of experiential learning.
Prerequisite(s): Instructor Permission.

CHEM 3090 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 three-hour lab per week.
Prerequisite(s): CHEM 2110 Organic Chemistry II: Synthesis and Mechanisms

CHEM 3410 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 1120 Chemical Principles II and CHEM 2100 Organic Chemistry I with a grade of "C" or better. A basic biology background is strongly recommended.
(Normally offered each fall semester.)

CHEM 3410L Biochemical Methods

1 hour

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 three-hour lab per week.
Corequisite(s): CHEM 3410 Biochemistry or BIO 3410 Biochemistry.
(Normally offered each fall semester.)

CHEM 3440 Instrumental Analysis

4 hours

The course will cover the principles and applications of chemical equilibrium and chemical analysis, data acquisition and analysis, as well as the theory and practice of instrumental methods of chemical analysis.
Prerequisite(s): CHEM 1120 Chemical Principles II and CHEM 1120L Chemical Principles II Laboratory with grades of "C-" or better.

CHEM 3510 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 2110 Organic Chemistry II: Synthesis and Mechanisms, CHEM 1120 Chemical Principles II and MATH 1600 Calculus I.

CHEM 3510L Physical Chemistry Laboratory

1 hour

Laboratory exercises in the measurement of physical and chemical properties of chemical systems. This course is designed to accompany CHEM 3510 Physical Chemistry I, Thermodynamics and Kinetics.
One three-hour lab per week.
Prerequisite(s): CHEM 2110 Organic Chemistry II: Synthesis and Mechanisms, CHEM 2110L Organic Chemistry II Laboratory CHEM 1120 Chemical Principles II and CHEM 1120L Chemical Principles II Laboratory.
Corequisite(s): CHEM 3510 Physical Chemistry I, Thermodynamics and Kinetics.
(Normally offered each fall semester.)

CHEM 3520 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 3510 Physical Chemistry I, Thermodynamics and Kinetics, CHEM 3510L Physical Chemistry Laboratory and MATH 1610 Calculus II.
(Normally offered in the spring semester of odd years.)

CHEM 3520L Physical Chemistry Laboratory

1 hour

Continuation of CHEM 3510L Physical Chemistry Laboratory. The course is designed to accompany CHEM 3520 Physical Chemistry II, Quantum Chemistry and Spectroscopy.
One 3-hour lab per week.
Corequisite(s): CHEM 3520 Physical Chemistry II, Quantum Chemistry and Spectroscopy.
(Normally offered each spring semester.)

CHEM 3620 Inorganic Chemistry

3 hours

A survey of inorganic systems including the study of periodic trends, bonding and structure, coordination compounds, nonaqueous solvents, inorganic mechanisms, bio-inorganic chemistry, and organometallic compounds.
Prerequisite(s): CHEM 3510 Physical Chemistry I, Thermodynamics and Kinetics.
(Normally offered each spring semester of even years.)

CHEM 3620L Inorganic Chemistry Laboratory

1 hour

A laboratory in support of Inorganic Chemistry. The laboratory work consists of the preparation and chemical and spectroscopic analysis of a variety of inorganic compounds and provides experience with a range of synthetic and spectroscopic techniques.

CHEM 3640 Instrumental Methods of Analysis

4 hours

The theory and applications of modern instrumental methods of chemical analysis.
Two lectures per week.
Two three-hour labs per week.
Prerequisite(s): CHEM 3510 Physical Chemistry I, Thermodynamics and Kinetics.
Recommended: PHYS 2200 Electronic Measurements.
(Normally offered each spring semester.)

CHEM 3900 Selected Topics

1-2 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 3950 Independent Study

1-2 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 3960 Special Projects

1-2 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 4050 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 laboratories per week.
Prerequisite(s): CHEM 3510 Physical Chemistry I, Thermodynamics and Kinetics. MATH 1610 Calculus II strongly recommended.

CHEM 4420 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 3410 Biochemistry.

CHEM 4900 Selected Topics

1-2 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 4950 Independent Study

1-2 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 4960 Special Projects

1-2 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 4980 Chemistry Seminar

1 hour

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 4999 Experiential Learning

0 hours

This course number corresponds to the "intensive" level of experiential learning required in the Archway liberal education curriculum. Experiential learning is a process through which students expand, deepen, integrate, and apply knowledge and skills acquired in the classroom or laboratory. All experiential credit assumes the student is intentional about the experience, is adequately prepared for it, is taking initiative, making decisions, and assuming responsibility, and will reflect meaningfully on the learning that takes place. Instructors or sponsors are expected to create experiential learning opportunities that are authentic, and to monitor and assess the activities. The student must complete at least 40 hours of experiential learning.
Prerequisite(s): Instructor Permission.

CHEM 5900 Selected Topics: Chemistry

3 hours

This course is designed to give students the opportunity for in-depth study of a chemistry- based concept. Topics will consist of a highly specialized area of study or revolve around issues or recent trends and innovations related to the field of chemistry.
This course is offered in University College only.