Twin Cities Campus

Chemistry B.S.Chem.

Chemistry

College of Science and Engineering

- Program Type: Baccalaureate
- Requirements for this program are current for Fall 2018
- Required credits to graduate with this degree: 120
- Required credits within the major: 70 to 75
- Degree: Bachelor of Science in Chemistry

The mission of the Department of Chemistry is to enrich the science of chemistry through the education of students from all disciplines, the training of future professional chemists, and the pursuit of knowledge.

Chemistry probes the fundamental concepts of nature and helps us understand the world around us. It deals with all substances at the molecular level: their composition, their properties, and how they are transformed into new substances. Chemistry is a central science of great importance to society. It provides a broad range of opportunities in many specialized fields, including biotechnology, polymer chemistry, environmental chemistry, materials chemistry, and medicine.

After graduating with a bachelor's degree, many chemistry majors go on to graduate or professional schools to pursue advanced degrees. Other graduates find employment in industry, education, or government.

Program Delivery

This program is available:

- via classroom (the majority of instruction is face-to-face)

Admission Requirements

Students must complete 10 courses before admission to the program.

Freshman and transfer students students are usually admitted to pre-major status before admission to this major

For information about University of Minnesota admission requirements, visit the Office of Admissions website.

Required prerequisites

Mathematics

MATH 1271 - Calculus I [MATH] (4.0 cr)
or MATH 1371 - CSE Calculus I [MATH] (4.0 cr)
MATH 1272 - Calculus II (4.0 cr)
or MATH 1372 - CSE Calculus II (4.0 cr)
MATH 2263 - Multivariable Calculus (4.0 cr)
or MATH 2374 - CSE Multivariable Calculus and Vector Analysis (4.0 cr)

Physical Sciences

CHEM 1061 - Chemical Principles I [PHYS] (3.0 cr)
or CHEM 1071H - Honors Chemistry I [PHYS] (3.0 cr)
CHEM 1065 - Chemical Principles I Laboratory [PHYS] (1.0 cr)
or CHEM 1075H - Honors Chemistry I Laboratory [PHYS] (1.0 cr)
CHEM 1062 - Chemical Principles II [PHYS] (3.0 cr)
or CHEM 1072H - Honors Chemistry II [PHYS] (3.0 cr)
CHEM 1066 - Chemical Principles II Laboratory [PHYS] (1.0 cr)
or CHEM 1076H - Honors Chemistry II Laboratory [PHYS] (1.0 cr)
CHEM 2301 - Organic Chemistry I (3.0 cr)
PHYS 1301W - Introductory Physics for Science and Engineering I [PHYS, WI] (4.0 cr)
or PHYS 1401V - Honors Physics I [PHYS, WI] (4.0 cr)
PHYS 1302W - Introductory Physics for Science and Engineering II [PHYS, WI] (4.0 cr)
or PHYS 1402V - Honors Physics II [PHYS, WI] (4.0 cr)

General Requirements

All students are required to complete general University and college requirements including writing and liberal education courses. For more information about University-wide requirements, see the liberal education requirements.Required courses for the major or minor in

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which a student receives a D grade (with or without plus or minus) do not count toward the major or minor (including transfer courses).

Program Requirements

Additonal Math, Science, or Statistics

Students must take an additional course in math or statistics. If the student takes the honors math sequence, this requirement is automatically fulfilled.

MATH 2243 - Linear Algebra and Differential Equations (4.0 cr)
or MATH 2373 - CSE Linear Algebra and Differential Equations (4.0 cr)
or PHYS 2303 - Physics III: Physics of Matter (4.0 cr)
or STAT 3021 - Introduction to Probability and Statistics (3.0 cr)

Major Courses

CHEM 4501 - Introduction to Thermodynamics, Kinetics, and Statistical Mechanics (3.0 cr)
CHEM 4502 - Introduction to Quantum Mechanics and Spectroscopy (3.0 cr)
CHEM 4701 - Inorganic Chemistry (3.0 cr)
CHEM 3101 - Introductory Analytical Chemistry Lecture (3.0 cr)
CHEM 3111 - Introductory Analytical Chemistry Lab (2.0 cr)
CHEM 2302 - Organic Chemistry II (3.0 cr)
Lab can be taken concurrent with or after taking CHEM 2302
CHEM 2311 - Organic Lab (4.0 cr)

Electives

Advanced Chemistry Lab Electives

Take 3 or more course(s) totaling 6 or more credit(s) from the following:
•CHEM 4094W - Directed Research [WI] (1.0 - 5.0 cr)
•CHEM 4111W - Modern Instrumental Methods of Chemical Analysis Lab [WI] (2.0 cr)
•CHEM 4311W - Advanced Organic Chemistry Lab [WI] (4.0 cr)
•CHEM 4511W - Advanced Physical Chemistry Lab [WI] (3.0 cr)
•CHEM 4711W - Advanced Inorganic Chemistry Lab [WI] (3.0 cr)
•CHEM 4223W - Polymer Laboratory [WI] (2.0 cr)
•CHEM 4423W - Foundations of Chemical Biology Laboratory [WI] (2.0 cr)

Advanced Chemistry Lecture

Select one course for a minimum of 3 credits from any non-required upper division course in chemistry.
CHEM 4xxx
or CHEM 5xxx
or CHEM 4001 - Chemistry of Biomass and Biomass Conversion to Fuels and Products [ENV] (4.0 cr)
or CHEM 4011 - Mechanisms of Chemical Reactions (3.0 cr)
or CHEM 4101 - Modern Instrumental Methods of Chemical Analysis (3.0 cr)
or CHEM 4201 - Materials Chemistry (3.0 cr)
or CHEM 4221 - Introduction to Polymer Chemistry (3.0 cr)
or CHEM 4301 - Applied Surface and Colloid Science (3.0 cr)
or CHEM 4321 - Organic Synthesis (3.0 cr)
or CHEM 4361 - Interpretation of Organic Spectra (3.0 cr)
or CHEM 4411 - Introduction to Chemical Biology (3.0 cr)
or CHEM 4715 - Physical Inorganic Chemistry (3.0 cr)
or CHEM 5245 *{Inactive}*(3.0 cr)
or CHEM 4021 - Computational Chemistry (3.0 cr)
or CHEM 4066 *{Inactive}*(3.0 cr)
or CHEM 4214 - Polymers (3.0 cr)
or CHEM 4322 - Advanced Organic Chemistry (3.0 cr)
or CHEM 4352 - Physical Organic Chemistry (3.0 cr)
or CHEM 4601 - Green Chemistry [ENV] (3.0 cr)
or CHEM 4735 - Bioinorganic Chemistry (3.0 cr)
or CHEM 4745 - Advanced Inorganic Chemistry (3.0 cr)
or CHEM 5210 - Materials Characterization (4.0 cr)
or CHEM 5755 - X-Ray Crystallography (4.0 cr)

Technical Electives

Select courses from GEOG, HMED, HSCI, and PSY will also be accepted if there is a technical component to the course.
Take 2 or more course(s) totaling 6 or more credit(s) from the following:
•CHEN 2xxx
•CHEN 3xxx
•CHEN 4xxx
•CHEN 5xxx
•MATS 2xxx

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•MATS 3xxx
•MATS 4xxx
•MATS 5xxx
•CSCI 2xxx
•CSCI 3xxx
•CSCI 4xxx
•CSCI 5xxx
•MATH 2xxx
•MATH 3xxx
•MATH 4xxx
•MATH 5xxx
•PHYS 2xxx
•PHYS 2xxx
•PHYS 3xxx
•PHYS 4xxx
•PHYS 5xxx
•STAT 3xxx
•STAT 4xxx
•STAT 5xxx
•ANAT 3001 - Human Anatomy (3.0 cr)
•BIOC 3021 - Biochemistry (3.0 cr)
•BIOC 4521 - Introduction to Physical Biochemistry (3.0 cr)
•BIOL 3211 - Physiology of Humans and Other Animals (3.0 cr)
•BIOL 4003 - Genetics (3.0 cr)
•BIOL 4004 - Cell Biology (3.0 cr)
•BBE 3013 - Engineering Principles of Molecular and Cellular Processes (3.0 cr)
•BBE 4001 - Chemistry of Biomass and Biomass Conversion to Fuels and Products [ENV] (4.0 cr)
•BBE 4301 - Applied Surface and Colloid Science (3.0 cr)
•CEGE 3501 - Introduction to Environmental Engineering [ENV] (3.0 cr)
•ESPM 3012 - Statistical Methods for Environmental Scientists and Managers [MATH] (4.0 cr)
•ESPM 3131 - Environmental Physics (3.0 cr)
•ESPM 3211 - Survey, Measurement, and Modeling for Environmental Analysis (3.0 cr)
•ESPM 3612W - Soil and Environmental Biology [WI] (4.0 cr)
•FSCN 3102 - Introduction to Food Science (3.0 cr)
•FSCN 4121 - Food Microbiology (3.0 cr)
•FSCN 4312W - Food Analysis [WI] (4.0 cr)
•GCD 3022 - Genetics (3.0 cr)
•GCD 3485 - Bioinformatic Analysis: Introduction to the Computational Characterization of Genes and Proteins (4.0 cr)
•GCD 4034 - Molecular Genetics and Genomics (3.0 cr)
•GCD 4143 - Human Genetics and Genomics (3.0 cr)
•GCD 4161 - Developmental Biology (3.0 cr)
•GCD 5036 - Molecular Cell Biology (3.0 cr)
•ESCI 2301 - Mineralogy (3.0 cr)
•MICB 3301 - Biology of Microorganisms (5.0 cr)
•MICB 4131 - Immunology (3.0 cr)
•NSCI 3101 - Neurobiology I: Molecules, Cells, and Systems (3.0 cr)
•PHSL 3051 - Human Physiology (4.0 cr)
•PHSL 3061 - Principles of Physiology (4.0 cr)
•PUBH 3104 - Environmental Health Effects: Introduction to Toxicology (2.0 cr)
•PUBH 6176 - Hazardous Materials and Waste Management (2.0 cr)
•PUBH 6190 - Environmental Chemistry (3.0 cr)
•PUBH 6191 *{Inactive}*(3.0 cr)
•SOIL 2125 - Basic Soil Science [PHYS, ENV] (4.0 cr)
•VBS 2032 - General Microbiology With Laboratory (5.0 cr)
•AEM 2011 - Statics (3.0 cr)
•AEM 2012 - Dynamics (3.0 cr)
•AEM 2021 - Statics and Dynamics (4.0 cr)
•AEM 3031 - Deformable Body Mechanics (3.0 cr)
•ANSC 3301 - Human and Animal Physiology (3.0 cr)
•BBE 2201 - Renewable Energy and the Environment [TS] (3.0 cr)
•CEGE 3101 - Computer Applications I (3.0 cr)
•CEGE 5541 - Environmental Water Chemistry (3.0 cr)
•EE 2001 *{Inactive}*(3.0 cr)
•PHYS 2201 - Introductory Thermodynamics and Statistical Physics (4.0 cr)
•ESPM 3425 - Atmospheric Pollution: From Smog to Climate Change (3.0 cr)
or ESCI 3425 *{Inactive}*(3.0 cr)

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Upper Division Writing Intensive within the major

Students are required to take one upper division writing intensive course within the major. If that requirement has not been satisfied within the core major requirements, students must choose one course from the following list. Some of these courses may also fulfill other major requirements.

Take 0 - 1 course(s) from the following:

- CHEM 4094W - Directed Research [WI] (1.0 - 5.0 cr)
- CHEM 4111W - Modern Instrumental Methods of Chemical Analysis Lab [WI] (2.0 cr)
- CHEM 4311W - Advanced Organic Chemistry Lab [WI] (4.0 cr)
- CHEM 4423W - Foundations of Chemical Biology Laboratory [WI] (2.0 cr)
- CHEM 4511W - Advanced Physical Chemistry Lab [WI] (3.0 cr)
- CHEM 4711W - Advanced Inorganic Chemistry Lab [WI] (3.0 cr)
- CHEM 4223W - Polymer Laboratory [WI] (2.0 cr)

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