## Chemistry

### Freshman Year

**Fall Semester**
- Chem 1061/65 Chem Princ I (placement into course, or 1015) 4
- Math 1371 Calculus I (placement into course, pre-reg) 4
- Phys 1301W Intro Physics I (&Math 1371) 4
- CSE 1001: 1st Yr Experience 4
- Liberal Education course or Writ 1301 3/4

**Spring Semester**
- Chem 1062/66 Chem Princ II (1061/1065) 4
- Math 1372 Calculus II (1371) 4
- Phys 1302W Intro Physics II (1301, &Math 1372) 4
- Liberal Education course or Writ 1301 3/4

### Sophomore Year

**Fall Semester**
- Chem 2301 Organic Chem I (1062/66) 3
- Chem 2101 Intro An Chem (1062/66, &2301) 3
- Phys 1302W Intro Physics II (1301, &Math 1372) 4
- Math 2374 Multivariable Calc (1372) 3/4
- Liberal Education course 3/4

**Spring Semester**
- Chem 2302 Organic Chem II (1062/66) 3
- Chem 2111 Intro An Chem Lab (&2101) 2
- Math 2373 Lin Alg/Diff Eq. (1372) 4
- Phys 2303 Phys III: Phys of Matter (1302, Math 1372) 4
- Stat 3021 Intro to Prob/Statistics (Math 1372) 3

### Junior Year

**Fall Semester**
- Chem 4502 Quantum Mech (1062/66, &Math 2374 or &2373, Phys 1302) 3
- Advanced Technical Elective 3
- Advanced Lab Elective 2
- Liberal Education course 3/4
- Open Elective (If needed to reach 120 credits) 3/4

**Spring Semester**
- Chem 4501 Intro to Thermo. (1062/66, Phys 1302, &Math 2374) 3
- Advanced Technical Elective 3
- Liberal Education course 3/4
- Open Elective (If needed to reach 120 credits) 3/4

### Senior Year

**Fall Semester**
- Chem 4701 Inorganic Chem (2311, &4501 or &4502) 3
- Advanced Chem Lec Elective 3
- Open Elective (If needed to reach 120 credits) 3/4

**Spring Semester**
- Advanced Lab Elective 2
- Open Elective (If needed to reach 120 credits) 3/4
- Open Elective (If needed to reach 120 credits) 3/4

### About This Plan

- This plan is not a contract. Curriculum can change.
- Shaded courses are only offered in the indicated semester.
- Course pre-requisites and co-requisites (designated by &) are listed below the course number and title. UD requires admission to the major prior to enrollment.
- Students can take either the CSE-only or University-wide versions of the math course (Math 1371/1271, 1372/1272, 2373/2243, 2374/2263).
- Double boxed courses are required for application to this major.
- Chemical Principles labs (1065/1066) must be taken concurrently with the lectures (1061/1062).
- Liberal Education and Writing requirements with an (*) will be fulfilled by taking courses required for this major at UM-TC.

### Applying to your Major

Students who have completed the required courses for admission to this major and have a 3.2 UM-TC technical GPA at the end of the fall semester will be guaranteed admission. All other students who have completed the required courses will be considered for admission on a space-available basis. Admission following the spring semester is only based on space availability. The major application database is available at z.umn.edu/csemajorapp.

### Department Contact Information

- Website: http://www.chem.umn.edu/undergrad/
- Main Phone: 612-624-6000
- Main Office: 139 Smith Hall
- Director of Undergraduate Studies: Professor David Blank
- Department Advisor: Stephanie Stathopoulos, stephs@umn.edu

### University Degree Requirements

All students must complete the following Writing & Liberal Education requirements, as noted on their APAS report. See link for full Core & Theme names: z.umn.edu/liberaleducation

#### Writing Requirements:

- University Writing: Writ 1301/1401 or equivalent
- Writing Intensive (WI):
  - Two: 1xxx or 2xxx level **
  - One: 3/4/5xxx level (*in major)*
  - One: 3/4/5xxx level (any dept.)*

#### Liberal Education

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### Total Credits Needed for Degree: 120
What can I do with a major in chemistry?

Many chemists and materials scientists work in research and development (R&D). In basic research, they investigate properties, composition, and structure of matter and the laws that govern the combination of elements and reactions of substances. In applied R&D, they create new products and processes or improve existing ones, often using knowledge gained from basic research. R&D chemists and materials scientists use computers and a wide variety of sophisticated laboratory instrumentation for modeling and simulation in their work. Chemical research has led to the discovery and development of new and improved synthetic fibers, paints, adhesives, drugs, cosmetics, electronic components, lubricants, and thousands of other products. Chemists and materials scientists also develop processes that save energy and reduce pollution, such as improved oil refining and petrochemical processing methods. Research on the chemistry of living things spurs advances in medicine, agriculture, food processing, and other fields.

Chemists also work in production and quality control in chemical manufacturing plants. They prepare instructions for plant workers that specify ingredients, mixing times, and temperatures for each stage in the process. They also monitor automated processes to ensure proper product yield and test samples of raw materials or finished products to ensure that they meet industry and government standards. Chemists report and document test results and analyze those results in hopes of further improving existing theories or developing new test methods.

A bachelor's degree in chemistry is the minimum educational requirement to be a research assistant, or analyst; however, many research jobs require a master's degree or Ph.D. for teaching or applied research. According to the U.S. Department of Labor, chemists primarily work in manufacturing firms, research and development, engineering, education, sales, pharmaceuticals, and biotechnology.

**Employers** (sample listing)
- American Polywater Corp.
- AMSOIL, Inc.
- Applied Materials, Inc.
- Aveda
- Bell Pharmaceuticals
- Brady Corp.
- Seagate Technology
- D.E. Shaw Research
- Exxon Mobil
- Intel Corp.
- NAVAIR Weapons Division
- Target Corp.
- US Water Services
- USDA
- WRR Environmental Services
- Oak Ridge Laboratory
- 3M
- Ecolab
- BASE, The Chemical Company
- ALLETE/MN Power
- Thermotech, Inc.
- OptiMetrics, Inc.
- HB Fuller Company
- Pace Analytical Services, Inc.

**Industries** (sample listing)
- Pharmaceuticals
- Petroleum
- Biotechnology
- Higher education
- Federal government
- Healthcare
- Water treatment
- Food production
- Consulting
- Packaging
- Industrial products
- Manufacturing

**Positions** (sample listing)

**General Chemist:** Deals with the basic functions of chemistry, including atomic structure, chemical bonding, states of matter, and the nature of solutions.

**Biochemist:** Deals with the chemistry of living things such as proteins, fats, starches, DNA, and drugs.

**Physical Chemist:** Deals with the physical properties of matter, such as thermodynamics, quantum mechanics, and kinetics.

**Organic Chemist:** Focuses on carbon containing compounds, such as those produced by living organisms. Organic chemists work in the petroleum, coal, wood products, plastics, textiles, and food industries.

**Inorganic Chemist:** Focuses on non-carbon containing compounds. This includes atomic structure and the principles of chemical bonding, acids and bases, and many of the basic concepts of chemical interaction. Inorganic chemists work in the mining and electronics industries.

**Analytical Chemist:** Seeks the exact composition of substances and the purity of raw materials and finished projects. Analytical chemists analyze and troubleshoot, and they may monitor air and water pollution as well as food and drug purity in pharmaceuticals.

**Toxicologist:** Plans and carries out laboratory and field studies to identify, monitor, and evaluate the impact of toxic materials and radiation on human and animal health, and the environment.

**Geochemist:** Applies chemistry to the earth and environmental sciences. Geochemists deal with topics such as the evolution of rocks, mineral stability, water chemistry, and geochemical cycles.

**Polymer Chemist:** Deals with the nature and structure of polymers. A typical application of polymer chemistry is the synthesis of materials for industrial or commercial applications.

**Pharmacologist:** Develops and tests drugs for medicinal use.

*Examples from “Occupational Outlook Handbook and Great Jobs for Chemistry Majors”*

*Some positions may require an advanced degree*