

CHEMISTRY

Department website (<https://www.uwp.edu/learn/departments/chemistry/>)

Professional Accreditations and Memberships:

The chemistry degree program is approved by the American Chemical Society. Students wishing to receive the ACS Certificate need to fulfill the requirements for the Professional Chemistry Concentration.

Student Organizations and Clubs:

Chemistry majors are encouraged to join the Chemistry Club.

Career Possibilities:

Chemistry graduates have an excellent placement rate. They enter graduate programs, medical school and pharmacy school and are qualified for employment in a wide variety of areas including agriculture, biotechnology, consulting, environmental control, consumer products, education, food science, forensics, geology, hazardous waste management, materials science, medicinal chemistry, petroleum, pharmaceuticals, polymers, sales and marketing, and water management. The UW-Parkside Advising and Career Center, the American Chemical Society and the Chemistry Club maintain information resources regarding careers in chemistry.

Department Overview

The Chemistry Department is in the College of Natural and Health Sciences. Faculty members possess Ph.D. degrees in analytical chemistry, biochemistry, organic chemistry and physical chemistry.

The major is comprised of five different concentrations, each uniquely tailored to specific professional goals. The Professional Concentration, as mentioned above, provides graduates with a Certificate of Completion by the American Chemical Society and is a premier concentration. The industrial concentration is for students seeking careers in chemical manufacturing and sales. For students with an interest in biochemistry, the pre-health professions concentration is designed to prepare students for professional schools while the biochemistry concentration serves students wanting to work in labs or those wishing to pursue graduate studies. Lastly, the general chemistry concentration is for those students who simply need a chemistry degree to satisfy employer expectations. Beginning in the first-year, students are exposed to and work with new instrumentation in the SCJ Integrated Science Lab. In addition, students are encouraged to participate in faculty-directed independent research projects. The chemistry major can be complemented with one of several related minors such as biological sciences, computer science, environmental studies, mathematics or physics.

The program also offers a traditional minor in chemistry and a pre-health professions minor. The traditional minor includes analytical lab skills where the pre-health professions minor includes biochemistry emphasis. A Certificate in Green Chemistry is also available for students wanting an introduction to the design of chemical products and processes that reduce the generation of hazardous waste.

Programs Offered

- Chemistry Major (BS) (<https://catalog.uwp.edu/programs/chemistry/chemistry-major/>)

- Chemistry for Pre-Health Professions Minor (<https://catalog.uwp.edu/programs/chemistry/chemistry-pre-health-professions-minor/>)
- Chemistry Minor (<https://catalog.uwp.edu/programs/chemistry/chemistry-minor/>)
- Green Chemistry Certificate (<https://catalog.uwp.edu/programs/chemistry/green-chemistry-certificate/>)
- Green Chemistry (AS) (<https://catalog.uwp.edu/programs/associate-degree-programs/green-chemistry/>)

Chemistry Major Concentrations

- General Chemistry
- Chemistry for Pre-Health Professions [Pre-Medical/Pharmacy]
- Biochemistry
- Industrial Chemistry
- Natural Products
- Professional Chemistry [ACS Approved]

Courses in Chemistry

CHEM 100 | The World of Chemistry | 3 cr

Introduces basic principles of chemistry including the composition of matter, measurement, nomenclature, calculations and reactions. Discusses current issues in science and technology and application of basic chemical principles to everyday life. Intended for non-science majors. Three-hour lecture.

Prerequisites: None.

Offered: Fall, Spring, Summer.

Meets: Natural Science: CHEM

CHEM 101 | General Chemistry I | 4 cr

Introduces fundamental principles of chemistry including atomic theory, periodic properties, energy, stoichiometry, nomenclature, bonding, Lewis structures, and aqueous solution chemistry. Four-hour lecture.

Prerequisites: MATH 111 or concurrent enrollment; or CHEM 100 with a C or better; and CHEM 103 or concurrent enrollment.

Offered: Fall, Spring.

Meets: Natural Science: CHEM

CHEM 102 | General Chemistry II | 4 cr

Covers fundamental principles of chemistry for science majors including topics in intermolecular forces and molecular properties, kinetics, thermodynamics, electrochemistry, chemical equilibrium and nuclear chemistry. Four-hour lecture.

Prerequisites: CHEM 101, CHEM 103, CHEM 104 or concurrent enrollment.

Offered: Fall, Spring, Summer.

CHEM 103 | General Chemistry Lab I | 1 cr

First semester lab sequence in general chemistry. Explores atomic and molecular properties, classification schemes for chemical reactions, aqueous solution chemistry, and calorimetry. Three-hour lab; lab fees.

Prerequisites: CHEM 101 or concurrent enrollment.

Offered: Fall, Spring.

CHEM 104 | General Chemistry Lab II | 1 cr

Explores through project-based learning, molecular modeling, kinetics, chemical equilibrium, acid-base chemistry, coordination chemistry, qualitative analysis through solubility and some quantitative analysis. Provides the second semester lab sequence in general chemistry. Three-hour lab. Requires lab fee.

Prerequisites: CHEM 103; CHEM 102 or concurrent enrollment.

Offered: Fall, Spring, Summer.

CHEM 115 | Chemical Science | 4 cr

Examines the fundamental principles of chemistry including the atomic nature of matter, chemical reactions, gases, solutions, acids and bases, and nuclear chemistry. Not open to students with credit in CHEM 102. May not be applied to the chemistry major. Requires lab fee. Three-hour lecture; three-hour lab.

Prerequisites: UW-Milwaukee math proficiency or UW-Parkside MATH 104 or MATH 111.

Offered: Fall.

Meets: Natural Science: CHEM

CHEM 155 | Chemistry Seminar: Careers, Safety and Literature | 3 cr

Introduces the technical disciplines of chemistry, the applied fields, and various career options. Develops chemical safety and information skills. Guest speakers are anticipated.

Prerequisites: CHEM 101; chemistry major; or consent of instructor.

Offered: Occasionally.

CHEM 206 | Quantitative Chemical Analysis | 5 cr

Introduces the evaluation of analytical data and reports associated with chemical analyses. Explores complex aqueous systems, and presents an overview of electroanalytical chemistry, chromatography and spectroscopy. Emphasizes spectroscopic and chromatographic laboratory techniques, and some thermal analyses. Two-hour lecture, one-hour discussion, six-hour lab. Requires lab fee.

Prerequisites: CHEM 102 and 104 with C or better in each; or consent of instructor.

Offered: Fall.

CHEM 210 | Introduction to Inorganic Chemistry | 3 cr

Covers the principles of the coordination chemistry of the transition metals. Emphasis on molecular orbital theory and its relevance to spectroscopy, magnetic properties, and reactivity of transition metal compounds. Discusses bioinorganic and organometallic chemistry as well as catalysis, the solid state, and relevant spectroscopic techniques.

Prerequisites: CHEM 102, CHEM 321 or concurrent; or consent of instructor.

Offered: Fall (even years).

CHEM 215 | Organic and Biochemistry | 4 cr

Explores organic chemistry and the structure and function of important biomolecules and energy metabolism. Not open to students with credit in CHEM 322 or BIOS 307. Lab fee. Three-hour lecture; two-hour lab.

Prerequisites: CHEM 102 and CHEM 104 or CHEM 114 or CHEM 115.

Offered: Spring.

CHEM 230 | Introduction to Green Chemistry | 2 cr

Studies the principles of green chemistry and their application to contemporary problems. The purpose of green chemistry is to protect and benefit the economy, people and the planet by finding creative and innovative ways to reduce waste, conserve energy, and discover replacements for hazardous substances. Two-hour lecture.

Prerequisites: CHEM 215 or CHEM 321 or concurrent registration in CHEM 321 or consent of instructor.

Offered: Occasionally.

CHEM 231 | Green Chemistry Lab | 2 cr

Illustrates the principles of green chemistry and their application to contemporary problems through laboratory experiments. Lab fee. Four-hour lab.

Prerequisites: CHEM 215 or CHEM 321 or concurrent registration in CHEM 321 or consent of instructor.

Offered: Occasionally.

CHEM 290 | Special Topics in Chemistry | 1-4 cr

Selected topics in chemistry. May repeat with different topic.

Prerequisites: Consent of instructor.

Offered: Occasionally.

CHEM 298 | Independent Study: Literature and/or Computational Research | 1-3 cr

Provides opportunity for individual projects involving literature research or computational studies conducted under the direct supervision and guidance of a staff member. Usually graded on credit/no-credit basis and not applied to GPA.

Prerequisites: Consent of instructor and department chair.

Offered: Fall, Spring, Summer.

CHEM 299 | Independent Study | 1-3 cr

Provides opportunity for research (experimental or theoretical projects) under the direct supervision and guidance of a regular staff member.

Prerequisites: CHEM 101 with C or better and consent of instructor, department chair.

Offered: Fall, Spring, Summer.

CHEM 302 | Physical Chemistry I | 4 cr

Examines thermodynamics and chemical kinetics. Includes spreadsheets and higher level programming for numerical analysis, electronic structure calculations, and molecular simulations. Three-hour lecture; three-hour lab.

Prerequisites: C or better in CHEM 206, MATH 221, and PHYS 202; or consent of instructor.

Offered: Fall.

CHEM 303 | Physical Chemistry II | 3 cr

Covers statistical mechanics, quantum mechanics, and spectroscopy.

Prerequisites: CHEM 302, PHYS 202; or consent of instructor.

Offered: Spring.

CHEM 304 | Physical Chemistry Lab I | 2 cr

Focuses on macroscopic phenomena experiments including physical properties of matter, kinetics, and thermodynamics. Four-hour lab. Lab fee.

Prerequisites: CHEM 302, PHYS 202; or consent of instructor.

Offered: Spring.

CHEM 306 | Chemical Instrumentation | 3 cr

Examines construction and principles of operation of modern instruments and their use in the chemistry laboratory. Three-hour lecture.

Prerequisites: C or better in CHEM 206; completion of PHYS 202 and CHEM 323; or consent of instructor.

Offered: Fall (even years).

CHEM 307 | Biochemical Metabolism | 3 cr

A study of the chemistry of biological systems, with emphasis on metabolism and macromolecular biosynthesis. Three-hour lecture. Cross-listed with: BIOS 307.

Prerequisites: CHEM 322 or consent of instructor.

Offered: Fall.

CHEM 308 | Experimental Methods/Biochemistry Laboratory | 2 cr

Familiarization with the use of scientific instruments and techniques, and developing proficiency in the process of scientific investigation. Intended for Biological Sciences majors who have completed all 200-level core courses or Chemistry majors who have completed CHEM 307 or 324. Four-hour lab. Requires fees. Cross-listed with: BIOS 435.

Prerequisites: CHEM 322 and consent of instructor.

Offered: Fall, Spring.

CHEM 310 | Inorganic Chemistry | 3 cr

Addresses descriptive and synthetic inorganic chemistry; emphasizes chemical periodicity, coordination compounds, and inorganic reaction mechanisms. Three-hour lecture.

Prerequisites: CHEM 303 or concurrent registration.

Offered: Occasionally.

CHEM 321 | Organic Chemistry I | 4 cr

Studies aliphatic and aromatic compounds with emphasis on structure, reaction mechanisms, and synthesis. Introduces spectroscopy. Three-hour lecture; one-hour discussion.

Prerequisites: CHEM 102, CHEM 104; or CHEM 114.

Offered: Fall, Spring.

CHEM 322 | Organic Chemistry II | 4 cr

A continuation of CHEM 321. More extensive use of spectroscopy in the elucidation of structures and reaction mechanisms. The chemistry of functional groups, syntheses, and selected topics. Three-hour lecture; one-hour discussion.

Prerequisites: CHEM 321.

Offered: Fall, Spring.

CHEM 323 | Organic Chemistry Lab | 2 cr

Introduces the methodology, techniques, and procedures of organic chemistry, including basic principles of green chemistry, the use of chemical literature, and laboratory record keeping. Emphasizes the synthesis and spectroscopic characterization of organic compounds. Four-hour lab. Requires fees.

Prerequisites: CHEM 322 or concurrent registration or consent of instructor.

Offered: Fall, Spring, Summer.

CHEM 324 | Chemistry of Biological Systems | 3 cr

Structures, synthesis and characterization of biological molecules including proteins, carbohydrates, nucleic acids, and primary and secondary metabolites. Chemical mechanisms of biological reactions. Biochemical thermodynamics and kinetics. Three-hour lecture.

Prerequisites: CHEM 322.

Offered: Fall.

CHEM 335 | Clinical Chemistry I | 3 cr

Explores biological samples, analytes, and assays pertinent to the clinical laboratory. Includes electrolyte, carbohydrate, protein, lipid, vitamin, and mineral analytes and the techniques utilized to detect and quantify such materials. Cross-listed with: AHS 335.

Prerequisites: AHS 300, CHEM 215.

Offered: Fall.

CHEM 336 | Clinical Chemistry II | 3 cr

Investigates metabolism and diagnostic procedures for analysis of metabolism and human disease. Analyzes data for indicators of common pathophysiology and human disease markers. Lecture. Cross-listed with: AHS 336.

Prerequisites: AHS 335 or CHEM 335.

Offered: Fall.

CHEM 350 | Chemistry of Natural Products | 3 cr

Surveys natural product classification and biosynthesis, the role of secondary metabolites, synthetic natural product synthesis and the role of natural products in human life extension.

Prerequisites: CHEM 324.

Offered: Occasionally.

CHEM 355 | Survey of Industrial Chemistry | 3 cr

Covers industrial applications of chemistry including a survey of the chemical industry and its principal products, mass and energy balances as applied to chemical processes, and the comparative economics of chemical processes.

Prerequisites: CHEM 230 and CHEM 322; or consent of instructor.

Offered: Occasionally.

CHEM 390 | Special Topics in Chemistry | 1-3 cr

Selected topics in chemistry. May repeat with different topic.

Prerequisites: None.

Offered: Occasionally.

CHEM 398 | Independent Study: Literature and/or Computational Research | 1-3 cr

Provides opportunity for individual projects involving literature research or computational studies conducted under the direct supervision and guidance of a staff member. Usually graded on credit/no-credit basis and not applied to GPA.

Prerequisites: CHEM 298, or C or better in CHEM 206 or in CHEM 321; and consent of instructor and department chair.

Offered: Fall, Spring, Summer.

CHEM 400 | Instrumental Analysis Laboratory | 3 cr

Experiments in trace analysis utilizing electrochemical and optical methods as well as gas and liquid chromatography. Six-hour lab.

Prerequisites: CHEM 206 or CHEM 208 with a C or better (in either), or consent.

Offered: Spring.

CHEM 401 | Advanced Organic Laboratory | 3 cr

Advanced multi-step synthesis and characterization of organic and some inorganic compounds. Structure elucidation by classical and instrumental methods such as IR, NMR, GC/MS, and UV spectroscopy. Includes applications of the principles of green chemistry. Six-hour lab. Lab fee: \$100.

Prerequisites: CHEM 322 and CHEM 323 with C or better (in both).

Offered: Fall.

CHEM 402 | Advanced Organic Chemistry | 3 cr

Investigates selected topics in mechanistic, theoretical, heterocyclic, and physical organic chemistry. Three-hour lecture.

Prerequisites: CHEM 322 with C or better.

Offered: Fall (odd years).

CHEM 410 | Advanced Biochemistry | 3 cr

Explores advanced topics in biochemistry including thermodynamics, protein structure, and enzyme kinetics and mechanisms. Three-hour lecture. Multi-career cross-listing: CHEM 620.

Prerequisites: CHEM307 or BIOS 307 or CHEM 324 or consent of instructor.

Offered: Spring (even years).

CHEM 450 | Current and Future Directions in Natural Products | 3 cr

Delves into historical, current and future methods in natural products identification, characterization, and production.

Prerequisites: CHEM 350.

Offered: Occasionally.

CHEM 490 | Special Topics in Chemistry | 1-3 cr

Selected topics in chemistry. May repeat with different topic.

Prerequisites: Consent of instructor.

Offered: Occasionally.

CHEM 494 | Internship in Chemistry | 1-3 cr

Work in a chemistry related position under the joint guidance of a faculty member and an on-site supervisor. Projects will specify learning goals and objectives related to the theory and application of modern chemistry. Usually graded on a credit/no credit basis. May be repeated for up to six credits.

Prerequisites: CHEM 206 or CHEM 208 or CHEM 323; GPA of 2.5 or higher and consent of instructor and department chair.

Offered: Fall, Spring.

CHEM 495 | Senior Seminar | 1 cr

Research and presentation of selected topics from chemical literature. One-hour discussion.

Prerequisites: Junior or senior standing.

Offered: Spring.

CHEM 497 | Senior Thesis | 1 cr

Thesis based on experimental work or literature search.

Prerequisites: Senior standing, chemistry major and consent of instructor.

Offered: Fall, Spring.

CHEM 499 | Independent Study | 1-3 cr

Provides opportunity for individual projects of an experimental or theoretical nature conducted under the direct supervision and guidance of a staff member. Usually credit/no-credit grading basis and not applied to GPA. Requires lab fee.

Prerequisites: C or better in one of: CHEM 206, CHEM 299 or CHEM 323; and consent of instructor and department chair.

Offered: Fall, Spring, Summer.