

CHEMISTRY (CHEM)

CHEM-135 Principles of Chemistry 3 Credits

Corequisites: CHEM-136

Prerequisites: None

This course introduces fundamental concepts and applications of chemistry, including atomic structure, the Periodic Table, chemical bonding, reaction stoichiometry, thermochemistry, ideal gas laws, and electrochemistry. Applied topics include batteries, fuel cells and corrosion, and a description of the chemistry and uses of metals and nonmetals are included.

Lecture: 3, Lab 0, Other 0

CHEM-136 Principles of Chemistry Lab 1 Credits

Corequisites: CHEM-135

Prerequisites: None

The laboratory introduces and/or illustrates chemical concepts and principles, and teaches the skills of data collection and evaluation. The SI system is emphasized.

Lecture: 0, Lab 2, Other 0

CHEM-137 General Chemistry I 3 Credits

Corequisites: CHEM-136

Prerequisites: None

An introduction to fundamental concepts of chemistry, including the Periodic Table, chemical nomenclature, reactions and reaction stoichiometry, atomic structure and chemical bonding. The course is open to all science majors, and is required for Chemistry majors. Non-science majors require permission of Chemistry Discipline Chair.

Lecture: 3, Lab 0, Other 1

CHEM-223 Introduction to Polymer Science 4 Credits

Prerequisites: CHEM-135 or CHEM-137

Minimum Class Standing: Sophomore

An introduction to the fundamental principles of Polymer Science. Topics include the relationship between polymer structure and engineering properties with discussions of the most widely used polymeric materials and processes in terms of their relative costs, design parameters, and applications - thermal, mechanical, and rheological testing is discussed as well as the environmental impact of polymeric materials. Each lecture is augmented by displays of fabricated parts which illustrate general plastic selection principles. Each student makes an oral and written presentation which illustrates the application of polymer science to a specific material, design and/or process.

Lecture: 4, Lab 0, Other 0

CHEM-237 General Chemistry II 3 Credits

Corequisites: CHEM-238

Prerequisites: CHEM-135 or CHEM-137

Minimum Class Standing: Freshman 2

General Chemistry II, is a continuation of CHEM-137, General Chemistry I. Topics covered include: properties of gases, thermochemistry, chemical thermodynamics, ideal and non-ideal solutions, chemical equilibrium, chemical kinetics, nuclear chemistry, and electrochemistry.

Lecture: 3, Lab 0, Other 1

CHEM-238 General Chemistry II Lab 1 Credits

Corequisites: CHEM-237

Prerequisites: CHEM-135 or CHEM-137

Minimum Class Standing: Freshman 2

This laboratory course, taken concurrently with CHEM-237, is designed to continue exploring the experimental principles of chemistry not covered in CHEM-136. Topics covered include empirical formulas of hydrates, gas laws, heats of reactions, freezing point depression, iodine clock, acid dissociation constant determination, buffers, solubility product constant determination, electrolysis of water, and the determination of thermodynamic properties.

Lecture: 0, Lab 3, Other 0

CHEM-345 Organic Chemistry I 4 Credits

Prerequisites: CHEM-237

Minimum Class Standing: Sophomore

Terms Offered: Summer, Fall

A thorough coverage of the chemistry of hydrocarbons will be provided. Topics include: valence theory, stereochemistry, structure, addition polymerization, reaction mechanisms and spectroscopy. This course is appropriate for science majors and environmental Chemistry minors.

Lecture: 6, Lab 0, Other 0

CHEM-346 Organic Chemistry I Lab 2 Credits

Corequisites: CHEM-345

Prerequisites: CHEM-237 and CHEM-238

Minimum Class Standing: Sophomore

This laboratory develops the basic skills needed for the separation, identification and synthesis of organic compounds. Instrumental techniques introduced will include FTIR, UV-VIS, GC and GC/MS. One four-hour laboratory per week.

Lecture: 0, Lab 4, Other 0

CHEM-347 Organic Chemistry II 4 Credits

Prerequisites: CHEM-345

Minimum Class Standing: Sophomore 2

A continuation of CHEM-345 with an emphasis on the chemistry of the organic functional groups and the synthesis of polyfunctional molecules will be provided. Appropriate for science majors.

Lecture: 4, Lab 0, Other 0

CHEM-348 Organic Chemistry II Lab 2 Credits

Corequisites: CHEM-347

Prerequisites: CHEM-345 and CHEM-346

Minimum Class Standing: Sophomore 2

A continuation of CHEM-346 with an emphasis on the advanced techniques used to synthesize multifunctional organic compounds will be provided. Instrumental methods will be intensively utilized to characterize complex chemical structures.

Lecture: 0, Lab 4, Other 0

CHEM-351 Biochemistry I 4 Credits

Corequisites: CHEM-352

Prerequisites: CHEM-345 and CHEM-346

Minimum Class Standing: Sophomore

The basic principles of biochemistry will be the focus of this course. Coverage includes a thorough description of the biochemical framework - amino acids, proteins, enzymes, lipids, membranes, carbohydrates, nucleic acids, DNA, and RNA. In addition, the energetics and metabolism of a number of biological processes will be introduced.

Lecture: 4, Lab 0, Other 0

CHEM-352 Biochemistry Lab 3 Credits

Corequisites: CHEM-351

Prerequisites: CHEM-345 and CHEM-346

Minimum Class Standing: Sophomore

An introduction to biochemistry laboratory procedures for the separation and analysis of biologically important molecules. This course also covers techniques and methodology important in the biotechnology field.

Lecture: 0, Lab 3, Other 0

CHEM-361 Physical Chemistry I 4 Credits

Corequisites: CHEM-362

Prerequisites: CHEM-237 and CHEM-238 and PHYS-224 and PHYS-225

Minimum Class Standing: Junior

A first course in physical chemistry, covering the topics of chemical thermodynamics, gas laws, solutions, transport properties, phases and phase diagrams, electrochemistry, colligative properties and the physical chemistry of macromolecules.

Lecture: 4, Lab 0, Other 0

CHEM-362 Physical Chemistry I Lab 3 Credits

Corequisites: CHEM-361

Prerequisites: None

Minimum Class Standing: Junior

This laboratory will illustrate principles covered in the CHEM-361 lecture and introduce the student to methods used in determining physical relationships in nature. Topics include equilibrium, phase diagrams, solutions, thermodynamics, gases, transport properties and error analysis.

Lecture: 0, Lab 3, Other 0

CHEM-363 Physical Chemistry II 4 Credits

Corequisites: CHEM-364

Prerequisites: CHEM-237 and PHYS-224 and PHYS-225 and (MATH-203 or MATH-203H or MATH-203X)

Minimum Class Standing: Junior 2

The second course in the physical sequence, continuing topics introduced in CHEM-361, Physical Chemistry I. Topics covered will include kinetic molecular theory, kinetics, quantum mechanics, solids and surfaces, photochemistry, atomic and molecular structure theory, spectroscopy, statistical mechanics.

Lecture: 4, Lab 0, Other 0

CHEM-364 Physical Chemistry II Lab 3 Credits

Corequisites: CHEM-363

Prerequisites: None

Minimum Class Standing: Junior 2

This laboratory will illustrate principles covered in the CHEM-363 lecture and introduce the student to methods used in determining physical relationships in nature. Topics include kinetics, quantum mechanics, solids, surface chemistry, electrochemistry, photochemistry, and spectroscopic techniques.

Lecture: 0, Lab 3, Other 0

CHEM-373 Analytical Chemistry 4 Credits

Corequisites: CHEM-374

Prerequisites: CHEM-237 and CHEM-238 and CHEM-345 and CHEM-346

Minimum Class Standing: Junior 2

Introduction to classical and modern instrumental analytical chemistry. The fundamentals of analytical statistics, acid/base calculations, titrations, basic chemical equilibrium, atomic and molecular spectroscopic, chromatographic, and electroanalytical methods of analysis will be covered.

Lecture: 4, Lab 0, Other 0

CHEM-374 Analytical Chemistry Lab 3 Credits

Corequisites: CHEM-373

Prerequisites: CHEM-345 and CHEM-346

Minimum Class Standing: Junior 2

This laboratory course covers the qualitative and quantitative analysis of chemical compounds including gravimetric, volumetric, and spectrophotometric methods.

Lecture: 0, Lab 3, Other 0

CHEM-381 Scientific 3D Printing 4 Credits

Prerequisites: None

This is a project based course designed to give you an understanding of 3D printing and how it can be used in both scientific and mechanical applications. This course begins with learning to design parts on a computer. Using these CAD skills, students will explore ergonomic and effective problem solving using best printing practices to make a better final product and minimize limitations of the printers. Students are expected to complete fairly open ended projects that demonstrate mastery over different functionalities of prints that are often used in larger projects. Students will have the flexibility to incorporate the requirements of the small functionality projects into a larger project for Co-Op, research, or personal use. The course will also explore how 3D printing is currently being used in industry and research.

Lecture: 0, Lab 0, Other 4

CHEM-437 Inorganic Chemistry 4 Credits

Corequisites: CHEM-438

Prerequisites: CHEM-345

Minimum Class Standing: Junior

In-depth coverage of the fundamentals of inorganic and bioinorganic chemistry, including structure and bonding of inorganic compounds, as well as their chemical periodicity and reactions. The descriptive chemistry of metals, non-metals and coordination compounds will also be discussed.

Lecture: 4, Lab 0, Other 0

CHEM-438 Inorganic Chemistry Lab 3 Credits

Corequisites: CHEM-437

Prerequisites: CHEM-346

Minimum Class Standing: Junior

This laboratory component is an introduction to the techniques used in the synthesis and characterization of metal complexes and organometallic compounds, including bioinorganic compounds. This course is open to all science majors and is required for chemistry majors. One three-hour laboratory per week.

Lecture: 0, Lab 3, Other 0

CHEM-451 Biochemistry II 4 Credits

Corequisites: CHEM-452

Prerequisites: CHEM-351 and CHEM-352

Minimum Class Standing: Junior 2

A comprehensive advanced Biochemistry lecture course. It will cover topics related to the biochemistry of the human body, including the breakdown and synthesis of glucose, fatty acids, amino acids, and nucleotides.

Lecture: 4, Lab 0, Other 0

CHEM-452 Biochemistry II Lab 3 Credits

Corequisites: CHEM-451

Prerequisites: CHEM-351 and CHEM-352

Minimum Class Standing: Junior 2

A comprehensive advanced Biochemistry laboratory. Topics related to the isolation and manipulation of DNA and proteins will be covered.

Including techniques such as PCR, Western blotting, mutagenesis, DNA Fingerprinting, and molecular modeling.

Lecture: 0, Lab 3, Other 0

CHEM-477 Advanced Organic Chemistry 4 Credits

Corequisites: CHEM-478

Prerequisites: CHEM-347 and CHEM-348

Minimum Class Standing: Senior

A senior level chemistry elective. This course will cover topics including the principles of structure/reactivity, reaction mechanisms, kinetic and thermodynamic control of reactions, radical and photochemistry, organometallic chemistry and total organic synthesis.

Lecture: 4, Lab 0, Other 0

CHEM-478 Advanced Organic Chemistry Lab 2 Credits

Corequisites: CHEM-477

Prerequisites: CHEM-347 and CHEM-348

Minimum Class Standing: Senior

A senior level chemistry elective course. The laboratory develops the skills needed to perform variety of organic reactions including photochemistry and organometallic chemistry. It also allows the student to use the knowledge developed to design and carry out a total synthesis for a target compound. Student will employ the separation, purification and identification techniques learned in CHEM-348 to perform the labs.

One four-hour laboratory per week.

Lecture: 0, Lab 4, Other 0

CHEM-491 CHEM Special Topics 4 Credits

Prerequisites: None

Advanced Chemistry Elective & Lab

Lecture: 4, Lab 0, Other 0

CHEM-492 CHEM Special Topics Lab 3 Credits

Prerequisites: None

Lecture: 0, Lab 3, Other 0

CHEM-494 Research Methods 4 Credits

Prerequisites: BIOL-242 or CHEM-238

Minimum Class Standing: Junior 2

Topics will include research ethics, study design and implementation, and results communications. Students will learn about these topics through readings, discussions, and practical application.

Lecture: 0, Lab 4, Other 0

CHEM-496 Senior Research/Seminar II 2 Credits

Prerequisites: CHEM-494

Minimum Class Standing: Senior

Seniors will conclude a senior research project with a faculty member, and prepare and present a seminar dealing with progress achieved during the research period. Guest seminar lectures by visiting faculty, industry or government scientists will also be scheduled. This course may be repeated twice for a total of six credits.

Lecture: 0, Lab 6, Other 0

CHEM-499 Chemistry Independent Study 4 Credits

Prerequisites: None

Terms Offered: As needed

Advanced Chemistry Independent Study

Lecture: 4, Lab 0, Other 0