

CHEMISTRY (CHEM)

Courses

CHEM 100 Chemistry and Society-GTSC2 3 Credits

Introduction to selected topics in chemistry with particular attention to chemistry in society. Minimal use of elementary mathematics is required.

Essential Learning Categories: Natural Sciences

Colorado Guaranteed Transfer (GT) Pathways General Education Curriculum

CHEM 111 Introduction to Concepts of General Chemistry 3 Credits

Introduction to concepts of General Chemistry. Designed as a preparatory course for CHEM 131. Topics include dimensional analysis, review of relevant algebra skills, basic atomic structure, molecular structure and shape, nomenclature, and stoichiometry.

Essential Learning Categories: Natural Sciences

Terms Typically Offered: Fall, Spring.

CHEM 121 Principles of Chemistry-GTSC1 4 Credits

Introduction to fundamental principles of chemistry. Designed for students planning a non-science major. Topics include atomic structure, bonding, periodic table, gas laws, mass relationships, solution theory, oxidation-reduction, electrochemistry, and ionic equilibrium. Four lectures and one three-hour lab per week.

Prerequisites: Mastery of high school algebra.

Corequisites: CHEM 121L.

Essential Learning Categories: Natural Science with lab - Both the lab and lecture must be completed

Colorado Guaranteed Transfer (GT) Pathways General Education Curriculum

Terms Typically Offered: Fall, Spring.

CHEM 121L Principles of Chemistry Laboratory-GTSC1 1 Credit

Lab component required for CHEM 121.

Prerequisites: Mastery of high school algebra.

Corequisites: CHEM 121

Essential Learning Categories: Natural Science with lab - Both the lab and lecture must be completed

Colorado Guaranteed Transfer (GT) Pathways General Education Curriculum

Fees: Yes.

CHEM 122 Principles of Organic Chemistry-GTSC1 4 Credits

Introduction to the chemical and physical properties of selected classes of organic compounds. Four lectures and one three-hour laboratory per week.

Prerequisites: CHEM 121/CHEM 121L or CHEM 131/CHEM 131L or one year of high school chemistry and permission of instructor.

Corequisites: CHEM 122L.

Essential Learning Categories: Natural Science with lab - Both the lab and lecture must be completed

Colorado Guaranteed Transfer (GT) Pathways General Education Curriculum

CHEM 122L Principles of Organic Chemistry Laboratory-GTSC1 1 Credit

Lab component required for CHEM 122.

Prerequisites: CHEM 121/CHEM 121L or CHEM 131/CHEM 131L or one year of high school chemistry and permission of instructor.

Corequisites: CHEM 122.

Essential Learning Categories: Natural Science with lab - Both the lab and lecture must be completed

Colorado Guaranteed Transfer (GT) Pathways General Education Curriculum

CHEM 123 Introduction to Environmental Chemistry 4 Credits

Application of basic chemistry principles to the environment. Topics include aquatic and atmospheric chemistry, biogeochemical cycling of the elements required for life and structural organic chemistry as it applies to the physical and biological properties of persistent organic pollutants.

Prerequisites: CHEM 131/CHEM 131L.

Terms Typically Offered: Spring.

CHEM 131 General Chemistry I-GTSC1 4 Credits

Fundamental principles of chemistry. Designed for students planning a major in science. Topics include dimensional analysis, atomic and molecular structure, stoichiometry, simple chemical reactions, thermochemistry, and gases.

Prerequisites: One year of high school chemistry, mastery of algebra, and a passing score on the chemistry assessment exam; Students without an appropriate chemistry assessment exam score should take CHEM 111; CHEM 111 or CHEM 121 may be substituted for an appropriate assessment score.

Corequisites: CHEM 131L.

Essential Learning Categories: Natural Science with lab - Both the lab and lecture must be completed

Colorado Guaranteed Transfer (GT) Pathways General Education Curriculum

Terms Typically Offered: Fall, Spring.

CHEM 131L General Chemistry Laboratory I-GTSC1 1 Credit

Fundamental principles of chemistry. Designed for students planning a major in science. Topics include dimensional analysis, atomic and molecular structure, stoichiometry, simple chemical reactions, thermochemistry, and gases.

Prerequisites: One year of high school chemistry, mastery of algebra, and a passing score on the chemistry assessment exam; Students without an appropriate chemistry assessment exam score should take CHEM 111; CHEM 111 or CHEM 121 may be substituted for an appropriate assessment score.

Corequisites: CHEM 131.

Essential Learning Categories: Natural Science with lab - Both the lab and lecture must be completed

Colorado Guaranteed Transfer (GT) Pathways General Education Curriculum

Terms Typically Offered: Fall, Spring.

Fees: Yes.

CHEM 132 General Chemistry II-GTSC1 4 Credits

Continuation of the material in CHEM 131. Topics include states of matter, solutions, kinetics, equilibrium, thermodynamics, and electrochemistry.

Prerequisites: CHEM 131/CHEM 131L or CHEM 151/CHEM 151L.

Corequisites: CHEM 132L.

Essential Learning Categories: Natural Science with lab - Both the lab and lecture must be completed

Colorado Guaranteed Transfer (GT) Pathways General Education Curriculum

CHEM 132L General Chemistry Laboratory II-GTSC1 1 Credit

Laboratory course to accompany CHEM 132. Designed for students planning a major in science. Freshman-level chemistry laboratory techniques will continue to be introduced. Experimental topics include: identification of chemical unknowns by qualitative analysis, colligative properties, acid-base titration, reaction kinetics, equilibrium constant determinations, and electrochemistry. Four lectures and one three-hour laboratory per week.

Prerequisites: CHEM 131/CHEM 131L or CHEM 151/CHEM 151L.

Corequisites: CHEM 132.

Essential Learning Categories: Natural Science with lab - Both the lab and lecture must be completed

Colorado Guaranteed Transfer (GT) Pathways General Education Curriculum

Fees: Yes.

CHEM 151 Engineering Chemistry-GTSC1 4 Credits

General chemistry for engineering majors. Topics include stoichiometry, thermodynamics, states of matter, acids and bases, oxidation-reduction, equilibrium, and kinetics. Examples and problems chosen to illustrate the application of chemistry to engineering.

Prerequisites: MATH 113 or higher or concurrently enrolled in MATH 119, MATH 119B, MATH 135, or MATH 151; CHEM 111 or a passing score on the chemistry placement exam.

Corequisites: CHEM 151L.

Essential Learning Categories: Natural Science with lab - Both the lab and lecture must be completed

Colorado Guaranteed Transfer (GT) Pathways General Education Curriculum

Terms Typically Offered: Fall, Spring.

CHEM 151L Engineering Chemistry Laboratory-GTSC1 1 Credit

Laboratory course to accompany CHEM 151. Freshman-level chemistry laboratory techniques will be introduced. Experimental topics include basic measurement techniques, stoichiometry, chemical reaction observation, titrations, and reaction kinetics.

Prerequisites: MATH 113 or concurrently enrolled in MATH 119, MATH 119B, MATH 135, or MATH 151; CHEM 111 or passing score on the chemistry assessment exam.

Corequisites: CHEM 151.

Essential Learning Categories: Natural Science with lab - Both the lab and lecture must be completed

Colorado Guaranteed Transfer (GT) Pathways General Education Curriculum

Terms Typically Offered: Fall, Spring.

Fees: Yes.

CHEM 196 Topics 1-3 Credits

Course may be taken multiple times up to maximum of 15 credit hours.

CHEM 296 Topics 1-3 Credits

Course may be taken multiple times up to maximum of 15 credit hours.

CHEM 300 Environmental Chemistry 4 Credits

Aquatic and atmospheric chemistry. Basic chemical, physical and biological properties of organic pollutants. Topics include smog formation, stratospheric ozone depletion, greenhouse gases, acid mine waste formation, biogeochemistry, and bioaccumulation of halogenated organics.

Prerequisites: CHEM 122/CHEM 122L or CHEM 132/CHEM 132L.

CHEM 301 Analytical Chemistry 3 Credits

Classical and instrumental methods of quantitative chemical analysis. Includes statistical treatment of experimental data, method characterization and validation, equilibrium, titrations, electrochemistry, spectroscopy, mass spectrometry, and chromatography.

Prerequisites: CHEM 132/CHEM 132L.

Corequisites: CHEM 301L.

CHEM 301L Analytical Chemistry Laboratory 1 Credit

Lab component required for CHEM 301.

Prerequisites: CHEM 132/CHEM 132L.

Corequisites: CHEM 301.

Fees: Yes.

CHEM 311 Organic Chemistry I 4 Credits

This course is the first semester of a two-semester introduction to basic organic chemistry. The nomenclature, structure, properties, and reactions of important classes of organic compounds are examined. The relationship of structure and bonding in organic compounds to reactivity is emphasized. Reactions are examined from mechanistic and synthetic perspectives.

Prerequisites: CHEM 132/CHEM 132L.

Corequisites: CHEM 311L.

CHEM 311L Organic Chemistry I Laboratory 1 Credit

This lab is the first semester of a two-semester sequence. It introduces common organic lab techniques (including chromatography, extraction, recrystallization, and distillation) used for separating and analyzing organic compounds.

Prerequisites: CHEM 132/CHEM 132L.

Corequisites: CHEM 311.

Fees: Yes.

CHEM 312 Organic Chemistry II 4 Credits

This course is the second semester of a two-semester introduction to basic organic chemistry. The nomenclature, structure, properties, and reactions of important classes of organic compounds are examined. The relationship of structure and bonding in organic compounds to reactivity is emphasized. Reactions are examined from mechanistic and synthetic perspectives. Spectroscopic analysis of organic compounds is also introduced.

Prerequisites: CHEM 132/CHEM 132L or permission of instructor.

Corequisites: CHEM 312L.

CHEM 312L Organic Chemistry II Laboratory 1 Credit

This lab is the second semester of a two-semester sequence. Common organic lab techniques, including spectroscopy, are used to carry out and analyze organic reactions.

Prerequisites: CHEM 132/CHEM 132L or permission of instructor.

Corequisites: CHEM 312.

Fees: Yes.

CHEM 315 Biochemistry I 3 Credits

Classical biochemistry concerned with the application of chemical principles to biological systems. Topics covered include: organic reactions in living cells, thermodynamics, water, acids and bases, and structural-functional relationships of carbohydrate, lipid, protein, and nucleic acid monomers and polymers.

Prerequisites: CHEM 312/CHEM 312L.

Terms Typically Offered: Fall.

CHEM 316 Biochemistry II 3 Credits

Continuation of fundamental biochemical principles, focused upon metabolism. Topics include: intersection of reciprocal regulation of catabolism and anabolism, citric acid cycle, oxidative phosphorylation, and intersections of carbohydrate, amino acid, nucleotide, and lipid metabolism.

Prerequisites: CHEM 315.

Terms Typically Offered: Spring.

CHEM 317L Biochemistry Laboratory 1 Credit

Laboratory investigation of fundamental applications of biochemistry. Techniques focus upon industrially-relevant purification and characterization of functional biomolecules and biomacromolecules.

Prerequisites: CHEM 315 (may be taken concurrently); CHEM 312/ CHEM 312L; and BIOL 105/BIOL 105L.

Terms Typically Offered: Fall.

CHEM 321 Physical Chemistry I 3 Credits

Principles of chemical thermodynamics and kinetics. Includes study of the kinetic theory of matter, first and second laws of thermodynamics, state functions, thermochemistry, entropy, free energy, chemical potential, phase transitions, chemical equilibria, and the rates and mechanisms of chemical reactions.

Prerequisites: CHEM 132/CHEM 132L or CHEM 151/CHEM 151L; and MATH 152; and PHYS 111/PHYS 111L or PHYS 131/PHYS 131L.

CHEM 322 Physical Chemistry II 3 Credits

An introduction to the quantum theory of atoms, molecules, and chemical bonding for chemists. Includes principles of quantum mechanics and their application to atomic structure, molecular spectroscopy, symmetry properties, and the determination of molecular structure. Also introduces the principles of statistical mechanics with application to molecules.

Prerequisites: CHEM 132/CHEM 132L or CHEM 151/CHEM 151L; and MATH 253 (may be taken concurrently); and PHYS 111/PHYS 111L or PHYS 131/PHYS 131L.

CHEM 341 Advanced Laboratory I 2 Credits

Experiments from analytical, inorganic, organic, physical, and biological chemistry designed to show the application of theory to chemical problems. In addition to a list of possible core experiments, each student chooses other experiments according to individual interests. Two three-hour laboratories per week.

Prerequisites: CHEM 301/CHEM 301L; CHEM 312/CHEM 312L; and CHEM 321.

Corequisites: CHEM 442.

Fees: Yes.

CHEM 351 Inorganic Chemistry I 3 Credits

Study of periodic trends and bonding throughout the periodic table. Includes periodic properties, advanced electron-dot diagrams, VSEPR, symmetry, group theory, molecular orbital diagrams, electron counting, and basic nomenclature.

Prerequisites: CHEM 312 (may be taken concurrently).

CHEM 352 Inorganic Chemistry II 3 Credits

Application of periodic trends and high level bonding concepts to main group, solid state, organometallic, and advanced coordination chemistries. Includes acid-base chemistry, donor-acceptor chemistry, crystalline solids, ligand field stabilization energy, Jahn-Teller Effects, pi-bonding ligands, reaction pathways at transition metal centers, and catalysts.

Prerequisites: CHEM 351.

CHEM 395 Independent Study 1-3 Credits

Course may be taken multiple times up to maximum of 6 credit hours.

CHEM 396 Topics 1-3 Credits

Course may be taken multiple times up to maximum of 15 credit hours.

CHEM 397 Structured Research 1-3 Credits

Chemical research guided by a faculty member. Sophomore through senior levels.

Prerequisites: Permission of instructor.

Course may be taken multiple times up to maximum of 4 credit hours.

CHEM 421 Advanced Organic Chemistry I 3 Credits

Selected topics in organic chemistry are discussed in detail.

Prerequisites: CHEM 312 and CHEM 322.

CHEM 422 Advanced Organic Chemistry II 3 Credits

Similar in content to CHEM 421, but without overlap in topics. CHEM 421 is not a prerequisite for CHEM 422.

Prerequisites: CHEM 312 and CHEM 322.

CHEM 431 Instrumental Analysis 3 Credits

Modern instrumental methods of analysis. Topics include signals and noise, atomic spectroscopy, molecular spectroscopy, electroanalytical chemistry and chromatographic separation methods. Three lectures and one 3-hour laboratory per week.

Prerequisites: CHEM 301/CHEM 301L.

Corequisites: CHEM 431L.

CHEM 431L Instrumental Analysis Laboratory 1 Credit

Lab component required for CHEM 431.

Prerequisites: CHEM 301/CHEM 301L.

Corequisites: CHEM 431.

Fees: Yes.

CHEM 442 Communicating in the World of Chemistry 1 Credit

Study and application of communication skills necessary for careers in chemistry-related fields. Includes laboratory notebooks, chemical publications, cover letters, resumes, and formal oral presentations.

Corequisites: CHEM 341.

CHEM 487 Formal Research 1-3 Credits

Chemical research guided by a faculty member. Results presented as a formal scientific paper in a format suitable for publication. Topics include laboratory notebooks, independent research, and formal reporting of research.

Course may be taken multiple times up to maximum of 4 credit hours.

CHEM 494 Seminar 1 Credit

Student, faculty, and other speakers present a variety of topics in chemistry and related fields.

Prerequisites: Chemistry major with senior standing or permission of instructor.

CHEM 495 Independent Study 1-3 Credits

Course may be taken multiple times up to maximum of 6 credit hours.

CHEM 496 Topics 3 Credits

Course may be taken multiple times up to maximum of 15 credit hours.

CHEM 497 Structured Research 1-3 Credits

Chemical research guided by a faculty member. Senior level.

Prerequisites: Permission of instructor.

Course may be taken multiple times up to maximum of 4 credit hours.

CHEM 596 Topics: 1-3 Credits

Course may be taken multiple times up to maximum of 15 credit hours.