

CHEMISTRY (CHEM)

CHEM 1151. Survey of Chemistry I (3)

First course in a two-semester sequence covering elementary principles of general, organic and biochemistry designed for allied health science majors (this course is also opened to non-science majors). Topics to be covered include elements and compounds, chemical equations, nomenclature, and molecular geometry.

Prerequisites: (MATH 0099 or MATH 1101 or MATH 1111 or MATH 1113 (may be taken concurrently) or MATH 1112 (may be taken concurrently) or MATH 1501 (may be taken concurrently)) or COMM with a score of 40 or CPTE with a score of 070 or S02 with a score of 430 or A02 with a score of 18 or ACCM with a score of 070

CHEM 1151L. Survey of Chemistry Lab I (1)

Laboratory accompanying CHEM 1151.

Prerequisites: CHEM 1151 (may be taken concurrently)

CHEM 1152. Survey of Chemistry II (3)

Second course in a two-semester sequence covering elementary principles of general, organic and biochemistry designed for allied health science majors (This course is also open to non-science majors).

Prerequisites: (CHEM 1151 and CHEM 1151L) or (CHEM 1211 and CHEM 1211L) or (CHEM 1211K)

CHEM 1152L. Survey of Chemistry Lab II (1)

Laboratory accompanying CHEM 1152.

Prerequisites: (CHEM 1151 and CHEM 1151L) or CHEM 131 or CHEM 151 and CHEM 1152 (may be taken concurrently)

CHEM 1211. Principles of Chemistry I (3)

First course in a two-semester sequence covering the fundamental principles and applications of chemistry designed for science majors. Topics to be covered include composition of matter, stoichiometry, periodic relations, and nomenclature. High School Chemistry is required for this course. Students who have not taken Chemistry in High School, and who desire to take CHEM 1211, must first take and pass CHEM 1151 and CHEM 1151L.

Prerequisites: CHEM 1211L (may be taken concurrently) and (MATH 1112 (may be taken concurrently) or MATH 1112A (may be taken concurrently) or MATH 1113 (may be taken concurrently) or MATH 130 or MATH 1501 (may be taken concurrently) or MATH 151)

CHEM 1211K. Principles of Chemistry I (4)

First course in a two-semester sequence covering the fundamental principles and applications of chemistry designed for science majors. Topics to be covered include composition of matter, stoichiometry, periodic relations, and nomenclature. Laboratory exercises supplement the lecture material. For additional course information, visit <http://ecore.usg.edu/courses/description.php>. This course is taught on-line only through eCore. It is not available on campus.

Prerequisites: (ECOR with a score of C) and MATH 1111 and MATH 1113

CHEM 1211L. Principles of Chemistry Lab I (1)

Laboratory accompanying 1211.

Prerequisites: CHEM 1211 (may be taken concurrently)

CHEM 1212. Principles of Chemistry II (3)

Second course in a two-semester sequence covering the fundamental principles and applications of chemistry for science majors.

Prerequisites: (CHEM 1211 and CHEM 1211L) and CHEM 1212L (may be taken concurrently) and (MATH 1112 or MATH 1113 or MATH 1501)

CHEM 1212K. Principles of Chemistry II (4)

Second course in a two-semester sequence covering the fundamental principles and applications of chemistry designed for science majors. Laboratory exercises supplement the lecture material. For additional course information, visit <http://ecore.usg.edu/courses/description.php>

Prerequisites: CHEM 1211 and CHEM 1211L or CHEM 1211K and MATH 1113 and ECOR with a score of C

CHEM 1212L. Principles of Chemistry Lab II (1)

Laboratory accompanying CHEM 1212.

Prerequisites: CHEM 1212 (may be taken concurrently) and CHEM 1211L

CHEM 1500. Freshman Chemistry Seminar (1)

The first of four chemistry seminars. Emphasis will be placed on laboratory safety, professional development, and the chemistry curriculum. Attendance at some department and/or university events will be required.

CHEM 2411. Organic Chemistry I (3)

A study of the common classes of carbon compounds, including their physical and chemical properties, methods of preparation, and reactions utilizing modern theories of electronic structure and reaction mechanisms.

Prerequisites: (CHEM 1212 and CHEM 1212L) and CHEM 2411L (may be taken concurrently)

CHEM 2411L. Organic Chemistry Laboratory I (1)

Laboratory accompanying CHEM 2411.

Prerequisites: CHEM 2411 (may be taken concurrently)

CHEM 2412. Organic Chemistry II (3)

A continuation of CHEM 2411 which focuses on functional groups and their reactions.

Prerequisites: (CHEM 2411 and CHEM 2411L) and CHEM 2412L (may be taken concurrently)

CHEM 2412L. Organic Chemistry Lab II (1)

Laboratory accompanying CHEM 2412.

Prerequisites: CHEM 2412 (may be taken concurrently) and CHEM 2411L

CHEM 2500. Sophomore Chemistry Seminar (1)

The second of four chemistry seminars. Emphasis will be placed on scientific ethics, science and society, and presentation of data. Attendance at some department and/or university events will be required.

Prerequisites: CHEM 1212 and CHEM 1212L and CHEM 1500

CHEM 2811. Quantitative Analysis (3)

This course intends to introduce the basics of analytical chemistry for students in STEM fields. The emphasis is to understand the theoretical aspects of quantitative analysis and develop problem-solving skills. In this course, students will learn how to apply the concepts of chemical reactivity and equilibrium from general chemistry in a quantitative fashion to the field of chemical analysis. In addition, students will learn how to design and conduct well-defined chemical analysis and present those results with a high level of scientific validity.

Prerequisites: (CHEM 1211 and CHEM 1211L and CHEM 1212 and CHEM 1212L)

Restrictions: Biology

CHEM 2811L. Quantitative Analysis Lab (1)

This lab course emphasizes the application of topics and theory covered in the lecture course (CHEM 2811). It introduces students to methods of chemical analysis through wet chemical techniques including quantifying analytes of interest. Topics covered include laboratory techniques of volumetric, gravimetric, elementary instrumental chemical analyses, uses of laboratory equipment/glassware, and basic statistical analysis.

Prerequisites: CHEM 2811 (may be taken concurrently)

CHEM 3202. Introductory Biochemistry (3)

An introduction to the chemistry of biological systems. Topics include proteins, enzymes, carbohydrates, lipids and metabolism pathways. A student may not receive credit for both CHEM 3202 and CHEM 4202.

Prerequisites: CHEM 2411 and CHEM 2411L

CHEM 3202L. Biochemistry Laboratory I (1)

An introduction to modern biochemical techniques. Experiments may include methods for protein, nucleic acid, carbohydrate, and lipid isolation and characterization, enzyme kinetics, spectroscopy, chromatography, and electrophoresis.

Prerequisites: CHEM 3202 (may be taken concurrently) or CHEM 4202 (may be taken concurrently)

CHEM 3210. Off-Campus Internship I (3)

Internship program for selected students who perform supervised chemical work in conjunction with professionals at local government, academic or private institutions. Employers coordinate with the University to evaluate student performance in the workplace. Students will be assigned a grade of Satisfactory or Unsatisfactory after completion of the internship.

Prerequisites: CHEM 1212 and CHEM 1212L

CHEM 3211. Off-Campus Internship II (3)

Internship program for selected students who perform supervised chemical work in conjunction with professionals at local government, academic or private institutions. Employers coordinate with the University to evaluate student performance in the workplace. Students will be assigned a grade of Satisfactory or Unsatisfactory after completion of the internship.

Prerequisites: CHEM 1212 and CHEM 1212L

CHEM 3220. On-Campus Internship I (3)

This is an internship program for selected students who will perform supervised work related to chemistry and/or pedagogy in conjunction with chemistry faculty at Clayton State University. Students will be assigned a grade for this course based on an evaluation by the faculty supervisor.

Prerequisites: (CHEM 1212 and CHEM 1212L)

CHEM 3221. On-Campus Internship II (3)

This is an internship program for selected students who will perform supervised work related to chemistry and/or pedagogy in conjunction with chemistry faculty at Clayton State University. Students will be assigned a grade for this course based on an evaluation by the faculty supervisor.

Prerequisites: (CHEM 1212 and CHEM 1212L)

CHEM 3222. Off-Campus Internship (3)

Internship program for selected students who perform supervised chemical work in conjunction with professionals at local government, academic or private institutions. Employers coordinate with the University to evaluate student performance in the workplace. Students will be assigned a grade of Satisfactory or Unsatisfactory after completion of the internship.

Prerequisites: CHEM 1212 and CHEM 1212L

CHEM 3223. On-Campus Internship (3)

This is an internship program for selected students who will perform supervised work related to chemistry and/or pedagogy in conjunction with chemistry faculty at Clayton State University. Students will be assigned a grade for this course based on an evaluation by the faculty supervisor.

Prerequisites: (CHEM 1212 and CHEM 1212L)

CHEM 3224. Introductory Research (3)

This course is a supervised introductory research experience with Chemistry faculty at Clayton State University. Students must articulate clear project goals and objectives. Students will learn to demonstrate use of scientific literature, and document their progress using a research notebook. The project will be summarized in a written research paper and an oral presentation to the department faculty. Students will be assigned a grade for this course based on evaluation by the supervisor and other CSU faculty.

Prerequisites: (CHEM 1212 and CHEM 1212L)

CHEM 3230. Introductory Research I (3)

This course is a supervised introductory research experience with Chemistry faculty at Clayton State University. Students must articulate clear project goals and objectives. Students will learn to demonstrate use of scientific literature, and document their progress using a research notebook. The project will be summarized in a written research paper and an oral presentation to the department faculty. Students will be assigned a grade for this course based on evaluation by the supervisor and other CSU faculty.

Prerequisites: (CHEM 1212 and CHEM 1212L)

CHEM 3231. Introductory Research II (3)

This course is a supervised introductory research experience with Chemistry faculty at Clayton State University. Students must articulate clear project goals and objectives. Students will learn to demonstrate use of scientific literature, and document their progress using a research notebook. The project will be summarized in a written research paper and an oral presentation to the department faculty. Students will be assigned a grade for this course based on evaluation by the supervisor and other CSU faculty.

Prerequisites: (CHEM 1212 and CHEM 1212L)

CHEM 3232. Introductory Research III (3)

This course is a supervised introductory research experience with Chemistry faculty at Clayton State University. Students must articulate clear project goals and objectives. Students will learn to demonstrate use of scientific literature, and document their progress using a research notebook. The project will be summarized in a written research paper and an oral presentation to the department faculty. Students will be assigned a grade for this course based on evaluation by the supervisor and other CSU faculty.

Prerequisites: (CHEM 1212 and CHEM 1212L)

CHEM 3311. Inorganic Chemistry (3)

A study of inorganic compounds and complexes through the use of topics such as the electronic structure of atoms and molecules, bonding, molecular symmetry, and coordination chemistry.

Prerequisites: CHEM 2411 and CHEM 2411L and CHEM 2412 (may be taken concurrently) and CHEM 2412L (may be taken concurrently)

CHEM 3311L. Inorganic Chemistry Laboratory (1)

A laboratory course that accompanies Chem 3311 and focuses on the synthesis, purification, and characterization of inorganic compounds and complexes.

Prerequisites: CHEM 2411 and CHEM 2411L and CHEM 2412 (may be taken concurrently) and CHEM 2412L (may be taken concurrently) and CHEM 3311 (may be taken concurrently)

CHEM 3400. Survey of Physical Chemistry (3)

A study of elementary physical chemistry introducing general concepts such as atomic structure, chemical bonding, spectroscopy, thermodynamics (ideal and real gases, chemical equilibria), and chemical kinetics (rates of reactions and transport properties of materials). This is a non-calculus based physical chemistry course.

Prerequisites: CHEM 1212 and CHEM 1212L and PHYS 1112

CHEM 3400L. Physical Chemistry Lab I (1)

Laboratory methods in elementary physical chemistry that introduce general concepts.

Prerequisites: CHEM 2412 and CHEM 2412L and PHYS 1112 and (CHEM 3400 (may be taken concurrently) or CHEM 3411 (may be taken concurrently))

CHEM 3411. Physical Chemistry I (3)

A study of physical chemistry including topics in thermodynamics (ideal and real gases, chemical equilibria), chemical kinetics (rates of reactions, transport properties of materials) and liquid and solid state theory.

Prerequisites: CHEM 1212 and CHEM 1212L and PHYS 2212 and MATH 2502

CHEM 3411L. Physical Chemistry Laboratory (2)

Laboratory methods in physical chemistry.

Prerequisites: CHEM 3411 (may be taken concurrently) and CHEM 3412 (may be taken concurrently)

CHEM 3412. Physical Chemistry II (3)

A study of the principles of quantum mechanics and its applications to chemical systems. Solutions of Schrodinger equation for simple systems, perturbation theory, one-electron atom, spin and relativistic effects, multi-electron atoms, chemical bonding and spectroscopy will be discussed.

Prerequisites: CHEM 1212 and CHEM 1212L and PHYS 2212 and MATH 2502

CHEM 3412L. Physical Chemistry Lab II (1)

Laboratory methods in physical chemistry.

Prerequisites: (CHEM 3411 or CHEM 3400) and CHEM 3400L and CHEM 3412 (may be taken concurrently)

CHEM 3500. Junior Chemistry Seminar (1)

The third of four chemistry seminars. Emphasis will be placed on career planning and scientific writing. Attendance at some department and/or university events will be required.

Prerequisites: CHEM 2412 and CHEM 2412L and CHEM 2500

CHEM 3811. Analytical Chemistry (3)

The study of classical quantitative determination methods, including volumetric and gravimetric analyses, equilibrium calculations, acid-base chemistry, and electrochemistry.

Prerequisites: CHEM 1212 and CHEM 1212L

CHEM 4110. Environmental Chemistry (3)

A study of the chemistry of our environment. Topics typically include air and water pollution, pharmaceuticals, plastics, bioenergetics, thermodynamics of life, and nuclear power.

Prerequisites: (CHEM 2412 and CHEM 2412L) or CHEM 252

CHEM 4201. Advanced Organic Chemistry (3)

Advanced concepts in organic chemistry, including conjugated systems, cycloaddition reactions, molecular orbital theory, heterocyclic chemistry, enolate chemistry, and organic polymers. Additional topics will reflect the needs and interests of the students and faculty.

Prerequisites: CHEM 2412

CHEM 4202. Biochemistry I (3)

A study of the chemistry of biological systems. Topics typically include proteins, enzymes, carbohydrates, lipids and metabolism pathways.

Prerequisites: CHEM 2412 and (CHEM 2412L or CHEM 252)

CHEM 4202L. Biochemistry Laboratory (3)

An introduction to modern biochemical techniques. Experiments may include methods for protein, nucleic acid, carbohydrate, and lipid isolation and characterization, enzyme kinetics, spectroscopy, chromatography, and electrophoresis.

Prerequisites: CHEM 2412 and CHEM 2412L and (CHEM 4202 (may be taken concurrently) or CHEM 3202 (may be taken concurrently))

CHEM 4203. Biochemistry II (3)

An extended study of metabolic pathways involving carbohydrates, lipids, amino acids, and nucleotides. Nucleic acids and hormonal regulation will also be addressed.

Prerequisites: CHEM 4202

CHEM 4203L. Biochemistry Laboratory II (1)

A continued study and application of modern biochemical techniques. Experiments may include methods for protein, nucleic acid, carbohydrate, and lipid isolation and characterization, enzyme kinetics, spectroscopy, chromatography, and electrophoresis.

Prerequisites: CHEM 3202L and (CHEM 3202 or CHEM 4202)

CHEM 4205. Medicinal Chemistry (3)

A study of medicinal chemistry and the underlying principles of organic chemistry. Topics will include drug delivery, anesthetics, structure/function relationships, receptor theory, neurotransmitters, synthesis of various tranquilizer classes, synthesis of antidepressants, enzyme inhibition, antibiotics, and non-steroidal anti-inflammatory drugs (NSAIDs).

Prerequisites: CHEM 2412 and CHEM 2412L or CHEM 252

CHEM 4206. Polymer Chemistry (3)

An overview of the function, synthesis, properties, and characterization of polymers. Topics include structure determination, formation and degradation reactions, molecular weight determination, physical states and transitions, mechanical properties, and spectroscopic characterization techniques.

Prerequisites: CHEM 2412 and CHEM 2412L

CHEM 4207. Electrochemistry (3)

Electrochemistry is a one-semester elective course for science majors covering the study of relations between chemical reactions and electricity. Major topics include electrode potentials & the Nernst equation, electrode reactions, voltammetry, amperometry, and electrochemical sensors.

Prerequisites: CHEM 2412 (may be taken concurrently) and CHEM 2412L (may be taken concurrently)

CHEM 4208. Food Chemistry (3)

An overview of the major reactions occurring in food preparation and preservation. Major food categories may include milk products, baking, meats, fermentation, and candy making.

Prerequisites: CHEM 2411

CHEM 4209. Color Chemistry (3)

An advanced topics chemistry course dealing with the chemistry of dyes and pigments. The relationship between electronic and physical structure and optical properties of materials is explored. Attention is given to the nature of color, human perception of color, generation of color in conjugated dyes and structural pigments, applications of dyes and pigments, and characterization of such materials.

CHEM 4222. Chemistry Research Practicum (3)

Research experience for students in Chemistry. Practicum assignments must be approved by the student's major advisor and the Chemistry faculty.

Prerequisites: CHEM 2412 and CHEM 2412L or CHEM 252

CHEM 4230. Chemistry Research Practicum I (3)

Research experience for students in Chemistry. Practicum assignments must be approved by the student's major advisor and the Chemistry faculty.

Prerequisites: CHEM 2412 and CHEM 2412L or CHEM 252

CHEM 4231. Chemistry Research Pract II (3)

Research experience for students in Chemistry. Practicum assignments must be approved by the student's major advisor and the Chemistry faculty.

Prerequisites: CHEM 2412 and CHEM 2412L or CHEM 252

CHEM 4232. Chemistry Research Pract III (3)

Research experience for students in Chemistry. Practicum assignments must be approved by the student's major advisor and the Chemistry faculty.

Prerequisites: CHEM 2412 and CHEM 2412L or CHEM 252

CHEM 4301. Inorganic Chemistry (3)

A study of inorganic chemistry. Topics typically include atomic structure, ionic bonding, lattice energy, valence bond theory, molecular orbital theory, coordination chemistry, nomenclature, reaction mechanisms, and an introduction to group theory.

Prerequisites: CHEM 2411 and CHEM 2411L

CHEM 4302. Solid State Chemistry (3)

An advanced topics chemistry course dealing with materials and bonding in the solid state. The relationship between electronic structure and crystal structure is developed. Attention is given to characterization of atomic and molecular arrangements in crystalline and amorphous solids, metals, ceramics, semiconductors, and polymers.

Prerequisites: CHEM 3411 and CHEM 3412

CHEM 4311. Advanced Inorganic Chemistry (3)

A study of the molecular structure and properties of inorganic compounds and complexes such as bonding; the relationship between electronic structure, molecular symmetry, and spectroscopy; and inorganic reaction mechanisms. The broader ideas of catalysis and organometallic chemistry will also be introduced.

Prerequisites: CHEM 3311

CHEM 4401L. Advanced Lab I: Organic Synth. (2)

A laboratory course involving a series of multipart experiments designed to solve realistic applied problems and build upon the chemical principles and experimental techniques introduced in earlier laboratories. This laboratory focuses on the synthesis, purification, and characterization of organic molecules using a variety of advanced techniques.

Prerequisites: (CHEM 2412 and CHEM 2412L and CHEM 4201 (may be taken concurrently))

CHEM 4402L. Advanced Lab II: Biochemistry (2)

A laboratory course involving a series of multipart experiments designed to solve realistic applied problems and build upon the chemical principles and experimental techniques introduced in earlier laboratories. This laboratory focuses on the isolation and characterization of biological molecules using a variety of advanced techniques.

Prerequisites: (CHEM 4202 and CHEM 4202L or BIOL 3250L)

CHEM 4403L. Advanced Lab III: Inorganic (2)

A laboratory course involving a series of multipart experiments designed to solve realistic applied problems and build upon the chemical principles and experimental techniques introduced in earlier laboratories. This laboratory focuses on synthesis, purification, and characterization of inorganic molecules using a variety of advanced techniques.

Prerequisites: (CHEM 2411 and CHEM 2411L and CHEM 2412L (may be taken concurrently) and CHEM 4301 (may be taken concurrently))

CHEM 4411. Biophysical Chemistry (3)

The study of thermodynamics, transport phenomena, and spectroscopic methods as they relate to biological systems.

Prerequisites: CHEM 3411 and CHEM 3412 and CHEM 4202

CHEM 4412. Computational Chemistry (3)

An advanced topics chemistry course designed to introduce the field of computational chemistry methods. Quantum mechanical and molecular mechanics methods will be studied. Students will take part in hands-on learning through the use of computational chemistry software.

Prerequisites: CHEM 3411 and CHEM 3412

CHEM 4413. Qual Assurance & Qual Control (3)

QA/QC is a one-semester elective course covering the skills needed to assess how products and materials perform throughout manufacturing, processing and shipping, ways of assessing how products function in the marketplace, strategies for fixing quality issues, and methods of analyzing end-user satisfaction. Major topics include personnel and training, validation of analytical procedures, standard operating procedures (SOPs), good manufacturing practices (GMPs), and report writing.

Prerequisites: CHEM 2412 (may be taken concurrently) and CHEM 2412L (may be taken concurrently) and CHEM 2811 and CHEM 2811L

CHEM 4500. Senior Chemistry Seminar (1)

The fourth of four chemistry seminars. Emphasis will be placed on reading the chemical literature and presentation skills. Attendance at some department and/or University events will be required.

Prerequisites: CHEM 3500

CHEM 4700. Special Topics in Chemistry (1-3)

Selected advanced topics of current interest in chemistry. This course will be offered as fits the needs and interests of the students and faculty.

Prerequisites: CHEM 1212

CHEM 4701. Special Topics in Chemistry II (1-4)

Selected advanced topics of current interest in chemistry. This course will be offered as fits the needs and interests of the students and faculty.

Prerequisites: CHEM 4700 (may be taken concurrently)

CHEM 4702. Special Topics Chemistry III (1-4)

Selected advanced topics of current interest in chemistry. This course will be offered as fits the needs of the students and faculty.

Prerequisites: CHEM 4700 (may be taken concurrently) and CHEM 4701 (may be taken concurrently)

CHEM 4811. Instrumental Analysis (3)

Theoretical principles and uses of modern instrumental methods covering: spectroscopy, electroanalysis, and chromatographic separations.

Prerequisites: CHEM 2412 and CHEM 2412L and CHEM 3811

CHEM 4811L. Instrumental Analysis Lab (1)

The use of modern instrumental techniques for qualitative and quantitative determination of substances.

Prerequisites: CHEM 4811 (may be taken concurrently) and CHEM 2811 and CHEM 2811L

CHEM 4812. Spectroscopy (3)

Applied spectroscopy theory and application of 1D- NMR, 2D-NMR, mass spectrometry, and infrared spectroscopy in the determination of organic structures.

Prerequisites: CHEM 2412 and CHEM 2412L

CHEM 4900. Biocomputing (3)

The human genome project and the web revolution present new challenges and opportunities for biologists and biochemists. The only way to deal effectively with the information explosion in biology and related disciplines is to use computers. Students in this course will use computer applications to search databases, perform calculations, and develop models concerning biological problems. This course is considered a capstone course for the biology degree program. A student may not receive credit for both BIOL 4900 and CHEM 4900.

Prerequisites: BIOL 3250 and BIOL 3250L and BIOL 4201 and (MATH 1231 or MATH 1401)

CHEM 4999A. Senior Evaluation (0)

The purpose of this class is to assess the chemistry degree program. Students will complete a series of surveys to assess the quality of the chemistry degree program. Students will also take a standardized subject test in chemistry to assess their content knowledge. This class should be taken in the last semester prior to graduation. Students enrolled in this class will have completed all chemistry coursework at the 2000-level and above at Clayton State University.

Prerequisites: (CHEM 3411 and CHEM 3412 and CHEM 4202 and CHEM 4811 (may be taken concurrently))

CHEM 4999B. Senior Evaluation (0)

The purpose of this class is to assess the chemistry degree program. Students will complete a series of surveys to assess the quality of the chemistry degree program. Students will also take a standardized subject test in chemistry to assess their content knowledge. This class should be taken in the last semester prior to graduation. Students should enroll in this class if they have completed any chemistry coursework at the 2000-level and above at an institution other than Clayton State University.

Prerequisites: (CHEM 3411 and CHEM 3412 and CHEM 4202 and CHEM 4811 (may be taken concurrently))