CHEM - Chemistry

Courses

CHEM 100 Horizons in Chemistry
Credit 1. 1 Lecture Hour.
An introduction to chemistry and its relationship to and influence on society; emphasis on chemical demonstrations and the practical application of chemical phenomena. For chemistry majors.
Prerequisite: Major in chemistry or approval of instructor.

CHEM 101 Fundamentals of Chemistry I
Credits 3. 3 Lecture Hours.
(CHEM 1311, 1411*) Fundamentals of Chemistry I. Introduction to modern theories of atomic structure and chemical bonding; chemical reactions; stoichiometry; states of matter; solutions; equilibrium; acids and bases; coordination chemistry.
Prerequisites: Concurrent enrollment in CHEM 111.

CHEM 102 Fundamentals of Chemistry II
Credits 3. 3 Lecture Hours.
(CHEM 1312, 1412*) Fundamentals of Chemistry II. Theory and applications of oxidation-reductions systems; thermodynamics and kinetics; complex equilibria and solubility product; nuclear chemistry; descriptive inorganic and organic chemistry.
Prerequisites: Concurrent enrollment in CHEM 112.

CHEM 103 Structure and Bonding
Credits 3. 3 Lecture Hours.
Rigorous treatment of chemical principles and their application.
Prerequisite: For entering students with satisfactory scores on math and chemistry placement examinations; concurrent enrollment in CHEM 113.

CHEM 104 Chemistry of the Elements
Credits 3. 3 Lecture Hours.
Continuation of CHEM 103.
Prerequisite: CHEM 103 and CHEM 113; concurrent enrollment in CHEM 114.

CHEM 106 Molecular Science for Citizens
Credits 3. 3 Lecture Hours.
(CHEM 1305, 1405*) Molecular Science for Citizens. Molecules that control daily life explored via a conceptual approach to molecular science; properties, synthesis, transformations and utility of important molecules and fuels, fibers, metals, pharmaceuticals, foods, biomolecules and structural materials; pollution, consumerism, energy production, disease, biotechnology and risk-benefit analysis considered.
Prerequisite: Concurrent enrollment in CHEM 116.

CHEM 107 General Chemistry for Engineering Students
Credits 3. 3 Lecture Hours.
Introduction to important concepts and principles of chemistry; emphasis on areas considered most relevant in an engineering context; practical applications of chemical principles in engineering and technology. Students completing CHEM 107 and changing majors to curricula requiring CHEM 101 and CHEM 102 may substitute CHEM 107 for CHEM 101. Students may not receive credit for both CHEM 107 and CHEM 101.
Prerequisite: Concurrent enrollment in CHEM 117.

CHEM 111 Fundamentals of Chemistry Laboratory I
Credit 1. 3 Lab Hours.
(CHEM 1111, 1411*) Fundamentals of Chemistry Laboratory I. Introduction to methods and techniques of chemical experimentation; qualitative and semiquantitative procedures applied to investigative situations.
Prerequisite: CHEM 101 or registration therein.

CHEM 112 Fundamentals of Chemistry Laboratory II
Credit 1. 3 Lab Hours.
(CHEM 1112, 1412*) Fundamentals of Chemistry Laboratory II. Introduction to analytical and synthetic methods and to quantitative techniques to both inorganic and organic compounds with emphasis on an investigative approach.
Prerequisites: CHEM 101 and 111 or equivalent; CHEM 102 or registration therein.

CHEM 113 Physical and Chemical Principles
Credit 1. 3 Lab Hours.
Elementary experiments in physical chemistry and quantitative analysis.
Prerequisite: CHEM 103 or registration therein.

CHEM 114 Qualitative Analysis
Credit 1. 3 Lab Hours.
Qualitative analysis, elementary inorganic syntheses and quantitative aspects of chemical equilibrium.
Prerequisites: CHEM 104 or registration therein; CHEM 113.

CHEM 116 Molecular Science for Citizens Laboratory
Credit 1. 3 Lab Hours.
(CHEM 1105, 1405*) Molecular Science for Citizens Laboratory. The importance of molecular science to daily life illustrated by using experiments, demonstration and videos; designed to accompany CHEM 106.
Prerequisite: CHEM 106 or registration therein.

CHEM 117 General Chemistry for Engineering Students Laboratory
Credit 1. 3 Lab Hours.
Introduction to important concepts and principles of chemistry in the laboratory; emphasis on areas considered most relevant in an engineering context; practical applications of chemical principles in engineering and technology. Students completing CHEM 117 and changing majors to curricula requiring CHEM 111 and CHEM 112 may substitute CHEM 117 for CHEM 111. Students may not receive credit for both CHEM 117 and CHEM 111.
Prerequisites: CHEM 107 or registration therein.

CHEM 222 Elements of Organic and Biological Chemistry
Credit 3. 3 Lecture Hours.
Organic chemistry and its applications to biological and agricultural chemistry, including chemistry of functional groups, acid-base and redox chemistry, stereochemistry and chemistry of important biological compounds. Not to be used as the basis for further study in organic chemistry or biochemistry.
Prerequisite: CHEM 101 or CHEM 103.

CHEM 227 Organic Chemistry I
Credit 3. 3 Lecture Hours.
Introduction to chemistry of compounds of carbon; general principles and their application to various industrial and biological processes.
Prerequisite: CHEM 102 or CHEM 104. Concurrent registration in CHEM 237 is suggested.
CHEM 228 Organic Chemistry II
Credits 3. 3 Lecture Hours.
(CHEM 2325, 2425*) Organic Chemistry II. Continuation of CHEM 227.
Prerequisite: CHEM 227. Concurrent registration in CHEM 238 is suggested.

CHEM 231 Techniques of Organic Chemistry
Credits 2. 1 Lecture Hour. 3 Lab Hours.
Techniques of organic chemistry; preparation, properties of typical organic compounds; separation, purification, analysis, and characterization of organic compounds.
Prerequisites: CHEM 112 or CHEM 114; CHEM 227 or registration therein.

CHEM 234 Organic Synthesis and Analysis IV
Credits 3. 1 Lecture Hour. 6 Lab Hours.
The synthesis of significant types of organic compounds and study of their properties; laboratory separations of mixtures of organic substances, identification of compounds by functional group tests and preparation of derivatives; instrumental methods of separation, identification and analysis.
Prerequisites: CHEM 228 or registration therein; CHEM 231 or CHEM 237.

CHEM 237 Organic Chemistry Laboratory
Credit 1. 3 Lab Hours.
(CHEM 2123, 2223, 2423*) Organic Chemistry Laboratory. Operations and techniques of elementary organic chemistry laboratory; preparation, reactions and properties of representative organic compounds.
Prerequisites: CHEM 102, CHEM 104 or CHEM 112, CHEM 114; CHEM 227 or registration therein.

CHEM 238 Organic Chemistry Laboratory
Credit 1. 3 Lab Hours.
(CHEM 2125, 2225, 2425*) Organic Chemistry Laboratory. Continuation of CHEM 237.
Prerequisites: CHEM 228 or registration therein; CHEM 237 or CHEM 231.

CHEM 242 Elementary Organic Chemistry Laboratory
Credit 1. 3 Lab Hours.
Operations and techniques of elementary organic chemistry laboratory with emphasis on experiments for students of agriculture.
Prerequisite: CHEM 222 or registration therein.

CHEM 285 Directed Studies
Credits 1 to 4. 1 to 4 Other Hours.
Introduction to research, library and laboratory work designed for the freshman or sophomore students.
Prerequisite: Approval of department head.

CHEM 289 Special Topics in...
Credits 1 to 4. 1 to 4 Lecture Hours.
Selected topics in an identified area of chemistry. May be repeated for credit.
Prerequisite: Approval of instructor.

CHEM 291 Research
Credits 0 to 4. 0 to 4 Other Hours.
Research conducted under the direction of faculty member in chemistry. May be repeated 2 times for credit.
Prerequisites: Freshman or sophomore classification and approval of instructor.

CHEM 315 Quantitative Analysis
Credits 3. 3 Lecture Hours.
Introduction to quantitative methods of analysis; solution chemistry; chemical equilibrium of analytically useful reactions and of processes important in advanced analytical methods including electrochemistry, separations and kinetic methods.
Prerequisite: CHEM 102 or CHEM 104.

CHEM 316 Quantitative Analysis
Credits 2. 2 Lecture Hours.
Methods of chemical analysis; chemical equilibrium; basic chemical instrumentation.
Prerequisite: CHEM 102 or CHEM 104.

CHEM 317 Quantitative Analysis
Credits 2. 2 Lecture Hours.
Introduction to the fundamental principles and applications of modern instrumental techniques of quantitative analysis, with emphasis on spectroscopic and chromatographic methods.
Prerequisite: CHEM 316.

CHEM 318 Quantitative Analysis Laboratory
Credit 1. 3 Lab Hours.
Laboratory work consists of selected experiments in quantitative analysis designed to typify operations of general analytical lab, including chemical analyses by volumetric and gravimetric methods; introduction to chemical measurements by spectroscopic and separations techniques and associated instrumentation.
Prerequisites: CHEM 112 or CHEM 114; CHEM 315 or CHEM 316 or registration therein.

CHEM 320 Instrumental Analysis Laboratory
Credits 2. 6 Lab Hours.
Experimental studies using modern spectroscopic, chromatographic and electroanalytical methods.
Prerequisites: CHEM 317 or registration therein; CHEM 318.

CHEM 322 Physical Chemistry for Engineers
Credits 3. 3 Lecture Hours.
Quantum theory, spectroscopy, statistical mechanics, kinetic theory, reaction kinetics, electrochemistry and macromolecules.
Prerequisites: CHEM 102 or CHEM 104; CHEM 205 and CHEM 354; MATH 152 or equivalent.

CHEM 325 Physical Chemistry Laboratory I
Credit 1. 3 Lab Hours.
Quantitative experiments involving physical chemistry principles in areas such as thermodynamics, electrochemistry, molecular structure and equilibria using modern instrumentation.
Prerequisite: CHEM 327 or registration therein.

CHEM 326 Physical Chemistry Laboratory II
Credit 1. 3 Lab Hours.
Quantitative experiments involving physical chemistry principles in such areas as kinetics, properties of gases, phase equilibria and macromolecules using modern instrumentation.
Prerequisite: CHEM 328 or registration therein.
CHEM 327 Physical Chemistry I  
Credits 3. 3 Lecture Hours.  
Introduction to quantum mechanics, exactly solvable model problems;  
many electron systems and approximate methods; chemical bonding and  
the electronic structure of molecules; rotational, vibrational, and electronic  
spectroscopy; molecular symmetry.  
Prerequisite: MATH 152 or MATH 172; MATH 221, MATH 251 or MATH  
253 encouraged; PHYS 208; PHYS 218. Replaces CHEM 324 in previous  
catalogs.

CHEM 328 Physical Chemistry II  
Credits 3. 3 Lecture Hours.  
A rigorous treatment of first, second, and third laws of thermodynamics;  
applications to gases (both ideal and real), liquids, solutions and phase  
equilibria; statistical thermodynamics; kinetic theory of gases; introduction  
to chemical kinetics.  
Prerequisite: CHEM 327. Replaces CHEM 323 in previous catalogs.

CHEM 362 Descriptive Inorganic Chemistry  
Credits 3. 3 Lecture Hours.  
Introduction to inorganic chemistry with a focus in descriptive inorganic  
chemistry, bonding theories in inorganic molecules and in the solid state,  
redox chemistry, descriptive main group and transition metal chemistry;  
ligand field theory, molecular magnetism and electronic spectra in  
transition metal complexes.  
Prerequisites: CHEM 102, CHEM 104 or equivalent.

CHEM 383 Chemistry of Environmental Pollution  
Credits 3. 3 Lecture Hours.  
Chemical pollutants in the air, in water and on land: their generation,  
chemical reactivity, action on environment and disappearance through  
chemical mechanisms; chemistry of existing pollution abatement.  
Prerequisites: CHEM 102 or CHEM 104; junior or senior classification.

CHEM 415 Analytical Chemistry  
Credits 3. 3 Lecture Hours.  
Theory and practical aspects of modern instrumental methods of  
quantitative analysis; instrumental approaches to selectivity and sensitivity;  
examples of major, minor and trace component analysis.  
Prerequisite: CHEM 315.

CHEM 433 Advanced Inorganic Chemistry Laboratory  
Credits 2. 6 Lab Hours.  
Preparation, characterization and properties of bioinorganic,  
organometallic and macromolecular inorganic compounds; special  
techniques (glove box manipulations and double-manifold Schlenk lines)  
for handling air-sensitive materials.  
Prerequisite: CHEM 362 or registration therein.

CHEM 434 Analytical Instrumentation Laboratory  
Credits 2. 6 Lab Hours.  
Practical application of modern instrumental methods of quantitative  
analysis; atomic and molecular techniques to conduct chemical  
characterizations and analyses.  
Prerequisite: CHEM 415 or registration therein.

CHEM 446 Organic Chemistry III  
Credits 3. 3 Lecture Hours.  
Principles and applications for students in chemistry, chemical engineering  
and biological and physical sciences; bonding, chemical reactivity,  
synthetic chemistry and synthesis.  
Prerequisites: CHEM 228 and CHEM 328 or concurrent enrollment in  
CHEM 328.

CHEM 447 Qual Organic Anal  
Credits 3. 1 Lecture Hour. 6 Lab Hours.  

CHEM 456 Chemical Biology  
Credits 3. 3 Lecture Hours.  
Application of chemical principles to biological phenomena; capstone  
course for advanced students, integrating organic or inorganic chemistry  
with biology.  
Prerequisites: CHEM 228 or equivalent; junior or senior classification.

CHEM 462 Inorganic Chemistry  
Credits 3. 3 Lecture Hours.  
Periodic relationships of elements, their compounds, principles of their  
bonding and applications.  
Prerequisites: CHEM 328 and CHEM 362.

CHEM 464 Nuclear Chemistry  
Credits 3. 3 Lecture Hours.  
Properties of the nucleus; radioactivity; decay kinetics; nuclear masses;  
theory of radioactive decay; nuclear reactions; radiochemistry; nuclear  
energy; hands-on demonstrations; applications to non-nuclear problems.  
Prerequisites: CHEM 322 or CHEM 327; CHEM 315 or CHEM 316  
recommended.

CHEM 466 Polymer Chemistry  
Credits 3. 3 Lecture Hours.  
Mechanisms of polymerization reactions of monomers and molecular  
weight distributions of products; principles, limitations and advantages of  
most important methods of molecular weight determination; relationship  
of physical properties to structure and composition: correlations of  
applications with chemical constitution.  
Prerequisites: CHEM 228 and CHEM 315 or equivalents.

CHEM 470 Industrial Chemistry  
Credits 3. 3 Lecture Hours.  
Applications of organic and inorganic chemical reactions in the  
manufacture of commercial products; chemistry of petroleum refining and  
petrochemical processing; industrial polymerization processes; commodity  
and fine chemical production; influence of kinetics and thermodynamics  
on economics of industrial chemical production; pollution abatement  
technology.  
Prerequisites: CHEM 228; junior or senior classification.

CHEM 481 Seminar  
Credits 2. 2 Lecture Hours.  
Preparation of oral and written reports on selected topics from recent  
technical publications.

CHEM 483 Green Chemistry  
Credits 3. 3 Lecture Hours.  
Environmentally benign chemistry; the design of chemical products and  
processes that reduce or eliminate the use and generation of hazardous  
substances; twelve principles of Green Chemistry; atom economy; use of  
renewable resources; catalysis for Green Chemistry; alternative solvents  
and reaction media; energy and the environment.  
Prerequisites: CHEM 228; CHEM 362 recommended; junior or senior  
classification.

CHEM 485 Directed Studies  
Credits 1 to 16. 1 to 16 Other Hours.  
Introduction to research, library and laboratory work.  
Prerequisites: Senior classification and approval of chemistry advisor.

CHEM 489 Special Topics in...  
Credits 1 to 4. 1 to 4 Lecture Hours.  
Selected topics in an identified area of chemistry. May be repeated for  
credit.
CHEM 491 Research

Credits 0 to 10. 0 to 10 Other Hours.

Active research of basic nature under the supervision of Department of Chemistry faculty member. Registration in multiple sections of this course is possible within a given semester provided that the per semester credit hour limit is not exceeded.

**Prerequisites:** Chemistry major; junior classification or approval of chemistry advisor.