

# Chemistry (CHEM)

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## Courses

### **CHEM 1100 Concepts of Chemistry: 4 semester hours.**

How scientific thought has produced chemical models of the structure of the material world, and the ethical and social consequences of its applications. Recommended for students not majoring in the natural sciences. Partially satisfies Objective 5 of the General Education Requirements. F, S

### **CHEM 1101 Introduction to Chemistry: 3 semester hours.**

Atomic structure, chemical calculations, solutions, acid-base reactions, and equilibrium. May not be used as a prerequisite to other courses in chemistry except CHEM 1102. PREREQ: MATH 1108 or equivalent. Partially satisfies Objective 5 of the General Education Requirements. F, S

### **CHEM 1102 Essentials of Organic and Biochemistry: 3 semester hours.**

Descriptive organic and biochemistry with emphasis on organic compounds of biological importance. May not be used as a prerequisite to other courses in chemistry. PREREQ: CHEM 1101 or CHEM 1111 and CHEM 1111L. COREQ: CHEM 1103. Partially satisfies Objective 5 of the General Education Requirements. F, S

### **CHEM 1103 Essentials of Organic and Biochemistry Laboratory: 1 semester hour.**

Laboratory course introducing fundamental measurement techniques, methods and materials used in general, organic and biochemistry. PREREQ: CHEM 1101 or CHEM 1111 and CHEM 1111L. COREQ: CHEM 1102. Partially satisfies Objective 5 of the General Education Requirements. F, S

### **CHEM 1111 General Chemistry I: 4 semester hours.**

Introductory course for students in scientific and technical fields; structure and reactivity of elements and compounds, stoichiometry, states of matter, solutions, and chemical periodicity. Students who have not taken a high school chemistry course are strongly encouraged to take CHEM 1101 before taking CHEM 1111. May be repeated upon completion of CHEM 1111L. PREREQ or COREQ: CHEM 1111L. PREREQ: MATH 1143 or MATH 1147 or equivalent. Partially satisfies Objective 5 of the General Education Requirements. F, S

### **CHEM 1111L General Chemistry I Lab: 1 semester hour.**

Laboratory course to accompany General Chemistry I. PRE-or-COREQ: CHEM 1111. Partially satisfies Objective 5 of the General Education Requirements. F, S

### **CHEM 1112 General Chemistry II: 3 semester hours.**

Introduction to kinetics, equilibrium, electrochemistry, and nuclear chemistry. May be repeated upon completion of CHEM 1112L. PREREQ: CHEM 1111 and CHEM 1111L or equivalent and MATH 1143 or MATH 1147 or equivalent. PREREQ or COREQ: CHEM 1112L Partially satisfies Objective 5 of the General Education Requirements. F, S

### **CHEM 1112L General Chemistry II Lab: 1 semester hour.**

Laboratory course to accompany General Chemistry II. PRE-or-COREQ: CHEM 1112. Partially satisfies Objective 5 of the General Education Requirements. F, S.

### **CHEM 1199 Experimental Course: 1-6 semester hours.**

The content of this course is not described in the catalog. Title and number of credits are announced in the Class Schedule. Experimental courses may be offered no more than three times with the same title and content. May be repeated.

### **CHEM 2211 Inorganic Chemistry I: 3 semester hours.**

An exploration of bonding and reactivity across the periodic table, emphasizing the correlation of electronic structure to atomic and chemical properties, the molecular orbital theory of bonding, thermodynamic analysis of chemical change, 3-dimensional geometry of molecular and solid-state systems, the reactivity of transition metals (acid/base, solubility, and redox phenomena), and coordination chemistry. PREREQ: CHEM 3301 or permission of instructor. F

### **CHEM 2213 Inorganic Chemistry I Laboratory: 1 semester hour.**

Preparation, isolation, and characterization of molecular and solid-state inorganic compounds. Specific techniques include air-free methods, gas-handling, measurement of electrical and magnetic properties, and UV-Vis, IR, and NMR spectroscopies. PREREQ: CHEM 3303 or permission of instructor. F

### **CHEM 2232 Quantitative Analysis: 2 semester hours.**

Theoretical foundations of quantitative analysis including an introduction to statistical analysis of chemical data generated from gravimetric, volumetric and colorimetric methods. PREREQ: CHEM 1112, CHEM 1112L and MATH 1160 or MATH 1170. COREQ: CHEM 2234 or permission of instructor. S

### **CHEM 2234 Quantitative Analysis Laboratory: 2 semester hours.**

Laboratory experiments in gravimetric, volumetric, and colorimetric analysis. PREREQ: CHEM 1112 and CHEM 1112L. COREQ: CHEM 2232 or permission of instructor. S

### **CHEM 2299 Experimental Course: 1-6 semester hours.**

The content of this course is not described in the catalog. Title and number of credits are announced in the Class Schedule. Experimental courses may be offered no more than three times with the same title and content. May be repeated.

### **CHEM 3301 Organic Chemistry I: 3 semester hours.**

The fundamentals of organic chemistry are examined through nomenclature, structure, physical and chemical properties, reaction mechanisms, spectroscopy and principal synthetic methods. PREREQ: CHEM 1112 and CHEM 1112L or permission of instructor. PREREQ or COREQ: CHEM 3303. F

### **CHEM 3302 Organic Chemistry II: 3 semester hours.**

A continuation of CHEM 3301. The further study of the preparation, reactions, properties, reaction mechanisms and spectroscopy of organic compounds. PREREQ: CHEM 3301 or permission of instructor. PREREQ or COREQ: CHEM 3304. S

### **CHEM 3303 Organic Chemistry Laboratory I: 1 semester hour.**

Introductory laboratory work in organic chemistry. Study and development of elementary techniques and their application to the preparation, isolation and characterization of simple organic compounds. COREQ: CHEM 3301 or permission of instructor. F

### **CHEM 3304 Organic Chemistry Laboratory II: 1 semester hour.**

Further experience in the fundamental operations of organic chemistry laboratory work including the preparation and analysis of typical compounds. PREREQ: CHEM 3303. COREQ: CHEM 3302 or permission of instructor. S

### **CHEM 3311 Introduction to Research: 1-2 semester hours.**

Directed library and laboratory research. Courses may be repeated for up to 6 credits. F, S

### **CHEM 3312 Introduction to Research: 1-2 semester hours.**

Directed library and laboratory research. Courses may be repeated for up to 6 credits. F, S

**CHEM 3331 Instrumental Analysis: 2 semester hours.**

Advanced quantitative analysis dealing chiefly with quantitative applications of instrumental methods. PREREQ: CHEM 2232 and CHEM 2234 or permission of instructor. F

**CHEM 3334 Instrumental Analysis Laboratory: 2 semester hours.**

Laboratory course giving experience in fundamental operations of modern instrumental methods of analysis. PREREQ: CHEM 2232, CHEM 2234 and CHEM 3331 or permission of instructor. S

**CHEM 3335 Experimental Biochemistry: 1 semester hour.**

Laboratory course including both qualitative and quantitative experiments.

**CHEM 3341 Topics in Physical Chemistry I: 3 semester hours.**

Selected topics in physical chemistry with application to biological systems are covered. Potential topics include: Molecular structure, thermodynamics of gases and solutions, reaction rates and mechanisms, basic quantum mechanics, and spectroscopic principles are covered in this first course of a two semester sequence. PREREQ: CHEM 1112 and CHEM 1112L, MATH 1160 or MATH 1170, PHYS 1112 or PHYS 2212, or permission of instructor. F

**CHEM 3342 Topics in Physical Chemistry II: 3 semester hours.**

Selected topics not covered in CHEM 3341 in physical chemistry with application to biological systems are covered. Potential topics include: Molecular structure, thermodynamics of gases and solutions, reaction rates and mechanisms, basic quantum mechanics, and spectroscopic principles are covered in this second course of a two semester sequence. PREREQ: CHEM 3341 or permission of instructor. S

**CHEM 3351 Physical Chemistry I: 3 semester hours.**

Selected fundamental principles of physical chemistry are covered. Potential topics include: Thermodynamics, reaction kinetics, molecular structure, quantum theory, spectroscopy, and solution chemistry in this first course of a two-semester sequence. PREREQ: CHEM 1112, CHEM 1112L, MATH 1175, and PHYS 2212. F

**CHEM 3352 Physical Chemistry II: 3 semester hours.**

Selected fundamental principles of physical chemistry not covered in CHEM 3351 are covered. Potential topics include: Thermodynamics, reaction kinetics, molecular structure, quantum theory, spectroscopy, and solution chemistry in the second course of a two-semester sequence. PREREQ: CHEM 3351. S

**CHEM 3365 Synthetic Methods: 2 semester hours.**

Practical aspects of chemical synthesis: Preparation, purification, and spectral interpretation for organic and inorganic molecules. It is recommended that students take CHEM 3366 concurrently with CHEM 3365. PREREQ: CHEM 2211, CHEM 3302, and CHEM 3304. F

**CHEM 3366 Synthetic Methods Laboratory: 2 semester hours.**

Advanced laboratory methods for preparation of organic and inorganic molecules: synthetic techniques, air-sensitive methods, purification techniques, and characterization methods. PRE-or-COREQ: CHEM 3365. F

**CHEM 3391 Seminar: 1 semester hour.**

A formal introduction to scientific presentations including a short student presentation on selected library or laboratory research. PREREQ: CHEM 3301, CHEM 3303 or permission of instructor. R1

**CHEM 3399 Experimental Course: 1-6 semester hours.**

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**CHEM 4400 Practicum in Physical Science: 2 semester hours.**

Practical problems associated with equipping, setting up and operating laboratories in chemistry. PREREQ: Permission of department chair. D

**CHEM 4407 Inorganic Chemistry II: 2 semester hours.**

Structure and reactivity of inorganic compounds including coordination compounds; acid-base chemistry and nonaqueous solvent systems; organometallic chemistry and other special topics of current interest. PREREQ: CHEM 2211 and PRE-OR-COREQ: CHEM 3352 or CHEM 3342, or permission of instructor. S

**CHEM 4433 Environmental Chemistry: 2 semester hours.**

Application of chemical principles and calculations to investigate environmental issues. Natural systems, environmental degradation and protection, and the methodology of chemical detection and monitoring. PREREQ: CHEM 2232 and CHEM 2234 or permission of instructor. F

**CHEM 4437 Environmental Chemistry Laboratory: 1 semester hour.**

Utilizes both structured and self-designed field and classroom experiments to emphasize principles of environmental chemistry. COREQ: CHEM 4433 or permission of instructor. F

**CHEM 4438 Experimental Biochemistry: 1 semester hour.**

Laboratory course including both qualitative and quantitative experiments. Equivalent to BIOL 4437. PREREQ or COREQ: BIOL 4432 or BIOL/CHEM 4445. F, S

**CHEM 4445 Biochemistry I: 3 semester hours.**

Introduction to basic aspects of biochemical systems, including fundamental chemical and physical properties of biomolecules. Enzymology, including allosterism, metabolic regulation, bioenergetics, and carbohydrate metabolism. Equivalent to BIOL 4445. PREREQ: BIOL 1101 and CHEM 3302. F

**CHEM 4447 Biochemistry II: 3 semester hours.**

Functional continuation of CHEM 4445. Lipid, amino acid, and nucleotide metabolism. Emphasis is on regulation of metabolism, metabolic dysfunctions, biochemical mechanisms of hormone action, biochemical genetics, protein synthesis, and metabolic consequences of genetic defects. Equivalent to BIOL 4447. PREREQ: BIOL/CHEM 4445. S

**CHEM 4448 Advanced Experimental Biochemistry: 2 semester hours.**

Advanced laboratory projects designed to emphasize techniques of qualitative and quantitative biochemical analysis. Equivalent to BIOL 4448. PREREQ: BIOL 4437/CHEM 4438. COREQ: BIOL 4447. S

**CHEM 4451 Physical Chemistry Laboratory I: 1 semester hour.**

Experiments in quantum chemistry and spectroscopy, thermodynamics, and chemical kinetics. COREQ: CHEM 3351. F

**CHEM 4452 Physical Chemistry Laboratory II: 1 semester hour.**

Continuation of CHEM 4451. Experiments in quantum chemistry and spectroscopy, thermodynamics, and chemical kinetics. COREQ: CHEM 3352. S

**CHEM 4470 Biorganic Chemistry: 3 semester hours.**

Overview of basic principles of organic mechanisms, an overview of biochemistry principles, fundamentals of proteins and protein synthesis, enzymes and enzyme reaction mechanisms including group transfer, hydrolysis, animations, phosphorylation, reductions and oxidation, mono- and di-oxygenation, substitutions, carboxylations, and decarboxylations, isomerizations, and elimination and addition reactions. PREREQ: CHEM 3302 and CHEM 4445 or BIOL 4445. OS

**CHEM 4481 Independent Problems in Chemistry: 1-4 semester hours.**

Directed library and laboratory research. Courses 4481 and 4482 may be repeated for up to 6 credits each. PREREQ: Permission of instructor. F

**CHEM 4482 Independent Problems in Chemistry: 1-4 semester hours.**

Directed library and laboratory research. Courses 4481 and 4482 may be repeated for up to 6 credits each. PREREQ: Permission of instructor. S

***CHEM 4485 Senior Research: 1-4 semester hours.***

The student will be introduced to research techniques, development of manipulative skills, instrumental methods, laboratory notebook keeping, data interpretation and library research. PREREQ: Acceptance into the B.S./M.S. program. May be repeated for up to 8 credits. D

***CHEM 4491 Seminar: 1 semester hour.***

A formal introduction to the chemical literature including electronic methods of literature searching. A detailed treatment of methods for presenting scientific seminars including a full-length student presentation on selected library or laboratory research. COREQ: CHEM 4481, CHEM 4482, or CHEM 4485, or permission of instructor. F, S

***CHEM 4498 Seminar in Biochemistry: 1 semester hour.***

Review of current research and literature in the field of biochemistry. Equivalent to BIOL 4498. PREREQ: Senior standing or permission of department. F, S

***CHEM 4499 Experimental Course: 1-6 semester hours.***

The content of this course is not described in the catalog. Title and number of credits are announced in the Class Schedule. Experimental courses may be offered no more than three times with the same title and content. May be repeated.