

# CHEMISTRY (CHE)

## CHE 101. Fundamentals of General, Organic and Biological Chemistry I. 3 Credits.

Students study the general fundamentals of chemistry: which includes atomic theory and radioactivity, bonding (including ions and molecules), stoichiometry, states of matter, and solutions including solubility, acids, bases and buffers. Students who have already received credit for CHE 110 with a grade of C- or higher are not eligible to take CHE 101.

**Prerequisites:** Take MA 107; Minimum grade C- or Math placement score of 3.

**Corequisites:** Take CHE 101L.

**Offered:** Every year, Fall

**UC:** Natural Sciences

## CHE 101L. Fundamentals of General, Organic and Biological Chemistry I Lab. 1 Credit.

Lab must be taken with CHE 101. (2.5 lab hrs.)

**Corequisites:** Take CHE 101.

**Offered:** Every year, Fall

**UC:** Natural Sciences

## CHE 102. Fundamentals of General, Organic and Biological Chemistry II. 3 Credits.

Students study the fundamental chemistry of carbon and the structural and functional relationships of hydrocarbons, alcohols, aldehydes, ketones, esters, carboxylic acids, amines, carbohydrates, lipids and proteins and their application to biochemistry.

**Prerequisites:** Take CHE 101, CHE 101L; Minimum grade C-.

**Corequisites:** Take CHE 102L.

**Offered:** Every year, Spring

**UC:** Natural Sciences

## CHE 102L. Fundamentals of General, Organic and Biological Chemistry II Lab. 1 Credit.

Lab must be taken with CHE 102. (2.5 lab hrs.)

**Prerequisites:** Take CHE 101, CHE 101L; Minimum grade C-.

**Corequisites:** Take CHE 102.

**Offered:** Every year, Spring

**UC:** Natural Sciences

## CHE 106. Chemical Principles with Biological Applications. 3 Credits.

Students learn about atomic theory (including radioactivity), bonding (including ions and molecules) and intermolecular forces, states of matter, solutions (including solubility, acids and bases, buffers, electrolytes and nonelectrolytes), carbon compounds and functional groups. Students apply these fundamental chemical principles to a variety of health-related case studies. (Enrollment restricted to nursing majors)

**Prerequisites:** Take MA 107; Minimum grade C-; or Math placement score of 3.

**Corequisites:** Take CHE 106L.

**Offered:** Every year, Fall and Spring

## CHE 106L. Chemical Principles with Biological Applications Lab. 1 Credit.

Lab to accompany CHE 106. (3 lab hrs.)

**Corequisites:** Take CHE 106.

**Offered:** Every year, Fall and Spring

## CHE 110. General Chemistry I. 3 Credits.

Students study the atomic theory of matter, nomenclature, chemical formulas and reaction equations, stoichiometry, the gas laws and the kinetic molecular theory, thermochemistry, atomic structure, periodicity of the elements, chemical bonding and molecular structure. (Note: this course is designed for science majors.)

**Prerequisites:** Take MA 107; Minimum grade C- or Math placement score of 3.

**Corequisites:** Take CHE 110L.

**Offered:** Every year, All

**UC:** Natural Sciences

## CHE 110L. General Chemistry I Lab. 1 Credit.

Lab must be taken with CHE 110. (3 lab hrs.)

**Corequisites:** Take CHE 110.

**Offered:** Every year, All

**UC:** Natural Sciences

## CHE 111. General Chemistry II. 3 Credits.

Students study intermolecular forces, properties of solutions, kinetics, chemical equilibrium, pH, acid-base solution chemistry, thermodynamics and electrochemistry. Problem-solving is emphasized.

**Prerequisites:** Take CHE 110, CHE 110L; Minimum grade C-.

**Corequisites:** Take CHE 111L.

**Offered:** Every year, Spring and Summer

**UC:** Natural Sciences

## CHE 111L. General Chemistry II Lab. 1 Credit.

Lab must be taken with CHE 111. (3 lab hrs.)

**Prerequisites:** Take CHE 110, CHE 110L; Minimum grade C-.

**Corequisites:** Take CHE 111.

**Offered:** Every year, Spring and Summer

**UC:** Natural Sciences

## CHE 202. Chemistry of Macro- and Micronutrients. 4 Credits.

Students investigate the fundamental chemistry of macro- and micronutrients through lectures, projects on current research in the chemistry of food, and integrated online chemistry activities. Emphasis is on the study of the chemistry of the following food components: carbohydrates, fats, proteins, vitamins, minerals and water. The different nutrient needs of non-human animal species are also examined. Enrollment in this course is restricted to students in the online degree completion programs. Students cannot receive credit for CHE 202 AND either SCI 161 or SCI 105. This course is offered online only.

**Prerequisites:** None

**Offered:** Every other year, Summer

## CHE 210. Organic Chemistry I. 3 Credits.

Students study the principles that govern the properties, reactions, and methods of preparation of organic compounds correlated with reaction mechanisms, stereochemistry, conformational analysis, resonance, and transition state theory, as well as the nomenclature of organic compounds. Specific functional groups studied include alkanes, alkyl halides, alkenes and alkynes.

**Prerequisites:** Take CHE 111, CHE 111L; Minimum grade C-.

**Corequisites:** Take CHE 210L.

**Offered:** Every year, Fall and Summer

## CHE 210L. Organic Chemistry I Lab. 1 Credit.

Lab must be taken with CHE 210. (3 lab hrs.)

**Corequisites:** Take CHE 210.

**Offered:** Every year, Fall and Summer

<b>CHE 211. Organic Chemistry II.</b>	<b>3 Credits.</b>	<b>CHE 305. Instrumental Analysis.</b>	<b>3 Credits.</b>
This course is a continuation of CHE 210. Students study specific groups such as aromatic compounds, alcohols and phenols, aldehydes, ketones, carboxylic acids and their derivatives and amines, and their analysis by infrared and nuclear magnetic resonance spectroscopy.		Students investigate the following instrumental analysis techniques: FTIR, NMR, UV-VIS, spectroscopy, mass spectrometry and separation methods including gas and liquid chromatography and other current techniques. Basic principles of electronics relating to the design and operation of chemical instrumentation are also discussed.	
<b>Prerequisites:</b> Take CHE 210, CHE 210L; Minimum grade C-.		<b>Prerequisites:</b> Take CHE 211, CHE 211L and CHE 215, CHE 215L; Minimum grade C-.	
<b>Corequisites:</b> Take CHE 211L.		<b>Corequisites:</b> Take CHE 305L.	
<b>Offered:</b> Every year, Spring and Summer		<b>Offered:</b> Every year, Spring	
<b>CHE 211L. Organic Chemistry II Lab.</b>	<b>1 Credit.</b>	<b>CHE 305L. Instrumental Analysis Lab.</b>	<b>1 Credit.</b>
Lab must be taken with CHE 211. (3 lab hrs.)		Lab must be taken with CHE 305. (3 lab hrs.)	
<b>Corequisites:</b> Take CHE 211.		<b>Corequisites:</b> Take CHE 305.	
<b>Offered:</b> Every year, Spring and Summer		<b>Offered:</b> Every year, Spring	
<b>CHE 215. Analytical Chemistry.</b>	<b>3 Credits.</b>	<b>CHE 315. Biochemistry I.</b>	<b>3 Credits.</b>
Students study the principles and practice of classical and modern chemical analysis. The following topics are studied: statistical treatment of analytical data, error analysis, experimental design and sample preparation, simple and complex equilibria, gravimetric analysis, potentiometry and spectrophotometry. Intended for chemistry and biochemistry majors and chemistry minors.		Students engage in a comprehensive study of biologically active compounds and their metabolism, biosynthesis and relationship to biological systems, and a detailed study of bioenergetics, enzyme kinetics and buffer systems.	
<b>Prerequisites:</b> Take CHE 111, CHE 111L; Minimum grade C-.		<b>Prerequisites:</b> Take CHE 211, CHE 211L; Minimum grade C-.	
<b>Corequisites:</b> Take CHE 215L.		<b>Offered:</b> Every year, All	
<b>Offered:</b> Every year, Fall and Spring		<b>CHE 315L. Biochemistry I Lab.</b>	<b>1 Credit.</b>
<b>CHE 215L. Analytical Chemistry Lab.</b>	<b>1 Credit.</b>	Students carry out a series of experiments that expose them to the basic principles of biochemical techniques including biomolecule detection, purification and quantitation, enzyme kinetics assays, protein sequence and structure analysis using bioinformatics tools, and carbohydrate analysis. CHE 315 must be taken prior to, or concurrently with CHE 315L. (3 lab hrs.)	
Lab must be taken with CHE 215. (3 lab hrs.)		<b>Corequisites:</b> Take CHE 315.	
<b>Corequisites:</b> Take CHE 215.		<b>Offered:</b> Every year, Fall and Spring	
<b>Offered:</b> Every year, Fall and Spring		<b>CHE 316. Biochemistry II.</b>	<b>3 Credits.</b>
<b>CHE 300. Special Topics.</b>	<b>3 Credits.</b>	Students examine metabolic pathways, motor proteins and neurotransmission with a focus on the structural biology, thermodynamics and regulation of key proteins. Nucleic acids–DNA and RNA–are investigated to understand the chemical principles that govern the flow of genetic information. Key concepts are applied toward an understanding of the molecular basis of disease and the biochemical rationale for the design and therapeutic use of drugs. Students complete experiential projects to explore the application of key concepts towards these topics.	
<b>Prerequisites:</b> Take two 200-level chemistry courses.		<b>Prerequisites:</b> Take CHE 315; Minimum grade C-.	
<b>Offered:</b> As needed		<b>Offered:</b> Every other year, Spring	
<b>CHE 301. Physical Chemistry I.</b>	<b>3 Credits.</b>	<b>CHE 399. Independent Study in Chemistry I.</b>	<b>1-3 Credits.</b>
Students investigate the underlying theories of chemical phenomena. The laws and fundamental equations of equilibrium thermodynamics are applied to the quantitative treatment of chemical equilibria, phase equilibria, electrochemical equilibria and ionic equilibria. The principles of chemical kinetics and reaction mechanisms also are investigated.		Permission of the chairperson is required. May be taken in more than one semester for up to a total of 6 credits.	
<b>Prerequisites:</b> Take CHE 111, CHE 111L; MA 141 or MA 151; and PHY 111, PHY 111L or PHY 122; Minimum grade C-.		<b>Prerequisites:</b> None	
<b>Corequisites:</b> Take CHE 301L.		<b>Offered:</b> All	
<b>Offered:</b> Every year, Fall		<b>CHE 410. Inorganic Chemistry.</b>	<b>3 Credits.</b>
<b>CHE 301L. Physical Chemistry I Lab.</b>	<b>1 Credit.</b>	Students study the electronic structure of atoms, ionic and covalent bonding, acid-base chemistry and non-aqueous solvents, coordination chemistry, and periodicity. Symmetry and chemical applications of group theory are introduced.	
Lab must be taken with CHE 301. (3 lab hrs.)		<b>Prerequisites:</b> Take CHE 111; Minimum grade C-.	
<b>Corequisites:</b> Take CHE 301.		<b>Offered:</b> Every other year, Fall	
<b>Offered:</b> Every year, Fall			
<b>CHE 302. Physical Chemistry II.</b>	<b>3 Credits.</b>		
Students study quantum theory, spectroscopy and statistical thermodynamics. The study of quantum mechanics is used to provide the basis for developing an understanding of atomic and molecular spectroscopy and chemical bonding.			
<b>Prerequisites:</b> Take CHE 301; Minimum grade C-.			
<b>Corequisites:</b> Take CHE 302L.			
<b>Offered:</b> Every year, Spring			
<b>CHE 302L. Physical Chemistry II Lab.</b>	<b>1 Credit.</b>		
Lab must be taken with CHE 302. (3 lab hrs.)			
<b>Corequisites:</b> Take CHE 302.			
<b>Offered:</b> Every year, Spring			

**CHE 420. Chemistry Integrative Capstone. 3 Credits.**

Topics in chemistry including history, ethics, environmental issues and current developments are explored from a scientific perspective. Through oral and written work, students demonstrate connections between their general education, co-curricular activities, major coursework and experiential learning project(s) in chemistry.

**Prerequisites:** Senior status as a chemistry/biochemistry major or approval of chairperson.

**Offered:** Every year, Spring

**CHE 475. Chemistry Seminar I. 1 Credit.**

Students attend research group meetings and outside seminars. Students prepare and present a literature-based seminar on a topic approved by their research mentor. (Enrollment restricted to senior chemistry and biochemistry majors.)

**Corequisites:** Take CHE 490.

**Offered:** Every year, Fall

**CHE 476. Chemistry Seminar II. 1 Credit.**

Students attend research group meetings and outside seminars. Students prepare and present a seminar and a poster presentation on their research project. (Enrollment restricted to senior chemistry and biochemistry majors.)

**Prerequisites:** Take CHE 475 and CHE 490.

**Corequisites:** Take CHE 491.

**Offered:** Every year, Spring

**CHE 490. Chemistry Research I. 3 Credits.**

Students work closely with a faculty mentor on a chemistry research project. A minimum of 100 lab hours or equivalent is required. (Enrollment restricted to senior chemistry and biochemistry majors.)

**Corequisites:** Take CHE 475.

**Offered:** Every year, Fall

**CHE 491. Chemistry Research II. 3 Credits.**

Students continue their work on a chemistry research project, which they began in CHE 490. A minimum of 100 lab hours or equivalent is required. (Enrollment restricted to senior chemistry and biochemistry majors.)

**Prerequisites:** Take CHE 475 and CHE 490.

**Corequisites:** Take CHE 476.

**Offered:** Every year, Spring