

# CHEMISTRY (CHEM)

## **CHEM 1211K. Chemical Principles I. 4 Credit Hours.**

Topics to be covered include atomic structure, bonding, properties of matter, thermodynamics and physical equilibria. Laboratory exercises supplement the lecture material. Credit not allowed for both CHEM 1310 and CHEM 1211K.

## **CHEM 1212K. Chemical Principles II. 4 Credit Hours.**

Topics to be covered include chemical equilibria, acids and bases, aqueous equilibria, electrochemistry, kinetics, main group and transition elements. Laboratory exercises supplement the lecture material. Credit not allowed for CHEM 1311/1312 and CHEM 1212K.

## **CHEM 12X1. Transfer General Chem. 4 Credit Hours.**

## **CHEM 1310. Principles of General Chemistry for Engineers. 4 Credit Hours.**

A first course in chemistry, surveying its fundamental laws and theories, for some engineering majors. It can serve as the first course in a two course sequence where CHEM 1315 is the second course. Topics include atomic structure; bonding theory; stoichiometry; properties of solids, liquids and gases; chemical thermodynamics; electrochemistry; and kinetics.

## **CHEM 1315. Survey of Organic Chemistry. 3 Credit Hours.**

Second or third course in chemistry for some engineering majors. The principles of organic chemistry will be surveyed as a basis for understanding materials, biochemical processes and applications.

## **CHEM 1801. Special Topics. 1 Credit Hour.**

## **CHEM 1802. Special Topics. 2 Credit Hours.**

## **CHEM 1803. Special Topics. 3 Credit Hours.**

## **CHEM 1XXX. Chemistry Elective. 1-21 Credit Hours.**

## **CHEM 2211. Introduction to Quantitative Analysis. 3 Credit Hours.**

Laboratory experimentation emphasizing quantitative chemical analysis. Credit not allowed for both CHEM 2211 and CHEM 1313.

## **CHEM 2214. Quantitative Chemical Analysis. 4 Credit Hours.**

Theory and laboratory of quantitative chemical analysis.

## **CHEM 2214R. CHEM 2214 Recitation. 0 Credit Hours.**

Recitation for Theory and laboratory of quantitative chemical analysis.

## **CHEM 2216. Quantitative Chemical Analysis. 2 Credit Hours.**

Theory of quantitative chemical analysis.

## **CHEM 2216L. Quantitative Chemical Analysis Laboratory. 2 Credit Hours.**

Laboratory practice of quantitative chemical analysis.

## **CHEM 2216R. Quantitative Chemical Analysis Recitation. 0 Credit Hours.**

Recitation to support the theory of quantitative chemical analysis.

## **CHEM 2311. Organic Chemistry I. 3 Credit Hours.**

An introduction to structure and reactivity of organic molecules.

## **CHEM 2312. Organic Chemistry II. 3 Credit Hours.**

The second course in the series dealing with the structure and reactivity of organic molecules.

## **CHEM 2313. Organic and Bioorganic Chemistry. 3 Credit Hours.**

A second course in organic chemistry that extends the study to topics in biochemistry.

## **CHEM 2380. Synthesis Laboratory I. 2 Credit Hours.**

Methods for preparation, isolation, and characterization of complex organic molecules, natural products, and polymers.

## **CHEM 2380U. Synthesis Laboratory I. 2 Credit Hours.**

Methods for preparation, isolation, and characterization of complex organic molecules, natural products, and polymers. Please note: This is the summer version of CHEM 2380-Synthesis Lab I.

## **CHEM 2601. Professional Skills for Chemists and Biochemists. 1 Credit Hour.**

An introduction to technical and communication skills utilized in upper level chemistry and biochemistry courses with additional focus on resume building and professional development.

## **CHEM 2694. Intern Assistantship (Undergraduate Internship for Pay). 1-21 Credit Hours.**

Undergraduate Internship for which the student is paid, Freshmen and Sophomores only.

## **CHEM 2695. Undergraduate Internship (Undergraduate Internship for Academic Credit). 1-21 Credit Hours.**

Undergraduate Internship for academic credit, Freshmen and Sophomores only.

## **CHEM 2698. Undergraduate Research Assistantship. 1-12 Credit Hours.**

Independent research conducted under the guidance of a faculty member.

## **CHEM 2699. Undergraduate Research. 1-12 Credit Hours.**

Independent research conducted under the guidance of a faculty member.

## **CHEM 2801. Special Topics. 1 Credit Hour.**

Lecture course in current special topics in chemistry and biochemistry. Topics will vary from year to year.

## **CHEM 2802. Special Topics. 2 Credit Hours.**

Lecture course in current special topics in chemistry and biochemistry. Topics will vary from year to year.

## **CHEM 2803. Special Topics. 3 Credit Hours.**

Lecture course in current special topics in chemistry and biochemistry. Topics will vary from year to year.

## **CHEM 2804. Special Topics. 4 Credit Hours.**

Lecture course in current special topics in chemistry and biochemistry. Topics will vary.

## **CHEM 2812. Special Topics. 2 Credit Hours.**

Lecture course in current special topics in chemistry and biochemistry. Topics will vary from year to year.

## **CHEM 2832. Special Topic. 2 Credit Hours.**

Lecture course in current special topics in chemistry and biochemistry. Topics will vary.

## **CHEM 2901. Special Problems in Chemistry. 1-21 Credit Hours.**

Course of individual instruction, which will include library conference and laboratory experience.

## **CHEM 2902. Special Problems in Chemistry. 1-21 Credit Hours.**

Course of individualized instruction, which will include library, conference and laboratory experience.

## **CHEM 2903. Special Problems in Chemistry. 1-21 Credit Hours.**

Course of individualized instruction, which will include library conference and laboratory experience.

## **CHEM 2XXX. Chemistry Elective. 1-21 Credit Hours.**

## **CHEM 3111. Inorganic Chemistry. 3 Credit Hours.**

A study of the reactions and structures of inorganic compounds and principles, generalizations and theories that assist in understanding their behavior.

**CHEM 3211. Analytical Chemistry. 5 Credit Hours.**

Introduction to the theory and practice of modern chemical analysis.

**CHEM 3216. Analytical Chemistry Lecture. 3 Credit Hours.**

Introduction to the theory of modern chemical analysis.

**CHEM 3216L. Analytical Chemistry Laboratory. 2 Credit Hours.**

Introduction to the practice of modern chemical analysis.

**CHEM 3281. Instrumental Analysis for Engineers. 4 Credit Hours.**

Provides a background to modern analytical chemistry and instrumental methods of analysis with applications to engineering and other areas.

**CHEM 3371. Organic Chemistry Laboratory. 2 Credit Hours.**

Multi-step organic synthesis and inorganic synthesis. Use of chemical literature and advanced spectroscopic techniques.

**CHEM 3380. Synthesis Laboratory II. 3 Credit Hours.**

Multi-step organic and inorganic synthesis. Use of the chemical literature and advanced spectroscopic techniques.

**CHEM 3411. Physical Chemistry I. 3 Credit Hours.**

Chemical thermodynamics, energetics of chemical reactions, changes of state, and electrochemistry.

**CHEM 3412. Physical Chemistry II. 3 Credit Hours.**

Quantum mechanics, atomic and molecular structure, bonding theory, molecular spectroscopy, statistical mechanics.

**CHEM 3481. Physical Chemistry Laboratory I. 2 Credit Hours.**

Laboratory investigations of physical principles applied to chemical systems.

**CHEM 3482. Physical Chemistry Laboratory II. 2 Credit Hours.**

Laboratory investigations of physical principles applied to chemical systems.

**CHEM 3511. Survey of Biochemistry. 3 Credit Hours.**

Introductory course in biochemistry dealing with the chemistry and biochemistry of proteins, lipids, carbohydrates, nucleic acids, and other biomolecules.

**CHEM 3700. The Science of Alternative Energy. 3 Credit Hours.**

Scientific principles governing the current and future approaches in solar photo-voltaics, fuel cells, biomass conversion, nuclear energy and wind power.

**CHEM 3812. Special Topics. 2 Credit Hours.**

Special Topics in Chemistry.

**CHEM 3XXX. Chemistry Elective. 1-21 Credit Hours.****CHEM 4113. Applications of Inorganic Chemistry in Current Energy Research. 3 Credit Hours.**

The principles of coordination chemistry applied to theories and mechanisms of energy conversion and storage in chemistry and biology. Students cannot receive credit for CHEM 4113 and CHEM 6171.

**CHEM 4311. Advanced Organic Chemistry. 3 Credit Hours.**

Construction reactions and functional group interconversions as applied to multistep organic synthesis.

**CHEM 4341. Applied Spectroscopy. 3 Credit Hours.**

Theory and application of NMR, mass spectrometry, and infrared spectroscopy in the determination of organic structures.

**CHEM 4401. Molecular Spectroscopy. 3 Credit Hours.**

Introduction to the theory and applications of molecular spectroscopy, including electronic, vibrational, rotational transitions, and selection rules.

**CHEM 4452. Chemistry of the Solid State. 3 Credit Hours.**

Application of the concepts of physical and inorganic chemistry to the structure of solids and their chemical and physical properties.

**CHEM 4485. Computational Chemistry. 3 Credit Hours.**

Introductory course in computational chemistry discussing electronic structure theory, semi-empirical methods, molecular mechanics, transition-state searching, and computation of thermodynamic quantities.

**CHEM 4511. Biochemistry I. 3 Credit Hours.**

The chemistry and biochemistry of proteins, lipids, carbohydrates, nucleic acids, and other biomolecules.

**CHEM 4512. Biochemistry II. 3 Credit Hours.**

The chemistry and biochemistry of proteins, lipids, carbohydrates, nucleic acids, and other biomolecules.

**CHEM 4521. Biophysical Chemistry. 3 Credit Hours.**

The physical chemistry of biological systems, biological macromolecules, and biological aggregates.

**CHEM 4581. Biochemistry Laboratory I. 3 Credit Hours.**

Modern biochemical techniques including methods for protein, nucleic acid, and lipid isolation and characterization; enzyme assays; chromatography; electrophoresis; and use of databases.

**CHEM 4582. Biochemistry Laboratory II. 3 Credit Hours.**

Laboratory techniques in the isolation and characterization of biological molecules with special emphasis on modern techniques.

**CHEM 4601. Chemistry Seminar. 2 Credit Hours.**

Student presentations of recent research topics in chemistry or biochemistry based on lab experience and/or literature searches.

**CHEM 4684. Advanced Chemistry Lab. 4 Credit Hours.**

A modular laboratory involving a series of multipart experiments that build upon chemical principles and experimental techniques introduced in earlier courses and instructional laboratories. Credit not allowed for both CHEM 4684 and CHEM 4681.

**CHEM 4694. Intern Assistantship (Undergraduate Internship for Pay). 1-21 Credit Hours.**

Undergraduate Internship for which the student is paid, Juniors and Seniors only.

**CHEM 4695. Undergraduate Internship (Undergraduate Internship for Academic Credit). 1-21 Credit Hours.**

Undergraduate Internship for academic credit, Juniors and Seniors only.

**CHEM 4696. Teaching Assistantship. 3 Credit Hours.**

Chemistry and biochemistry teaching carried out under the guidance of a faculty member. Non-Billable for Pay.

**CHEM 4698. Undergraduate Research Assistantship. 1-12 Credit Hours.**

Independent research conducted under the guidance of a faculty member.

**CHEM 4699. Undergraduate Research. 1-12 Credit Hours.**

Independent research conducted under the guidance of a faculty member.

**CHEM 4740. Atmospheric Chemistry. 3 Credit Hours.**

This course provides a general chemical description of the Earth's atmospheric system with a major focus on the two lowest layers of the atmosphere, i.e., the troposphere and the stratosphere. Crosslisted with EAS 4740.

**CHEM 4760. Biocatalysis and Metabolic Engineering. 3 Credit Hours.**

This course provides an in-depth coverage of various topics in biocatalysis and metabolic engineering. Goals of this course are the development of an understanding of proteins as catalysts, their functioning in metabolic networks, their application in various industries, recognition of their potential for addressing future challenges in science and engineering. Crosslisted with CHBE 4760.

**CHEM 4765. Drug Design, Development, and Delivery. 3 Credit Hours.**

Introduction to the pharmaceutical development process, including design of new drugs, synthesis and manufacturing issues, and methods for delivery into the body. Includes student presentations. Crosslisted with CHBE and BMED 4765.

**CHEM 4775. Polymer Science and Engineering I: Formation and Properties. 3 Credit Hours.**

An introduction to the chemistry, structure, and formation of polymers, physical states and transitions, physical and mechanical properties of polymer fluids and solids. Crosslisted with CHE, ME, MSE, and PTFE 4775.

**CHEM 4776. Polymer Science and Engineering II: Analysis, Processing, and Laboratory. 3 Credit Hours.**

Polymer fabrication processes and methods of characterization and identification of polymers are presented. Experiments in polymerization, processing, and property evaluation of polymers. Crosslisted with CHE, ME, MSE, and TFE 4776.

**CHEM 4801. Special Topics. 1 Credit Hour.**

Topics of current interest not included in the regular course offerings.

**CHEM 4802. Special Topics. 2 Credit Hours.**

Topics of current interest not included in the regular course offerings.

**CHEM 4803. Special Topics. 3 Credit Hours.**

Topics of current interest not included in the regular course offerings.

**CHEM 4804. Special Topics. 4 Credit Hours.**

Topics of current interest not included in the regular course offerings.

**CHEM 4805. Special Topics. 5 Credit Hours.**

Topics of current interest not included in the regular course offerings.

**CHEM 4901. Special Problems in Chemistry. 1-21 Credit Hours.**

Course of individualized instruction, which will include library, conference, and laboratory investigations.

**CHEM 4902. Special Problems in Chemistry. 1-21 Credit Hours.**

Course of individualized instruction, which will include library, conference, and laboratory investigations.

**CHEM 4903. Special Problems in Chemistry. 1-21 Credit Hours.**

Course of individualized instruction, which will include library, conference, and laboratory investigations.

**CHEM 4XXX. Chemistry Elective. 1-21 Credit Hours.**