

Berkeley College of Chemistry

Berkeley Global Undergraduate Visiting Student Program in Chemistry Course Curriculum

To earn a certificate from Berkeley Global and the College of Chemistry, students will be required to complete the following.

- Students must enroll in 12 units in the fall semester and 15 units in the spring semester of coursework related to chemical biology or theoretical chemistry. Additional units may be taken with the pre-approval of the College of Chemistry.
- Enroll in all courses through Concurrent Enrollment.
- Students must successfully complete all relevant coursework with a letter grade of C- or better.
- Achieve a GPA of at least 2.0 in all courses taken in the College.
- Courses taken P/NP will be excluded from the calculation of the GPA.

Please note that not all courses will be offered each semester and are subject to change.

Courses for Chemical Biology

CHEM 103 Inorganic Chemistry in Living Systems 3 Units

The basic principles of metal ions and coordination chemistry applied to the study of biological systems.

CHEM 105 Instrumental Methods in Analytical Chemistry 4 Units

Principles, instrumentation and analytical applications of atomic spectroscopies, mass spectrometry, separations, electrochemistry and micro-characterization. Discussion of instrument design and capabilities as well as real-world problem solving with an emphasis on bioanalytical, environmental, and forensic applications. Hands-on laboratory work using modern instrumentation, emphasizing independent projects involving real-life samples and problem solving.

CHEM C110L General Biochemistry and Molecular Biology Laboratory 4

Experimental techniques of biochemistry and molecular biology, designed to accompany the lectures in Molecular and Cell Biology 100B and 110.

CHEM 135 Chemical Biology 3 Units

One-semester introduction to biochemistry, aimed toward chemistry and chemical biology majors.

CHEM C170L Biochemical Engineering Laboratory 3 Units

Laboratory techniques for the cultivation of microorganisms in batch and continuous reactions. Enzymatic conversion processes. Recovery of biological products.

CHEM C271A Chemical Biology I - Structure, Synthesis and Function of Biomolecules

1 Unit

This course will present the structure of proteins, nucleic acids, and oligosaccharides from the perspective of organic chemistry. Modern methods for the synthesis and purification of these molecules will also be presented.

CHEM C271B Chemical Biology II - Enzyme Reaction Mechanisms 1 Unit

This course will focus on the principles of enzyme catalysis. The course will begin with an introduction of the general concepts of enzyme catalysis which will be followed by detailed examples that will examine the chemistry behind the reactions and the three-dimensional structures that carry out the transformations.

CHEM C271C Chemical Biology III - Contemporary Topics in Chemical Biology 1 Unit

This course will build on the principles discussed in Chemical Biology I and II. The focus will consist of case studies where rigorous chemical approaches have been brought to bear on biological questions. Potential subject areas will include signal transduction, photosynthesis, immunology, virology, and cancer. For each topic, the appropriate bioanalytical techniques will be emphasized.

Courses for Computational Chemistry**CHEM 121 Introduction to Computational Chemistry** 3 Units

This course demonstrates how computers are used to solve modern problems in physical chemistry. It focuses first on methods of electronic structure theory that reveal details of molecular structure and energetics, and secondly on simulation methods that explore fluctuations and dynamics of complex systems comprising many molecules. Students will use MATLAB to implement these numerical approaches for illustrative problems. No prior programming experience is required.

CHEM 122 Quantum Mechanics and Spectroscopy 3 Units

Postulates and methods of quantum mechanics and group theory applied to molecular structure and spectra.

CHEM C191 Quantum Information Science and Technology 3 Units

This multidisciplinary course provides an introduction to fundamental conceptual aspects of quantum mechanics from a computational and informational theoretic perspective, as well as physical implementations and technological applications of quantum information science. Basic sections of quantum algorithms, complexity, and cryptography, will be touched upon, as well as pertinent physical realizations from nanoscale science and engineering.

CHM ENG 140 Introduction to Chemical Process Analysis 4 Units

Material and energy balances applied to chemical process systems. Determination of thermodynamic properties needed for such calculations. Sources of data. Calculation procedures.

CHM ENG 143 Computational Methods in Chemical Engineering 4 Units

The purpose of Chemical Engineering Modeling and Computations in Chemical Engineering is to teach students the methodologies used in setting up mathematical models of simple chemical processes and operations, and the numerical techniques used to simulate them. Included are techniques to obtain physical properties of mixtures/solutions using equations of state. This is followed by simple processes such as vapor liquid equilibrium, separation operations such as distillation, heat transfer, and chemical reactions in ideal reactors such as stirred tank and plug flow. Later on, real chemical process equipment and processes are modeled and simulated, using many of the techniques learned earlier.

Courses for Either Track

CHEM 120A Physical Chemistry 3 Units

Kinetic, potential, and total energy of particles and forces between them; principles of quantum theory, including one-electron and many-electron atoms and its applications to chemical bonding, intermolecular interactions, and elementary spectroscopy.

CHEM 120B Physical Chemistry 3 Units

Statistical mechanics, thermodynamics, equilibrium and applications to chemical systems: states of matter, solutions and solvation, chemical kinetics, molecular dynamics, and molecular transport.

CHEM 125 Physical Chemistry Laboratory 3 Units

Experiments in thermodynamics, kinetics, molecular structure, and general physical chemistry.

CHEM H194 Research for Advanced Undergraduates 2 - 6 Units

Students may pursue original research under the direction of one of the members of the staff, with faculty permission. Students must have a minimum 3.4 GPA.

CHEM 195 Special Topics 3 Units

Special topics will be offered from time to time. Examples are: photochemical air pollution, computers in chemistry.

CHEM 196 Special Laboratory Study 2 - 6 Units

Special laboratory work for advanced undergraduates under the direction of one of the members of the staff, with faculty permission.