

# Chemistry

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## Overview

The Chemistry Department at UC Berkeley provides the opportunity for an undergraduate student to obtain a thorough and fundamental knowledge of all fields of chemistry. There are lecture courses in the general areas of inorganic, organic, and physical chemistry, plus many more specialized courses, including analytical, nuclear, and biophysical chemistry, and chemical biology. Laboratory experience is provided in inorganic and organic synthesis, analytical methods, physical chemical measurements, spectroscopy, biochemical engineering, and chemical methods in nuclear technology. Independent and original work is stressed in the laboratories and modern equipment is available to carry out the work. The equipment and techniques available to the undergraduate students include nuclear magnetic resonance; electron paramagnetic resonance; visible, ultraviolet, and infrared spectrometers; X-ray diffraction; mass spectrometry; high-vacuum, high-pressure, and low-temperature equipment; gas chromatography; and others. Many of these instruments are interfaced directly to computers; in other cases, data analysis and graphics displays are accomplished using the College of Chemistry Computer Facility. In addition, arrangements can be made to use many specialized research techniques available on the campus.

More important than the formal lecture and laboratory courses is the intellectual environment provided by the department. There is a student commons room that makes it convenient for students to learn from one another. The Chemistry Library has an excellent collection of books, journals, and reference materials. Graduate student instructors, who are themselves graduate students working toward PhD degrees, are further sources of scientific information and help. Faculty members are available as academic advisers and hold office hours for consultation about their courses. They are also willing to discuss chemistry, science, career opportunities, and even philosophy. The best way to take full advantage of the scientific opportunities available in the department is to join a research group. This can be done through courses for advanced undergraduates or simply as an employee.

Graduate study at Berkeley is mainly individual learning in a research field chosen by the student. New students begin research shortly after arriving in Berkeley and usually complete their thesis work in about five years or less. Courses are normally taken only during the first two years, but seminars are a rich source of new knowledge throughout the entire graduate career. All graduate students are required to be graduate student instructors for a minimum of three semesters. Teaching is not only an essential service; it is an excellent method for learning. Financial support for graduate students is provided by graduate student instructor positions, research assistantships, and fellowships.

There is currently an active graduate student organization whose membership includes all graduate students in the college. The overall goal of this organization is to give graduate students involvement in the department and to provide a sense of community among the various separate subdisciplines in the college as well as to increase communication among faculty, administration, and students.

## Undergraduate Programs

Chemistry (<http://guide.berkeley.edu/archive/2017-18/undergraduate/degree-programs/chemistry>): BA (offered through the College of Letters and Science), BS (offered through the College of Chemistry), Minor

Chemical Biology (<http://guide.berkeley.edu/archive/2017-18/undergraduate/degree-programs/chemical-biology>): BS

## Graduate Program

Chemistry (<http://guide.berkeley.edu/archive/2017-18/graduate/degree-programs/chemistry>): PhD

## Chemistry

### CHEM 1A General Chemistry 3 Units

Terms offered: Fall 2018, Summer 2018 8 Week Session, Spring 2018  
Stoichiometry of chemical reactions, quantum mechanical description of atoms, the elements and periodic table, chemical bonding, real and ideal gases, thermochemistry, introduction to thermodynamics and equilibrium, acid-base and solubility equilibria, introduction to oxidation-reduction reactions, introduction to chemical kinetics.

General Chemistry: Read More [+]

#### Rules & Requirements

**Prerequisites:** High school chemistry recommended

**Credit Restrictions:** Students will receive no credit for Chemistry 1A after completing Chemistry 1AD or 4A. A deficient grade in Chemistry 1A may be removed by taking Chemistry 1AD.<BR/>

#### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture, 1 hour of discussion, and 0 hours of voluntary per week

**Summer:** 8 weeks - 6 hours of lecture, 2 hours of discussion, and 0 hours of voluntary per week

#### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

General Chemistry: Read Less [-]

## CHEM 1AD General Chemistry (Digital) 3 Units

Terms offered: Spring 2016

An interactive general chemistry course that uses modern digital technology, offered in a smaller classroom setting to facilitate student participation and foster an engaging learning environment. Topics cover the Chemistry 1A curriculum, ranging from quantum mechanics and interactions of atoms and molecules to properties and equilibria of bulk materials. The course involves a blend of classroom lectures and peer learning with substantial web-based assignments and resources including web access to lecture videos. Lecture time is also devoted to ChemQuiz peer discussions and live demos of chemical properties and processes, which students generally find to be illuminating and valuable learning experiences.

General Chemistry (Digital): Read More [ + ]

### Rules & Requirements

**Prerequisites:** High school chemistry recommended

**Credit Restrictions:** Students will receive no credit for Chemistry 1AD after completing Chemistry 1A or 4A. A deficient grade in Chemistry 1A may be removed by taking Chemistry 1AD.

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 1 hour of discussion per week

**Summer:** 8 weeks - 6 hours of lecture and 2 hours of discussion per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructors:** Pines, Slack

General Chemistry (Digital): Read Less [ - ]

## CHEM 1AL General Chemistry Laboratory 1 Unit

Terms offered: Fall 2018, Summer 2018 8 Week Session, Spring 2018

An experimental approach to chemical sciences with emphasis on developing fundamental, reproducible laboratory technique and a goal of understanding and achieving precision and accuracy in laboratory experiments. Proper use of laboratory equipment and standard wet chemical methods are practiced. Areas of investigations include chemical equilibria, spectroscopy, nanotechnology, green chemistry, and thermochemistry. Concurrent enrollment in 1A is recommended.

General Chemistry Laboratory: Read More [ + ]

### Rules & Requirements

**Prerequisites:** 1A (may be taken concurrently)

**Credit Restrictions:** Students will receive no credit for 1AL after taking 4A.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1 hour of lecture, 3 hours of laboratory, and 0 hours of voluntary per week

**Summer:** 8 weeks - 2 hours of lecture, 6 hours of laboratory, and 0 hours of voluntary per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam not required.

General Chemistry Laboratory: Read Less [ - ]

## CHEM 1B General Chemistry 4 Units

Terms offered: Summer 2018 8 Week Session, Spring 2018, Summer 2017 8 Week Session

Introduction to chemical kinetics, electrochemistry, properties of the states of matter, binary mixtures, thermodynamic efficiency and the direction of chemical change, quantum mechanical description of bonding introduction to spectroscopy. Special topics: Research topics in modern chemistry and biochemistry, chemical engineering.

General Chemistry: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** CHEM 1A and CHEM 1AL with min grades of C-; or CHEM 4A with min grade of C-; or AP CHEM with min score of 4; or CHEM HL IB with min score of 5; or GCE A-Level CHEM with min grade of C

**Credit Restrictions:** Students will receive no credit for Chemistry 1B after completing Chemistry 4B.

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of lecture, 4 hours of laboratory, and 0 hours of voluntary per week

**Summer:** 8 weeks - 6 hours of lecture, 8 hours of laboratory, and 0 hours of voluntary per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

General Chemistry: Read Less [\[-\]](#)

## CHEM W1A General Chemistry 3 Units

Terms offered: Summer 2013 10 Week Session, Summer 2013 8 Week Session, Summer 2012 8 Week Session

Stoichiometry of chemical reactions, quantum mechanical description of atoms, the elements and periodic table, chemical bonding, real and ideal gases, thermochemistry, introduction to thermodynamics and equilibrium, acid-base and solubility equilibria, introduction to oxidation-reduction reactions, introduction to chemical kinetics. This course is web-based.

General Chemistry: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** High school chemistry is recommended

**Credit Restrictions:** Students will receive no credit for W1A after taking 1A or 4A. A deficiency in 1A may be removed by taking W1A.

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of web-based lecture and 1 hour of web-based discussion per week

**Summer:** 8 weeks - 6 hours of web-based lecture and 2 hours of web-based discussion per week

**Online:** This is an online course.

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

General Chemistry: Read Less [\[-\]](#)

## CHEM 3A Chemical Structure and Reactivity 3 Units

Terms offered: Fall 2018, Summer 2018 8 Week Session, Spring 2018

Introduction to organic chemical structures, bonding, and chemical reactivity. The organic chemistry of alkanes, alkyl halides, alcohols, alkenes, alkynes, and organometallics.

Chemical Structure and Reactivity: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** CHEM 1A with min grade of C-; or AP Chem with min score of 4; or Chem HL IB with min score of 5; or GCE A-Level Chem with min grade of C

**Credit Restrictions:** Students will receive no credit for CHEM 3A after completing CHEM 12A; a deficient grade in CHEM 12A may be removed by taking CHEM 3A- will restrict credit if completed before Chemistry 3A.

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

**Summer:** 8 weeks - 6 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

Chemical Structure and Reactivity: Read Less [\[-\]](#)

## CHEM 3AL Organic Chemistry Laboratory 2 Units

Terms offered: Fall 2018, Spring 2018, Fall 2017

Introduction to the theory and practice of methods used in the organic chemistry laboratory. An emphasis is placed on the separation and purification of organic compounds. Techniques covered will include extraction, distillation, sublimation, recrystallization, and chromatography. Detailed discussions and applications of infrared and nuclear magnetic resonance spectroscopy will be included.

Organic Chemistry Laboratory: Read More [ + ]

### Rules & Requirements

**Prerequisites:** CHEM 1A and CHEM 1AL with min grades of C-; or CHEM 4A with min grade of C-; or AP CHEM with min score of 4; or CHEM HL IB with min score of 5; or GCE A-Level CHEM with min grade of C-  
Corequisite: CHEM 3A with min grade of C- or coenrollment in CHEM 3A

**Credit Restrictions:** Students will receive no credit for 3AL after taking 12A.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1 hour of lecture and 4 hours of laboratory per week

**Summer:** 8 weeks - 2 hours of lecture and 8 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam not required.

Organic Chemistry Laboratory: Read Less [ - ]

## CHEM 3B Chemical Structure and Reactivity 3 Units

Terms offered: Fall 2018, Summer 2018 8 Week Session, Spring 2018  
Conjugation, aromatic chemistry, carbonyl compounds, carbohydrates, amines, carboxylic acids, amino acids, peptides, proteins, and nucleic acid chemistry. Ultraviolet spectroscopy and mass spectrometry will be introduced.

Chemical Structure and Reactivity: Read More [ + ]

### Rules & Requirements

**Prerequisites:** CHEM 3A and CHEM 3AL with min grades of C-

**Credit Restrictions:** Students will receive no credit for 3B after taking 12B.

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

**Summer:** 8 weeks - 6 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

Chemical Structure and Reactivity: Read Less [ - ]

## CHEM 3BL Organic Chemistry Laboratory 2 Units

Terms offered: Fall 2018, Summer 2018 8 Week Session, Spring 2018

The synthesis and purification of organic compounds will be explored. Natural product chemistry will be introduced. Advanced spectroscopic methods including infrared, ultraviolet, and nuclear magnetic resonance spectroscopy and mass spectrometry will be used to analyze products prepared and/or isolated. Qualitative analysis of organic compounds will be covered.

Organic Chemistry Laboratory: Read More [ + ]

### Rules & Requirements

**Prerequisites:** CHEM 3AL with min grade of C-  
Co-requisite: CHEM 3B with min grade of C- or co-enrollment in CHEM 3B

**Credit Restrictions:** Students will receive no credit for 3BL after taking 12B.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1 hour of lecture and 4 hours of laboratory per week

**Summer:** 8 weeks - 2 hours of lecture and 8 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam not required.

Organic Chemistry Laboratory: Read Less [ - ]

## CHEM N3AL Organic Chemistry Laboratory 2 Units

Terms offered: Summer 2018 8 Week Session, Summer 2017 8 Week Session, Summer 2015 8 Week Session

Introduction to the theory and practice of methods used in the organic chemistry laboratory. An emphasis is placed on the separation and purification of organic compounds. Techniques covered will include extraction, distillation, sublimation, recrystallization, and chromatography. Detailed discussions and applications of infrared and nuclear magnetic resonance spectroscopy will be included.

Organic Chemistry Laboratory: [Read More](#) [+]

### Rules & Requirements

**Prerequisites:** CHEM 1A and CHEM 1AL with min grades of C-; or CHEM 4A with min grade of C-; or AP CHEM with min score of 4; or CHEM HL IB with min score of 5; or GCE A-Level CHEM with min grade of C.  
Co-requisite: CHEM 3A with min grade of C- or co-enrollment in CHEM 3A. Chemistry 4A

**Credit Restrictions:** Students will receive no credit for N3AL after taking 12A.

### Hours & Format

**Summer:** 8 weeks - 2 hours of web-based lecture and 8 hours of laboratory per week

**Online:** This is an online course.

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam not required.

**Instructor:** Pedersen

Organic Chemistry Laboratory: [Read Less](#) [-]

## CHEM 4A General Chemistry and Quantitative Analysis 4 Units

Terms offered: Fall 2018, Fall 2017, Fall 2016

Series is intended for majors in physical, biological sciences, and engineering. It presents the foundation principles of chemistry, including stoichiometry, ideal and real gases, acid-base and solubility equilibria, oxidation-reduction reactions, thermochemistry, entropy, nuclear chemistry and radioactivity, the atoms and elements, the periodic table, quantum theory, chemical bonding, molecular structure, chemical kinetics, and descriptive chemistry. Examples and applications will be drawn from diverse areas of interest such as atmospheric, environmental, materials, polymer and computational chemistry, and biochemistry. Laboratory emphasizes quantitative work. Equivalent to 1A-1B plus 15 as prerequisite for further courses in chemistry.

General Chemistry and Quantitative Analysis: [Read More](#) [+]

### Rules & Requirements

**Prerequisites:** High school chemistry; calculus (may be taken concurrently); high school physics is recommended

**Credit Restrictions:** Students will receive no credit for 4A after taking 1A. Deficiency in 4A may be removed by successfully completing 1A and 1AL together in the same semester.

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture, 4 hours of laboratory, and 0 hours of voluntary per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

General Chemistry and Quantitative Analysis: [Read Less](#) [-]

## CHEM 4B General Chemistry and Quantitative Analysis 4 Units

Terms offered: Spring 2018, Spring 2017, Spring 2016

Series is intended for majors in physical, biological sciences, and engineering. It presents the foundation principles of chemistry, including stoichiometry, ideal and real gases, acid-base and solubility equilibria, oxidation-reduction reactions, thermochemistry, entropy, nuclear chemistry and radioactivity, the atoms and elements, the periodic table, quantum theory, chemical bonding, molecular structure, chemical kinetics, and descriptive chemistry. Examples and applications will be drawn from diverse areas of interest such as atmospheric, environmental, materials, polymer and computational chemistry, and biochemistry. Laboratory emphasizes quantitative work. Equivalent to 1A-1B plus 15 as prerequisite for further courses in chemistry.

General Chemistry and Quantitative Analysis: Read More [+]

### Rules & Requirements

**Prerequisites:** High school chemistry; calculus (may be taken concurrently); high school physics is recommended

**Credit Restrictions:** Deficiency in 4B may be removed by successfully completing 15.

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture, 4 hours of laboratory, and 0 hours of voluntary per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

General Chemistry and Quantitative Analysis: Read Less [-]

## CHEM 12A Organic Chemistry 5 Units

Terms offered: Fall 2018, Fall 2017, Fall 1978

A study of all aspects of fundamental organic chemistry, including nomenclature, chemical and physical properties, reactions and syntheses of the major classes of organic compounds. The study includes theoretical aspects, reaction mechanisms, multistep syntheses, and the chemistry of polycyclic and heterocyclic compounds. This course is more extensive and intensive than 3A-3B and includes a greater emphasis on reaction mechanisms and multistep syntheses. 12A (F); 12B (SP)  
Organic Chemistry: Read More [+]

### Rules & Requirements

**Prerequisites:** 12A: 1B or 4B with grade of C- or higher; 12B: 12A with grade of C- or higher. For students majoring in chemistry or a closely related field such as chemical engineering or molecular and cell biology

**Credit Restrictions:** Students will receive no credit for 12A after taking both 3A and 3AL. Deficiency in 12A may be removed by successfully completing 3A and 3AL in the same semester. Students will receive no credit for 12A after taking 112A. Chem 12A is formerly known as Chem 112A.

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture, 1 hour of discussion, 5 hours of laboratory, and 0 hours of voluntary per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Formerly known as:** Chemistry 112A

Organic Chemistry: Read Less [-]

## CHEM 12B Organic Chemistry 5 Units

Terms offered: Spring 2018

A study of all aspects of fundamental organic chemistry, including nomenclature, chemical and physical properties, reactions and syntheses of the major classes of organic compounds. The study includes theoretical aspects, reaction mechanisms, multistep syntheses, and the chemistry of polycyclic and heterocyclic compounds. This course is more extensive and intensive than 3A-3B and includes a greater emphasis on reaction mechanisms and multistep syntheses. 12A (F); 12B (SP)  
Organic Chemistry: Read More [ + ]

### Rules & Requirements

**Prerequisites:** 12A: 1B or 4B with grade of C- or higher. 12B: 12A with grade of C- or higher. For students majoring in chemistry or a closely related field such as chemical engineering or molecular and cell biology

**Credit Restrictions:** Students will receive no credit for 12B after taking both 3B and 3BL. Deficiency in 12B may be removed by successfully completing 3B and 3BL in the same semester. Students will receive no credit for 12B after taking 112B. Chem 12B is formerly known as Chem 112B.

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture, 1 hour of discussion, 5 hours of laboratory, and 0 hours of voluntary per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Formerly known as:** Chemistry 112B

Organic Chemistry: Read Less [ - ]

## CHEM 15 Analytical and Bioanalytical Chemistry 3 Units

Terms offered: Fall 2018, Fall 2017, Fall 2016

An introduction to analytical and bioanalytical chemistry including background in statistical analysis of data, acid-base equilibria, electrochemical, spectrometric, and chromatographic methods of analysis and some advanced topics in bioanalytical chemistry such as micro-fluidics, bioassay techniques, and enzymatic biosensors.  
Analytical and Bioanalytical Chemistry: Read More [ + ]

### Rules & Requirements

**Prerequisites:** 1A and 1AL or equivalent

**Credit Restrictions:** Deficiency in 15 may be removed by successfully completing 4B.

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of lecture and 4 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

Analytical and Bioanalytical Chemistry: Read Less [ - ]

## CHEM 24 Freshman Seminar 1 Unit

Terms offered: Spring 2017, Spring 2016, Spring 2015

The Freshman Seminar Program has been designed to provide new students with the opportunity to explore an intellectual topic with a faculty member in a small seminar setting. Freshman seminars are offered in all campus departments, and topics may vary from department to department and semester to semester. Enrollment limited to 15 freshmen.  
Freshman Seminar: Read More [ + ]

### Rules & Requirements

**Repeat rules:** Course may be repeated for credit when topic changes. Course may be repeated for credit when topic changes.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1 hour of seminar per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** The grading option will be decided by the instructor when the class is offered. Final exam required.

Freshman Seminar: Read Less [ - ]

## CHEM 49 Supplementary Work in Lower Division Chemistry 1 - 4 Units

Terms offered: Fall 2017, Fall 2016, Spring 2016

Students with partial credit in lower division chemistry courses may, with consent of instructor, complete the credit under this heading.  
Supplementary Work in Lower Division Chemistry: Read More [ + ]

### Rules & Requirements

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1-4 hours of independent study per week

### Summer:

6 weeks - 1-6 hours of independent study per week

8 weeks - 1-4 hours of independent study per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam not required.

Supplementary Work in Lower Division Chemistry: Read Less [ - ]



## CHEM 96 Introduction to Research and Study in the College of Chemistry 1 Unit

Terms offered: Fall 2017, Fall 2016, Fall 2015

Introduces freshmen to research activities and programs of study in the College of Chemistry. Includes lectures by faculty, an introduction to college library and computer facilities, the opportunity to meet alumni and advanced undergraduates in an informal atmosphere, and discussion of college and campus resources.

Introduction to Research and Study in the College of Chemistry: Read More [+]

### Rules & Requirements

**Prerequisites:** Freshman standing in the College of Chemistry, or consent of instructor

**Credit Restrictions:** Students will receive no credit for Chemistry 96 after taking Chemistry C96 or Chemical and Biomolecular Engineering C96.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1 hour of seminar per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Offered for pass/not pass grade only. Final exam required.

Introduction to Research and Study in the College of Chemistry: Read Less [-]

## CHEM 98 Supervised Group Study 1 - 4 Units

Terms offered: Fall 2018, Fall 2017, Spring 2017

Group study of selected topics.

Supervised Group Study: Read More [+]

### Rules & Requirements

**Prerequisites:** Consent of instructor

**Credit Restrictions:** Enrollment is restricted; see the Introduction to Courses and Curricula section of this catalog.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1-4 hours of directed group study per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Offered for pass/not pass grade only. Final exam not required.

Supervised Group Study: Read Less [-]

## CHEM 98W Directed Group Study 1 Unit

Terms offered: Spring 2013, Fall 2012, Spring 2009

Topics vary with instructor. Enrollment restrictions apply.

Directed Group Study: Read More [+]

### Rules & Requirements

**Credit Restrictions:** Enrollment is restricted; see the Introduction to Courses and Curricula section of this catalog.

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1 hour of directed group study per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Offered for pass/not pass grade only. Final exam not required.

Directed Group Study: Read Less [-]

## CHEM 100 Communicating Chemistry 2 Units

Terms offered: Spring 2011, Spring 2010, Spring 2009

For undergraduate and graduate students interested in improving their ability to communicate their scientific knowledge by teaching chemistry in elementary schools. The course will combine instruction in inquiry-based chemistry teaching methods and learning pedagogy with 10 weeks of supervised teaching experience in a local school classroom. Thus, students will practice communicating scientific knowledge and receive mentoring on how to improve their presentations. Approximately three hours per week, including time spent in school classrooms.

Communicating Chemistry: Read More [+]

### Rules & Requirements

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of lecture and 1 hour of fieldwork per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

### Formerly known as: 20

Communicating Chemistry: Read Less [-]



## CHEM 103 Inorganic Chemistry in Living Systems 3 Units

Terms offered: Fall 2018, Fall 2017, Fall 2016

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

Inorganic Chemistry in Living Systems: [Read More](#) [+]

### Rules & Requirements

**Prerequisites:** Chemistry 3A or 112A. Chemistry majors can only count 2 of the 3 units towards their Allied Subject requirement

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

Inorganic Chemistry in Living Systems: [Read Less](#) [-]

## CHEM 104A Advanced Inorganic Chemistry 3 Units

Terms offered: Fall 2018, Fall 2017, Fall 2016

The chemistry of metals and nonmetals including the application of physical chemical principles.

Advanced Inorganic Chemistry: [Read More](#) [+]

### Rules & Requirements

**Prerequisites:** 1B, 4B, or 3A; 104A is prerequisite to 104B

**Credit Restrictions:** 104A: No restrictions; 104B: Students will receive two units of credit after taking 103.

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

**Summer:** 8 weeks - 6 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

Advanced Inorganic Chemistry: [Read Less](#) [-]

## CHEM 104B Advanced Inorganic Chemistry 3 Units

Terms offered: Spring 2018, Spring 2017, Spring 2016

The chemistry of metals and nonmetals including the application of physical chemical principles.

Advanced Inorganic Chemistry: [Read More](#) [+]

### Rules & Requirements

**Prerequisites:** 104A or consent of instructor. Chemical Biology majors can only count 2 of the 3 units towards their Allied Subject requirement for 104B after taking 103

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

**Summer:** 8 weeks - 6 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

Advanced Inorganic Chemistry: [Read Less](#) [-]

## CHEM 105 Instrumental Methods in Analytical Chemistry 4 Units

Terms offered: Spring 2018, Spring 2017, Spring 2016

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.

Instrumental Methods in Analytical Chemistry: [Read More](#) [+]

### Rules & Requirements

**Prerequisites:** 4B; or 1B and 15; or 1B and a UC GPA of 3.3 or higher

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of lecture and 8 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

Instrumental Methods in Analytical Chemistry: [Read Less](#) [-]

## CHEM 108 Inorganic Synthesis and Reactions 4 Units

Terms offered: Fall 2018, Fall 2017, Fall 2016

The preparation of inorganic compounds using vacuum line, air-and moisture-exclusion, electrochemical, high-pressure, and other synthetic techniques. Kinetic and mechanistic studies of inorganic compounds.

Inorganic Synthesis and Reactions: [Read More](#) [+]

### Rules & Requirements

**Prerequisites:** 4B or 15; 104B with grade of C- or higher, or 103

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of lecture and 8 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

Inorganic Synthesis and Reactions: [Read Less](#) [-]

## CHEM C110L General Biochemistry and Molecular Biology Laboratory 4 Units

Terms offered: Fall 2018, Spring 2018, Fall 2017

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

General Biochemistry and Molecular Biology Laboratory: [Read More](#) [+]

### Rules & Requirements

**Prerequisites:** 110 (may be taken concurrently)

### Hours & Format

**Fall and/or spring:** 15 weeks - 2-2 hours of lecture and 6-8 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam not required.

**Also listed as:** MCELLBI C110L

General Biochemistry and Molecular Biology Laboratory: [Read Less](#) [-]

## CHEM 113 Advanced Mechanistic Organic Chemistry 3 Units

Terms offered: Fall 2018, Fall 2016, Fall 2015

Advanced topics in mechanistic and physical organic chemistry typically including kinetics, reactive intermediates, substitution reactions, linear free energy relationships, orbital interactions and orbital symmetry control of reactions, isotope effects, and photochemistry.

Advanced Mechanistic Organic Chemistry: [Read More](#) [+]

### Rules & Requirements

**Prerequisites:** 3B or 112B with a minimum grade of B- or consent of instructor

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

Advanced Mechanistic Organic Chemistry: [Read Less](#) [-]

## CHEM 114 Advanced Synthetic Organic Chemistry 3 Units

Terms offered: Spring 2018, Spring 2017, Spring 2015

Advanced topics in synthetic organic chemistry with a focus on selectivity. Topics include reductions, oxidations, enolate chemistry and the aldol reaction, reactions of non-stabilized anions, olefination reactions, pericyclic reactions and application to the synthesis of complex structures.

Advanced Synthetic Organic Chemistry: [Read More](#) [+]

### Rules & Requirements

**Prerequisites:** 3B or 112B with a minimum grade of B- or consent of instructor

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

Advanced Synthetic Organic Chemistry: [Read Less](#) [-]

## CHEM 115 Organic Chemistry--Advanced Laboratory Methods 4 Units

Terms offered: Fall 2018, Summer 2018 First 6 Week Session, Spring 2018

Advanced synthetic methods, chemical and spectroscopic structural methods, designed as a preparation for experimental research.

Organic Chemistry--Advanced Laboratory Methods: Read More [ + ]

### Rules & Requirements

**Prerequisites:** 112B with a grade of C- or higher

### Hours & Format

**Fall and/or spring:** 15 weeks - 1 hour of lecture and 11 hours of laboratory per week

### Summer:

6 weeks - 2.5 hours of lecture and 27.5 hours of laboratory per week

8 weeks - 2 hours of lecture and 20.5 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Alternative to final exam.

Organic Chemistry--Advanced Laboratory Methods: Read Less [ - ]

## CHEM 120A Physical Chemistry 3 Units

Terms offered: Fall 2018, Spring 2018, Fall 2017

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.

Physical Chemistry: Read More [ + ]

### Rules & Requirements

**Prerequisites:** 4B or equivalent; Physics 7B or 8B; Mathematics 53; Mathematics 54 or consent of instructor

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 0 hours of voluntary per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

Physical Chemistry: Read Less [ - ]

## CHEM 120B Physical Chemistry 3 Units

Terms offered: Fall 2018, Fall 2017, Fall 2016

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

Physical Chemistry: Read More [ + ]

### Rules & Requirements

**Prerequisites:** 4B or equivalent; Mathematics 53; Mathematics 54 (may be taken concurrently); Physics 7B or 8B

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

Physical Chemistry: Read Less [ - ]

## CHEM 122 Quantum Mechanics and Spectroscopy 3 Units

Terms offered: Fall 2017, Spring 2017, Spring 2015

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

Quantum Mechanics and Spectroscopy: Read More [ + ]

### Rules & Requirements

**Prerequisites:** 120A

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

Quantum Mechanics and Spectroscopy: Read Less [ - ]

## CHEM 125 Physical Chemistry Laboratory 3 Units

Terms offered: Fall 2018, Spring 2018, Fall 2017

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

Physical Chemistry Laboratory: Read More [ + ]

### Rules & Requirements

**Prerequisites:** Two of the following: 120A, 120B, C130, or 130B with grades of C- or higher (one of which may be taken concurrently)

**Credit Restrictions:** Deficiency in 125 may be removed by successfully completing C182. Consent of instructor is required to enroll in 125 after completing C182 or EPS C182.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1 hour of lecture and 5 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

Physical Chemistry Laboratory: Read Less [ - ]

## CHEM 130B Biophysical Chemistry 3 Units

Terms offered: Spring 2018, Spring 2017, Spring 2016

The weekly one-hour discussion is for problem solving and the application of calculus in physical chemistry. Molecular structure, intermolecular forces and interactions, biomolecular spectroscopy, high-resolution structure determinations.

Biophysical Chemistry: Read More [ + ]

### Rules & Requirements

**Prerequisites:** Chemistry C130 or Molecular and Cell Biology C100A, or consent of instructor. Chemistry and Chemical Biology majors can only count 2 of the 3 units towards their Allied Subject requirement

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of lecture and 1 hour of discussion per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

Biophysical Chemistry: Read Less [ - ]

## CHEM C130 Biophysical Chemistry: Physical Principles and the Molecules of Life 4 Units

Terms offered: Fall 2018, Spring 2018, Fall 2017

Thermodynamic and kinetic concepts applied to understanding the chemistry and structure of biomolecules (proteins, DNA, and RNA).

Molecular distributions, reaction kinetics, enzyme kinetics. Bioenergetics, energy transduction, and motor proteins. Electrochemical potential, membranes, and ion channels.

Biophysical Chemistry: Physical Principles and the Molecules of Life: Read More [ + ]

### Rules & Requirements

**Prerequisites:** Chemistry 3A or 112A, Mathematics 1A, Biology 1A and 1AL; Chemistry 3B or 112B recommended

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 1 hour of discussion per week

**Summer:** 8 weeks - 5.5 hours of lecture and 2 hours of discussion per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Also listed as:** MCELLBI C100A

Biophysical Chemistry: Physical Principles and the Molecules of Life: Read Less [ - ]

## CHEM 135 Chemical Biology 3 Units

Terms offered: Fall 2018, Fall 2017, Fall 2016

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

Chemical Biology: Read More [ + ]

### Rules & Requirements

**Prerequisites:** 3B or 112B; Biology 1A; or consent of instructor

**Credit Restrictions:** Students will receive no credit for 135 after taking Molecular and Cell Biology 100B or 102.

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

Chemical Biology: Read Less [ - ]

## CHEM C138 The Berkeley Lectures on Energy: Energy from Biomass 3 Units

Terms offered: Fall 2015, Fall 2014, Fall 2013

After an introduction to the different aspects of our global energy consumption, the course will focus on the role of biomass. The course will illustrate how the global scale of energy guides the biomass research. Emphasis will be placed on the integration of the biological aspects (crop selection, harvesting, storage and distribution, and chemical composition of biomass) with the chemical aspects to convert biomass to energy. The course aims to engage students in state-of-the-art research.

The Berkeley Lectures on Energy: Energy from Biomass: Read More [+]

### Rules & Requirements

**Prerequisites:** Chemistry 1B or Chemistry 4B, Mathematics 1B, Biology 1A

**Repeat rules:** Course may be repeated for credit under special circumstances: Repeatable when topic changes with consent of instructor. Repeatable when topic changes with consent of instructor.

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructors:** Bell, Blanch, Clark, Smit, C. Somerville

**Also listed as:** BIO ENG C181/CHM ENG C195A/PLANTBI C124

The Berkeley Lectures on Energy: Energy from Biomass: Read Less [-]

## CHEM 143 Nuclear Chemistry 2 Units

Terms offered: Fall 2018, Fall 2017, Fall 2016

Radioactivity, fission, nuclear models and reactions, nuclear processes in nature. Computer methods will be introduced.

Nuclear Chemistry: Read More [+]

### Rules & Requirements

**Prerequisites:** Physics 7B or equivalent

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

Nuclear Chemistry: Read Less [-]

## CHEM 146 Radiochemical Methods in Nuclear Technology and Forensics 3 Units

Terms offered: Spring 2018, Spring 2017, Spring 2016

Experimental illustrations of the interrelation between chemical and nuclear science and technology and nuclear forensics; radioactive decay and counting techniques; nuclear spectroscopy; fundamental radiochemical techniques; radiochemical separations techniques; tracers; activation analysis; forensic applications of radiochemistry; fusion, fission and nuclear reactors.

Radiochemical Methods in Nuclear Technology and Forensics: Read More [+]

### Objectives Outcomes

**Course Objectives:** Familiarize students with principles of nuclear and radiochemistry and its many important applications in our daily lives; provide hands-on training.

**Student Learning Outcomes:** A solid understanding of nuclear and radiochemistry; proficiency in safe handling of radioactive materials in the laboratory, and appreciation for the wide application of radiochemical techniques in chemistry, nuclear technology, and nuclear forensics.

### Rules & Requirements

**Prerequisites:** 4B or 15; 143 is recommended

### Hours & Format

**Fall and/or spring:** 15 weeks - 1.5 hours of lecture and 4.5 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructor:** Nitsche

Radiochemical Methods in Nuclear Technology and Forensics: Read Less [-]

## CHEM 149 Supplementary Work in Upper Division Chemistry 1 - 4 Units

Terms offered: Spring 2016, Spring 2015, Spring 2014

Students with partial credit in upper division chemistry courses may, with consent of instructor, complete the credit under this heading.

Supplementary Work in Upper Division Chemistry: [Read More](#) [+]

### Rules & Requirements

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1-4 hours of independent study per week

### Summer:

6 weeks - 2.5-10 hours of independent study per week

8 weeks - 1.5-7.5 hours of independent study per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

Supplementary Work in Upper Division Chemistry: [Read Less](#) [-]

## CHEM C150 Introduction to Materials Chemistry 3 Units

Terms offered: Spring 2018, Spring 2017, Spring 2015, Spring 2014, Spring 2012

The application of basic chemical principles to problems in materials discovery, design, and characterization will be discussed. Topics covered will include inorganic solids, nanoscale materials, polymers, and biological materials, with specific focus on the ways in which atomic-level interactions dictate the bulk properties of matter.

Introduction to Materials Chemistry: [Read More](#) [+]

### Rules & Requirements

**Prerequisites:** 104A; 104B is recommended

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Also listed as:** MAT SCI C150

Introduction to Materials Chemistry: [Read Less](#) [-]

## CHEM C170L Biochemical Engineering Laboratory 3 Units

Terms offered: Fall 2018, Spring 2018, Spring 2014, Spring 2013

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

Biochemical Engineering Laboratory: [Read More](#) [+]

### Rules & Requirements

**Prerequisites:** Chemical Engineering 170A (may be taken concurrently) or consent of instructor

### Hours & Format

**Fall and/or spring:** 15 weeks - 7 hours of laboratory and 1 hour of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Also listed as:** CHM ENG C170L

Biochemical Engineering Laboratory: [Read Less](#) [-]

## CHEM C178 Polymer Science and Technology 3 Units

Terms offered: Spring 2018, Fall 2016, Spring 2016, Spring 2015

An interdisciplinary course on the synthesis, characterization, and properties of polymer materials. Emphasis on the molecular origin of properties of polymeric materials and technological applications. Topics include single molecule properties, polymer mixtures and solutions, melts, glasses, elastomers, and crystals. Experiments in polymer synthesis, characterization, and physical properties.

Polymer Science and Technology: [Read More](#) [+]

### Rules & Requirements

**Prerequisites:** Junior standing

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 3 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructor:** Segalman

**Also listed as:** CHM ENG C178

Polymer Science and Technology: [Read Less](#) [-]



## CHEM C182 Atmospheric Chemistry and Physics Laboratory 3 Units

Terms offered: Spring 2018, Spring 2017, Spring 2016

Fluid dynamics, radiative transfer, and the kinetics, spectroscopy, and measurement of atmospherically relevant species are explored through laboratory experiments, numerical simulations, and field observations. Atmospheric Chemistry and Physics Laboratory: Read More [ + ]

### Rules & Requirements

**Prerequisites:** Earth and Planetary Science 50 and 102 with grades of C- or higher (one of which may be taken concurrently) or two of the following: Chemistry 120A, 120B, C130, or 130B with grades of C- or higher (one of which may be taken concurrently)

**Credit Restrictions:** Deficiency in C182 may be removed by successfully completing 125. Consent of instructor is required to enroll in C182 after completing 125.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1.5 hours of lecture and 5 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Also listed as:** EPS C182

Atmospheric Chemistry and Physics Laboratory: Read Less [ - ]

## CHEM C191 Quantum Information Science and Technology 3 Units

Terms offered: Spring 2017, Fall 2014, Spring 2012

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.

Quantum Information Science and Technology: Read More [ + ]

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructors:** Crommie, Vazirani, Whaley

**Also listed as:** COMPSCI C191/PHYSICS C191

Quantum Information Science and Technology: Read Less [ - ]

## CHEM 192 Individual Study for Advanced Undergraduates 1 - 3 Units

Terms offered: Spring 2016, Fall 2015, Spring 2015

All properly qualified students who wish to pursue a problem of their own choice, through reading or nonlaboratory study, may do so if their proposed project is acceptable to the member of the staff with whom they wish to work.

Individual Study for Advanced Undergraduates: Read More [ + ]

### Rules & Requirements

**Prerequisites:** Consent of instructor and adviser

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 0 hours of independent study per week

### Summer:

6 weeks - 1-5 hours of independent study per week

8 weeks - 1-4 hours of independent study per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam not required.

Individual Study for Advanced Undergraduates: Read Less [ - ]

## CHEM H193 Senior Honors Thesis 3 Units

Terms offered: Spring 2016, Fall 2015, Spring 2015

A senior honors thesis is written in consultation with the student's faculty research advisor. This is a required course for students wishing to graduate with honors in Chemistry or Chemical Biology.

Senior Honors Thesis: Read More [ + ]

### Rules & Requirements

**Prerequisites:** Senior standing, approval of faculty research advisor, overall GPA of 3.4 or higher at Berkeley

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 9-0 hours of independent study per week

**Summer:** 8 weeks - 16.5 hours of independent study per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Alternative to final exam.

Senior Honors Thesis: Read Less [ - ]



## CHEM H194 Research for Advanced Undergraduates 2 - 4 Units

Terms offered: Fall 2016, Summer 2016 8 Week Session, Spring 2016  
Students may pursue original research under the direction of one of the members of the staff.

Research for Advanced Undergraduates: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** Minimum GPA of 3.4 overall at Berkeley and consent of instructor and adviser

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 0 hours of independent study per week

### Summer:

0 weeks - 2-4 hours of independent study per week

6 weeks - 2-4 hours of independent study per week

8 weeks - 2-4 hours of independent study per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam not required.

Research for Advanced Undergraduates: Read Less [\[-\]](#)

## CHEM 195 Special Topics 3 Units

Terms offered: Fall 2018, Spring 2018, Spring 2016  
Special topics will be offered from time to time. Examples are: photochemical air pollution, computers in chemistry.  
Special Topics: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** Consent of instructor

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

**Summer:** 10 weeks - 4.5 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

Special Topics: Read Less [\[-\]](#)

## CHEM 196 Special Laboratory Study 2 - 4 Units

Terms offered: Spring 2016, Fall 2015, Summer 2015 8 Week Session  
Special laboratory work for advanced undergraduates.

Special Laboratory Study: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** Consent of instructor and adviser

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1-1 hours of independent study per week

### Summer:

6 weeks - 2.5-2.5 hours of independent study per week

8 weeks - 2-2 hours of independent study per week

10 weeks - 1.5-1.5 hours of independent study per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam not required.

Special Laboratory Study: Read Less [\[-\]](#)

## CHEM 197 Field Study in Chemistry 1 - 4 Units

Terms offered: Summer 2016 8 Week Session, Spring 2016, Summer 2015 8 Week Session

Supervised experience in off-campus organizations relevant to specific aspects and applications of chemistry. Written report required at the end of the term. Course does not satisfy unit or residence requirements for the bachelor's degree.

Field Study in Chemistry: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** Upper division standing and consent of instructor

**Credit Restrictions:** Enrollment is restricted; see the Introduction to Courses and Curricula section of this catalog.

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of fieldwork per week

**Summer:** 8 weeks - 6 hours of fieldwork per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Offered for pass/not pass grade only. Final exam not required.

Field Study in Chemistry: Read Less [\[-\]](#)

## CHEM 198 Directed Group Study 1 - 4 Units

Terms offered: Fall 2018, Summer 2018 Second 6 Week Session, Fall 2017

Group study of selected topics.

Directed Group Study: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** Completion of 60 units of undergraduate study and in good standing

**Credit Restrictions:** Enrollment is restricted; see the Introduction to Courses and Curricula section of this catalog.

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1-4 hours of directed group study per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Offered for pass/not pass grade only. Final exam not required.

Directed Group Study: Read Less [\[-\]](#)

## CHEM 199 Supervised Independent Study and Research 1 - 4 Units

Terms offered: Spring 2016, Fall 2015, Spring 2015

Enrollment is restricted by regulations listed in the .

Supervised Independent Study and Research: Read More [\[+\]](#)

### Rules & Requirements

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 0 hours of independent study per week

### Summer:

6 weeks - 1-5 hours of independent study per week

8 weeks - 1-4 hours of independent study per week

### Additional Details

**Subject/Course Level:** Chemistry/Undergraduate

**Grading/Final exam status:** Offered for pass/not pass grade only. Final exam not required.

Supervised Independent Study and Research: Read Less [\[-\]](#)

## CHEM 200 Chemistry Fundamentals 1 Unit

Terms offered: Fall 2018, Fall 2017, Fall 2016

Review of bonding, structure, stereochemistry, conformation, thermodynamics and kinetics, and arrow-pushing formalisms.

Chemistry Fundamentals: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** Graduate standing or consent of instructor

### Hours & Format

**Fall and/or spring:** 6 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Graduate

**Grading:** Letter grade.

Chemistry Fundamentals: Read Less [\[-\]](#)

## CHEM 201 Fundamentals of Inorganic Chemistry 1 Unit

Terms offered: Fall 2018, Fall 2017, Fall 2016

Review of bonding, structure, MO theory, thermodynamics, and kinetics.

Fundamentals of Inorganic Chemistry: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** Graduate standing or consent of instructor

### Hours & Format

**Fall and/or spring:** 6 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Graduate

**Grading:** Letter grade.

Fundamentals of Inorganic Chemistry: Read Less [\[-\]](#)

## CHEM 208 Structure Analysis by X-Ray Diffraction 4 Units

Terms offered: Spring 2017, Spring 2016, Spring 2015

The theory and practice of modern, single-crystal X-ray diffraction. Groups of four students determine the crystal and molecular structure of newly synthesized materials from the College of Chemistry. The laboratory work involves the mounting of crystals and initial evaluation by X-ray diffraction film techniques, the collection of intensity data by automated diffractometer procedures, and structure analysis and refinement.

Structure Analysis by X-Ray Diffraction: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** Consent of instructor

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of lecture and 8 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Chemistry/Graduate

**Grading:** Letter grade.

Structure Analysis by X-Ray Diffraction: Read Less [\[-\]](#)

## CHEM 214 Heterocyclic Chemistry 3 Units

Terms offered: Spring 2018, Spring 2015, Spring 2014

Advanced topics in organic chemistry with a focus on the reactivity and synthesis of aromatic heterocycles. Classic and modern methods for the synthesis of indoles, pyridines, furans, pyrroles, and quinolines will be covered, as well as complex, multi-heteroatom ring systems. Applications to medicinal and bioorganic chemistry will be included where appropriate. Heterocyclic Chemistry: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** Graduate student standing or consent of instructor. A year of organic chemistry with a grade of B- or better is required for undergraduate enrollment

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Graduate

**Grading:** Letter grade.

**Instructor:** Maimone

Heterocyclic Chemistry: Read Less [\[-\]](#)

## CHEM 220A Thermodynamics and Statistical Mechanics 3 Units

Terms offered: Fall 2018, Fall 2017, Fall 2016

A rigorous presentation of classical thermodynamics followed by an introduction to statistical mechanics with the application to real systems.

Thermodynamics and Statistical Mechanics: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** 120B

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Graduate

**Grading:** Letter grade.

Thermodynamics and Statistical Mechanics: Read Less [\[-\]](#)

## CHEM 220B Statistical Mechanics 3 Units

Terms offered: Spring 2017, Spring 2016, Spring 2015

Principles of statistical mechanics and applications to complex systems.

Statistical Mechanics: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** 220A

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Graduate

**Grading:** Letter grade.

Statistical Mechanics: Read Less [\[-\]](#)

## CHEM 221A Advanced Quantum Mechanics 3 Units

Terms offered: Fall 2018, Fall 2017, Fall 2016

Introduction, one dimensional problems, matrix mechanics, approximation methods.

Advanced Quantum Mechanics: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** 120B and 122 or equivalent

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Graduate

**Grading:** Letter grade.

Advanced Quantum Mechanics: Read Less [\[-\]](#)

## CHEM 221B Advanced Quantum Mechanics 3 Units

Terms offered: Spring 2018, Spring 2017, Spring 2016  
Time dependence, interaction of matter with radiation, scattering theory.  
Molecular and many-body quantum mechanics.  
Advanced Quantum Mechanics: Read More [+]

### Rules & Requirements

**Prerequisites:** 221A

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Graduate

**Grading:** Letter grade.

Advanced Quantum Mechanics: Read Less [-]

## CHEM 222 Spectroscopy 3 Units

Terms offered: Fall 2017, Spring 2017, Spring 2015  
This course presents a survey of experimental and theoretical methods of spectroscopy, and group theory as used in modern chemical research. The course topics include experimental methods, classical and quantum descriptions of the interaction of radiation and matter. Qualitative and quantitative aspects of the subject are illustrated with examples including application of linear and nonlinear spectroscopies to the study of molecular structure and dynamics and to quantitative analysis. This course is offered jointly with 122.  
Spectroscopy: Read More [+]

### Rules & Requirements

**Prerequisites:** Graduate standing or consent of instructor

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Graduate

**Grading:** Letter grade.

Spectroscopy: Read Less [-]

## CHEM 223A Chemical Kinetics 3 Units

Terms offered: Spring 2018, Spring 2017, Spring 2016  
Deduction of mechanisms of complex reactions. Collision and transition state theory. Potential energy surfaces. Unimolecular reaction rate theory. Molecular beam scattering studies.  
Chemical Kinetics: Read More [+]

### Rules & Requirements

**Prerequisites:** 220A (may be taken concurrently)

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Graduate

**Grading:** Letter grade.

Chemical Kinetics: Read Less [-]

## CHEM C230 Protein Chemistry, Enzymology, and Bio-organic Chemistry 2 Units

Terms offered: Spring 2015, Spring 2014, Spring 2013  
The topics covered will be chosen from the following: protein structure; protein-protein interactions; enzyme kinetics and mechanism; enzyme design. Intended for graduate students in chemistry, biochemistry, and molecular and cell biology.  
Protein Chemistry, Enzymology, and Bio-organic Chemistry: Read More [+]

### Rules & Requirements

**Prerequisites:** Graduate standing or consent of instructor

### Hours & Format

**Fall and/or spring:**  
10 weeks - 3 hours of lecture per week  
15 weeks - 2 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Graduate

**Grading:** Letter grade.

**Also listed as:** MCELLBI C214

Protein Chemistry, Enzymology, and Bio-organic Chemistry: Read Less [-]

## CHEM C234 Green Chemistry: An Interdisciplinary Approach to Sustainability 3 Units

Terms offered: Spring 2016, Spring 2015, Spring 2014, Spring 2013

Meeting the challenge of global sustainability will require interdisciplinary approaches to research and education, as well as the integration of this new knowledge into society, policymaking, and business. Green Chemistry is an intellectual framework created to meet these challenges and guide technological development. It encourages the design and production of safer and more sustainable chemicals and products. Green Chemistry: An Interdisciplinary Approach to Sustainability: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** One year of chemistry, including a semester of organic chemistry, or consent of instructors based on previous experience

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

**Summer:** 6 weeks - 20 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Graduate

**Grading:** Letter grade.

**Instructors:** Arnold, Bergman, Guth, Iles, Kokai, Mulvihill, Schwarzman, Wilson

**Also listed as:** ESPM C234/PB HLTH C234

Green Chemistry: An Interdisciplinary Approach to Sustainability: Read Less [\[-\]](#)

## CHEM C236 Energy Solutions: Carbon Capture and Sequestration 3 Units

Terms offered: Fall 2018, Spring 2017, Spring 2015, Spring 2014, Spring 2013

After a brief overview of the chemistry of carbon dioxide in the land, ocean, and atmosphere, the course will survey the capture and sequestration of CO<sub>2</sub> from anthropogenic sources. Emphasis will be placed on the integration of materials synthesis and unit operation design, including the chemistry and engineering aspects of sequestration. The course primarily addresses scientific and engineering challenges and aims to engage students in state-of-the-art research in global energy challenges.

Energy Solutions: Carbon Capture and Sequestration: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** Chemistry 4B or 1B, Mathematics 1B, and Physics 7B, or equivalents

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Graduate

**Grading:** Letter grade.

**Instructors:** Bourg, DePaolo, Long, Reimer, Smit

**Also listed as:** CHM ENG C295Z/EPS C295Z

Energy Solutions: Carbon Capture and Sequestration: Read Less [\[-\]](#)

## CHEM C238 The Berkeley Lectures on Energy: Energy from Biomass 3 Units

Terms offered: Fall 2015, Fall 2014, Fall 2013

After an introduction to the different aspects of our global energy consumption, the course will focus on the role of biomass. The course will illustrate how the global scale of energy guides the biomass research. Emphasis will be places on the integration of the biological aspects (crop selection, harvesting, storage, and distribution, and chemical composition of biomass) with the chemical aspects to convert biomass to energy. The course aims to engage students in state-of-art research.

The Berkeley Lectures on Energy: Energy from Biomass: Read More [+]

### Rules & Requirements

**Prerequisites:** Biology 1A; Chemistry 1B or 4B, Mathematics 1B

**Repeat rules:** Course may be repeated for credit under special circumstances: Repeatable when topic changes with consent of instructor.Repeatable when topic changes with consent of instructor.

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Graduate

**Grading:** Letter grade.

**Instructors:** Bell, Blanch, Clark, Smit, C. Somerville

**Also listed as:** BIO ENG C281/CHM ENG C295A/PLANTBI C224

The Berkeley Lectures on Energy: Energy from Biomass: Read Less [-]

## CHEM 243 Advanced Nuclear Structure and Reactions 3 Units

Terms offered: Spring 2013, Fall 2009, Fall 2008

Selected topics on nuclear structure and nuclear reactions.

Advanced Nuclear Structure and Reactions: Read More [+]

### Rules & Requirements

**Prerequisites:** 143 or equivalent and introductory quantum mechanics

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Graduate

**Grading:** Letter grade.

Advanced Nuclear Structure and Reactions: Read Less [-]

## CHEM 250A Introduction to Bonding Theory 1 Unit

Terms offered: Fall 2018, Fall 2017, Fall 2016

An introduction to group theory, symmetry, and representations as applied to chemical bonding.

Introduction to Bonding Theory: Read More [+]

### Rules & Requirements

**Prerequisites:** 200 or 201 or consent of instructor and background in the use of matrices and linear algebra

### Hours & Format

**Fall and/or spring:** 6 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Graduate

**Grading:** Letter grade.

Introduction to Bonding Theory: Read Less [-]

## CHEM 250B Inorganic Spectroscopy 1 Unit

Terms offered: Spring 2015, Spring 2014, Spring 2013

The theory of vibrational analysis and spectroscopy as applied to inorganic compounds.

Inorganic Spectroscopy: Read More [+]

### Rules & Requirements

**Prerequisites:** 250A or consent of instructor

### Hours & Format

**Fall and/or spring:**

6 weeks - 3 hours of lecture per week

15 weeks - 0 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Graduate

**Grading:** Letter grade.

Inorganic Spectroscopy: Read Less [-]

## CHEM 251A Coordination Chemistry I 1 Unit

Terms offered: Fall 2018, Fall 2017, Fall 2016

Structure and bonding, synthesis, and reactions of the d-transition metals and their compounds.

Coordination Chemistry I: Read More [+]

### Rules & Requirements

**Prerequisites:** 250A or consent of instructor

### Hours & Format

**Fall and/or spring:** 6 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Graduate

**Grading:** Letter grade.

Coordination Chemistry I: Read Less [-]

**CHEM 251B Coordination Chemistry II 1 Unit**

Terms offered: Spring 2018, Spring 2014, Spring 2011

Synthesis, structure analysis, and reactivity patterns in terms of symmetry orbitals.

Coordination Chemistry II: Read More [\[+\]](#)

**Rules & Requirements**

**Prerequisites:** 251A or consent of instructor

**Hours & Format**

**Fall and/or spring:** 6 weeks - 3 hours of lecture per week

**Additional Details**

**Subject/Course Level:** Chemistry/Graduate

**Grading:** Letter grade.

Coordination Chemistry II: Read Less [\[-\]](#)

**CHEM 252A Organometallic Chemistry I 1 Unit**

Terms offered: Fall 2018, Fall 2017, Fall 2016

An introduction to organometallics, focusing on structure, bonding, and reactivity.

Organometallic Chemistry I: Read More [\[+\]](#)

**Rules & Requirements**

**Prerequisites:** 200 or 201 or consent of instructor

**Hours & Format**

**Fall and/or spring:** 6 weeks - 3 hours of lecture per week

**Additional Details**

**Subject/Course Level:** Chemistry/Graduate

**Grading:** Letter grade.

Organometallic Chemistry I: Read Less [\[-\]](#)

**CHEM 252B Organometallic Chemistry II 1 Unit**

Terms offered: Fall 2018, Fall 2017, Fall 2016

Applications of organometallic compounds in synthesis with an emphasis on catalysis.

Organometallic Chemistry II: Read More [\[+\]](#)

**Rules & Requirements**

**Prerequisites:** 252A or consent of instructor

**Hours & Format**

**Fall and/or spring:** 6 weeks - 3 hours of lecture per week

**Additional Details**

**Subject/Course Level:** Chemistry/Graduate

**Grading:** Letter grade.

Organometallic Chemistry II: Read Less [\[-\]](#)

**CHEM 253A Materials Chemistry I 1 Unit**

Terms offered: Fall 2018, Fall 2017, Spring 2016

Introduction to the descriptive crystal chemistry and electronic band structures of extended solids.

Materials Chemistry I: Read More [\[+\]](#)

**Rules & Requirements**

**Prerequisites:** 200 or 201, and 250A, or consent of instructor

**Hours & Format**

**Fall and/or spring:**

6 weeks - 3 hours of lecture per week

15 weeks - 0 hours of lecture per week

**Additional Details**

**Subject/Course Level:** Chemistry/Graduate

**Grading:** Letter grade.

Materials Chemistry I: Read Less [\[-\]](#)

**CHEM 253B Materials Chemistry II 1 Unit**

Terms offered: Fall 2018, Fall 2017, Spring 2016

General solid state synthesis and characterization techniques as well as a survey of important physical phenomena including optical, electrical, and magnetic properties.

Materials Chemistry II: Read More [\[+\]](#)

**Rules & Requirements**

**Prerequisites:** 253A or consent of instructor

**Hours & Format**

**Fall and/or spring:**

6 weeks - 3 hours of lecture per week

15 weeks - 0 hours of lecture per week

**Additional Details**

**Subject/Course Level:** Chemistry/Graduate

**Grading:** Letter grade.

Materials Chemistry II: Read Less [\[-\]](#)



## CHEM 253C Materials Chemistry III 1 Unit

Terms offered: Fall 2018, Fall 2017, Spring 2016

Introduction to surface catalysis, organic solids, and nanoscience.

Thermodynamics and kinetics of solid state diffusion and reaction will be covered.

Materials Chemistry III: Read More [a]

### Rules & Requirements

**Prerequisites:** 253A or consent of instructor

### Hours & Format

**Fall and/or spring:** 5 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Graduate

**Grading:** Letter grade.

**Instructors:** Somorjai, Yang

Materials Chemistry III: Read Less [-]

## CHEM 254 Bioinorganic Chemistry 1 Unit

Terms offered: Spring 2015, Spring 2014, Spring 2013

A survey of the roles of metals in biology, taught as a tutorial involving class presentations.

Bioinorganic Chemistry: Read More [a]

### Hours & Format

#### Fall and/or spring:

6 weeks - 3 hours of lecture per week

15 weeks - 0 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Graduate

**Grading:** Letter grade.

Bioinorganic Chemistry: Read Less [-]

## CHEM 260 Reaction Mechanisms 2 Units

Terms offered: Fall 2018, Fall 2017, Fall 2016

Advanced methods for studying organic reaction mechanisms. Topics include kinetic isotope effects, behavior of reactive intermediates, chain reactions, concerted reactions, molecular orbital theory and aromaticity, solvent and substituent effects, linear free energy relationships, photochemistry.

Reaction Mechanisms: Read More [a]

### Rules & Requirements

**Prerequisites:** 200 or consent of instructor

### Hours & Format

**Fall and/or spring:** 10 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Graduate

**Grading:** Letter grade.

**Formerly known as:** 260A-260B

Reaction Mechanisms: Read Less [-]

## CHEM 261A Organic Reactions I 1 Unit

Terms offered: Fall 2018, Fall 2017, Fall 2016

Features of the reactions that comprise the vocabulary of synthetic organic chemistry.

Organic Reactions I: Read More [a]

### Rules & Requirements

**Prerequisites:** 200 or 201 or consent of instructor

### Hours & Format

**Fall and/or spring:** 6 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Graduate

**Grading:** Letter grade.

Organic Reactions I: Read Less [-]

## CHEM 261B Organic Reaction II 1 Unit

Terms offered: Fall 2018, Fall 2017, Fall 2016

More reactions that are useful to the practice of synthetic organic chemistry.

Organic Reaction II: Read More [a]

### Rules & Requirements

**Prerequisites:** 261A or consent of instructor

### Hours & Format

**Fall and/or spring:** 6 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Graduate

**Grading:** Letter grade.

Organic Reaction II: Read Less [-]

**CHEM 261C Organic Reactions III 1 Unit**

Terms offered: Fall 2013, Fall 2012, Fall 2011

This course will consider further reactions with an emphasis on pericyclic reactions such as cycloadditions, electrocyclizations, and sigmatropic rearrangements.

Organic Reactions III: Read More [\[+\]](#)

**Rules & Requirements**

**Prerequisites:** 261B or consent of instructor

**Hours & Format**

**Fall and/or spring:** 6 weeks - 3 hours of lecture per week

**Additional Details**

**Subject/Course Level:** Chemistry/Graduate

**Grading:** Letter grade.

Organic Reactions III: Read Less [\[-\]](#)

**CHEM 262 Metals in Organic Synthesis 1 Unit**

Terms offered: Spring 2018, Spring 2017, Spring 2016

Transition metal-mediated reactions occupy a central role in asymmetric catalysis and the synthesis of complex molecules. This course will describe the general principles of transition metal reactivity, coordination chemistry, and stereoselection. This module will also emphasize useful methods for the analysis of these reactions.

Metals in Organic Synthesis: Read More [\[+\]](#)

**Rules & Requirements**

**Prerequisites:** 261B or consent of instructor

**Hours & Format**

**Fall and/or spring:**

6 weeks - 3 hours of lecture per week

15 weeks - 0 hours of lecture per week

**Additional Details**

**Subject/Course Level:** Chemistry/Graduate

**Grading:** Letter grade.

Metals in Organic Synthesis: Read Less [\[-\]](#)

**CHEM 263A Synthetic Design I 1 Unit**

Terms offered: Spring 2018, Spring 2017, Spring 2016

This course will describe the application of modern reactions to the total synthesis of complex target molecules. Natural products, such as alkaloids, terpenes, or polypropionates, as well as theoretically interesting "non-natural" molecules will be covered.

Synthetic Design I: Read More [\[+\]](#)

**Rules & Requirements**

**Prerequisites:** 262 or consent of instructor

**Hours & Format**

**Fall and/or spring:**

6 weeks - 3 hours of lecture per week

15 weeks - 0 hours of lecture per week

**Additional Details**

**Subject/Course Level:** Chemistry/Graduate

**Grading:** Letter grade.

Synthetic Design I: Read Less [\[-\]](#)

**CHEM 263B Synthetic Design II 1 Unit**

Terms offered: Spring 2018, Spring 2017, Spring 2016

The principles of retrosynthetic analysis will be laid down and the chemistry of protecting groups will be discussed. Special attention will be given to the automated synthesis of biopolymers such as carbohydrates, peptides, and proteins, as well as nucleic acids.

Synthetic Design II: Read More [\[+\]](#)

**Rules & Requirements**

**Prerequisites:** 263A or consent of instructor

**Hours & Format**

**Fall and/or spring:**

6 weeks - 3 hours of lecture per week

15 weeks - 0 hours of lecture per week

**Additional Details**

**Subject/Course Level:** Chemistry/Graduate

**Grading:** Letter grade.

Synthetic Design II: Read Less [\[-\]](#)

## CHEM 265 Nuclear Magnetic Resonance Theory and Application 1 Unit

Terms offered: Fall 2018, Fall 2017, Fall 2016

The theory behind practical nuclear magnetic resonance spectroscopy and a survey of its applications to chemical research.

Nuclear Magnetic Resonance Theory and Application: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** 200 or 201 or consent of instructor

### Hours & Format

#### Fall and/or spring:

6 weeks - 3 hours of lecture per week

15 weeks - 0 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Graduate

**Grading:** Letter grade.

Nuclear Magnetic Resonance Theory and Application: Read Less [\[-\]](#)

## CHEM 268 Mass Spectrometry 2 Units

Terms offered: Spring 2018, Spring 2017, Spring 2016

Principles, instrumentation, and application in mass spectrometry, including ionization methods, mass analyzers, spectral interpretation, multidimensional methods (GC/MS, HPLC/MS, MS/MS), with emphasis on small organic molecules and bioanalytical applications (proteins, peptides, nucleic acids, carbohydrates, noncovalent complexes); this will include the opportunity to be trained and checked out on several open-access mass spectrometers.

Mass Spectrometry: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** Graduate standing or consent of instructor

### Hours & Format

**Fall and/or spring:** 10 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Graduate

**Grading:** Letter grade.

Mass Spectrometry: Read Less [\[-\]](#)

## CHEM 270A Advanced Biophysical Chemistry I 1 Unit

Terms offered: Spring 2018, Spring 2016, Spring 2015

Underlying principles and applications of methods for biophysical analysis of biological macromolecules.

Advanced Biophysical Chemistry I: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** 200 or consent of instructor

### Hours & Format

**Fall and/or spring:** 7.5 weeks - 2 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Graduate

**Grading:** Letter grade.

Advanced Biophysical Chemistry I: Read Less [\[-\]](#)

## CHEM 270B Advanced Biophysical Chemistry II 1 Unit

Terms offered: Spring 2018, Spring 2016, Spring 2015

More applications of methods for biophysical analysis of biological macromolecules.

Advanced Biophysical Chemistry II: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** 270A or consent of instructor

### Hours & Format

**Fall and/or spring:** 7.5 weeks - 2 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Graduate

**Grading:** Letter grade.

Advanced Biophysical Chemistry II: Read Less [\[-\]](#)

## CHEM C271A Chemical Biology I - Structure, Synthesis and Function of Biomolecules 1 Unit

Terms offered: Spring 2018, Spring 2017, Spring 2016

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.

Chemical Biology I - Structure, Synthesis and Function of Biomolecules:

Read More [\[+\]](#)

### Hours & Format

**Fall and/or spring:** 5 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Graduate

**Grading:** Letter grade.

**Also listed as:** MCELLBI C212A

Chemical Biology I - Structure, Synthesis and Function of Biomolecules:

Read Less [\[-\]](#)

## CHEM C271B Chemical Biology II - Enzyme Reaction Mechanisms 1 Unit

Terms offered: Spring 2018, Spring 2017, Spring 2016

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.

Chemical Biology II - Enzyme Reaction Mechanisms: Read More [\[+\]](#)

### Hours & Format

**Fall and/or spring:** 5 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Graduate

**Grading:** Letter grade.

**Also listed as:** MCELLBI C212B

Chemical Biology II - Enzyme Reaction Mechanisms: Read Less [\[-\]](#)

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

Terms offered: Spring 2018, Spring 2017, Spring 2016

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.

Chemical Biology III - Contemporary Topics in Chemical Biology: Read More [\[+\]](#)

### Hours & Format

**Fall and/or spring:** 5 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Graduate

**Grading:** Letter grade.

**Also listed as:** MCELLBI C212C

Chemical Biology III - Contemporary Topics in Chemical Biology: Read Less [\[-\]](#)

## CHEM 295 Special Topics 1 - 3 Units

Terms offered: Fall 2018, Spring 2016, Fall 2015

Lecture series on topics of current interest. Recently offered topics:

Natural products synthesis, molecular dynamics, statistical mechanics, molecular spectroscopy, structural biophysics, organic polymers, electronic structure of molecules and bio-organic chemistry.

Special Topics: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** Graduate standing or consent of instructor

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1-3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Graduate

**Grading:** Offered for satisfactory/unsatisfactory grade only.

Special Topics: Read Less [\[-\]](#)

## CHEM 298 Seminars for Graduate Students 1 - 3 Units

Terms offered: Fall 2018, Spring 2018, Fall 2017

In addition to the weekly Graduate Research Conference and weekly seminars on topics of interest in biophysical, organic, physical, nuclear, and inorganic chemistry, there are group seminars on specific fields of research. Seminars will be announced at the beginning of each semester. Seminars for Graduate Students: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** Graduate standing

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1-3 hours of colloquium per week

### Additional Details

**Subject/Course Level:** Chemistry/Graduate

**Grading:** Offered for satisfactory/unsatisfactory grade only.

Seminars for Graduate Students: Read Less [\[-\]](#)

## CHEM 299 Research for Graduate Students 1 - 9 Units

Terms offered: Fall 2018, Spring 2018, Fall 2017

The facilities of the laboratory are available at all times to graduate students pursuing original investigations toward an advanced degree at this University. Such work is ordinarily in collaboration with a member of the staff.

Research for Graduate Students: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** Graduate standing

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 0 hours of independent study per week

### Additional Details

**Subject/Course Level:** Chemistry/Graduate

**Grading:** Letter grade.

Research for Graduate Students: Read Less [\[-\]](#)

## CHEM 300 Professional Preparation: Supervised Teaching of Chemistry 2 Units

Terms offered: Fall 2018, Spring 2018, Fall 2017

Discussion, curriculum development, class observation, and practice teaching in chemistry.

Professional Preparation: Supervised Teaching of Chemistry: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** Graduate standing and appointment as a graduate student instructor

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of seminar per week

### Additional Details

**Subject/Course Level:** Chemistry/Professional course for teachers or prospective teachers

**Grading:** Letter grade.

Professional Preparation: Supervised Teaching of Chemistry: Read Less [\[-\]](#)

## CHEM 301 Pre-High School Chemistry Classroom Immersion 1 Unit

Terms offered: Fall 2018, Fall 2017, Spring 2017

Provides training and opportunity for graduate students to make presentations in local public schools. Training ensures that presenters are aware of scientific information mandated by the State of California for particular grade levels, and that presentations are intellectually stimulating, relevant to the classroom students' interests, and age-appropriate. Time commitment an average of two to three hours/week, but actual time spent is concentrated during preparation and classroom delivery of presentations, which are coordinated between teachers' needs and volunteers' availability.

Pre-High School Chemistry Classroom Immersion: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** Graduate standing

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1 hour of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Professional course for teachers or prospective teachers

**Grading:** Offered for satisfactory/unsatisfactory grade only.

**Instructor:** Bergman

Pre-High School Chemistry Classroom Immersion: Read Less [\[-\]](#)

## CHEM 301A Undergraduate Lab Instruction 2 Units

Terms offered: Fall 2017, Spring 2017, Fall 2016

Tutoring of students in 1AL and 1B laboratory. Students attend one hour of the regular GSI preparatory meeting and hold one office hour per week to answer questions about laboratory assignments.

Undergraduate Lab Instruction: [Read More](#) [+]

### Rules & Requirements

**Prerequisites:** Junior standing or consent of instructor; 1A, 1AL, and 1B with grades of B- or higher

**Repeat rules:** Course may be repeated for credit up to a total of 4 units. Course may be repeated for a maximum of 4 units.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1 hour of lecture and 4 hours of tutorial per week

### Additional Details

**Subject/Course Level:** Chemistry/Professional course for teachers or prospective teachers

**Grading:** Offered for pass/not pass grade only.

Undergraduate Lab Instruction: [Read Less](#) [-]

## CHEM 301B Undergraduate Chemistry Instruction 2 Units

Terms offered: Fall 2017, Spring 2017, Fall 2016

Tutoring of students in 1A-1B. Students attend a weekly meeting on tutoring methods at the Student Learning Center and attend 1A-1B lectures.

Undergraduate Chemistry Instruction: [Read More](#) [+]

### Rules & Requirements

**Prerequisites:** Sophomore standing; 1A, 1AL, and 1B with grades of B- or higher

**Repeat rules:** Course may be repeated for credit up to a total of 4 units. Course may be repeated for a maximum of 4 units.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1 hour of lecture and 5 hours of tutorial per week

### Additional Details

**Subject/Course Level:** Chemistry/Professional course for teachers or prospective teachers

**Grading:** Offered for pass/not pass grade only.

**Formerly known as:** 301

Undergraduate Chemistry Instruction: [Read Less](#) [-]

## CHEM 301C Chemistry Teacher Scholars 2 Units

Terms offered: Fall 2018, Spring 2018, Fall 2017

The Chemistry Undergraduate Teacher Scholar Program places undergraduate students as apprentice instructors in lower division laboratory and discussion sections. In a weekly meeting with instructors, participants learn about teaching, review chemistry knowledge, and are coached to mentor students.

Chemistry Teacher Scholars: [Read More](#) [+]

### Rules & Requirements

**Prerequisites:** Chemistry 1A or Chemistry 4A or equivalent. Consent of instructor required

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1.5-1.5 hours of lecture and 1-1 hours of discussion per week

### Additional Details

**Subject/Course Level:** Chemistry/Professional course for teachers or prospective teachers

**Grading:** Offered for pass/not pass grade only.

Chemistry Teacher Scholars: [Read Less](#) [-]

## CHEM 301D Undergraduate Chemistry Course Instruction 1 - 2 Units

Terms offered: Fall 2017, Spring 2017, Fall 2016

Tutoring of students enrolled in an undergraduate chemistry course.

Undergraduate Chemistry Course Instruction: [Read More](#) [+]

### Rules & Requirements

**Prerequisites:** Junior standing or consent of instructor; completion of tutored course with a grade of B- or better

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 2-4 hours of tutorial per week

### Additional Details

**Subject/Course Level:** Chemistry/Professional course for teachers or prospective teachers

**Grading:** Offered for pass/not pass grade only.

Undergraduate Chemistry Course Instruction: [Read Less](#) [-]

## CHEM 301T Undergraduate Preparation for Teaching or Instruction in Teaching 2 Units

Terms offered: Spring 2015, Spring 2014, Spring 2013

Undergraduate Preparation for Teaching or Instruction in Teaching: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** Junior standing, overall GPA 3.1, and consent of instructor

**Repeat rules:** Course may be repeated for credit up to a total of 8 units. Course may be repeated for a maximum of 8 units.

### Hours & Format

**Fall and/or spring:** 15 weeks - 2-3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Chemistry/Professional course for teachers or prospective teachers

**Grading:** Letter grade.

Undergraduate Preparation for Teaching or Instruction in Teaching: Read Less [\[-\]](#)

## CHEM 301W Supervised Instruction of Chemistry Scholars 2 Units

Terms offered: Fall 2017, Spring 2017, Fall 2016

Tutoring of students in the College of Chemistry Scholars Program who are enrolled in general or organic chemistry. Students attend a weekly meeting with instructors.

Supervised Instruction of Chemistry Scholars: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** Sophomore standing and consent of instructor

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1 hour of independent study and 4-5 hours of tutorial per week

### Additional Details

**Subject/Course Level:** Chemistry/Professional course for teachers or prospective teachers

**Grading:** Offered for pass/not pass grade only.

Supervised Instruction of Chemistry Scholars: Read Less [\[-\]](#)

## CHEM 375 Professional Preparation: Supervised Teaching of Chemistry 2 Units

Terms offered: Prior to 2007

Discussion, curriculum development, class observation, and practice teaching in chemistry.

Professional Preparation: Supervised Teaching of Chemistry: Read More [\[+\]](#)

### Rules & Requirements

**Prerequisites:** Graduate standing and appointment as a graduate student instructor

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of seminar per week

### Additional Details

**Subject/Course Level:** Chemistry/Professional course for teachers or prospective teachers

**Grading:** Letter grade.

Professional Preparation: Supervised Teaching of Chemistry: Read Less [\[-\]](#)

## CHEM 602 Individual Study for Doctoral Students 1 - 8 Units

Terms offered: Fall 2017, Spring 2017, Fall 2016

Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D. degree. May not be used for unit or residence requirements for the doctoral degree.

Individual Study for Doctoral Students: Read More [\[+\]](#)

### Rules & Requirements

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1-8 hours of independent study per week

**Summer:** 8 weeks - 1.5-15 hours of independent study per week

### Additional Details

**Subject/Course Level:** Chemistry/Graduate examination preparation

**Grading:** Offered for satisfactory/unsatisfactory grade only.

Individual Study for Doctoral Students: Read Less [\[-\]](#)



## **CHEM 700 QB3 Colloquium for Graduate Students 0.0 Units**

Terms offered: Fall 2017, Fall 2016

Weekly Graduate colloquium on topics of interest in QB3 research.

QB3 Colloquium for Graduate Students: [Read More](#) [+]

### **Rules & Requirements**

**Prerequisites:** Graduate standing

**Repeat rules:** Course may be repeated for credit without restriction.

### **Hours & Format**

**Fall and/or spring:** 15 weeks - 1-2 hours of colloquium per week

### **Additional Details**

**Subject/Course Level:** Chemistry/Graduate examination preparation

**Grading:** Offered for satisfactory/unsatisfactory grade only.

**Formerly known as:** Chemistry 999

QB3 Colloquium for Graduate Students: [Read Less](#) [-]