

# CHEMISTRY (CHEM)

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**CHEM 6611 Selected Topics in Physical Chemistry**

6 credit hours

This is a graduate-level directed study course in a specific area of physical chemistry. Topics can vary but reflect the expertise of the instructor and the research interests of the student(s).

**CHEM 6612 Quantum Chemistry**

3 credit hours

The advanced principles of quantum physics are used to develop an understanding of atomic and molecular structure. This is a modified version of undergraduate course CHEM 4412. Students attend the undergraduate lectures and are expected to complete at least the course requirements of the undergraduate course as well as any supplementary graduate requirements as specified by the instructor.

**CHEM 6613 Physical Chemistry**

3 credit hours

An advanced course on statistical thermodynamics and the study of chemical reaction rates and mechanisms. This is a modified version of undergraduate course CHEM 4413. Students attend the undergraduate lectures and are expected to complete at least the course requirements of the undergraduate course as well as any supplementary graduate requirements as specified by the instructor.

**CHEM 6614 Symmetry and Chemical Applications of Group Theory**

3 credit hours

An advanced course on symmetry and group theory for the experimental chemist. Applications of point groups and space groups in organic chemistry, inorganic chemistry, molecular spectroscopy, atomic and molecular structure and crystallography. This is a modified version of undergraduate course CHEM 4414. Students attend the undergraduate lectures and are expected to complete at least the course requirements of the undergraduate course as well as any supplementary graduate requirements as specified by the instructor.

**CHEM 6621 Selected Topics in Inorganic Chemistry**

6 credit hours

This is a graduate-level directed study course in a specific area of inorganic chemistry. Topics can vary but reflect the expertise of the instructor and the research interests of the student(s).

**CHEM 6622 Advanced Topics in Inorganic Chemistry**

3 credit hours

Current topics and applications of inorganic chemistry will be covered, and may include the following: cluster chemistry, chemistry of the lanthanides and actinides, inorganic and organometallic materials, bioinorganic chemistry and inorganic photochemistry. This is a modified version of undergraduate course CHEM 4422. Students attend the undergraduate lectures and are expected to complete at least the course requirements of the undergraduate course as well as any supplementary graduate requirements as specified by the instructor.

**CHEM 6631 Selected Topics in Analytical Chemistry**

6 credit hours

This is a graduate-level directed study course in a specific area of analytical chemistry. Topics can vary but reflect the expertise of the instructor and the research interests of the student(s).

**CHEM 6632 Instrumental Analysis I**

3 credit hours

Emphasis will be placed on i) separation techniques including high performance and gas chromatography; ii) organic mass spectrometry; iii) analogue circuits and devices and digital electronics. This is a modified version of undergraduate course CHEM 3432. Students attend the undergraduate lectures and are expected to complete at least the course requirements of the undergraduate course as well as any supplementary graduate requirements as specified by the instructor.

**CHEM 6633 Instrumental Analysis II**

3 credit hours

Emphasis will be placed on (i) atomic spectroscopy including atomic absorption and emission; (ii) x-ray fluorescence; (iii) modern electrochemical techniques including differential pulse voltammetry and stripping analysis; (iv) inorganic mass spectrometry. This is a modified version of undergraduate course CHEM 4443. Students attend the undergraduate lectures and are expected to complete at least the course requirements of the undergraduate course as well as any supplementary graduate requirements as specified by the instructor.

**CHEM 6641 Selected Topics in Analytical Chemistry**

6 credit hours

This is a graduate-level directed study course in a specific area of organic chemistry. Topics may include organic synthesis, stereochemistry, heterocyclic compounds and natural products, and reflect the expertise of the instructor and the research interests of the student(s).

**CHEM 6643 Organic Reaction Mechanisms**

3 credit hours

A study of the more important mechanisms of reactions of organic molecules and the methods by which they are elucidated: applications of kinetic data, isotope effects, linear free energy relationships, orbital symmetry control and acid and base catalysis. This is a modified version of undergraduate course CHEM 3443. Students attend the undergraduate lectures and are expected to complete at least the course requirements of the undergraduate course as well as any supplementary graduate requirements as specified by the instructor.

**CHEM 6644 Synthesis in Organic**

3 credit hours

A study of the principles involved in the planning and execution of the synthesis of organic molecules. Laboratory experiments are designed so that students learn to identify their products by the use of spectroscopic and other techniques. This is a modified version of undergraduate course CHEM 4444. Students attend the undergraduate lectures and are expected to complete at least the course requirements of the undergraduate course as well as any supplementary graduate requirements as specified by the instructor.

**CHEM 6645 Organic Spectroscopy**

3 credit hours

An advanced course on interpretation of  $^1\text{H}$  and  $^{13}\text{C}$  nuclear magnetic resonance spectra. Infrared spectroscopy, mass spectrometry, and ultra-violet spectrophotometry will also be applied to the problems of organic and organometallic structural determination. This is a modified version of undergraduate course CHEM 3445. Students attend the undergraduate lectures and are expected to complete at least the course requirements of the undergraduate course as well as any supplementary graduate requirements as specified by the instructor.

**CHEM 6651 Biochemistry**

3 credit hours

This course reviews and/or presents an advanced course on the chemistry and biochemistry of macromolecules such as proteins, enzymes, simple and complex carbohydrates, lipids, nucleic acids, and coenzymes. A relationship between the molecular structure of a given macromolecule, its properties, and its function in the living system is explored. The laboratory work concentrates on the isolation, purification, and analysis of naturally occurring macromolecules and includes study of their properties, using micro chemical measurements. This is a modified version of undergraduate course CHEM 3451. Students attend the undergraduate lectures and are expected to complete at least the course requirements of the undergraduate course as well as any supplementary graduate requirements as specified by the instructor.

**CHEM 6652 Biochemistry: Metabolism**

3 credit hours

A course presenting principles of metabolism of biomolecules involved in energy production, formation of biosynthetic substrates and metabolism of nucleic acids. Both catabolic and anabolic processes as well as transport of biomolecules within cells and organs are considered. This is a modified version of undergraduate course CHEM 4452. Students attend the undergraduate lectures and are expected to complete at least the course requirements of the undergraduate course as well as any supplementary graduate requirements as specified by the instructor.

**CHEM 6653 Selected Topics in Biochemistry**

6 credit hours

This is a graduate-level directed study course in a specific area of biochemistry. Topics can vary but reflect the expertise of the instructor and the research interests of the student(s).

**CHEM 6690 Directed Study in Chemistry**

3 credit hours

These courses are intended to supplement the course offerings in chemistry and allow students to delve deeper into a subject of particular interest to them. Students must show some initiative and be willing to work independently.