

Chemistry (CHEM)

CHEM 5300 Chemistry Graduate Practice **0 SCH (0-0)**

The beginning graduate student must complete a one-semester course Chemistry Graduate Practice. The course provides a general orientation and resources for incoming graduate students related to the Chemistry Graduate Program. Students are explained the different degree plan options and concentration areas. The course offers workshops for thesis writing, group discussion, and meetings with the the course instructor for individual guidance.

CHEM 5301 Advanced Chemistry Instruments **3 SCH (2-4)**

Principles and practices in design of instruments for research, analysis and process control. Prerequisite: CHEM 4401.

Fee: \$5.00

CHEM 5303 Advanced Analytical Chem **3 SCH (3-0)**

An advanced survey of principles of chemical analysis with emphasis on newer developments in the field of analytical chemistry. Prerequisite: CHEM 4401.

CHEM 5305 Project Research **3 SCH (3)**

Designed for students on a project research degree plan. Requires completion of a research project within one semester of research activity.

Prerequisite: Departmental approval.

CHEM 5306 Thesis Research **3 SCH (3)**

Designed for students on a thesis research degree plan. Requires completion of a thesis project in two semesters of research activity. May be repeated for a maximum of 6 semester hours. Prerequisite: Departmental approval.

CHEM 5308 Chem/Biochem Analysis **3 SCH (3-0)**

The use of advanced synchronous x-ray, Raman and mass spectrometry for surface-profiling and depth-profiling of chemical and biochemical materials, material-air/solution interface. Prerequisite: CHEM 4401 or equivalent measurement, spectroscopy or analytical course.

CHEM 5311 Advanced Inorganic Chemistry **3 SCH (3-0)**

In depth study of d- and f-block elements, their acid-base properties, standard reduction potentials, periodic trends of properties of the elements and their compounds, ligand field theory, coordination compounds, bonding and structure, optical and magnetic properties, and reaction mechanism of coordination compounds. Recovery of d- and f-block elements and industrial applications as well as metal ions in biomolecules will be discussed.

Prerequisite: CHEM 4311.

CHEM 5312 Coordination Chem & Catalysis **3 SCH (3-0)**

Coordination chemistry is the study of compounds formed between metal ions and other neutral or negatively charged molecules. Aspects covered relate to characterization, synthesis, structure and chemical analysis of coordinated materials used in catalysis. Topics include: Introduction to chemical catalysis, kinetics, reaction theory, catalyst characterization, solid catalysts, surface reactivity and catalysis in practice with an emphasis on energy.

Prerequisite: CHEM 4311 or approval by instructor.

CHEM 5313 Chemistry and Nanoscience **3 SCH (3-0)**

Chemical concepts related to nanoscience. Selected topics include chemical, optical, electronic, and magnetic interactions produced by nanomaterials, the relationship between microstructural scale and its influence on physical mechanism, and appropriate applications such as solar devices, fuel cells or biomedical agents. Prerequisite: Departmental Approval.

CHEM 5323 Advanced Organic Chemistry **3 SCH (3-0)**

An advanced treatment of organic chemistry including a study of both cyclic and acyclic compounds. Prerequisites: CHEM 3323/3123 and CHEM 3325/3125.

CHEM 5324 Designing Organic Syntheses **3 SCH (3-0)**

A one-semester course that reviews the syntheses of increasingly complex molecules and the retrosynthetic strategies used to develop the synthetic schemes. Required development of a synthetic plan for a structure taken from the recent literature. Prerequisites: CHEM 3325, CHEM 5323.

CHEM 5325 Chemistry of Natural Products **3 SCH (3-0)**

A one-semester course that provides an introduction to the broad field of natural products chemistry by reviewing the major classes of natural products in terms of isolation, structure, properties, synthesis and physiological importance where applicable. Prerequisite: CHEM 3325.

CHEM 5326 Heterocyclic Chemistry **3 SCH (3-0)**

A one-semester course that provides an introduction to the broad field of heterocyclic chemistry by reviewing the major classes of heterocyclic compounds in terms of nomenclature, structure, properties, preparations, reactions and physiological importance where applicable. Prerequisite: CHEM 3325.

CHEM 5327 Advanced Organic Synthesis **3 SCH (3-0)**

An in-depth survey of modern synthetic reactions in the areas of carbon-carbon single and double bond formations and cycloaddition reactions. Prerequisites: CHEM 3125, CHEM 3325.

CHEM 5328 Physical Organic Chemistry **3 SCH (3-0)**

A one-semester course that provides an in-depth survey of molecular orbital theory in a thorough and rigorous manner and emphasizes the molecular orbital interpretation of various types of concerted pericyclic reactions. Prerequisites: CHEM 3125, CHEM 3325.

CHEM 5329 Asymmetric Synthesis 3 SCH (3)

An in-depth survey of practical methods for the synthesis of enantiomerically pure organic compounds in agrochemical and pharmaceutical industries and in university research laboratories. Prerequisites: CHEM 3125, CHEM 3325.

CHEM 5331 Advanced Physical Chemistry 3 SCH (3-0)

Detailed investigation of modern and traditional approaches to the study of chemical reaction rates. Prerequisites: CHEM 3331, CHEM 3332, CHEM 4131, CHEM 4132.

CHEM 5332 Molecular Modeling 3 SCH (3-0)

As an introduction to Quantum Mechanics-Molecular Modeling, this course serves two purposes: (1) Use computational tools to help increase student understanding of material already covered in various chemistry courses (2) Teach students about computational chemistry (molecular modeling) itself, with the goal to enable them to apply these computational tools in research projects. Prerequisite: CHEM 3332 or approval by instructor.

CHEM 5333 Bioinformatics 3 SCH (3-0)

Computational models of biological systems and mechanisms. Models may use tools and web applications to solve diverse problems, such as protein or nucleic acid structure, function, stability, or evolutionary relationship. Prerequisite: CHEM 3181 or equivalent literature or research methods course.

CHEM 5341 Biochem Analysis of Proteins 3 SCH (3-0)

Biochemical study of proteins (methods of protein purification, principles of protein structure and the study of proteins as enzymes). Prerequisite: CHEM 4341.

CHEM 5342 Biochem Analysis of Gene Ex 3 SCH (3-0)

Biochemical study of nucleic acids and the expression of genetic information (nucleic acid structures and manipulation, transcription and translation). Prerequisite: CHEM 4341.

CHEM 5343 Forensic Chemistry 3 SCH (3-0)

Understanding the theory, concepts and application of forensic chemistry to complex problem solving related to crime detection and solving of crime via chemical means, such as use of mass spectrometry, chromatography, and spectroscopy. Prerequisite: CHEM 4401 or equivalent analytical or bioanalytical course.

CHEM 5345 Medical Biochemistry 3 SCH (0-3-0-0-1)

The course examines fundamental aspects of biochemistry critical to understanding the chemical and cellular mechanisms relevant to health and disease including metabolism, enzymology, and genetics. Counts as an elective for the Health Science Post-baccalaureate Certificate

CHEM 5351 Environmental Chemistry 3 SCH (3-0)

The advanced study of chemistry as the basis of the environmental regulations for air pollution, water pollution, solid/hazardous wastes, toxic commercial chemical products and employee safety. Prerequisite: CHEM 1311/CHEM 1111 and CHEM 1312/CHEM 1112 or equivalent.

CHEM 5363 Chem & Morphological Analysis 3 SCH (3-0)

State-of-the-art techniques commonly employed in modern materials characterization. Aspects covered relate to characterization, structure and chemical analysis of materials. Techniques include microscopy, spectroscopy and X-ray diffraction. Prerequisite: Departmental Approval.

CHEM 5365 Graduate Research 3 SCH (3-0)

Individual research problems defined and supervised by a Department of Chemistry graduate faculty member with permission of the department chair. Provides experiences in individual design, execution and reporting of small units of research of professional caliber. May be repeated; no more than 6 hours may be counted toward one degree. Prerequisite: Departmental approval and completion of appropriate safety courses, as defined by the research mentor.

CHEM 5412 Special Topics in Chemistry 1-4 SCH (1-4-0)

A detailed study of special areas of chemistry featuring current advances and trends. Course may be repeated for credit when topics are different. A laboratory may or may not be offered.

Fee: \$5.00