**DESCRIPTION OF GRADUATE COURSES**

**CHEM 5000. ADVANCED INORGANIC CHEMISTRY I. (3)** Topics include atomic and molecular structure, bonding theories, molecular symmetry; and group theory, chemistry of transition metals and organometallic complexes, and catalysis. Prerequisites: CHEM 3220 (Physical Chemistry II) and CHEM4200, 4201 (Inorganic Chemistry I). Required of all degree candidates. Offered only in fall.

**CHEM 5010. ADVANCED INORGANIC CHEMISTRY II. (3)** Spectroscopic characterization of inorganic and organometallic compounds, and reaction mechanisms of inorganic, organometallic, and bioinorganic compounds. Prerequisite: CHEM 4210 (Inorganic Chemistry II) or CHEM 5000. Offered only in spring.

**CHEM 5110. RESEARCH. (1-9)** A variable-credit course in methods of research and reporting in the field of chemistry. Only five hours is applicable toward degree requirements. Required of all degree candidates. Offered every semester.

**CHEM 5120. THESIS WRITING. (2)** Research and writing under the supervision of the thesis director. Once students have registered for this class, they must re-enroll in it every semester until they complete the thesis. Required of all degree candidates. Offered every semester.

**CHEM 5210. ADVANCED ORGANIC CHEMISTRY I. (3)** A critical study of the structural theory of organic chemistry and advanced discussion of reaction mechanism. Prerequisites: **CHEM 2020, 2021** (Organic Chemistry II [formerly **CHEM 212, 212L])** and CHEM **3220, 3221** (Physical Chemistry II). Required of all degree candidates. Offered only in fall.

**CHEM 5220. ADVANCED ORGANIC CHEMISTRY II. (3)** Synthesis of natural products. Prerequisite: CHEM 5210, or permission of instructor. Offered only in spring.

**CHEM 5310. ADVANCED PHYSICAL CHEMISTRY I. (3)** A broad discussion of the laws of thermodynamics, quantum mechanics, spectroscopy, and classical transport processes, as well as an introduction to statistical mechanics. Prerequisites: CHEM 3220, 3221 (Physical Chemistry II). Required of all degree candidates. Offered only in spring.

**CHEM 5320. ADVANCED PHYSICAL CHEMISTRY II. (3)** A focus on quantum mechanics as it applies to chemistry, including molecular orbital theory and the relationship of quantum mechanics to molecular spectroscopy. Prerequisite: CHEM 5310, or permission of the instructor. Offered only in the fall.

**CHEM 5360. CHEMICAL KINETICS. (3)** Experimental and theoretical considerations of chemical reaction rates and mechanisms. Prerequisite: CHEM 5310. Offered on demand.

**CHEM 5410. ADVANCED BIOCHEMISTRY I. (3)** An in-depth study of the chemical and physical properties and biological functions of proteins, carbohydrates, lipids, and nucleic acids. Prerequisites: CHEM 3420, 3421 (General Biochemistry II), or permission of instructor. Offered only in fall.

**CHEM 5420. ADVANCED BIOCHEMISTRY II. (3)** An in-depth study of the catabolic pathways, including their chemical reactions, energetics, and regulation. Prerequisite: CHEM 5410, or permission of the instructor. Offered only in spring.

**CHEM 5510. ADVANCED ANALYTICAL CHEMISTRY. (3**) A critical study of recent developments in chemical and instrumental methods of analysis. Prerequisite: CHEM 3220, 3221 (Physical Chemistry II). Required of all degree candidates. Offered only in spring.

**CHEM 5600. SPECTROSCOPIC METHODS IN CHEMISTRY. (3**) Various spectroscopic methods in chemistry, concentrating on the practical aspect of using spectroscopic techniques to solve structural problems. Techniques include ultraviolet spectroscopy, infrared spectroscopy, nuclear magnetic resonance (NMR) spectroscopy, including “two dimensional” (2D) NMR in solving problems, mass spectrometry (MS). Prerequisites: CHEM 2020, 2021 (Organic Chemistry II) or equivalent. Offered in fall.

**CHEM 6005, 6006. SEMINAR I, II. (1, 1)** Review and discussion of important current literature in the various areas of chemistry. Both courses required of all degree candidates. CHEM 6005 offered in fall and 6006 in spring.

**CHEM 6405, 6406, 6407, 6408, 6409. SPECIAL TOPICS IN ANALYTICAL CHEMISTRY, BIOCHEMISTRY, INORGANIC CHEMISTRY, ORGANIC CHEMISTRY, AND PHYSICAL CHEMISTRY. (3, 3, 3, 3, 3)** Faculty-generated lecture courses on selected topics of current interest or student need. Offered on demand.

**CHEM 6200. BIOCHEMISTRY OF CELLULAR SIGNAL TRANSDUCTION. (3)** Study of the biochemical processes involved in cellular responses to signal molecules, such as hormones. Focus on the mechanisms by which cells transform extracellular signals into changes in cellular function. Pre-requisites: **CHEM 3410**, **CHEM 5410**, or permission of the instructor. Offered in the fall.

**CHEM 6500. CANCER BIOCHEMISTRY AND BIOLOGY: (3)** An in-depth study of the biochemical and biological basis of cancer.  Topics include biochemistry/biology of: cellular oncogenes; growth factor receptors; tumor suppressors; angiogenesis; invasion and metastasis; and cancer treatment.   Prerequisites: ~~CHEM5410 or~~ Permission of the instructor. Three hours of lecture per week.  Offered only in Spring

**CHEM 6800 ADVANCED PHARMACOLOGY. (3)** An in-depth discussion of the principles of pharmacology and how it applies to the evaluation and development of drugs. Topics covered include pharmacokinetics, absorption, metabolism, distribution, transport mechanisms and clinical aspects. Prerequisite: CHEM 3410. Offered only in the Fall.