CHEMISTRY (CHEM)

CHEM 3110 Chemical Systems I (3 Credits)
Advanced discussion of modern concepts of organic chemistry; bonding, stereochemistry, reaction mechanisms. Prerequisites: CHEM 2453 and equivalent of one year of physical chemistry.

CHEM 3120 Chemical Systems II (3 Credits)
Interpretation of trends in the chemistry of the elements in terms of orbital interactions. Most examples will be taken from the third row transition metals and the boron and carbon groups. Prerequisites: CHEM 2131, CHEM 3310 and CHEM 3110.

CHEM 3130 Chemical Systems III (3 Credits)
Advanced-level physical biochemistry course intended for advanced-level undergraduates and graduate students. Focuses on kinetic, thermodynamic and dynamic aspects of biopolymers; delineates the relationship of these properties to the mechanism and function of biological macromolecules. Prerequisites: CHEM 3811, CHEM 3812, CHEM 3813, CHEM 3610 or the equivalent.

CHEM 3220 Advanced Analytical Chemistry (3 Credits)
Principles of chemical instrumentation applied to analytical measurements; principles, instrumentation and applications of spectrometric and chromatographic measurements. Prerequisites: CHEM 3210 and CHEM 3621, or the equivalent.

CHEM 3310 Structure and Energetics I (3 Credits)
Fundamentals of quantum chemistry, and introduction to symmetry and molecular structure of small and large systems. Prerequisite: one year of physical chemistry.

CHEM 3320 Structure and Energetics II (3 Credits)
Computational methods in chemistry. Prerequisites: CHEM 3310, one year of physical chemistry.

CHEM 3410 Atmospheric Chemistry (3 Credits)
The concepts of equilibrium thermodynamics, kinetics, and photochemistry will be applied to understanding atmospheric processes. Covers urban air pollution in detail with focus on primary pollutants. Also covers stratospheric chemistry with focus on ozone chemistry and the chemistry of climate change. Prerequisites: (CHEM 2270 and CHEM 2453) OR CHEM 2240.

CHEM 3411 Aquatic Chemistry (3 Credits)
The circulation of the oceans and their chemical make-up. 'Classical water pollution problems' like biological oxygen demand and turbidity are discussed. Also presented: aquifer structure and flow, ground water chemistry, pollutant partitioning between stationary and mobile phases, heterogeneous surface chemistry, and the detection of trace contaminants. Prerequisites: (CHEM 2270 and CHEM 2453) or CHEM 2240.

CHEM 3412 Environmental Chemistry & Toxicology (3 Credits)
A survey of environmental toxicology concepts: animal testing, dose-response data, epidemiology, risk assessment. The course includes ecotoxicology, focusing on the alteration of biological and chemical systems beyond the simple response of an individual to an environmental chemical. Prerequisites: CHEM 2270 and CHEM 2453.

CHEM 3413 Aerosol Science (3 Credits)
CHEM 3413 is an introductory course that presents fundamental concepts associated with atmospheric aerosols in both natural and human environments. The course will focus on the sources, behavior, and effects of atmospheric aerosols, or particulate matter (PM) within the contexts of the natural environment and climate, human health, and industrial applications. The course will provide an overview of the chemical and physical characteristics of particulate matter and measurement methods, including chemical reactions that lead to aerosol formation and transformation. Examples and demonstrations will discuss applications to medical science, public health, clouds and climate, air pollution, colors in the sky, the built environment, mechanical engineering, chemical industry, and many other topics that stimulate curiosity. Aerosols affect almost every aspect of the environment and human health and are an important part of countless industrial processes or commercial products. The course is designed to provide a background to students interested in further study or careers broadly in (a) the environmental sciences, (b) medical or health sciences, or (c) many chemical or other scientific or engineering fields where aerosol processes are involved. CHEM 3413 will be taught at an upper-division (3000) level, but with enough flexibility to expect all environmental science, chemistry, biochemistry, biology, ecology, or engineering majors with the prerequisite year of chemistry to have fun and be able to learn effectively and succeed. The course is lecture-only; no lab is required, although demonstrations and hands on activities will be involved. The course fulfills requirements for the Environmental Chemistry B.S. major or minor, elective credit toward the Environmental Science B.S. or B.A. majors, and elective credit toward graduate programs in Chemistry. Prerequisite: CHEM 2240 or CHEM 2131.

CHEM 3610 Physical Chemistry I (3 Credits)
Fundamentals of thermodynamics, including phase and reaction equilibria, properties of solutions, and electrochemistry needed for advanced study in life sciences and for Physical Chemistry II and III. May be taken for graduate credit by nonchemistry majors. Prerequisites: CHEM 2453, calculus and physics.

CHEM 3620 Physical Chemistry II (3 Credits)
Fundamentals of quantum chemistry, including theories of atomic and molecular structure and spectroscopy. May be taken for graduate credit by nonchemistry majors. Prerequisite: CHEM 3610.

CHEM 3621 Physical Chemistry III (3 Credits)
Fundamentals of kinetic theory and statistical mechanics. May be taken for graduate credit by nonchemistry majors. Prerequisite: CHEM 3620.

CHEM 3703 Topics in Organic Chemistry (3 Credits)
May include organic photochemistry, organic synthesis, organic electrochemistry or natural products. May be repeated for credit. Prerequisites: CHEM 3110 or equivalent and others depending on topic.

CHEM 3705 Topics in Biochemistry (3,4 Credits)
May include physical techniques for exploring biological structure, biological catalysis, and selected fields within biochemistry taught from original literature. May be repeated for credit. Prerequisites: CHEM 3831 and 3813.

CHEM 3811 Biochemistry-Proteins (3 Credits)
Protein structure and function, starting with the building blocks and forces that drive the formation of protein structure and the basic concepts of protein structure, and continuing with enzyme catalysis, kinetics, and regulation. Prerequisites: CHEM 2453 or instructor permission.

CHEM 3812 Biochemistry-Membranes/Metabolism (3 Credits)
Membranes and membrane mediated cellular processes, energy and signal transduction, and metabolic/biosynthetic pathways. Prerequisite: CHEM 3811 or CHEM 3831.

CHEM 3813 Biochemistry-Nucleic Acids (3 Credits)
Molecular processes underlying heredity, gene expression and gene regulation in prokaryotes and eukaryotes. Prerequisites: CHEM 2453 and CHEM 3811.

CHEM 3831 Advanced Protein Biochemistry (3 Credits)
This course provides fundamental insights into the chemistry and physics of proteins. It investigates how amino acids form proteins with highly complex three-dimensional structures and how these structures mediate function. We examine key research articles and their contribution to our current understanding of proteins. Topics range from protein folding to enzyme kinetics and emphasize basic principles. Prerequisites: CHEM 2453 and instructor permission.

CHEM 3991 Independent Study (1-10 Credits)
May be repeated for credit.

CHEM 3995 Independent Research (1-10 Credits)
Research project conducted under guidance of a faculty member. Credit hours and projects arranged on an individual basis. May be repeated for credit.

CHEM 4900 Chemistry Seminar (0 Credits)
A weekly presentations of research in progress and of current literature by outside speakers. faculty and graduate students.

CHEM 4980 Internship-Graduate (0 Credits)
The work will have a well-defined chemistry or biochemistry component that will enhance the student's understanding of the field and provide hands-on real-world experience.

CHEM 4991 Independent Study (1-10 Credits)

CHEM 4995 Independent Research (1-10 Credits)

CHEM 5991 Independent Study (1-10 Credits)

CHEM 5995 Independent Research (1-10 Credits)