SC341 Chemical Engineering (3-0-3)
Assistant Professor D. Luning Prak

An introductory course designed to prepare students to be able to solve material and energy balances relative to chemical processes utilizing the engineering approach for problem solving. 
Prereq: SC112, SP212, SM221.

SC485A Computational Chemistry (3-0-3)
Assoc. Prof. R. E. McClean

Computational chemistry may be described as the use of computational methods to investigate chemical problems. In this course, an overview of the commonly used methods will be presented. They include molecular mechanics, ab initio, semi-empirical, and density functional methods. Modern computational chemistry software will routinely be used to investigate molecular structure and properties, reaction energetics, and potential energy surfaces. Prereq: SC346.

SC485B Organometallic Chemistry and Catalysis (3-0-3).
Assistant Professor A. MacArthur

The use of transition-metal catalysts to construct strong C-C, C-N, and C-O bonds in a variety of compounds has had an enormous impact on the pharmaceutical, polymer, and fuel industries in recent years. This course will provide an inorganic, metallocentric survey of organometallic chemistry. The topics to be discussed include the synthesis and properties or organometallic reagents, as well as the reaction conditions, mechanistic pathways and importance of these transition-metal complexes in a wide-range of synthetic pathways and industrial reactions. 
Prereq: SC226 and SC356.

SC485C Global Challenges in Chemistry: Climate Change and Alternative Energy (3-0-3)
Professor J. Fitzgerald

Americans are being bombarded with messages from politicians, industrialists, scientists, national and international environmental groups, etc about two major challenges facing the U.S. and indeed all of mankind - depletion of cheap hydrocarbon-derived fuels and global warming due to man-made CO₂ emissions. These challenges will only become more pronounced as Third-World countries (primarily China and India) seek to attain living standards enjoyed by the U.S. and other First-World countries.

This course will critically evaluate the scientific evidence relevant to man-made climate change. The historical record clearly documents natural variations in global temperature – if there is a current warming trend, is it due to human activities? If so, what are appropriate policies – should the U.S. ratify the Kyoto Protocol?

This course will also explore energy alternatives which have received recent attention. “Clean” coal, biofuels, nuclear, solar, wind, geothermal, ocean thermal and biomass technologies will all be included. The relative advantages and disadvantages of these technologies as well as roadblocks to application will be considered. Prereq: 1/C or 2/C STEM majors.
SC485M  Biochemistry Laboratory Techniques (1-6-3)  
Asst. Prof. D. Morse

Students will learn a variety of modern biochemistry methods including: ion exchange, size exclusion, and affinity chromatography; gel electrophoresis; UV-visible spectroscopy; enzyme kinetics; polymerase chain reaction; and DNA cloning. These techniques will be applied to the production, purification and analysis of proteins and nucleic acids.

SB487  Advanced Topics in Biology (3-2-4)  
Asst. Prof. D. Isaac

The content of this course can change on a rotating basis and will feature a rigorous treatment of various areas in modern biology. The topics for Fall of 2009 are Neurobiology and Developmental Biology. The course will build on basic principles underlying nervous system function introduced in SB252 and apply them to sensory modalities such as vision, taste, hearing and balance as well as nervous system development and higher cortical functions. We will use the examples set by studies performed in model organisms such as the fruitfly Drosophila melanogaster and the roundworm Caenorhabditis elegans to elucidate the mechanisms by which normal development proceeds in higher eukaryotes. A lab component of the course will complement both areas of study. Prereq: SB252. Does not count as a chemistry major elective.

SPRING 2010 CHEMISTRY / BIOLOGY ELECTIVES

SC336  Biochemistry II (3-0-3)  
Assoc. Prof. J. Schlessman

This course will provide advanced treatment of topics covered in SC335, such as biomolecular structure, bioenergetics and enzyme kinetics, and cover the following new material as well: biosynthesis of amino acids, nucleotides and cofactors; photosynthesis and plant metabolic cycles; signal transduction; molecular genetics; regulation of eukaryotic and prokaryotic gene expression. There will be an introduction to virology, immunology and the metabolism of specialized cells. Prereq: SC335.

SC351  Chemical Structure Determination by X-ray Diffraction (2-2-3)  
Assoc. Prof. W. Pearson

X-ray diffraction is the most powerful tool for determining the three-dimensional structures of molecules. This course is a practical, hands-on introduction to modern methods of 3D molecular structure determination by X-ray diffraction. Students will learn the basics of the technique from crystal growth to final structure solution. Prereq: SC112 and SM212.

SC481  Special Topics in Physical Chemistry (1-0-1)  
Prof. M. Campbell

This course will expand on topics covered in the physical chemistry sequence. Depending on class interest, topics might include lasers, transport properties, perturbation theory, angular
momentum coupling, atomic spectroscopy, the Zeeman effect, molecular orbital theory of polyatomics, group theory and molecular reaction dynamics including transition state theory. Other topics of interest to the class will be covered as time permits. Prereq: SC346.

SC486A Electrochemical Applications (3-0-3)
Asst. Prof. R. Calhoun

This course will offer insight into a broad spectrum of modern applications of electrochemistry. The beginning of the course will discuss some elementary theory and include basic techniques such as voltammetry and amperometry. However, advanced topics such as fuel cells, electrogenerated chemiluminescence (ECL), and scanning electrochemical microscopy (SECM) will be discussed and demonstrated.

SC486C Polymer Synthesis: from ATRP to Ziegler-Natta (3-0-3)
Assoc. Prof. S. Lin

From bulk commercial plastics made by the ton to the genes within our cells, polymers are found everywhere. This course will build upon the basic reaction mechanisms learned in organic and inorganic chemistry by which different classes of polymers are made. The implications of synthetic methods on polymer molecular weight, stereochemistry, and other physical characteristics will be discussed. Prereq: SC226, SC364, and SC356.

SC486D Statistical Mechanics (3-0-3)
Prof. J. Harrison

Statistical mechanics is a branch of chemistry that endeavors to explain macroscopic properties from a microscopic, or molecular, point of view. In much the same way as the kinetic molecular theory explains the macroscopic behavior of gases from a microscopic point of view, quantities such as enthalpy, entropy, and heat capacity can be explained from a molecular point of view using statistical mechanics. This class will discuss the distribution functions, ensembles, and partition functions needed to describe macroscopic thermodynamic properties. Prereq: SC345 and SC346.

SC486E CBRNE: Chemical, Biological, Radiological/Nuclear & Explosives Incidents (3-0-3)
LT E. Wilfong and LCDR P. Kaiser, USN

Chemical, biological, radiological, nuclear and explosive (CBRNE) events refer to the uncontrolled release of chemicals, biological agents or radioactive contamination into the environment or explosions that cause widespread damage. The number of nations and non-national terrorist and criminal organizations capable of developing, possessing and deploying CBRNE weapons is steadily increasing. Since September 11th 2001 and the subsequent anthrax attacks, there has been renewed concern about domestic and foreign CBRNE events. This course will focus on the basics of key biological, chemical, radiological, nuclear and high yield explosives including discussions of the physiological consequences of exposure, prophylactic and post-exposure treatment options, production, weaponization/dissemination and current and future technologies for the detection of agents.