

## FALL 2016 CHEMISTRY / BIOLOGY ELECTIVES

### **SB453: Neuroscience and Developmental Biology (3-2-4)**

#### **Professor B. Rehill**

This course offers an advanced treatment of neuroscience and developmental biology that builds on both the molecular and cellular background provided in SB251 and the basic principles underlying nervous system function introduced in SB252 and applies them to topics including both somatic and special sensory modalities, initiation, execution and coordination of motor programs and the neuroanatomical organization of the pathways that control these functions. Additional special topics will be introduced on a rotating basis. The course will also use the examples set by studies performed in model organisms to elucidate the mechanisms by which normal development proceeds in higher eukaryotes with an emphasis on neural development.

*Prereq: SB252. The course does not count as a chemistry major elective.*

### **SC442 Propellants and Explosives (2-2-3)**

#### **Professor P. Trulove**

This course will explore the fundamental aspects of the chemistry of propellants and explosives. It will delve into the structural, physical, and chemical properties of these energetic materials. It will investigate the application of these energetic materials to military and civilian systems, and it will explore methods and processes to detect and characterize energetic materials both before and after use. This course will consist of classroom lecture and group activities. In addition, it will involve laboratory experiments investigating energetic materials and their applications.

*Prereq: SC226, SC345.*

### **SC451 Bioinorganic Chemistry (3-0-3)**

#### **Associate Professor J. Lomax**

Life is inorganic, too. Every breath uses the iron protein, hemoglobin, and every step is supported by bone made of calcium salts and driven by phosphate containing molecules such as ATP. This course will shed light on the structure and function of these bioinorganic compounds using a host of techniques such as X-ray diffraction and NMR spectroscopy. *Prereq. SC335 and SC356 or permission of the department chair.*

### **SC485C: Global Challenges in Chemistry, Climate Change and Sustainable Energy (3-0-3)**

#### **Professor J. Fitzgerald**

The popular media is filled with messages from politicians, industrialists, scientists and environmental groups about two major and interconnected challenges facing the U.S. and indeed all of mankind – access to affordable and sustainable energy and global warming due to man-made CO<sub>2</sub> emissions. These challenges will only become more pronounced as developing countries (primarily China and India) seek to attain living standards enjoyed by the U.S. and other developed countries.

This course will present students with an overview of the trade-offs between energy use and the environment. We will critically evaluate the scientific evidence relevant to man-made climate change. The historical record clearly documents natural variations in climate – if there is a

current warming trend, is it due to human activities? If so, what are appropriate policies? We will also cover basic energy science, current energy usage, the best estimates of energy supplies and developing technologies for energy feedstock harvesting. Energy alternatives which have received recent attention, including “clean” coal, biofuels, nuclear, solar, wind, geothermal, ocean thermal and biomass, will be discussed. The relative advantages and disadvantages of these technologies as well as roadblocks to application will be considered. *Prereq or corequisite: SC345 or EM300*

### **SC485D: Astrochemistry (3-0-3)**

**Professor R. Ferrante**

Astrochemistry is the study of chemistry throughout space. It is an inherently interdisciplinary topic of (literally) universal significance. From the original observation of He in the sun in 1868, through the dawn of radioastronomy and space exploration in the 1950s, and up to the current age of ever more sophisticated terrestrial observatories and unmanned space probes, spectroscopy has been the key to understanding the universe. By looking at the instruments, methods, data and conclusions, this course will survey some broad areas of astrochemistry, including the Big Bang beginning of it all, processes in molecular clouds that lead to star formation and the protoplanetary disk; the evolution of such nebula into planets and their atmospheres; clues available from comets and asteroids about interstellar space; and the possible implications of it all for the development of life, on earth and otherwise. Along the way we will use real data in exercises to get a sense of what is known or knowable, and through several “Citizen Science” projects maybe even make a real discovery! *Prereq: SC346 or equivalent*

## Spring 2017 CHEMISTRY / BIOLOGY ELECTIVES

### **SC311 Marine and Atmospheric Chemistry (3-0-3)**

**Professor D. O'Sullivan**

An introduction to chemical processes that influence the chemistry of marine waters and the atmospheric marine boundary layer. The course will begin with the composition of seawater and progress towards an understanding of the biogeochemical cycles of important elements in oceanic systems, including the chemistry of tropospheric ozone and aerosol formation. The impact these process have on current and future naval operations will be discussed. *Prereq: SC225 or validation equivalents.*

### **SB338: Molecular and General Genetics (3-0-3)**

**Associate Professor D. Morse**

Students in this course will study the inheritance of traits, starting with basic (Mendelian) genetics and ending with modern molecular biology. The course will examine incomplete dominance, epistasis, pleiotropy, transformation, cloning, genetic *engineering*, imprinting, and experimental techniques. Colisted as SC338. *Prereq: SB251 or SC335.*

### **SC336: Biochemistry II (3-0-3)**

**CDR L. Kennedy**

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.*

### **SC486C: Chemistry of Drugs, Poisons, and Toxins (3-0-3).**

**Associate Professor C. Kinter**

This course will explore how biologically relevant compounds are discovered and synthesized. Students will examine how chemical structure relates to biological activity. While studying a variety of pharmaceuticals, the students will look at the role chemist play in the process of discovering, optimizing activity, testing, and bringing drugs to market. The class will also examine the adverse effects of common poisons and agents used as chemical weapons.

*Prerequisites SC226*

### **SC486D: Biophysical Chemistry (3-0-3)**

**Assistant Professor E. Yates**

Biophysical Chemistry is the study of biological systems through the use of theories and methods of the physical sciences. Fundamental principles from biology, physics and chemistry are utilized in the field of biophysics to gain molecular and structural insights into the mechanisms of biological processes. This course will apply the principles of thermodynamics, kinetics and equilibria toward biological systems including proteins, nucleic acids and membranes. The course develops a physicochemical description of biological systems through physical and chemical explanations of biological phenomenon, as well as using physical chemistry theories and experimental methods applied to biological systems to understand their physical properties. Some topics to be covered in the course include protein structure, aggregation and self-assembly, membranes, thermodynamics and interactions, chemical equilibrium, kinetics, spectroscopy, scanning probe microscopy, nanotechnology, surface phenomena and biomacromolecule dynamics. *Prerequisites: SC345 and SC346*