

FALL 2022 (AY23) CHEMISTRY / BIOLOGY ELECTIVES

SC485A Surface Chemistry: Methods and Applications (3-0-3)

CAPT Julie Spencer

Surface chemistry is vitally important in many areas of modern life. In this course, students will be exposed to modern methods of surface analysis (such as Scanning Electron Microscopy, X-ray Photoelectron Spectroscopy, Atomic Force Microscopy, etc.) as well as interesting applications such as nanotechnology, catalysis, materials science, and drug delivery.

Prerequisites: SC345 or permission of the Department Chair. Counts as a Chemistry elective

SC485C: Organometallics: Bonding, Catalysis, and Award-Winning Reactions (3-0-3)

Asst. Prof. Wesley Farrell

Compounds featuring metal-carbon bonds are among the most fascinating and important to modern society. Referred to as "organometallics", these species are capable of catalyzing the synthesis of myriad products, from small molecules to ultrahigh molar mass polymers, that have revolutionized our world. In this course, we will investigate the fundamentals of these interesting molecules, focusing on bonding and reaction mechanisms unique to organometallics, and then explore some of the most well-known and award-winning catalytic processes that yield products essential to everyday life. Current primary literature will be used throughout the course.

Prerequisites: SC226, SC356 or permission of the Department Chair.

SB453: Neuroscience & Development (3-2-4)

Prof. Brian Rehill

Neuroscience and Developmental Biology is 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.

Prerequisites: SB252

SB/SC485B: Applications of Molecular Biology and Biochemistry (2-2-3)

Asst. Prof. Leighanne Basta

This course will delve into the methodology of cloning, protein overexpression, protein purification, and assay development. Students will learn about experimental methods in molecular biology and biochemistry by reading primary literature and will put those practices into action as they perform similar experiments toward generating and assaying mycobacterial cell wall biosynthetic enzymes. Counts as a chemistry major elective.

Prerequisites: SB251 and SC226.

SC412: Environmental Chemistry (3-0-3)

Prof. Dianne Luning Prak

Many analytical chemistry techniques can be used to learn more about the chemistry of our environment. In this course students will be exposed to specific applications of these techniques to various environmental systems (i.e., water, air, soil, etc.). Topics to be explored may include the bio- and geo-chemical cycles, the effect of military activities on the environment, and the use of "green chemistry" in industry.

Prerequisites: SC262 or SC264 or permission of the Department Chair.

SPRING 2023 (AY23) CHEMISTRY / BIOLOGY ELECTIVES

SC486A: Atmospheric Chemistry: Advanced Topics in Physical Chemistry Elective (3-0-3)

Asst. Prof. Melonie Teichert

This course will extend what students learned in their physical chemistry courses to advanced topics, with a focus on both important foundational research as well as current research trends. Real-world applications, specifically in atmospheric chemistry, will be highlighted. The effects of human activity on air quality and climate will be discussed in contexts such as greenhouse gases, ozone depletion, and pollution. Possible topics to be discussed include advanced kinetics, molecular reaction dynamics, photochemistry, spectroscopy, potential energy surfaces, and statistical mechanics. There will be a focus on the very important connections between the macroscopic world and the molecular level using chemistry content covered previously in the major as well as new topics from this course. Students will consult the primary research literature to complete a final project.

Prerequisites: SC345 and SC346

SC486C: Polymer Synthesis: From ATRP to Ziegler-Natta (3-0-3)

Prof. Shirley Lin

Although the age of synthetic polymers began only in the mid-20th century, by 2015 more than 320 million tons of commodity plastics were manufactured world-wide. In the span of a mere 60 years, synthetic polymers have become an integral part of our lives, appearing in diverse applications ranging from precision drug delivery systems to smart bullet-proof vests. During this course, we will investigate the science behind the production of both large-scale commodity and high-performance polymers and explore the cutting edge of macromolecular design. Students will have opportunities for hands-on experience with polymeric materials throughout the semester.

Prerequisites: SC226, SC262, SC356 or permission from the Chair

SC416 Analytical Chemistry in Forensic Investigations (3-0-3)

Prof. Christine Copper

This course will address the types of sample collection techniques used in criminal investigations, as well as the chemical and instrumental methods used to determine the presence of substances associated with illicit activities. Emphasis will be placed on specific forensic investigative techniques such as DNA fingerprinting, drug detection, arson investigations (petroleum residues), bombings (explosives residues) and characterization of fibers and paint.

Prerequisites: SC361

SC486D: Current Topics in Organic Chemistry (3-0-3)

Prof. Craig Whitaker

Current Topics in Organic Chemistry – From Sarin Gas and Novichok Poisoned Underpants to Bomb Sniffing Dogs and Smart Polymers Organic compounds are very important to our daily life. Recent world events have illustrated that chemical threats/advances are very real and come from a wide range of organic structures. Timely design, synthesis, detection, and identification of these materials is of great importance. This course will focus initially on introducing current real world issues ranging from new lethal chemicals (synthetic and naturally occurring), assessing toxicity, neutralizing deadly compounds, smart polymers and spectroscopic techniques to reveal the true nature of the organic materials and how they affect the world around us. Additionally, Warren Buffet recently said “one easy way to become worth 50 percent more than you are now – at least – is to hone your communication skills.” So students in this course will analyze journal articles, design laboratory experiments and also learn how to effectively present information in an appropriate and engaging style.

Prerequisites: SC225, SC226, SC262

SC336: Biochemistry II (3-0-3)

Asst. Prof. Ina O'Carroll

This course will expand and build on topics from SC335, such as biomolecular structure, bioenergetics and enzyme kinetics, to cover biosynthesis of amino acids, nucleotides and cofactors; photosynthesis and plant metabolic cycles; signal transduction; molecular genetics; regulation of eukaryotic and prokaryotic gene expression.

Prerequisites: SC335