CHEM 521 (OPUS 1756)  
Advanced Organic Chemistry I  
Instructor: Simon Blakey  
TTH 1 pm – 2:15 pm  
E363  
3 credits  
This course will cover the principles of physical organic chemistry starting with bonding theory, structure, thermochemistry and kinetics. These basic principles will be integrated into a mechanistic description of organic reactions. Techniques for describing, understanding and analyzing reaction mechanisms will be presented ("arrow-pushing", energy profiles, isotope effects, solvent effects, stereochemical and conformational analysis). Prerequisites are organic chemistry and physical chemistry.

Recommended Text: Modern Physical Organic Chemistry, Eric V. Anslyn/Dennis A. Dougherty

CHEM 522 (OPUS 1757)  
Advanced Organic Chemistry II (Reactions)  
Instructor: Frank McDonald  
TTh 8:30 am – 9:45 am  
E363  
3 credits  
This course will provide an overview of the main classes of reactions that are used in synthetic organic chemistry. Learning objectives will focus on the mechanistic basis of chemoselectivity between functional groups, regioselectivity among functional groups, and stereoselectivity including enantioselective transformations. This course will prepare students for Chem 523 (Advanced Organic Chemistry III, synthesis) in spring semester. Prerequisite Chem 221-222 (or equivalent introductory organic courses).

Required Text: “Finding the Right Partner: A Survey of Selective Organic Transformations” authored by the instructor, will be distributed gratis to students at the beginning of the semester.

CHEM 531 (OPUS 1758)  
Intro to Molecular Quantum Mechanics  
Instructor: Joel Bowman  
TuTh 11:30 am – 12:45 am  
E363  
3 credits  
This course will present the foundations of modern quantum chemistry. The Schrödinger equation and applications to a variety of one, two and three-dimensional problems will be presented. The necessary background of special functions and basics of quantum mechanics will also be presented.

Required Text: Mathematics for Quantum Chemistry, Jay Martin Anderson
This course will provide an introduction to the experimental techniques of modern physical chemistry. It will cover theoretical and practical issues pertaining to equipment (including lasers, optical elements, and detectors) as well as experimental design.

This course will develop a detailed molecular view of the building blocks of life which include nucleic acids, proteins, and lipids. The course will start with a detailed description of nucleotide conformations, biosynthesis, synthetic modification, and a discussion of functional nucleic acids. We will then focus our attention to protein structure, biosynthesis, synthetic modification, the incorporation of unnatural amino acids, and enzyme kinetics.

Enzyme catalysts will be described using chemical principles. Topics will be organized from the perspective of mechanism and cofactor rather than metabolism or control. Examples from major classes of enzymes will be presented and their mechanisms discussed. Experimental approaches used to investigate catalytic mechanism will also be emphasized.

This course will examine the role organic chemistry has played in the probing of biological systems. Particular focus will be placed on current topics in Chemical Biology, particularly experiments in which 1) chemical synthesis enables one to probe or control biological systems in novel ways or 2) manipulation of biological systems facilitates novel chemical syntheses. As the goal of the course is to familiarize students with innovative recent experimental approaches and to stimulate them to conceive their own new methods, students will be responsible for delivering presentations on topics selected from the literature and generating several novel research proposal ideas. The proposals will be evaluated for creativity, feasibility, and impact. Recent discoveries and applications from both the scientific literature and industry will be prominently featured throughout the course.

Required text: Chemical Biology, Waldmann and Janning.

Additional Course Options:

599R Thesis Research (pre-candidacy) (OPUS 1760).
799R Advanced Research (post-candidacy) (OPUS 1764).

Reminders About Courses:

- You must enroll in at least 9 hours to be considered a full-time student.
- All students should meet with their advisor to decide on necessary coursework and register themselves online via OPUS.
- You must be enrolled full time in the semester in which you plan to graduate.
- You will be automatically enrolled in TATT 600, TATT 605, CHEM 504, CHEM 597R, CHEM 606, CHEM 791, CHEM 798 and JPE 600 whenever these courses are required.
- Students who wish to register for courses outside of the Department of Chemistry must complete the External Coursework Petition. This form requires signatures from the advisor, the Instructor of Record for the requested course, and the Director of Graduate Studies.

For any questions, contact the Graduate Coordinator Ana Maria Velez in Atwood 380K.