Content: 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.

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

Content: This course will give an overview of the main classes of reactions that are used in synthetic organic chemistry. Emphasis will be placed in ensuring that the students gain a strong foundation of the mechanisms of these reactions, as well as their scope and limitations, so that the students can effectively use these reactions in practical synthetic applications.

Prerequisite Chem 221-222 (or equivalent introductory organic course).

No text is required. An advanced draft of the instructor's textbook will be distributed at the beginning of the semester.

Students may wish to purchase one or more of the following texts for background, but these are not required:

- Strategic Applications of Named Reactions in Organic Synthesis (Kurti and Czako), Elsevier, ISBN 0-12-429785-4
- Organic Mechanisms (Reinhard Bruckner), Springer-Verlag, ISBN 978-3-642-03650-7
- March’s Advanced Organic Chemistry (Michael B. Smith and Jerry March), ISBN 978-0-471-72091-1

Content: This course will present the foundations of modern quantum chemistry. The Schroedinger 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.

Texts: Mathematics for Quantum Chemistry by Jay Martin Anderson

Advanced Physical Chemistry V

Chemistry 536 covers the statistical theory that underlies thermodynamics, and how that statistical theory can be applied in simulating of systems of molecules at thermal equilibrium. Through computer simulation exercises, students will gain basic skills in using molecular simulation software.

Textbook:
Understanding Molecular Simulation, Second Edition: From Algorithms to Applications by Daan Frenkel and Berend Smith
CHEM 551: Adv Inorganic Chemistry  
Scarborough  
TT  
10:00-11:15

Content: Advanced inorganic chemistry will cover basic coordination chemistry and Group Theory and its application to inorganic chemistry. We will survey the chemistry of inorganic compounds from the standpoint of chemical bonding principles. You will learn to use molecular orbital theory to describe the structure and reactivity of inorganic and organometallic complexes.

Texts (recommended):
- Chemical Structure and Bonding by Dekock and Gray
- Chemical Applications of Group Theory (3rd Edition) by Cotton
- Inorganic Chemistry (4th Edition) by Miessler and Tarr
- Orbital Interactions in Chemistry by Albright, Burdett and Whangbo (2nd Edition)

CHEM 571: BioMolecular Chemistry  
Weinert  
MWF  
10:00-10:50

The 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.

Texts: N/A

CHEM 575R: Physical Biochemistry  
Conticello  
TT  
10:00-11:15

The course involves the application of physical chemical approaches to study biological macromolecules. Topics will include the study of biomacromolecular structure, stability, and mechanism. Physical/analytical methods will be applied to understand the structure and function of biological macromolecules.

Texts: N/A

CHEM 791R: BioMolecular Seminar
CHEM 792R: Inorganic Seminar
CHEM 793R: Organic Seminar
CHEM 794R: Physical Seminar