

# **Syllabus CHEM 4311/CHEM 8833**

## **1. Structure and Models of Bonding**

- Atomic structure
- Quantum numbers and atomic orbitals
- Lewis structures
- Valence-shell electron pair repulsion rules
- Hybridization
- Combined valence bond/molecular orbital model
- Molecular orbital theory and concepts in electronic structure theory
- Larger molecules: Qualitative molecular orbital theory (QMOT)

### **First Exam**

## **2. Strain and Stability**

- Thermochemistry: stable molecules and reactive intermediates
- Structure and energetics
- Electronic Effects
- Strained molecules

## **3. Acid-Base Chemistry**

- Aqueous Solution
- Nonaqueous systems
- Predicting acid strength in solution
- Lewis acid and bases

### **Second Exam**

## **3. Stereochemistry**

- Stereogenicity and stereoisomerism
- Symmetry and stereochemistry
- Topicity relationships
- Reaction stereochemistry

## **5. Organic Reaction Mechanisms I**

- Reaction types and mechanistic classes
- Basic concepts on writing reaction mechanisms

### **Third Exam**

## **6. Organic Reaction Mechanisms II**

- Polar mechanisms under basic conditions
- Polar mechanisms under acidic conditions

### **Fourth Exam**

### ***Comprehensive Final Exam (Topic 1-6)***