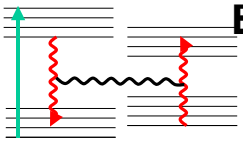
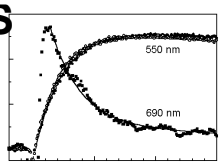


BIOPHYSICAL SPECTROSCOPY AND KINETICS



BioC **5528**, Spectroscopy and Kinetics
Spring 2019, Tu & Th (Location NHH 2-101), 10:10-12:05*, 4 credits
Course web site: http://cbs.umn.edu/ddt/about/teaching/bioc5528

*Class time may be shifted slightly to accommodate other courses. This will be discussed first day of class.

Instructors:
Dave Thomas, BMBB (NHH 5-124, 5-0957, ddt@umn.edu)
John Lipscomb, BMBB (NHH 5-112, 5-6454, lipsc001@umn.edu)

Summary: Introduction to the principles and applications of spectroscopy and kinetics to the analysis of biomolecular structure, dynamics, and function.

Target audience: The course is designed for **advanced undergraduates and first- and second-year graduate students,** who have taken at least one semester of undergraduate physical chemistry or physics. For undergraduates, Bioc 4521 (Introduction to Physical Biochemistry) provides excellent preparation for this course. Bioc 5528 is complementary to the fall semester course Bioc 5527 (Introduction to Structural Biology), but that course is not a prerequisite. A typical class includes both undergraduate and graduate students, majoring in Biochemistry, Chemistry, Physics, Chemical Engineering, Medicinal Chemistry, or Biomedical Engineering. Both 5527 and 5528 are required for BMBB grad students with a minor in Structural Biology and Biophysics. *Students should contact the course director to discuss questions about prerequisites and other issues.*

Course Content:

Spectroscopy. The first section, taught by Dr. Thomas, introduces the principles of spectroscopy and discusses applications of specific techniques to biochemical structure and dynamics. The first part of this section deals with optical spectroscopy, especially UV/visible absorption and fluorescence. The second part covers spin-label electron paramagnetic resonance (EPR). Particular emphasis is placed on the use of extrinsic spectroscopic probes that can provide information on structural dynamics and interactions, complementary to the techniques covered in Bioc 5527 (e.g., x-ray diffraction, electron microscopy, NMR, MS).

Kinetics. The second section, taught by Dr. Lipscomb, deals with the theory and application of steady-state and transient kinetics techniques to the study of dynamics in biological systems. The first part of this section deals with the use of steady-state kinetic techniques, including inhibitor studies, to investigate enzyme mechanisms. The second part deals with the use of transient techniques such as stopped-flow to investigate rapid biological events, including pre-steady-state enzyme kinetics. Special emphasis is placed on the identification of reaction intermediates and techniques for the evaluation of kinetics obtained from spectroscopic data.

The two sections of the course will be independent; separately graded, and equally weighted. However, they will be connected by the mathematical principles of kinetics, which are fundamental in describing spectroscopic observations, and by emphasizing the use of spectroscopic applications to detect and characterize biochemical reactions. The goal is to help you read and understand papers in this field, from such journals as JACS, Biochemistry, Biophysical Journal, Journal of Molecular Biology, and Journal of Biological Chemistry.

Course Format: Much of class time will be used for lectures, but there will also be ample time for discussions of problem sets, laboratory demonstrations, review, and exams.

Reference Materials: There are no required texts; all required materials will be provided in class or on the course web site.

Grades:

Spectroscopy: three graded problem sets (15% total) and one graded exam (35%).
Kinetics: several ungraded problem sets, a graded paper (5%), and two graded exams (20% and 25%).

The exams will be based on lecture handouts, assigned reading, and problem sets. ***Undergraduates are graded separately from graduate students***. Average grades in this course last 3 years: Ugrad 3.50, Grad 3.58.