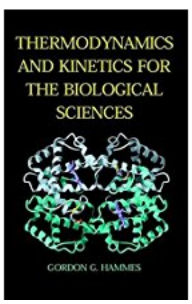
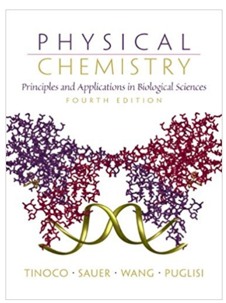
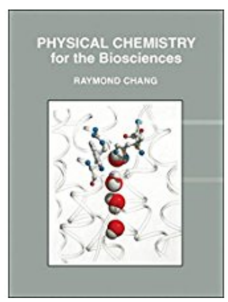
Course: CHEM 828 – Bioanalysis
Instructor: Robert C. Dunn
Office: 220G Multidisciplinary Research Building
Email: rdunn@ku.edu
Phone: 785-864-4313
Classroom: 2049 Malott Hall
Time: T, Th, 11:00 – 12:15
Office Hours: By appointment

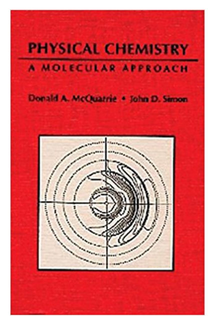
Course Description: This course covers important aspects in modern chemical measurement with particular emphasis placed on bioanalysis. Designing and implementing modern bioanalytical measurements requires a strong background in thermodynamics and kinetics to fully optimize measurement metrics. In this class, we will briefly review these concepts and discuss how they influence important measurement parameters. The goal is to help build a foundation from which students can critically evaluate and exploit new technologies and assays for bioanalysis.

Course Materials: Material for this course will be gathered from a number of sources including textbooks and primary literature. Any physical chemistry textbook, especially those with a biological emphasis, will be a good source for the thermodynamic and kinetic portions of the class. Any of the following are suggested:









The first text is highly recommended and available from Amazon used for a couple of bucks!

General Course Outline:

I. Introduction to Bioanalysis
- What is bioanalysis?
- Goals of this class
- Examples to motivate review of basics

II. Review of Basic Thermodynamics
- Work and Heat
- First Law of Thermodynamics
- State Functions: Enthalpy, Entropy and Free Energy
- Gibbs versus Helmholtz Free Energies in biological systems
- Host-guest interactions, binding stoichiometry, etc.
- Applications

III. **Molecular Motion and Transport**
Kinetic theory
Molecular collisions and mean free path
Diffusion
Applications

IV. **Review of Kinetics**
Rate laws
Experimental determination
Temperature dependence
Link with thermodynamics
Rates near equilibrium
Catalyst and Enzyme kinetics
Applications

V. **Putting it All Together:**
Thermal shift assays
Isothermal titration calorimetry
Binding assays
Immunoassays
Enzyme reaction assays
Microscale analysis

The approach taken in this class regarding assignments and graded material will be linked to student enrollment numbers. Larger classes favor standard exam/homework approaches while smaller enrollments enable more flexibility in assignment type. Therefore, an outline for graded material will be presented in the second week once enrollment numbers are set.

Assignments and Grades: The grade you receive will reflect your attendance and participation in class, an NIH style proposal that you will work on throughout the semester, and graded assignments on the material covered. For the latter, problem sets will be handed out throughout the semester for you to work on. The goal is to reinforce the concepts learned in class and help illustrate how the material applies to real world problems. Throughout the semester you will also work on an NIH style (RO1) proposal related to your research (handouts will be provided). Each component of the proposal will be turned in at the specified dates, with the complete proposal due at the end of the semester. Finally, a seminar on your proposed research will be given at the end of the semester and evaluated by the class.

Specific Aims (1 page):	Due: 9/28/2017
Research Strategy (12 pages)	
Significance :	Due: 10/19/2017
Innovation:	Due: 11/2/2017
Approach:	Due: 11/16/2017
Complete Proposal	Due: Thursday 12/7/2017

Grades will be assigned according to the following:

Class attendance and participation	10%
Problem Sets	30%
Proposal	45%
Presentation	15%