Introduction to Biophysical Chemistry
Chem 4150/6150 (3.0 credits)
Department of Chemistry, Georgia State University
2016 Spring semester

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Time and location: Tuesdays and Thursdays, 5:30 to 6:45 pm, Langdale Hall 717

Office Hours: Tuesdays 4 to 5 pm or by appointment

Prerequisites: Math 2212 or equivalent with grade of C or higher

Course Objective: Chemical control of biological systems requires a quantitative understanding of the physicochemical properties that define their structure and function. This course introduces students to the principles of physical chemistry with a focus on their application to biochemical processes and biophysical interactions.

Expected Learning Outcomes:
1. Understand the principles of physical chemistry that govern the interactions of biological macromolecules with small molecules (including drugs) and other macromolecules;
2. Become familiar with major biophysical techniques used to study biochemical systems;
3. Develop skills needed to critically analyze experimental data;
4. Develop a physically intuitive view of biological systems at the molecular level.

Textbook:
Physical Chemistry: Principles and Applications in Biological Sciences by Tinoco, Sauer, Wang, Puglisi, Harbison, and Rovnyak, 5th edition (2014), Pearson, Upper Saddle River, NJ.

Course materials:
Course content consists primarily of lecture slides, which will be supplied on Brightspace, class discussions (i.e. notes that you take in class), and problem sets (more below). They are supplemented by textbook reading as indicated in the course schedule on p.3.

Problem sets:
A problem set will be assigned approximately every two weeks. They are aimed at reinforcing the concepts presented in class and prepare you for many of the questions on the tests. They will be marked for completeness only. Solutions for selected problems will be provided after the due dates.

Policy regarding calculators:
For problem solving, you will need a scientific calculator and learn how to use it. Any standalone scientific calculator will suffice; programming or graphing capabilities are not required. If you want suggestions, units such as the Casio fx-260 or fx-300 are reasonably equipped, widely available, easy to use, and inexpensive (<$10). **N.B. Sharing or substitution of standalone calculators with phones, tablets, or laptop computers during exams is not allowed.**

Grading Scale:
Assessment is based on the assigned problem sets (20%) and tests (**4** x 20%), the last of which will be held during Finals week. Students can be assured of the following grades by attaining the indicated scores:

95%	**A+**	77%	**B+**	67%	**C+**	50%	**D**
85%	**A**	74%	**B**	64%	**C**	Below 60%	**F**
80%	**A-**	70%	**B-**	60%	**C-**		

Academic integrity:
Students are reminded of the University's academic honesty policy, which can be found here: http://deanofstudents.gsu.edu/student-conduct/academic-honesty-policy. Specifically, all tests taken must represent individual, unaided efforts. Receiving or offering information on a test is cheating, as is the use of unauthorized supplementary materials or devices. Accessing and copying from the textbook's solution manual in your problem sets is also cheating. The consequences of cheating are severe and permanent: don't do it!

Tentative Course Schedule (revised 12/10/2015)

Week	Date	Topic		Chapter
1	1/12	Course overview and introduction		12
	1/14	Thermodynamics	Energy and enthalpy	2
2	1/19		Entropy and free energy	3
	1/21		Chemical potential and equilibrium constants	4
3	1/26		Calorimetry and non-calorimetric methods	
	1/28	Physicochemical bases of biomolecular interactions		12
4	2/2	Physicochemical properties of biological macromolecules		
	2/4	Disposition of matter in living systems		
5	2/9	**Test 1**		
	2/11	Quantitative formulation of biomolecular interactions at equilibrium	Introduction, independent site binding	5
6	2/16		Heterogeneity in site binding	
	2/18		Statistical features of multi-site binding	
7	2/23		Cooperativity, one-dimensional lattices	
	2/25	Kinetics	Chemical kinetics	9
8	3/1		Enzyme kinetics	10
	3/3			
9	3/7	**Test 2**		
	3/9	Hydrodynamics	Theory: sedimentation, diffusion and viscosity	8
10	3/15	**Spring break — no class**		
	3/17			
11	3/22	Hydrodynamics (continued)	Techniques: gel, Electrophoresis, gel filtration, AUC	8
	3/24			
12	3/29	Spectroscopy	Quantum mechanical basis of spectroscopy	11
	3/31		Absorption spectroscopy: Beer's law, UV/vis, CD	13
13	4/5	**Test 3**		
	4/7	Spectroscopy (continued)	Emission spectroscopy: fluorescence, luminescence	13
14	4/12		Scattering in solution: SLS, DLS, Raman	
	4/14		Nuclear magnetic resonance	14
15	4/19	Microscopy and x-ray crystallography		15
	4/22			
Finals week	TBA	**Test #4 (4/26 to 5/3)**		