Introduction to Biophysical Chemistry
Chem 4150/6150 (3.0 credits)
Department of Chemistry, Georgia State University
2015 Spring semester

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Time and location: Tuesdays and Thursdays, 5:30 to 6:45 pm, PSC 311

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 rigorous understanding of the physicochemical properties that define their structure and function. This course is designed to introduce students to the principles of physical chemistry with a focus on their application to biochemical processes and biophysical interactions.

Expected Learning Outcomes:
1. Understand fundamental biophysical principles that govern biological macromolecules and their interactions with small molecules (including drugs) and other macromolecules;
2. Develop familiarity with major techniques used to study increasingly more complex 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.

Grading Scale:
Assessment is based on weekly homework assignments (20%), and quizzes (**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+**	83.3%	**B+**	73.3%	**C+**	Below 60%	**F**
90%	**A**	80%	**B**	70%	**C**		
86.6%	**A-**	76.6%	**B-**	60%	**D**		

Academic Honesty:
Students are reminded of the University's academic honesty policy, which can be found at the following link: http://deanofstudents.gsu.edu/student-conduct/academic-honesty-policy. A good rule of thumb is: if it feels wrong, don't do it!

Tentative Course Schedule

Week	Date		Topic	Chapter
1	1/13	Introduction	Nature of biophysical interactions	
	1/15		Properties of macromolecules	12
2	1/20		Macromolecules vs. “small” molecules	
	1/22	Thermodynamics	Energy and enthalpy	2
3	1/27		Entropy	3
	1/29			
4	2/3		Free energy and equilibrium constants	4
	2/5			
5	2/10		Calorimetry and non-calorimetric methods	
	2/12	**Quiz 1**		
6	2/17	Quantitative formulation of biomolecular interactions at equilibrium	Independent binding and heterogeneity	
	2/19		Competition	5
7	2/24		Introduction to statistical mechanics; cooperativity	
	2/26		Unique features of binding to nucleic acids	
8	3/3	Kinetics of biomolecular interactions	Chemical kinetics	9
	3/5		Enzyme kinetics	10
9	3/10			
	3/12	**Quiz 2**		
10	3/17	**Spring break — no class**		
	3/19			
11	3/24	Overview of quantum mechanics	Relevance to biophysical experimental analysis	11
	3/26	Optical spectroscopy	Absorption spectroscopy: Beer’s law, UV/vis, CD	13
12	3/31		Emission spectroscopy: fluorescence, luminescence	
	4/2	Molecular scattering	Solution: SLS, DLS, Raman	
13	4/7		X-ray crystallography	15
	4/9	**Quiz 3**		
14	4/14	Hydrodynamics	Theory: sedimentation, diffusion and viscosity	
	4/16		Techniques: gel, Electrophoresis, gel filtration, AUC	8
15	4/21	Nuclear magnetic resonance		14
	4/23	Mass spectroscopy		
Finals week	TBA	**Quiz #4 (4/28 to 5/5)**		