Introduction to Biophysical Chemistry
CHEM 4150/6150 (3.0 credits)
Department of Chemistry, Georgia State University
2017 Spring semester

Instructor: Gregory M. K. Poon, Ph.D.
NSC 416
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Time and location: Tuesdays and Thursdays, 5:30 to 6:45 pm, **Sparks Hall 304**

Office Hours: Tuesdays 4 to 5 pm in NSC 416 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. Develop skills needed to critically analyze experimental data;
3. Develop a physically intuitive view of biological systems at the molecular level.

Recommended 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 iCollege, 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 provided approximately every two weeks. They are aimed at applying the concepts presented in class and **preparing you for the questions on the tests.** We will work on part of the problem sets in groups during class, the rest is for you to complete outside of class. They will be not be marked, but you may submit them on the due dates for extra credits.

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 tests is not allowed.**

Assessments:
Assessment is based on attendance (10%) and in-class tests (**3** x 30%), the last of which will be held during Finals week. **You can recover up to 30% of your final grade with extra credit earned by scores on problem sets which you choose to submit.** Tests are composed of a mixture of multiple choices and short written questions. Graduate students enrolled in CHEM 6150 will answer extra questions, which are optional (bonus) for undergraduate students, aimed at probing a more advanced level of understanding.

Grading Scale:
Students can be assured of the following grades by attaining the indicated scores:

90%	**A+**	77%	**B+**	67%	**C+**	50%	**D**
85%	**A**	74%	**B**	64%	**C**	Below 50%	**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. The consequences of cheating are potentially severe and permanent: don't do it!

Course Schedule

Week	Session	Date	Topic		Chapter
1	1	1/10	Introduction		
	2	1/12	Mathematics review	Algebra	
2	3	1/17		Differential calculus	
	4	1/19		Integral calculus	
3	5	1/24	**Test 1 (Sessions 1 to 4)**		
	6	1/26	Thermodynamics I	Introduction	2
4	7	1/31		Energy and enthalpy	
	8	2/2		Entropy and free energy	3
5	9	2/7		Chemical potential and equilibrium constants	4
	10	2/9		Standard states and non-ideality	
6	11	2/14	Review for Test 2		
	12	2/16	**Test 2 (Sessions 6 to 11)**		
7	13	2/21	Thermodynamics II	Applications to biomolecular interactions I	2,3,4
	14	2/23		Applications to biomolecular interactions II	
8	15	2/28		Applications to biomolecular interactions III	
	16	3/2	Interpreting biomolecular interactions at equilibrium	Introduction and independent site binding	5,6
9	17	3/7		Heterogeneity in site binding	
	18	3/9		Statistical features of multi-site binding	
10	19	3/21		Cooperativity	
	20	3/23	Review for Test 3		
11	21	3/28	**Test 3 (Sessions 13 to 20)**		
	22	3/30	Kinetics	Introduction	9
12	23	4/4		Chemical kinetics	
	24	4/6		Enzyme kinetics	10
13	25	4/11		Enzyme kinetics	
	26	4/13	Hydrodynamics	Diffusive properties of macromolecules	8
14	27	4/18		Applications of hydrodynamics to biomolecules	
	28	4/20	Review for Test 4		
Finals			**Test 3 (Sessions 22 to 28)**		