CHEM 4521
Biophysical Chemistry
Fall 2015

Course meeting place/time: MWF 11:05-11:55am MoS&E 1222

Description:
The course objective is to introduce you to important concepts in biophysical chemistry. You will develop an understanding of how thermodynamics, kinetics, and spectroscopy are applied to problems of biological interest. You will consult current literature concerning the application of biophysical techniques to characterize biological molecules and systems.

Instructor:
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Office: IBB 2209
Office hours: Wed, Fri 12-1 pm

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Office Hours: Wed 10-11 am

Readings:
Physical Chemistry, Principles and Applications in Biological Sciences, Tinoco, Sauer, Wang, Puglisi, Harbison & Rovnyak -- 5th Edition, ISBN 978-0136056065
Other materials as distributed

Grading:

Midterm exams	20% x 2 =	40%
Homework assignments	2% x 5 =	10%
Quizzes	TBA	10%
Project	TBA	5%
Participation, attendance		5%
Final exam	30% x 1 =	30%

T-Square Page:
To include some lecture notes, a class schedule, relevant course information. The information available on T-square is NOT a substitute for attending class.

GT Honor Code:
All students are expected to follow the Georgia Tech Academic Honor Code (www.honor.gatech.edu). Examples of other academic misconduct include, but are not limited to: possessing, using, or exchanging improperly acquired written or verbal information in the preparation of the quizzes, exams and paper; submission of a paper that is wholly or substantially identical to that created by another person or persons, without adequate credit notations indicating authorship. All examinations must be completed by the individual with no assistance from any other person, reference book, website or notes.

Course Policies

1. HOMEWORKS. Problem sets are an integral part of your learning in this course. You should expect to spend **15-20** hours on each assignment. Do not leave the assignment until the night before it is due, as you will not benefit from the solutions presented the next day. You may work together with other students on the assignment but must submit your own work for grading. Homework assignments are to be photocopied by you and submitted at the start of the class on which they are due. Homework is NOT accepted late, including at the end of class, under any circumstances. However, homework assignments can be accepted early by arrangement, or submitted by a classmate in attendance. We will review homework problems in class. Be prepared to present a problem on the board to the class. **Selected homework problems will be graded** and contribute to your overall final grade as indicated above.

2. MISSED EXAMS & QUIZZES. All exams will be closed book and questions will consist of calculations, short answer, and essay questions. There are two hour-long exams and one final exam in this class and they cannot be exempted under any circumstances. If a student has a conflict with an exam/quiz date due to a LEGITIMATE excuse, this must be disclosed in writing with appropriate documentation. For this course, legitimate excuses include, but are not limited to, interviews for graduate/professional school or job, and presentation of independent research at a scientific meeting. If a student is sick on the day of an exam or quiz, a doctor's note must be furnished in order to schedule a makeup. All make-up exams or quizzes, whether due to conflict or illness, must be taken within 1 week of the original exam date; no exceptions. Quizzes will be announced during the semester.

3. CLASS PROJECT. Students will be responsible for a short 5-7 min. presentation at the end of the semester. Each presentation project should be prepared by a group of two students. The students should chose one or two papers describing the most recent advances in thermodynamics, computer simulations, NMR, X-ray and spectroscopy. A brief ~1-2 page report containing the brief summary of the paper(s) as well as highlighting the major reasons for their selection will be due on October 23rd. 2-3 presentation slides should be deposited on T-square by November 23. The presentations will be held on November 30 and December 2, and should highlight the intrinsic merit of the work, importance of the studies and the results for a broader community as well as contain a brief summary of major results.

4. MATHEMATICS. This course uses the languages of biochemistry, physical chemistry, and mathematics. It is assumed that the student has successfully completed all of the pre-requisites for this course. In particular, the student should be able to recall concepts in single and multi- variable calculus and is comfortable with taking partial derivatives. It is further expected that the student is familiar with finite series and their approximations, complex numbers, polar coordinates, as well as basic counting statistics. If a student is not familiar with these concepts, he/she is encouraged to consult the course textbook as well as those of previous courses.

5. REGRADES. If a student believes that a question has been graded incorrectly, they should submit a written explanation in writing within 1 week of the exam.

6. FINAL GRADES. Final grades will be assigned relative to student rank in the class (curved). No scores will be dropped in calculating the final score.

APPROXIMATE COURSE SCHEDULE

Week	Lecture	Weekday	Date	Topic
	1	Mon	17-Aug	Course Intro
Week 1	2	Wed	19-Aug	First Law
	3	Fri	21-Aug	Second Law
	4	Mon	24-Aug	Free Energy
Week 2	5	Wed	26-Aug	Statistical Thermodynamics
	6	Fri	28-Aug	Protein Denaturation
	7	Mon	31-Aug	Free Energy
Week 3	8	Wed	2-Sep	Calorimetry, **Project Teams due**
		Fri	4-Sep	**Homework 1**
		Mon	7-Sep	*Labor Day*
Week 4	9	Wed	9-Sep	Ligand binding
	10	Fri	11-Sep	Ligand binding
	11	Mon	14-Sep	Stabilizing forces
Week 5	12	Wed	16-Sep	Macromolecule folding
		Fri	18-Sep	**Homework 2**
		Mon	21-Sep	**Exam 1**
Week 6	13	Wed	23-Sep	Heisenberg Uncertainty Principle/Math review
	14	Fri	25-Sep	Particle in a Box
	15	Mon	28-Sep	Harmonic oscillator
Week 7	16	Wed	30-Sep	HO/Rigid Rotor
	17	Fri	2-Oct	RR/H-atom
	18	Mon	5-Oct	H-atom
Week 8	19	Wed	7-Oct	Computational Chemistry, Molecular Dynamics
		Fri	9-Oct	**Homework 3**
		Mon	12-Oct	*Fall Break*
Week 9	20	Wed	14-Oct	EM radiation
	21	Fri	16-Oct	Abs/Emission spectroscopy
	22	Mon	19-Oct	Vibrational spectroscopy
Week 10*	23	Wed	21-Oct	Vibrational spectroscopy
	24	Fri	23-Oct	Rayleigh scattering, **draft of the project due**
	25	Mon	26-Oct	Raman spectroscopy
Week 11	26	Wed	28-Oct	Raman spectroscopy
		Fri	30-Oct	**Homework 4**
	27	Mon	2-Nov	Fluorescence spectroscopy
Week 12	28	Wed	4-Nov	Fluorescence spectroscopy
		Fri	6-Nov	**Exam 2**
	29	Mon	9-Nov	NMR
Week 13	30	Wed	11-Nov	NMR
		Fri	13-Nov	History of Crystallography
	31	Mon	16-Nov	X-ray crystallography
Week 14	32	Wed	18-Nov	X-ray crystallography
	33	Fri	20-Nov	X-ray crystallography
		Mon	23-Nov	**Homework 5, project due**
Week 15	34	Wed	25-Nov	*Thanksgiving break*
	35	Fri	27-Nov	*Thanksgiving break*
	36	Mon	30-Nov	Project presentations
Week 16	37	Wed	2-Dec	Project presentations
	38	Fri	4-Dec	Review

Key due dates:	**Homework**	**Exam**	**Project**
September 2			Teams due
September 4	Homework 1		
September 18	Homework 2		
September 21		Exam 1	
October 9	Homework 3		
October 23			Report due
***October 25**	**Withdraw date**		
October 30	Homework 4		
November 6		Exam 2	
November 23	Homework 5		Slides due
November 30			Presentations
December 2			Presentations
December 9	**8:00-10:50 am**	**Exam 3**	