CHEM 4521/6582
Biophysical Chemistry
Fall 2011

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, transport, 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. You will prepare a written critique on a relevant current scientific topic.

Instructor:
Prof. Raquel L. Lieberman
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In any correspondence, please include the course number if your subject line
Office IBB 1303
Office hours: Wed, Fri 12-1

Substitute Instructor: Dr. Anton Petrov. Email: anton.petrov@biology.gatech.edu

TA:
Jeff Culver. Email: jaculver9@gatech.edu
Office Hours: TBD

Readings:
Physical Chemistry, Principles and Applications in Biological Sciences & Solutions Manual
Tinoco, Sauer, Wang and Puglisi -- 4th Edition, ISBN 0-13-095943-X
Other materials as distributed

Grading:
Four midterm exam 15% each
One group written project: 20%
Homework assignments, announced quizzes, participation, attendance: 20%

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. The page paper must be written de novo by the student. ***Ten students were caught plagiarizing in some form last year and were reported to the Dean of Students; do not let this be you!***

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 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. Homeworks do not get graded for accuracy; it is the student's responsibility to ensure that he/she has the correct solution. We will review homework problems in class. Be prepared to present a problem on the board to the class.

2. MISSED EXAMS & QUIZZES. All exams will be closed book and questions will consist of calculations, short answer, and essay questions. There are three hour-long exams 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.

3. FINAL EXAM IS MIDTERM EXAM. The scheduled final exam for this course is the first day of finals (Monday Dec 12). The exam on this day will cover the material since Exam 3 (not cumulative).

5. COMMENTARY PROJECT. All students are expected to work together in their assigned groups (4521) and put in equivalent effort as their group mates. Each student is responsible for all of the content of the journal article and any ensuing summary, presentation, or written assignment. Groups must work together to write a critical review, not just a summary of the journal article. It is further expected that numerous rounds of revisions will be required for an adequate level of polish to be achieved. More about the specifics of the commentary project appear on T-square. Any materials handed in as part of this assignment is subject to the Georgia Tech Honor Code.

6. MATHEMATICS. This course uses the languages of biochemistry, physical chemistry, and mathematics. It is assumed that the student has successfully taken 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, 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.

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

8. 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

	1	Mon	22-Aug	Course Intro	
Week 1	2	Wed	24-Aug	First Law	
	3	Fri	26-Aug	Second Law	
	4	Mon	29-Aug	Free Energy	
Week 2	5	Wed	31-Aug	Protein denaturation	
	6	Fri	1-Sep	**Homework 1**	
		Mon	*5-Sep*	*Labor Day*	
Week 3	7	Wed	7-Sep	Calorimetry **Paper selection sign-up**	**THERMODYNAMICS OF BIOLOGICAL MACROMOLECULES**
		Fri	9-Sep	Ligand binding	
	8	Mon	12-Sep	Ligand Binding	
Week 4	9	Wed	14-Sep	Stabilizing forces	
	10	Fri	16-Sep	Stabilizing forces	
	11	Mon	19-Sep	Structural transitions	
Week 5	12	Wed	21-Sep	Structural transitions, **Homework 2**	
		Fri	23-Sep	**Exam 1**	
	13	Mon	26-Sep	Background/History of Quantum **Abstracts of papers due**	
Week 6	14	Wed	28-Sep	Heisenberg Uncertainty Principle	
		Fri	30-Sep	Particle in a Box	
	15	Mon	3-Oct	HO	
Week 7	16	Wed	5-Oct	HO/Rigid Rotor	
	17	Fri	7-Oct	RR/H-atom	
	18	Mon	10-Oct	EM radiation	
Week 8	19	Wed	12-Oct	Abs/Emission Spectroscopy	
		Fri	14-Oct	**Homework 3**	
		Mon	*17-Oct*	*Fall Break*	**INTERACTION OF BIOLOGICAL MACROMOLECULES WITH LIGHT**
Week 9	20	Wed	19-Oct	Rayleigh Scattering	
	21	Fri	21-Oct	**Exam 2**	
	22	Mon	24-Oct	Vibrational Spectroscopy	
Week 10	23	Wed	26-Oct	**Homework 4**	
		Fri	28-Oct	Raman Spectroscopy	
	24	Mon	31-Oct	Fluorescence Spectroscopy	
Week 11	25	Wed	2-Nov	Fluorescence Spectroscopy	
		Fri	4-Nov	Fluorescence Spectroscopy	
	26	Mon	7-Nov	X-ray Crystallography ***First draft of paper due***	
Week 12	27	Wed	9-Nov	X-ray Crystallography	
	28	Fri	11-Nov	NMR Spectroscopy	

	29	Mon	14-Nov	NMR Spectroscopy	
Week 13		Wed	16-Nov	NMR Spectroscopy	
	30	Fri	18-Nov	**Exam 3**	
				Diffusion	**TRANSPORT OF BIOLOGICAL MACROMOLECULES**
	31	Mon	21-Nov	***Peer review due***	
Week 14	32	Wed	23-Nov	Sedimentation	
		Fri	*25-Nov*	*Thanksgiving*	
		Mon	28-Nov	Electrophoresis	
Week 15	33	Wed	31-Nov	Electrophoresis	
		Fri	2-Dec	**Homework 5**	
	34	Mon	5-Dec	Protein folding in vitro	
Week 16	35	Wed	7-Dec	Protein folding in vitro	
	36	Fri	9-Dec	Protein folding in vitro	
		Mon	12-Dec	***Exam 4***	
				Final paper due by 5pm	

Key due dates:	**Homework**	**Exam**	**Commentary Project**
September 1:	Homework 1		
September 7:			Paper Selection
September 21:	Homework 2		
September 23:		Exam 1	
September 26:			Abstract due
October 14:	Homework 3		
October 21:		Exam 2	
October 26:	Homework 4		
November 7:			First Draft due
November 18:		Exam 3	
November 21:			Peer Review due
December 2:	Homework 5		
December 12:		Exam 4	Final Commentary due