

MSE 6407/ BME 8813: Biological Properties
Day/Time: MWF/ 3:05-3:55PM
Room: MRDC 4404

Instructor: Drs. Thomas Barker & Valeria Tohver Milam
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OFFICE HOURS: By appointment

COURSE DESCRIPTION AND OBJECTIVES: This graduate level course will address the structure-property relationships of cellular components. More specifically, the course addresses correlations between molecular-level structure with macroscopic properties of key cellular macromolecules such as proteins, extracellular matrix, nucleic acids, biological membranes and cellular receptors. One-half of the course will provide an overview of fundamental biological concepts. The second half of the course will survey various characterization methodologies for biological and biomimetic systems using examples from recent literature. The overall objectives of this course are to provide students with an understanding of how to employ materials characterization approaches to examine the dynamic and specific nature of cellular components.

Prerequisites: none except graduate level student status

RECOMMENDED TEXTBOOKS: *Fundamentals of Biochemistry* by D. Voet et al, 2nd edition (2006), Wiley. *The Molecular Biology of the Cell* by Bruce Alberts, et al Fourth Edition. 2002. Garland Science. Note: These textbooks are recommended but not required.

LECTURES: Half of the course will provide an overview of biological systems. The other half of the course will focus on characterization of biological systems. Much of the lecture material for the latter part of the course will be based on selected journal articles (approximately one article per lecture). Students are strongly encouraged to read assigned articles prior to class. Supplementary reading assignments based on the recommended textbook or other journal articles will be suggested, but not required. **Please turn off cell phones, pagers, etc. before entering the classroom.**

QUIZZES: Approximately every two weeks, quizzes based on lecture material will be given at the beginning of class.

EXAMINATIONS: There will be two in-class, closed book and notes examinations during the semester. If a student has a legitimate conflict, the exam must be rescheduled by that student prior to the examination day.

FINAL PRESENTATION: During the last week of the semester, students will take turns giving a 10-15 minute oral presentation on a journal article selected by the student. A five-minute question and answer session will follow the presentation. The article must not coincide with those assigned by the instructors, but can be on a specific topic related to a lecture or other topic suggested by the instructors. One month prior to the presentation, the student must seek approval for the journal article he or she has selected. One week prior to the presentation, the student must turn in a one page report on the article which includes 1) an abstract of the article's research objectives and conclusions and 2) a critique highlighting strengths and weaknesses of the authors' experimental approach and conclusions 3) suggestion(s) of future related work to explore. The one page report will be circulated to the class prior to the oral presentations. After all oral presentations have been completed, each student will provide a brief critique (one paragraph each) on each of the oral presentations and one-page reports provided by his or her classmates. The written critique should assess (1) the overall quality and clarity of each oral presentation; (2) how well the presenter addressed questions raised by the audience; and (3) the validity and merit of the accompanying one-page report. Questions raised by the students following each presentation will also be considered as part of the "Critique" grade.

GRADE: Your final grade will be computed based upon your performance and scaled according to the following scheme:

Quizzes – 25%
Examination 1 - 25%
Examination 2 - 25%
One-page Paper – 10%
Presentation - 10%
Critique – 5%

ACADEMIC INTEGRITY

In this course students are encouraged to study together.

Students are to neither receive nor provide help to others during exams.

The use of programmable calculators is not allowed during exams.

Any student suspected of academic misconduct will be referred to the Office of Student Integrity at the Georgia Institute of Technology.

TENTATIVE LECTURE TOPICS:

Date/Instructor	Topics or Article	Quiz or Exam
Jan 7 th /Milam	Course Intro	
Jan 9 th /Barker	General cell anatomy & biochemistry	
Jan 11 th /Milam	Y.-B. Lu <i>et al. PNAS</i> 103 17759-17764	
Jan 14 th /Barker	DNA & RNA Part I	
Jan 16 th /Milam	A.W. Peterson <i>et al. Nucl Acids Res.</i> 2001 451 553-556	
Jan 18 th	DNA & RNA Part II	
Jan 21 st	MLK Holiday	
Jan 23 rd /Milam	Smith <i>et al Science</i> 1996 271 795-799	
Jan 25 th	Quiz 1	Quiz 1
Jan 28 th /Barker	Proteins – Part I	
Jan 30 th /Barker	Proteins – Part II	
Feb 1 st /Barker	Quiz 2	Quiz 2
Feb 4 th /Barker	Receptor-Ligand Binding	
Feb 6 th /Milam	A.G. Kanaras <i>et al. Angew. Chem. Int. Ed.</i> 2003 42 191-194	
Feb 11 th /Barker	No lecture	
Feb 13 th	EXAM 1	EXAM 1
Feb 18 th /Milam	E.L. Florin <i>et al. Science</i> 1994 264 415	
Feb 20 th /Barker	Cellular Membranes	
Feb 25 th /Milam	TBA	
Feb 27 th /Barker	Focal Adhesions	
March 4 th /Barker	Cytoskeleton – Part I	
March 6 th /Barker	Cytoskeleton – Part II	
March 8 th	Quiz 3	Quiz 3
March 11 th /Milam	D. Humphrey <i>Nature</i> 2002 416 413-416	
March 13 th /Milam	TBA	
March 18-22	SPRING BREAK	
March 25 th /Milam	C. Storm <i>et al. Nature</i> 2005 435 191-194	
March 27 th /Barker	Extracellular Matrix – Part I	
March 29 th	Quiz 4	Quiz 4
April 1 st /Barker	Extracellular Matrix – Part II	
April 3 rd /Milam	TBA	
April 5 th	Journal article selection due (email to Profs. Milam & Barker by 5pm)	
April 8 th /Barker	Viruses & Bacteriophage	
April 10 th /Milam	S.R. Whaley <i>et al. Nature</i> 2000 405 665-668	
April 15 th /Barker	Cellular Machines – Special Topic	
April 17 th	EXAM 2	EXAM 2
April 19 th	One page paper due (email to Profs. Milam & Barker by 5pm)	
April 22 nd & April 24 th	Student Presentations	
April 29 th	Written critiques dues (email to Profs. Milam & Barker by 5pm)	