PURDUE UNIVERSITY

DEPARTMENT OF BIOCHEMISTRY

BCHM 60501 Macromolecules
Syllabus
Fall 2016

INSTRUCTOR: Dr. Frederick Gimble
office: BCHM 10
TEL: 494-1653
e-mail: fgimble@purdue.edu

Office hours: By appointment

LECTURE TA: Mr. Colin Carlock
office: BIND 280
TEL: 6-3765
e-mail: ccarloc@purdue.edu

Office hours: Monday, Friday 11:30-12:30 pm BCHM 314

COURSE OBJECTIVES

A typical BCHM 60501 class includes students from a variety of departments, graduate programs, and scientific backgrounds. In this course we will review the properties of amino acids and nucleotides and basic principles that govern the different levels of macromolecular structure. In the post-genomic age, we can use sequence analyses to predict protein and RNA structure and to give clues as to their functions. Students will learn the basic concepts behind these techniques. Students will become familiar with methods used to determine the three-dimensional structures of macromolecules, and how to critically evaluate the accuracy of such structures. We will explore special topics in macromolecular science, including membrane proteins, bioinformatics, CRISPR Cas genome modification and ribozymes.

DEPARTMENTAL LEARNING OUTCOMES ADDRESSED BY THIS COURSE

- ☐ BCHM 60501 students will be able to describe the chemical structures of the building blocks of biological macromolecules, including amino acids and nucleic acids.
- ☐ BCHM 60501 students will demonstrate knowledge of the higher order structures of proteins and nucleic acids.
- ☐ BCHM 60501 students will acquire information literacy: the ability to locate, evaluate and utilize information in the disciplines of biochemistry and molecular biology that is required for research, data analysis, and communication.

TEXTBOOK

Texts on reserve in the Life Sciences Library or online include:

Proteins: Structures and Molecular Properties (Thomas E. Creighton)
Biophysical Chemistry of Nucleic Acids and Proteins (Thomas E. Creighton) *Online*
Physical and Chemical Basis of Molecular Biology (Thomas E. Creighton) *Online*
Protein Structure and Function, Primers in Biology (Gregory A. Petsko and Dagmar Ringe)
Introduction to Protein Structure (Carl Branden and John Tooze)

Structure and Mechanism in Protein Science: A guide to Enzyme Catalysis and Protein Folding (Alan Fersht).
Nucleic Acids: Structures, Properties and Functions (Bloomfield, Crothers, Tinoco)
Lewin's Genes XI (Krebs, Goldstein, Kilpatrick)

Any of these would be a valuable reference for this course and for those considering a career in life sciences.

LECTURE TIME AND PLACE

Monday, Wednesday and Friday, BCHM 105, 10:30-11:20. Lectures will be recorded, and will be available for students who miss a class or who would like to review a lecture. They can be downloaded at http://www.itap.purdue.edu/tlt/BoilerCast/

BLACKBOARD

The syllabus for the course, lecture notes, and grading keys for quizzes and exams will be available via the Purdue University Blackboard Learn site: https://mycourses.purdue.edu/

ASSESSMENT

Exams are not cumulative.
The grading for this course will be as follows:

Problem sets	150 points
Class Presentations/written summary	80 points
Exam 1	190 points
Exam 2	190 points
Exam 3	190 points

The cutoff values for letter grades are as follows:

720 points	A
640 points	B
560 points	C
480 points	D
479 points and below	F

Missing an exam will result in a grade of 0 being recorded unless documented justification for the absence is presented. Any request to be excused from an exam must include official documentation (doctor's note, request from academic advisor, etc.) explaining why the exam was or will be missed. Makeup tests will be scheduled in consultation with the instructor.

If you have any disagreements with the way any of your exams have been graded, please consult the grading key and then discuss them with the lecture TA. In the event this does not resolve your concerns, please take them up with the instructor.

Requests for re-grades must be submitted no later than the end of the second class period after the graded test or assignment has been returned.

EXTRA CREDIT

There will be no opportunity for extra credit unless discussed explicitly during class.

OBTAINING EXTRA HELP

Dr. Gimble will be available to answer your questions immediately after class or by appointment (arranged in class or by e-mail). Alternatively, you can submit questions by e-mail that can be answered in class or by return e-mail.

The lecture TA will hold office hours for at least 2 hours per week, and will be able to answer additional questions by appointment. The lecture TA will also hold optional help sessions before each exam.

ACADEMIC MISCONDUCT

Academic misconduct of any kind will not be tolerated in any course offered by the Department of Biochemistry. Information on Purdue's policies with regard to academic misconduct can be found at http://www.purdue.edu/studentregulations/student_conduct/regulations.html

Any incidence of academic misconduct will be reported to the Office of the Dean of Students. Academic misconduct may result in disciplinary sanctions including expulsion, suspension, probated suspension, disciplinary probation, and/or educational sanctions. In addition, such misconduct will result in punitive grading such as:

- receiving a lower or failing grade on the assignment, or
- assessing a lower or failing grade for the course

Punitive grading decisions will be made after consultation with the Office of the Dean of Students. Please note reported incidences of academic misconduct go on record for reference by other instructors. Further, a record of academic misconduct is likely to influence how current/future situations are handled.

To provide you with an unambiguous definition of academic misconduct, the following text has been excerpted from "Academic Integrity: A Guide for Students", written by Stephen Akers, Ph.D., Executive Associate Dean of Students (1995, Revised 1999, 2003), and published by the Office of the Dean of Students in cooperation with Purdue Student Government, Schleman Hall of Student Services, Room 207, 475 Stadium Mall Drive West Lafayette, IN 47907-2050.

"Purdue prohibits "dishonesty in connection with any University activity. Cheating, plagiarism, or knowingly furnishing false information to the University are examples of dishonesty." [Part 5, Section III-B-2-a, *Student Regulations*] Furthermore, the University Senate has stipulated that "the commitment of acts of cheating, lying, and deceit in any of their diverse forms (such as the use of substitutes for taking examinations, the use of illegal cribs, plagiarism, and copying during examinations) is dishonest and must not be tolerated. Moreover, knowingly to aid and abet, directly or indirectly, other parties in committing dishonest acts is in itself dishonest." [University Senate Document 72-18, December 15, 1972]

More specifically, the following are a few examples of academic dishonesty which have been discovered at Purdue University.

- substituting on an exam for another student
- substituting in a course for another student
- paying someone else to write a paper and submitting it as one's own work
- giving or receiving answers by use of signals during an exam
- copying with or without the other person's knowledge during an exam
- doing class assignments for someone else
- plagiarizing published material, class assignments, or lab reports
- turning in a paper that has been purchased from a commercial research firm or obtained from the internet
- padding items of a bibliography
- obtaining an unauthorized copy of a test in advance of its scheduled administration
- using unauthorized notes during an exam
- collaborating with other students on assignments when it is not allowed
- obtaining a test from the exam site, completing and submitting it later
- altering answers on a scored test and submitting it for a regrade
- accessing and altering grade records
- stealing class assignments from other students and submitting them as one's own
- fabricating data
- destroying or stealing the work of other students

Plagiarism is a special kind of academic dishonesty in which one person steals another person's ideas or words and falsely presents them as the plagiarist's own product. This is most likely to occur in the following ways:

- using the exact language of someone else without the use of quotation marks and without giving proper credit to the author
- presenting the sequence of ideas or arranging the material of someone else even though such is expressed in one's own words, without giving appropriate acknowledgment
- submitting a document written by someone else but representing it as one's own"

Students can report issues of academic integrity that they observe through the Office of the Dean of Students website (www.purdue.edu/odos), or 765-494-8778 or integrity@purdue.edu.

CLASS ATTENDANCE

In accordance with University policy, you are expected to attend every scheduled class. If you have a valid reason for missing class such as a University-sponsored activity, religious observances, illness, or family emergency, the instructor or TA will assist you in obtaining information and materials you may have missed. Students who skip class without a valid excuse should not expect the instructor or TA to supply class notes or provide special help. The official university policy, see: http://www.purdue.edu/univregs/pages/ac_regs_pro/classes.html

EMERGENCY PREPAREDNESS

In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances. To get information about changes in this course consult the class Blackboard site or e-mail or phone the instructor.

PURDUE UNIVERSITY

DEPARTMENT OF BIOCHEMISTRY

ON-LINE COURSE EVALUATIONS

During the last two weeks of the semester, you will be provided an opportunity to evaluate this course and your instructor(s). To this end, Purdue has transitioned to online course evaluations. On Monday of the fifteenth week of classes, you will receive an official email from evaluation administrators with a link to the online evaluation site. You will have two weeks to complete this evaluation. Your participation in this evaluation is an integral part of this course. Your feedback is vital to improving education at Purdue University. I strongly urge you to participate in the evaluation system.

NON-DISCRIMINATION POLICY STATEMENT

Purdue University's non-discrimination policy will be upheld in this classroom. Purdue University is committed to maintaining a community which recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her own potential. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas, and enriches campus life.

Purdue University views, evaluates, and treats all persons in any University related activity or circumstance in which they may be involved, solely as individuals on the basis of their own personal abilities, qualifications, and other relevant characteristics.

In this course, each voice in the classroom has something of value to contribute. Please take care to respect the different experiences, beliefs and values expressed by students and staff involved in this course. We support Purdue's commitment to diversity, and welcome individuals of all ages, backgrounds, citizenships, disability, sex, education, ethnicities, family statuses, genders, gender identities, geographical locations, languages, military experience, political views, races, religions, sexual orientations, socioeconomic statuses, and work experiences

For more information, see http://www.purdue.edu/purdue/ea_eou_statement.html.

PURDUE UNIVERSITY

DEPARTMENT OF BIOCHEMISTRY

LECTURE SCHEDULE

Lecture/Date	Instructor	Topic
1. August 22	Gimble	Introduction to BCHM60501/Elements of protein structure, Pymol
2. August 24	Gimble	Elements of protein structure: Introduction, Primary, Secondary structure
3. August 26	Gimble	Elements of protein structure:, Tertiary structure
4. August 29	Gimble	Elements of protein structure: Quaternary structure
5. August 31	Gimble	Elements of protein structure: protein sequence analysis structure prediction
6. September 2	Gimble	Elements of protein structure: Protein stability
September 5	*Labor day, no class*	
7. September 7	Gimble	Elements of protein structure: Protein folding and stability
8. September 9	Gimble	Elements of protein structure: Protein Folding Student Presentation
9. September 12	Post	Elements of protein structure-Determining structure
10. September 14	Gimble	Elements of protein structure-Determining structure
11. September 16	Rochet	Amyloids
12. September 19	Gimble	Elements of protein structure-Determining structure
13. September 21	Hall	Proteins and Introduction to proteomics
September 22	Optional Review TBA	
14. September 23	Hall	Proteomics
15. September 26	**Exam 1**	**Exam 1: 8:00-10:00 pm LILY 1105**
16. September 28	Hall	Post-translational modifications
17. September 30	Pascuzzi	Bioinformatics
18. October 3	Pascuzzi	Bioinformatics
19. October 5	Gimble	Membrane proteins
20. October 7	Gimble	Student presentations
October 10	*Fall break-No Class*	
21. October 12	Puthiyaveetil	Nanomachines of photosynthesis
22. October 14	Gimble	Binding and physical interaction methods
23. October 17	Lohman	Polyketide synthases
24. October 19	Gimble	Synthetic Biology
25. October 21	Gimble	Synthetic Biology
26. October 24	Student Presentations	
27. October 26	Gimble	Nucleic acid chemical properties
October 27	Optional Review TBA	
28. October 28	Gimble	RNA structure and structure prediction
29. October 31	**Exam 2**	**Exam 2: 8:00-10:00 pm LILY 1105**
30. November 2	Gimble	RNA secondary and tertiary structure
31. November 4	Gimble	RNA secondary and tertiary structure
32. November 7	Gimble	Unusual nucleic acid structures
33. November 9	Gimble	Unusual nucleic acid structures
34. November 11	Gimble	Protein-nucleic acid interactions
35. November 14	Gimble	mRNA splicing
36. November 16	Gimble	RNA silencing
37. November 18	Gimble	Student Presentation
38. November 21	Gimble	Riboswitches
November 23/25	*Thanksgiving-No Class*	
39. November 28	Gimble	Riboswitches
40. November 30	Gimble	CRISPR-Cas
41. December 2	Gimble	CRISPR-Cas
42. December 5	Gimble	Protein synthesis by ribosomes
43. December 7	Gimble	Protein synthesis by ribosomes
44. December 9	Review	