ENZYMOLOGY (Spring 2015)

Chem 4630
Chem 6630
Biol 4630
Biol 6630

Instructor: Dr. Giovanni Gadda, 549 NSC, ggadda@gsu.edu

Teaching Assistant: Mr. Dan Su, 510 NSC

Prerequisites: Organic Chemistry (CHEM 2400)
Biochemistry I (CHEM 4600/6600)

Lecture: MW 5:30-6:45 pm, room: Sparks Hall 306

Office Hours: **MW, 6:45 – 7:30 pm (only by email appointment).**
The instructor will be available to meet with students during office hours. **Please send e-mail ahead of time to schedule an appointment at these hours**. Students are required to bring their lecture notes.

Text: 1) Enzyme Kinetics and Mechanism, Paul F. Cook and W. W. Cleland; 2007; Garland Science Publishing; ISBN: 0815341407.

Required Reading: 1) Kuyper, B.J. (1991) Bringing up scientists in the art of critiquing research. *Bioscience*, 41:248-250 – it will be provided.
2) Peer-reviewed journal articles (TBA) to cover some topics.
3) Various handouts.

Course Objective: This course intends to provide an introduction to the fundamental concepts in enzyme mechanisms and kinetics, to the common methods for studying enzymes, and the current developments in the field.

Course Requirements: Students must attend all class sessions.

Graduate students:
3 take-home exams + in-class definitions (100 pts each; total 300 pts)
1 oral presentation (100 pts)
4 written critiques will be counted (25 pts each; total 100 pts)
Total pts. 500

Undergraduate students:
3 take-home exams + in-class definitions (100 pts each; total 300 pts)
4 written critiques will be counted (25 pts each; total 100 pts)
Total pts. 400

Take-home problem sets: Problem sets must be turned in at the beginning of class on the dates they are due in.
Oral presentations: Students, working in pairs, will prepare an oral presentation of a peer-reviewed journal article chosen from a pool suggested by the instructor. The length of the presentation will be announced depending upon class enrollment. Each presentation should consist of (but not limited to) the following elements: a background and introduction to the article to be presented, a discussion of the techniques employed, a discussion of the results obtained and an overall interpretation of the results. In addition, the students should provide their own critical evaluation of the article. It is responsibility of the presenters to prepare copies of the article and hand them to the rest of the class at least one week (7 days) prior to the presentation. Since a team composed of two students will present each journal article, it is the students' responsibility to ensure an equal workload during the presentation.
Written critiques: Students will write a 1-2 page critique of the article presented in class using the *Bioscience* article as a guide. The written critiques will be handed in at the beginning of class. Up to 5 written critiques, one for each day of paper presentation (*see syllabus*) will be turned in for grading (4 will be counted for the final grading).

Important Note: *Failure to turn in any assignment on time (take-home problem sets, written critiques, or any other extra assignment) will result in a **5% penalty of the grade for each day of delay**.*
All students, irrespective of whether they present, are responsible for reading and preparing to discuss each article presented during the semester.

Coursework and Grading:
The grading will be based on the following criteria:
a) Accuracy of answer and reasoning
b) Adequacy of answer and/or presentation and/or written critique, i.e., reasoning for basis of answer must be clear
c) All results must be presented with proper units, e.g., time, concentration, etc.
d) Discussion participation, e.g., points/issues raised, questions, answers, etc.

Projected Grading Scale: A+: 95%, A: 90%, A-: 87%, B+: 84%, B: 80%, B-: 77%, C+: 74%, C: 70%, C-: 67%, D: 60%, F: <60%

Cheating: A student who cheats on an assignment **will receive a zero** for that assignment. The Department of Chemistry follows the University Policy on Academic Honesty published in the "Faculty Affairs Handbook" and the "On Campus: The Undergraduate Co-

Curricular Affairs Handbook." Any suspected offenses may be referred to the Department Chair for appropriate action.
All tests taken must represent your individual, unaided efforts. To receive or offer information during an examination is cheating. The use of unauthorized supplementary materials during tests is also cheating.

Miscellaneous:

March 3 is the last day to withdraw from class and receive a "W". The University requires that faculty members must, on a date after the mid-point of the course to be set by the Provost (or his designee):
1. Give a WF to all those students who are on their rolls but no longer taking the class and
2. Report the last day the student attended or turned in an assignment.

TENTATIVE LECTURE SCHEDULE

This schedule is a general guide and may be modified as needed

NOTE: All students are required to independently review the Michaelis-Menten approach to study enzyme kinetics (with the related equation, plot, and the three conditions that are required to use this approach), and the Henderson-Hasselbach equation for the description of the ionization of weak acids and bases (relationships between pH and pK_a). These basic topics will NOT be covered in lectures.

Date	#	Topics
Jan 12	1	Introduction to the course + general concepts
Jan 14	2	Modern enzymology in the 21st century
Jan 21	3	What are enzymes and how they work
Jan 26	4	Principles and mechanisms of enzyme catalysis (1)
Jan 28	5	Principles and mechanisms of enzyme catalysis (2)
Feb 2	6	Effective concentration of the catalyst
Feb 4	7	Initial velocity studies: basic kinetic tools ***Assignment 1 distributed + in-class definition (covers lectures 1-7)***
Feb 9	8	Initial velocity studies: significance of the kinetic parameters ***Assignment 1 due in before class starts***
Feb 11	9	Reversible enzyme inhibition
Feb 16	10	Initial velocity studies in the presence of added products
Feb 18	11	Enzymatic reactions with multiple substrates (1) ***Assignment 2 distributed + in-class definition (covers lectures 1-11)***
Feb 23	12	Enzymatic reactions with multiple substrates (2) ***Assignment 2 due in before class starts***
Feb 25	13	Product inhibition and its applications
Mar 2	14	How to derive analytical rate equations (1)
Mar 4	15	How to derive analytical rate equations (2)
Mar 9	16	Rapid reaction kinetics: basic kinetic tools
Mar 11	17	Rapid reaction kinetics: applications (1)
Mar 23	18	Rapid reaction kinetics: applications (2)
Mar 25	19	Isotopic probes of kinetic mechanism
Mar 30	20	Isotope effects as a probe of mechanism
Apr 1	21	pH Dependence of kinetic parameters and isotope effects (1)
Apr 6	22	pH Dependence of kinetic parameters and isotope effects (2)
Apr 8	23	Paper presentation (Groups 1/2) ***Written critique #1 due in class before class starts***
Apr 13	24	Paper presentation (Groups 3/4) ***Written critique #2 due in class before class starts***
Apr 15	25	Paper presentation (Groups 5/6) ***Written critique #3 due in class before class starts*** ***Assignment 3 distributed (covers lectures 1-25)***
Apr 20	26	Paper presentation (Groups 7/8) **Written critique #4 due in class before class starts** **Assignment 3 due in before class starts**
Apr 22	27	Paper presentation (Groups 9/10) **Written critique #5 due in class before class starts**
Apr 27	28	Paper presentation (Groups 11/12) **Written critique #6 due in class before class starts**