81.428/528 Molecular Biotechnology – Spring 2012

Prof. Hwai-Chen Guo; Olsen 413B, ext. 2878, HwaiChen_Guo@uml.edu

TR 9:30-10:45 AM; Location Olsen Hall 403

Course Prerequisites:

Principles of Biology I (81.111) or equivalent
(Biochemistry (81.419/519 or equivalent) recommended)

Course Materials:

Required Text*: Molecular Biotechnology: Principles and Applications of Recombinant DNA. B.R. Glick, J.J. Pasternak, and C.L. Patten (2010), 4th Ed. (ISBN 978-1-55581-498-4), ASM (American Society for Microbiology) Press.
Assigned readings throughout the semester

Course Description:

A study of the principles and applications of modern molecular biotechnology. The course will starts with the fundamentals of biotechnology using recombinant DNA methodologies. Selected topics will then be discussed, with a particular focus on recombinant protein production for industrial, agricultural, pharmaceutical, or biomedical applications. Recent developments in methodologies and applications of transgenic plants and animals will also be covered, as well as the social, regulatory, and ethical issues of molecular biotechnology. In addition to the required textbook, students will be required to read and discuss assigned articles concerning current development in molecular biotechnology. Graduate students (taking the 81.528 credit) will also be required to read and present primary research papers from the scientific literature. Upon finishing the course, students should have core concepts and the foundation needed to support their own research and/or appreciate ongoing development in molecular biotechnology. Each student should also have better prepared to read and comprehend publications from the scientific literature or current events in biotechnology.

Grading Policies:

1. **Undergraduates (81.428)**: Students will be graded on the evaluation of the three 1-hour exams, the comprehensive final exam, and a combination of class participation, attendance, and overall attitude toward the course. The exams will cover materials from the textbook, lectures/handouts, assigned readings, and papers presented by graduate students. The exams will have open-response questions, and may require students to utilize the information from class to design experiments to address problems, or to interpret hypothetical experimental data. Class participation will be evaluated based on class attendance and participation in critique and discussions of the paper presentations by graduate students. Students will also be called upon at random during the class period to summarize and lead a discussion on assigned readings concerning current events/news in biotechnology. Assigned readings will be announced in class, and in the following class period a student will be selected at random to make a brief informal presentation summarizing and critiquing the assigned reading (~10 minutes) and to further lead class discussion (another 10 minutes); such a discussion will take place during the last 20-25 minutes of class. Questions related to the assigned readings and discussions will be included in the exams. There is no extra credit and no make-up exam.
2. **Graduates (81.528)**: Students will be evaluated as for undergraduate students, with slightly different weighing policies. In addition, graduate students are required to present one recent scientific paper of their choices, typically by Microsoft Powerpoint presentation or its equivalent.

Students will make a 15 minute oral presentation at the end of the course, in a format similar to those presented at professional meetings, and critique each other's presentations. Your need to carefully choose your paper for presentation, and are advised to seek the input of the instructor by mid-semester as to the appropriateness of a chosen paper. It must be a primary research article or letter from the journal *Nature Biotechnology* that greatly interests you, and is published within the past 18 months, or research that you have performed or are currently performing at UML (or elsewhere). Students need to distribute copies of their papers to the class at least two weeks before their presentations. Presentations will be evaluated by the instructor and your peers (using a scoring sheet to be distributed) based upon the relevance and difficulty of the chosen paper as well as the thoroughness of the presentation. Students are expected to provide enough background information so that the audience would understand why and how the research was done, and what is the scientific gap or hypothesis the paper was intended to address. Students are also expected to provide their own critiques/opinions of the paper.

Grading Weights:	Undergraduates	Graduates
Exam I	20%	15%
Exam II	20%	15%
Exam III	20%	15%
Presentation	NA	15%
Final Exam	30%	30%
Participation	10%	10%

Course Rules:

The Course Syllabus and the Course Rules are subject to change throughout the semester at the discretion of the instructor. Timely notice will be given regarding any changes, either in class, by e-mail, and/or on the website http://faculty.uml.edu/hwaichen_guo/Teaching/Teaching.aspx

In Class/Presentation:

- No Cell phones, iPod, IM, nor chatting
- Graduate students have 15 minutes for their presentations
- Missed presentations cannot be make-up
- Be respectful of other students' presentations, ask questions but no chatting

Exams:

- Closed book exams
- No make-up exams
- Cheating on any exam will not be tolerated, and will receive an "F" for the course

Lecture Schedule:

Dates	Subject	Chapter*
January 24 T	Course Intro, Development	1
26 R	DNA, RNA, Protein Synthesis	2
31 T	Recombinant DNA Technology	3
February 2 R	(continue)	3
7 T	DNA Synthesis, Amplification, Sequencing	4
9 R	Bioinformatics, Genomics, Proteomics	5
14 T	(continue)	5
16 R	Manipulation of Gene Expression in Prokaryotes	6
21 T	(continue)†	6
23 R	Exam I (chapters 1-5 + assigned readings/discussions)	
28 T	Heterologous Protein Production in Eukaryotes	7
March 1 R	(continue)†	7
6 T	Directed Mutagenesis, Protein Engineering	8
8 R	(continue)	8
13 T	No Class, Spring Recess	
15 R	No Class, Spring Recess	
20 T	Protein Therapeutics	10
22 R	Vaccines	12
27 T	Industrial Large-Scale Protein Production	17
29 R	Exam II (chapters 6-10 + assigned readings/discussions)	
April 3 T	Genetic Engineering of Plants: Methods	18
5 R	Genetic Engineering of Plants: Applications	20
10 T	Transgenic Animals	21
12 R	Regulations & Societal Issues	22,23
17 T	Academic Large-Scale Protein Purification-Denatured†	handouts
19 R	Exam III (chapters 12-23 + assigned readings/discussions)	
24 T	Academic Large-Scale Protein Purification-Native Form†	handouts
26 R	Academic Large-Scale Protein Purification-Applications†	handouts
May 1 T	Graduate Student Presentations	
3 R	(continue)	
9-17 W-R	Final Exam (purification handouts and cumulative)	

* chapter in the required textbook; † guest lecturer

Assessment of Presentation 81.428/528 Date:_____.

Student Reviewer:_____.

Using the following guidelines for your assessment, provide a number for each category/speaker:

1	2	3	4	5	6
Poor	Fair	Good	Very Good	Excellent	Outstanding
(75)	(80)	(85)	(90)	(95)	(100)

I. Introduction: Did the presenter establish and understanding of the subject?

II. Methods / Results: What was the overall quality of the slides, and how well did the presenter explain each set of data?

III. Conclusions: Did the presenter adequately summarize the data and/or the studies, and establish what the data showed and where the research is heading.

1. Student Presenter:

I. Introduction:

II. Methods / Results:

III. Conclusions:

Comments:

2. Student Presenter:

I. Introduction:

II. Methods / Results:

III. Conclusions:

Comments:

3. Student Presenter:

I. Introduction:

II. Methods / Results:

III. Conclusions:

Comments:

4. Student Presenter:

I. Introduction:

II. Methods / Results:

III. Conclusions:

Comments:

5. Student Presenter:

I. Introduction:

II. Methods / Results:

III. Conclusions:

Comments:

6. Student Presenter:

I. Introduction:

II. Methods / Results:

III. Conclusions:

Comments: