

## **CHEM525: Biochemistry Laboratory Techniques (Fall 2012)**

### **Instructor:**

Dr. Jason C. Hurlbert

Office: Sims 301B

Office hours: MWF 11-12 and by appointment

Phone: 323-4928

E-mail: [hurlbertj@winthrop.edu](mailto:hurlbertj@winthrop.edu)

### **Meeting Times:**

**All Sections:** Prelab Lecture Mondays, 12:30 - 1:20 PM

**Section 001 :** Laboratory Tuesdays, 2:00 - 4:50 PM

**Section 002 :** Laboratory Wednesdays, 2:00 - 4:50 PM

**Credit Hours:** 1

**Textbook:** None. Handouts and Scientific articles will be provided.

**Required Materials:** Scientific calculator, laboratory notebook, safety goggles

### **Course Goals and Objectives**

We will cover recombinant protein production and purification, enzymological analysis and the solution structure of enzymes in several experiments over the course of the semester. As we perform the experiments, I hope you will gain an appreciation of the various techniques performed in modern biochemical research.

### **Student Learning Outcomes**

Upon the completion of this course, students will:

- 1) Be able to perform routine biochemical laboratory techniques and operate instrumentation found in any biochemistry modern laboratory
- 2) Know how to statistically validate and interpret data obtained from experimentation
- 3) Utilize modern bioinformatics software in the study of biological molecules
- 4) Be able to better read and interpret scientific research articles

### **Course Requirements / Grading for the Course**

#### **Prelab Assignments:**

Due to the tight schedule we will follow during the semester, you will be given assignments at the conclusion of the Monday afternoon prelab lectures that must be completed before you may begin work on your scheduled laboratory session. This requirement is necessary to ensure that you will be able to perform the myriad tasks that need to be accomplished in the laboratory each week. Failure to complete the prelab assignments AND bring the completed work to class with you will result in you being barred from the lab for the week. This will, in turn, result in you not being able to complete the assigned work and being unable to complete the Section Writeup which will seriously lower your overall grade.

### **Section Writeups**

Four different section writeups will be due during the semester. These writeups will be due at the start of the lab period indicated on the detailed course schedule. Each weekly writeup must include the following sections: 1) Materials and Methods, 2) Results and Discussion, 3) Conclusions and 4) References. The Results and Discussion section will contain all necessary Figures and Tables in addition to scientific explanations of the data. All Figures and Tables must be prepared in accordance to the guidelines provided to authors in the Journal of Biological Chemistry ([www.jbc.org](http://www.jbc.org)).

### **Final Report**

A final report will be due on the last prelab meeting of the course (December 3). This report will be a compilation of the corrected section writeups you turned in during the semester with Abstract and Introduction sections. The entire report must be formatted in the style of an article from the Journal of Biological Chemistry. Despite the fact that much of the material will already be written, you will need to construct a laboratory report that is coherent, logical and accurately describes what you have done during the semester.

### **Laboratory Notebook**

A laboratory notebook is one of most important tools a scientist has and is just as important in this class. You must carefully document all of the procedures and reagents you use as well as the data you collect during the semester. Any of your peers should be able to pick up your lab notebook and be able to reproduce what you did without any problem. Keep this in mind should you have any questions about what you should enter into your notebook. We will discuss how to properly keep a notebook in the first prelab session and examples will be provided.

### **Final Exam**

A cumulative final exam will be given on the final week of the semester and it will cover the background material, theories and practices covered during the semester.

### **Final Grade**

Prelab Assignments: 10 x 10 pts = 100 points

Section Writeups: 4 x 30 pts = 120 points

Homework Assignments: 3 x 20 pts = 60 points

Final Paper: 50 points

Laboratory Notebook: 20 points

Final Exam: 30 points Total: 380 points

### **Grading Scale:**

A: >90% of the total Points

B+: 87 - 89.9% of the total Points, B: 80 - 86% of the total Points

C+: 77 - 79.9% of the total Points, C: 70 - 76.9% of the total Points

D: 60 - 69.9% of the total Points

F: <60% of the total Points

### Tentative Course Schedule

Week of	Topic	Assignment Due
Aug 20	Course Overview and Semester Plan	---
Aug 27	Practical Bioinformatics: Looking AND Seeing with Entrez/BLAST and Chimera	
Sept 3	Spectrophotometric Assays	Entrez / BLAST and Chimera Homework assignments due
Sept 10	Protein Expression and Purification: Cell Lysis	Spectrophotometry Worksheet due
Sept 17	Protein Expression and Purification: FPLC: Ion Exchange Chromatography	
Sept 24	Analysis of Protein Purification: SDS-PAGE	Rough Draft (Handwritten text!) of Introduction due
Oct 1	Kinetics I: Analysis of Polymer Depolymerization Kinetics by reversed phase HPLC	Rough Draft (Handwritten text!) of Protein Purification and SDS-PAGE Writeups
Oct 8	Kinetics II: Spectrophotometry I: Influence of [Substrate] on enzymatic reactions	Protein Purification and SDS-PAGE Writeup due
Oct 15	Kinetics III: Spectrophotometry II: Influence of pH on enzymatic reactions	
Oct 22	Circular Dichroism Spectropolarimetry: Chemical Denaturation of Proteins	Rough Draft (Handwritten text!) of Kinetics I, II and III Writeup
Oct 29	Mass Spectrometry I: MALDI-TOF MS analysis of purified FPLC fractions	Kinetics I, II and III Writeup due
Nov 5	Mass Spectrometry II: Three-dimensional mapping of protein structures by limited proteolysis	Mass Spectrometry I Writeup due
Nov 12	Final Lab Report Preparation	Rough Draft of Mass Spec II Writeup due
Nov 19	<b>Thanksgiving Break</b>	Mass Spec I and II Writeup due
Nov 26	Final Lab Report Preparation	Rough Draft of Final Lab Report Due
Dec 3	Lab Cleanup	Final Report Due

**Students taking the course for graduate credit**

Any student taking the course for graduate credit will be required to prepare a final presentation (20 minutes) summarizing the experimental results from the semester. This presentation must clearly introduce the family of enzymes under study in the class, describe the theoretical basis of each of the experiments performed and clearly discuss and interpret the results. This presentation will count as 20% of the final grade.

**Technology in the Classroom**

You will need to make certain that you bring a scientific calculator to the lab each session, and, more importantly, you must know how to use the linear regression mode of your calculator. No laptop computers or cellular phones may be used in the laboratory when class is meeting as the distractions they cause present a significant safety hazard. Anyone caught using these devices during class without prior permission will immediately be asked to leave for the day and will not be allowed to make up the laboratory work they miss as a result of their actions.

**Drop Policy:** As described in the Winthrop University Undergraduate catalog

**Student code of conduct**

As noted in the Student Conduct Code: “Responsibility for good conduct rests with students as adult individuals.” The policy on student academic misconduct is outlined in the “Student Conduct Code Academic Misconduct Policy” in the online *Student Handbook* (<http://www2.winthrop.edu/studentaffairs/handbook/StudentHandbook.pdf>).

**Students with Disabilities**

Winthrop University is dedicated to providing access to education. If you have a disability and require specific accommodations to complete this course, contact the Office of Disability Services (ODS) at 323-3290. Once you have your official notice of accommodations from the Office of Disability Services, please inform me as early as possible in the semester.