

## **FALL 2009 BIOLOGY 555: ELECTRON MICROSCOPY LECTURE**

**2 Credits**

**Class meets Wednesday 1:00-2:50 in LS 132**

**TEXT:** **Scanning and Transmission Electron Microscopy 1993.** Flegler et al,  
Freeman and Company Press (a copy is on Reserve at Love Library)

**OTHER:** **Blackboard (SDSU)**

**EM Facility instrument tutorials**

**EM Facility website:** <http://www.sci.sdsu.edu/emfacility>

Through the use of texts, images, the world wide web, and equipment demonstrations, you will learn the theoretical basis of operation of, as well as sample preparation for, a transmission and a scanning electron microscope. With this knowledge, you should be able to design sample preparation protocols based on your knowledge of the equipment. A variety of specialized techniques, and the images obtained, will also be presented, along with a discussion of the types of research data obtained from these techniques. You will be able to identify the techniques used to create the images, and explain the use of these techniques to test scientific hypotheses.

**Grades are based on performance on quizzes and exams, on the basis of**

**Quizzes (100 points, 20%):** There will be a quiz given in each lecture period except those sessions with exams. Each quiz will be worth 10 points, and the 10 best scores will be used to compute a final quiz grade (maximum credit 100 points). The quizzes will cover the material TO BE PRESENTED in the lecture of the day, and will require students to review the lecture notes (on BlackBoard) before coming to the class. There will be no make-up quizzes, as only the 10 best scores will be counted. If you take 10 or fewer quizzes, your grade will be the sum of all the quizzes you were present for. The quizzes will be given at the start of class. People coming late to class will miss the quiz, and will not be able to take the quiz once the lecture has started, as the quiz material will be presented in the lecture.

**2 interim examinations, (each 1 hour, each worth 100 point, each 20%) and 1 final, cumulative exam (2 hours, 40% of grade, 200 points).** The exams will consist of short answer, fill in the blank, matching, and essay questions. Exam questions will be taken from lecture, the assigned readings, or any other materials assigned through Blackboard. The final exam is comprehensive. Additional reference texts are available in Love Library, or the EM Facility, Physical Science-1

**Students not enrolled in Biology 556 or 557 should visit the Facility to view equipment.**

### **Tentative schedule of weekly lecture topics and readings**

1-Microscopes--an overview	pp. 1-11, 93-95
Basic components and how they work and comparison of images and data obtained	
2-Vacuum systems	pp. 23-42
3-Lenses/ electronics	pp. 13-22
4a-Transmission Electron Microscopy:	pp. 43-64
Image formation/Detectors	
4b-Scanning Electron Microscopy:	pp 65-90
Image formation/Detectors	

**5-Interim Examination I (September 2 THROUGH September 23 classes)  
September 30 in class**

**--bring blank essay paper or blue book--**

6-Imaging: silver and silica based recording, printing	pp. 200-219
7-TEM Sample preparation I	pp 100-148
Shadowing/negative staining/freeze fracture	pp 97-100, 126-142
8-TEM Sample preparation II	
Fixation chemicals/ solutions	pp 100-108
Microwaves	
Cryogenics	pp. 108-114
9-TEM Sample preparation III	
Dehydration/ solvents/Embedding	pp. 114-118
Sectioning	

**10-Interim Examination II (October 7 THROUGH October 28 class)  
November 4 in class**

**--bring blank essay paper or blue book--**

11-TEM Staining	pp. 118-126
Cytochemistry/Antibodies	pp 145-148
12-Tomography	
13a-SEM sample preparation	pp151-168
fixation solution considerations	pp 100-114. 162-168
Chemicals/Cold	
Dehydration/Critical Point Drying (CPD)	pp. 113-114, 159-167
coating	pp 152-158, 132-136
13b- Material Sciences sample preparation	
14-Electron Microscopy and X ray analysis	pp. 173-199

**INCLUSIVE FINAL EXAM (from day one through the last lecture)**

**Monday December 14 from 1300-1500 in LS 132**

**--bring blank essay paper or blue book--**