I. Description of Course:

1. Department/Course: BIOT - 120B
2. Title: SEM - Biological Applications and Techniques
3. Cross Reference:
4. Units: 0.5
   Lec Hrs: 0.25
   Lab Hrs: 0.75
   Tot Hrs: 18.00
5. Repeatability: Yes Times: 2
6. Grade Options: Grade Only (GR)

7. Degree/Applicability: Credit, Degree Applicable, Not Transferable (D)
8. General Education:
9. Field Trips: Not Required
10. Requisites:
    Prerequisite
    BIOT 120A Introduction to SEM Technology

12. Catalog Description:
Students will learn theory, operation, and applications of Scanning Electron Microscopy in biological sciences including techniques for biological specimen preparation.

13. Class Schedule Description:

14. Counselor Information:
Students receive hands-on training in use of the Scanning Electron Microscope for making photographs of highly magnified biological specimens.

II. Student Learning Outcomes
The student will:

1. Demonstrate skill in use of stereo dissecting microscope.
2. Describe the applications of scanning electron microscopy pertaining to the biological sciences; identify the components and types of the scanning electron microscope.
3. Demonstrate skill in the processing of biological specimens.
4. Demonstrate skill in operating the Hitachi SU-1500 SEM; explain the process of image formation.

III. Course Outline:
A. General microscopy concepts
   1. Magnification, resolution and other microscopy concepts
   2. Interactions of light and matter
   3. Simple vs. compound microscopes
B. Scanning electron microscopy theory
   1. Limitations and powers of the electron beam
   2. Specimen-beam interactions and other SEM signal uses
C. Scanning electron microscope instrumentation
   1. Electron microscope component systems
2. Process of image formation
3. SEM vs. ESEM
4. SEM operation
D. Specimen processing
   1. Processing considerations for biological/non-biological specimens
   2. Processing procedures
   3. Processing instrumentation and theory

IV. Course Assignments:
   A. Reading Assignments
      1. Library reserve readings
      2. Internet readings and learning modules
   B. Projects, Activities, and other Assignments
      1. Take-home review questions, eg. the student will describe the 5 basic component systems of a scanning electron microscope and explain their respective functions.
      2. Take-home assignments, eg. collect specimens suitable for SEM viewing.
   C. Writing Assignments
      1. Homework questions, eg. write an assessment of potential specimens regarding their suitability.

V. Methods of Evaluation:
   A. Quizzes and final exam - may include fill-in, true-false, multiple choice, short essay questions, eg. "What ultimately limits resolution in microscopes? Why does an electron beam provide improved resolution and magnification in comparison to a regular light source?"
   B. In-class assignments, homework, hands-on activities will also comprise a portion of the student's grade.

VI. Methods of Instruction:
   A. Lecture
   B. Laboratory
   C. Discussion
   D. Demonstration

VII. Textbooks:
   Recommended

   Supplemental

VIII. Supplies:

CID 3506