Department of Biology BI 450/650

Molecular Biology Investigations New Spring, 1999

1. Catalog Description and Credit Hours

Gene cloning and analysis in an independent, investigative environment.
DNA library screening, primer/probe design, cloning, sequencing, sequence analysis. 1 hour lecture, 4 hours lab. I, II. 3 credit hours.

II. Prerequisites: BI 200 (General Microbiology), CH 340 or 341 (Organic Chemistry), Pre- or co-requisite: BI 381 (General Genetics).

Ill. Purposes or objectives of the course:

This course is designed to provide experience in molecular biology techniques in an investigative environment. Students will work individually to clone and characterize a gene from a DNA library based on sequence information obtained from a purified protein. Each student will work independently.

Course Objectives:

A. To provide basic experience in molecular biology methods.

B. To provide an experiential learning environment where each student must exercise considerable scientific judgment in the actual performance of the project.

C. To provide a laboratory experience that reflects as closely as possible the actual investigative process in a molecular biology research situation.

Expected Student Outcomes:

The course should develop in students the following abilities:

A. Plan appropriate experiments.

B. Interpret molecular biology data, draw appropriate conclusions and modify experimental approaches in response to the results.

C. Exhibit a broad understanding of gene cloning and analysis methods.

D. Apply experience gained in the laboratory to analysis of published research.

IV. Expectations of Students.

Undergraduate Students:

Students will be expected to attend each lecture and lab session with the added expectation that many activities related to the project they will pursue will have to be done outside of normally scheduled class time. Time released from normal lab periods will assure that the nominal 4 lab hours per week will be maintained as closely as possible. Each student will be required to keep a professional lab notebook with all procedures and results detailed. In addition, as students exercise judgment about specific procedures, they will be encouraged to seek the advice of faculty and other students, and duly attribute that advice to its sources. For each new major laboratory method employed, students will be required to locate and summarize a recent primary literature article in which the method was important. During the course of the semester, students will prepare 4 interim lab reports explaining results to that point. Ultimately, each student will prepare a publication quality manuscript detailing and discussing the results of the project.

Graduate Students:

Graduate students will be required to prepare a five to ten page proposal outlining additional experiments that should be done to gain complete characterization of the gene and its regulation. Graduate students must be concurrently enrolled in BI 689, Graduate Seminar, or have already completed that course..

V. Course Content or Outline:

Lecture	class hours
Introduction	1
Protein Methods	2
Library Screening/probe design	2
Library Construction	2
DNA isolation methods	2
RNA/cDNA methods	1
Labeling techniques	1
PCR methods	2
Advanced techniques	2

Lab	class hours
Intro/basic techniques	4
SDS gel purification of proteins	4
Electroblotting of purified proteins	4
Probe design and labeling	4
Library plating and plaque lifts	8
Plaque hybridization and screening	4
Plaque rescreening	4
Excision/subcloning	8
Restriction mapping	4
Plasmid purification	4
Sequence analysis, protein structure prediction	4
Polymerase chain reaction	8

VI. Textbook: Ausubel, et al. 1995. *Short Protocols in Molecular Biology.*

VII. Basis for Student Evaluation.

Lab Notebook	15%
Paper summaries	10%
Interim lab reports	40%
Final Manuscript	35%

For Graduate Students

Lab Notebook		15%
Paper summaries	10%	
Interim lab reports	40%	
Final Manuscript	25%	
Proposal	10%	