

College of San Mateo

Official Course Outline

1. TITLE: BIOL 123 – Biotechnology Workshop: Techniques and Applications of the Polymerase Chain Reaction
Semester Units/Hours: 1.0 units; a minimum of 16.0 lecture hours/semester
Method of Grading: Letter Grade Only

2. COURSE DESIGNATION:

Degree Credit
Transfer credit: CSU

3. COURSE DESCRIPTIONS:

Catalog Description:
Workshop in principles, applications, and hands-on techniques in PCR (polymerase chain reaction).

4. STUDENT LEARNING OUTCOMES (SLO'S):

Upon successful completion of this course, a student will meet the following outcomes:

1. Perform PCR
2. Identify components, illustrate with diagrams, and analyze results of polymerase chain reaction (PCR).
3. Explain how PCR works, and recognize some of its applications.
4. Accurately and reproducibly use micropipets, perform simple DNA extraction, use a thermal cycler, analyze DNA by agarose and acrylamide gel electrophoresis.
5. Record purpose, materials, methods, and results in a laboratory notebook to use for reference, review and future work.

5. SPECIFIC INSTRUCTIONAL OBJECTIVES:

Upon successful completion of this course, a student will be able to:

- A. Perform PCR
- B. Identify components, illustrate with diagrams, and analyze results of polymerase chain reaction (PCR).
- C. Explain how PCR works, and recognize some of its applications.
- D. Accurately and reproducibly use micropipets, perform simple DNA extraction, use a thermal cycler, analyze DNA by agarose and acrylamide gel electrophoresis.
- E. Record purpose, materials, methods, and results in a laboratory notebook to use for reference, review and future work.

6. COURSE CONTENT:

Lecture Content:

Outline and schedule of class topics over several class meetings (due to time requirements of class activities, no more than eight class meetings should be held):

I. Introduction

A. Lecture: DNA structure and replication

B. Workshop exercises

1. Using micropipets

2. Pouring and loading agarose gels.

II. Working with DNA

A. Lecture: DNA denaturation and renaturation, replication requirements

B. Workshop exercise: Restriction fragments of lambda DNA analyzed by agarose gel electrophoresis.

III. PCR

A. Lecture: The need for primers in DNA replication and PCR

B. Workshop exercises

1. Perform DNA extraction
2. Perform first PCR (Alu).

IV. Advanced PCR

A. Lecture:

1. More about PCR requirements
2. Genetics of Alu PCR results

B. Workshop exercises

1. Run agarose gels on products of first PCR
2. Perform second PCR (D1S80).

V. Conclusion

A. Workshop exercises

1. Results of first PCR
2. Run acrylamide gels on products of second PCR

B. Lecture: genetics of D1S80

C. optional linear regression analysis of results

D. Evaluation of each other's lab and lecture notebooks; course evaluation.

Lab Content:

Class is a workshop with lecture/lab components. See lecture content.

TBA Hours Content:

No TBA Hours

- REPRESENTATIVE METHODS OF INSTRUCTION:

Typical methods of instruction may include:

1. Lecture
2. Lab
3. Discussion
4. Observation and Demonstration

- REPRESENTATIVE ASSIGNMENTS

Representative assignments in this course may include, but are not limited to the following:

1. Writing Assignments:

Completion of a two-part notebook is required.

Part A-complete lecture notes (okay to rewrite), including diagrams

Part B- lab notebook: for each exercise (often several in a day): state purpose, list materials, step-by-step procedures, results, notes/comments. do not rewrite; this is a record of everything you do, and should not be changed, corrected, edited, etc. okay to write comments, explanations, write something again more neatly for reference, but do not replace original.

2. Reading Assignments:

Last class evaluate three other students' notebooks: Read them over and rate their success in the following:

a-Lecture notes appear complete; b-Lecture notes are neat, readable; c-Lecture notes are organized; d-Write a sentence describing attributes of each notebook that you would incorporate into your own in the future.

Read background information and laboratory techniques provided by Applied Biosystems and other sources, downloaded from WebAccess.

• REPRESENTATIVE METHODS OF EVALUATION

Representative methods of evaluation may include:

1. Class Participation
2. Class Performance
3. Class Work
4. Portfolios
5. Projects
6. Evaluation of lecture and laboratory parts of notebook by three other students will measure achievement of course objectives in understanding, recording and communicating the method of PCR in words and diagrams. Participation: Students are required to attend all five meetings of the class. Weekly work on pipet techniques, DNA preparation, gel electrophoresis are observed and supervised by instructor, and student success is measured by lab results, photographs of gel bands and comparison to class work in general, proper labelling of photos, interpretation, and conclusions, all recorded in lab notebook.

• REPRESENTATIVE TEXT(S):

Possible textbooks include:

Spencer, C.A. . GENETIC TESTIMONY: A GUIDE TO FORENSIC DNA PROFILING, ed. Pearson Prentice Hall, 2004

Palladino, M., . UNDERSTANDING THE HUMAN GENOME PROTECT, ed. Benjamin Cummings, 2002

Other:

Background information and laboratory techniques provided by Applied Biosystems are available for download on WebAccess for the class.

Origination Date: August 2011
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Course Originator Kathleen Diamond