College of San Mateo
Official Course Outline

1. **COURSE ID:** BIOL 123 **TITLE:** Biotechnology Workshop: Techniques and Applications of the Polymerase Chain Reaction
   Units: 1.0 units **Hours/Semester:** 16.0-18.0 Lecture hours; and 32.0-36.0 Homework hours
   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 or modeling of techniques in PCR (polymerase chain reaction). A materials fee as shown in the Schedule of Classes is payable upon registration.

4. **STUDENT LEARNING OUTCOME(S) (SLO'S):**
   Upon successful completion of this course, a student will meet the following outcomes:
   1. Recognize and outline the main steps of PCR (polymerase chain reaction).
   2. Understand and explain how PCR works.
   3. Describe some applications of Polymerase Chain Reaction.

5. **SPECIFIC INSTRUCTIONAL OBJECTIVES:**
   Upon successful completion of this course, a student will be able to:
   1. Recognize and outline the main steps of PCR (polymerase chain reaction).
   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.

6. **COURSE CONTENT:**
   Lecture Content:

   Outline of class topics over several class meetings (due to time requirements of class activities, no more than eight class meetings should be held):
   A. Lecture: DNA structure, replication and how PCR works; this includes:
   1. DNA denaturation and renaturation, replication requirements
   2. The need for primers in DNA replication and PCR
   3. PCR reactions and analysis of results by agarose and acrylamide gel electrophoresis
   4. DNA fingerprinting to identify individuals
   5. Other applications, for example, using PCR to detect Covid-19 infection by presence of viral RNA

   B. Workshop exercises/techniques
   1. Using micropipets
   2. Crude DNA extractions and sources
   3. Gel electrophoresis
   4. Genetics of PCR results
   5. Modeling DNA fingerprinting using STRs
   6. Modeling PCR to detect Covid-19 infection by presence of viral RNA

   Lab Content:
   Class is a workshop with lecture/modeling and simulation components. See lecture content.

7. **REPRESENTATIVE METHODS OF INSTRUCTION:**
   Typical methods of instruction may include:
   A. Lecture
   B. Directed Study
   C. Discussion
   D. Observation and Demonstration
   E. Other (Specify): Third party simulations and animations

8. **REPRESENTATIVE ASSIGNMENTS**

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

Representative assignments in this course may include, but are not limited to the following:
Online third-party simulation Assignments:
Student lecture-technique journals must be organized by topic, in sequence for the course's five meetings: each topic section will have Lecture and Applications with related Techniques shown by Simulations or Models that apply the molecular principles.
Group Discussions on Canvas
Class (Zoom) presentations on modeling results for DNA fingerprinting and Covid-19 testing

Reading Assignments:

Reading Assignments: current application articles

9. **REPRESENTATIVE METHODS OF EVALUATION**
Representative methods of evaluation may include:
   A. Class Participation
   B. Class Work
   C. Oral Presentation
   D. Projects
   E. Simulation
   F. Evaluation of lecture-techniques notebook by instructor, and assessment of presentation by other 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 is observed in class by instructor, and by Group Discussions and simulation scores, and student success is measured by lecture-techniques notebook.

10. **REPRESENTATIVE TEXT(S):**
Possible textbooks include:
   A. Alberts, B., et al. *Essential Cell Biology*, 5th ed. New York: W. W. Norton & Company, 2019
Other:
   A. Background information and laboratory techniques provided by Applied Biosystems are available for download on Canvas for the class.

Origination Date: August 2020
Curriculum Committee Approval Date: October 2020
Effective Term: Fall 2021
Course Originator: Kathleen Diamond