

**Common Course Outline**  
**BIOL 253**  
**Techniques of Biotechnology II**  
**5 Semester Hours**

**Community College of Baltimore County**

**Description**

**Techniques in Biotechnology I**

Introduces the theory and practice of biotechnology Laboratory procedures; discusses cloning, nucleic acid manipulation, sequencing, DNA/RNA transfer techniques, and bioinformatics. BIOL 253 meets for two lecture hours and 9 laboratory hours per week. Requires Program director signature.

**Overall Course Objectives**

This course is intended to prepare students for an entry-level position in a biotechnology or bioscience laboratory or to transfer to a four-year school for programs in molecular biology, biology, bioinformatics, or biochemistry.

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

1. Isolate and mutate, and manipulate DNA using restriction endonuclease digestion, site-directed mutagenesis, and polymerase chain reaction.
2. Perform gene transfer (transformation) in bacteria and yeast.
3. Perform restriction digestion, gel electrophoresis, DNA purification, DNA sequencing, and polymerase chain reaction to map, characterize or manipulate DNA.
4. Make and screen a cDNA library.
5. Perform DNA/RNA transfer and blotting procedures including Western blot, Northern blot, and southern blot.
6. Design PCR primers and oligonucleotides.
7. Maintain a laboratory notebook; create and maintain a standard operating procedure manual; maintain laboratory records including supply requisition, purchase orders, material safety data sheet, and quality control records.
8. Use supplier and vendor catalogues to identify and order equipment and supplies as well as for a laboratory reference and information source.
9. Prepare stock solution, dilution, and culture media.
10. Sterilize and decontaminate solutions and the workspace.
11. Communicate about their work in written reports and oral presentations.
12. Design an experiment using appropriate positive and negative controls.
13. Troubleshoot laboratory methods and laboratory equipment.
14. Analyze and interpret data.

15. Perform a literature search to find background information concerning scientific findings as well as laboratory procedures and methods.
16. Use bioinformatics to utilize genomic databases, BLAST technology, and analyze nucleotide and amino acid sequences.

### **Major Topics**

- A. Introduction to Laboratory Management
  - Record Keeping
  - Reading and Interpreting Scientific Papers and Publications
  - Literature Search
  - Bioinformatics Genomic Database Search
  - Laboratory Safety – Material Safety Data Sheets
  - Use of Laboratory glassware, Pipettors and Micropipettors for Measurement
  - Preparation of Stock solutions and culture Media
  - Sterilization
  - Basic Laboratory Equipment Use and Maintenance
- B. Manipulation and Characterization of DNA
  - Plasmid Preparation
  - Subcloning into Plasmid Vectors
  - PCR Cloning
  - Site-directed Mutagenesis
  - Random Mutagenesis
  - Restriction Endonuclease Digestion
  - DNA Quantitation – Spectrophotometric/Gel Based
  - Polymerase Chain Reaction
- C. Gene Transfer
  - Transformation of Competent Bacterial Cells
  - Retrieval of Plasmid from Transformed Cells
  - Transformation of Yeast Cells
- D. DNA Retrieval and Characterization
  - Selection
  - Plasmid Retrieval
  - Tetrad Analysis
  - PCR Confirmation
  - Southern, Western, Northern Blot Analysis
  - Preparation and Screening of a DNA Library
  - DNA Sequencing
- E. Communication
  - Oral communication with Peers and Scientists
  - Written Communication with peers and Scientists
  - Scientific Writing
  - Oral Presentation of Data
  - Written Presentation of Data

## **Course Requirements**

*Prerequisites:* BIOL 251 (which may be taken concurrently) with an earned grade of “C” or better.

*Grading/exams:* Grading procedures will be determined by the individual faculty member but may include exams, quizzes, laboratory notebook, laboratory reports, reading assignments, presentations and laboratory projects.

## **Other Course Information**

Individual faculty members who teach this course may include additional course objectives and topics or exclude some of these course objectives and topics. It is expected that a majority of these topics will be covered.

Date Revised: 07/09/2019