

Course Competencies Template – Form 112

GENERAL INFORMATION	
Course Prefix/Number: BSC-2426L	Course Title: Biotechnology Methods and Applications Lab-I
Number of Credits: 2	
Degree Type	<input type="checkbox"/> B.A. <input type="checkbox"/> B.S. <input type="checkbox"/> B.A.S <input checked="" type="checkbox"/> A.A. <input checked="" type="checkbox"/> A.S. <input type="checkbox"/> A.A.S. <input checked="" type="checkbox"/> C.C.C. <input type="checkbox"/> A.T.C. <input type="checkbox"/> V.C.C
Date Submitted:	Effective Year/Term:
<input checked="" type="checkbox"/> New Course Competency <input type="checkbox"/> Revised Course Competency	
Course Description (limit to 50 words or less): This laboratory course is designed to complement BSC-2426 Biotechnology Methods and Applications I. This is a hands-on course that emphasizes the basic laboratory principles, techniques, and instrumentation, necessary for effective work in pharmaceutical-, biotechnology-, and/or research laboratory setting(s).	
Prerequisite(s): Previous knowledge of chemistry and biology strongly recommended	Corequisite(s): BSC-2426- Biotechnology Methods and Applications-I

Course Competencies: (for further instruction/guidelines go to: <http://www.mdc.edu/asa/curriculum.asp>)

Competency 1: Upon successful completion of this course, students will demonstrate knowledge of the *basic safety procedures* in a biotechnology laboratory by:

1. Describing the elements of a safe laboratory environment.
2. Identifying general personal protection regulations and appropriate laboratory attire.
3. Describing the location and purpose of safety equipment in the laboratory.
4. Demonstrating the safe use of autoclaves and electrical equipment in the laboratory.
5. Demonstrating the safe disposal of broken glassware and sharp instruments.
6. Identifying the chemical hazards associated with the laboratory.
7. Demonstrating the safe use of chemicals in the laboratory.
8. Implementing strategies for minimizing exposure to laboratory hazards.
9. Demonstrating safe handling and usage of research microorganisms, plants, animals and their derivatives.

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10. Describing proper safety measures when working with recombinant DNA.
11. Demonstrating proper storage and disposal of hazardous materials and biological specimens.
12. Evaluating Material Safety Data Sheets and official regulatory compliance policies.
13. Demonstrating proper safety procedures in handling emergency situations and contacting appropriate services and personnel.

Competency 2: Upon successful completion of this course, students will demonstrate knowledge of *standard operating and record-keeping procedures* in a biotechnology laboratory by:

1. Describing the principles and rules for quality documentation in the laboratory.
2. Identifying procedural forms, protocols, reports, and logbooks in the laboratory.
3. Demonstrating accurate collection and recording of laboratory data.
4. Maintaining documentation of experimental procedures and results.
5. Demonstrating labeling procedures.

Competency 3: Upon successful completion of this course, students will demonstrate knowledge of the *mathematic applications* in the biotechnology laboratory by:

1. Listing standard laboratory mathematical equations/calculations.
2. Solving equations with different units.
3. Solving equations with different ratios and proportions.
4. Solving exponential relationships.
5. Organizing data visually.
6. Analyzing the relationships between data represented graphically or in charts.
7. Demonstrating the recognition of sample's representation and randomness.
8. Demonstrating calculations of variance and standard deviation.

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9. Identifying patterns of normal distribution and standard deviation.
10. Solving the percentage of error for particular experiments.

Competency 4: Upon successful completion of this course, students will demonstrate knowledge concerning *the preparation of laboratory solutions* in a biotechnology laboratory by:

1. Demonstrating the calculation of percentage concentrations of solutions.
2. Demonstrating the calculation of molar and normal concentrations of solutions.
3. Applying the use of the “X” designation for expressing the concentration of diluted solutions.
4. Demonstrating the conversion of a standard formulation into amounts of reagent employed in the preparation of a solution.
5. Determining the amount of a stock reagent of a given concentration needed to obtain the desired final concentration of a solution.
6. Summarizing the safety standards for proper storage of laboratory solutions.
7. Performing dilutions.
8. Demonstrating how to monitor pH in a solution.
9. Preparing laboratory solutions for use in experimental procedures.

Competency 5: Upon successful completion of this course, students will demonstrate knowledge and ability to *use and collect data from different kinds of instruments* common for a biotechnology laboratory by:

1. Demonstrating the handling and operation of:
 - a) mechanical and electric balances,
 - b) pipettes, micropipetting devices and volumetric glassware,
 - c) thermometers,
 - d) pH-meters,
 - e) spectrophotometers,
 - f) centrifuges,
 - g) incubators,
 - h) laminar flow cabinets,
 - i) electrophoresis equipment,
 - j) gel-viewing devices,

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- k) water baths,
- l) microscopes,
- m) PCR machines

2. Evaluating technical issues and maintenance associated with laboratory equipment.

Competency 6: Upon successful completion of this course, students will demonstrate knowledge of nucleic acid structure, function and properties by:

1. Explaining:
 - a) DNA isolation procedures,
 - b) DNA restriction enzyme treatment,
 - c) DNA fragments separation by means of agarose gel electrophoresis,
 - d) Polymerase Chain Reaction (PCR).
2. Performing:
 - a) DNA isolation procedures,
 - b) DNA restriction enzyme treatment,
 - c) DNA fragments separation by means of agarose gel electrophoresis,
 - d) PCR.
3. Analyzing:
 - a) DNA isolations procedures,
 - b) DNA restriction endonuclease treatment,
 - c) DNA fragment separation by means of agarose gel electrophoresis,
 - d) PCR.
4. Explaining the resolving power of agarose gel versus polyacrylamide gel electrophoresis for the analysis of DNA.
5. Constructing a standard curve for DNA markers migrating during agarose gel electrophoresis and extrapolating the size of an unknown fragment of DNA.
6. Constructing a restriction map for a fragment of DNA.
7. Listing methods used to quantify DNA.
8. Quantifying DNA.

Competency 7: Upon successful completion of this course, students will demonstrate knowledge of *basic separation methods* by:

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1. Listing parameters for methods of separation, fractionation and clarification.
2. Comparing and contrasting different purification methods.
3. Listing the basic principles and types of filtration and chromatography.
4. Explaining basic principles of centrifugation and factors that determine the rate of sedimentation of a particle.
5. Defining differential centrifugation, density centrifugation, and continuous centrifugation.
6. Describing fixed angle rotors, horizontal rotors, near vertical and vertical tube rotors, k factors, balancing a rotor, centrifuge and rotor maintenance.

Competency 8: Upon successful completion of this course, students will demonstrate knowledge of protein structure, function, isolation and characterization by:

1. Explaining standard methods used for extraction and purification of proteins.
2. Using spectrophotometry as a quantitative method for determining total protein concentration and explaining the chemical reaction responsible for the Bradford Assay.
3. Performing protein analysis by polyacrylamide gel electrophoresis.

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