Miami Dade College

Course Competencies Template – Form 112

GENERAL INFORMATION	
Course Prefix/Number: BSC-2426	Course Title: Biotechnology Methods and Applications-I
Number of Credits: 3	
Degree Type	☐ B.A. ☐ B.S. ☐ B.A.S ☒ A.A. ☒ A.S. ☐ A.A.S. ☒ C.C.C. ☐ A.T.C. ☐ V.C.C
Date Submitted:	Effective Year/Term:
☒ New Course Competency ☐ Revised Course Competency	
Course Description (limit to 50 words or less): This course addresses the basic principles, concepts and techniques of biotechnology necessary for an understanding of the field, and effective work in a pharmaceutical-, biotechnology- and/or research-laboratory setting(s). Practical applications of biotechnology are explored.	
Prerequisite(s): Previous knowledge of chemistry and biology strongly recommended	Corequisite(s): BSC-2426L Biotechnology Methods and Applications lab-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 field of biotechnology with respect to the branches of science involved, the history of biotechnology, possible career choices and the future of the biotech industry by:

1. Defining the concept of biotechnology.
2. Explaining different biotechnology specialties and the scientific disciplines contributing to each.
3. Listing examples of historic and contemporary products from biotechnology applications.
4. Describing the history of domestication and agriculture as well as the history of fermented foods and beverages.
5. Listing milestones of modern biotechnology development.
6. Describing basic methods and applications of modern biotechnology.
7. Demonstrating basic methods and applications of modern biotechnology.
8. Summarizing the organization and functions of biotechnology companies.

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9. Describing biotechnology workplaces.

10. Defining important skills and training required to become part of the biotechnology workforce.

11. Discussing career opportunities and hiring trends in biotechnology.

Competency 2: Upon successful completion of this course, students will demonstrate knowledge of biotechnology workplace and safety regulations by:

1. Defining safety rules in the workplace.

2. Describing hazards and risk assessment.

3. Naming regulatory agencies.

4. Describing Occupational Safety and Health Administration (OSHA) worker safety regulations.

5. Defining principles of labeling, documentation, and housekeeping practices.

6. Summarizing actions directed to reduce risk in the laboratory setting.

Competency 3: Upon successful completion of this course, students will demonstrate knowledge of cell structure by:

1. Describing the structures and functions of prokaryotic cells.

2. Describing the structures and functions of eukaryotic cells.

3. Listing examples of prokaryotic and eukaryotic cells.

4. Comparing and contrasting prokaryotic and eukaryotic cells.

Competency 4: Upon successful completion of this course, students will demonstrate an understanding of the use of microrganisms in biotechnology by:

1. Describing the features of bacteria that make them useful tools for many applications in biotechnology.

2. Listing examples of how yeast can serve valuable roles in biotechnology.

3. Differentiating between alcoholic and lactic acid fermentation and discussing the importance of each in the production of common foods and beverages.

4. Demonstrating principles of microbial fermentation.

5. Describing how microorganisms play an important role in the development and production of recombinant proteins.

6. Listing examples of therapeutic proteins.

7. Identifying microorganisms that may pose a threat as bioweapons.

8. Categorizing biotechnology strategies that may be used to detect, identify, and combat bioweapons.

9. Describing the features of viruses that make them useful tools for many applications in biotechnology.

Competency 5: Upon successful completion of this course, students will demonstrate knowledge of the basic principles of recombinant DNA technology by:

1. Describing the basic structure of DNA, RNA, and proteins.

2. Demonstrating the principles of DNA isolation.

3. Describing methods to specifically cut and join DNA.

4. Describing methods to separate restriction DNA fragments and visualize DNA.

5. Comparing methods of DNA cloning in different types of cloning vectors.

6. Describing different methods of cell transformation, transient expression and transfection.

7. Explaining the use of DNA libraries.

8. Comparing Southern, Northern and Western blot hybridization.

9. Demonstrating the principles of the Polymerase Chain Reaction.

10. Listing the various methods of DNA sequencing.

11. Explaining the principles of Sanger's method of DNA sequencing

12. Defining methods of DNA micro-array technology.

13. Describing recombinant DNA production systems used to generate proteins.

14. Listing examples of therapeutic proteins generated using recombinant DNA technology.

15. Describing the use of recombinant DNA in the food industry.

16. Summarizing the ethical issues associated with the utilization of recombinant DNA technology in food development and safety.

Competency 6: Upon successful completion of this course students will demonstrate an understanding of the importance of *proteins and the methods for their production, isolation and purification* by:

1. Describing the qualitative analysis of proteins.

2. Describing the principles of protein extraction and purification.

3. Describing chemical assays such as turbidity, viscosity and density of proteins.

4. Describing the features unique to *E. coli* that lead to its frequent use in protein production.

5. Describing methods employed in sequencing short peptides and proteins.

6. Explaining proteomics and how it may be applied to protein research and development.

Competency 7: Upon successful completion of this course, students will demonstrate an *understanding of genomics* by:

1. Explaining differences between genetic, cytological and physical maps.

2. Demonstrating knowledge of applications for the human genome project.

3. Listing other genome projects.

4. Discussing the ethical, legal and social implications of the Human Genome Project.

Competency 8: Upon successful completion of this course, students will demonstrate knowledge of *molecular data collection and manipulation*:

1. Describing bioinformatics and the utilization of computational information management systems in biological research and dissemination of biological information.

2. Describing databases and websites available for sequence acquisition and analysis.

3. Accessing the location of sequences available in GenBank.

4. Utilizing a webcutter to generate restriction enzyme maps of a DNA sequence.

5. Performing BLAST search for homologous sequences and motifs in DNA sequences.

6. Utilizing the ExPASy proteomic server to translate DNA sequences into amino acid sequences.

7. Designing oligonucleotides of specific length, base composition, and nucleotide sequence by using computer technologies.

8. Calculating the melting temperature for an oligonucleotide.

9. Describing factors that affect oligonucleotide binding and function in PCR and other biotechnology applications.

Competency 9: Upon successful completion of this course, students will demonstrate knowledge of the *legislation employed in the regulation of Biotechnology* by:

1. Explaining the roles of federal and state agencies in the development and manufacturing of biotechnology products.

2. Comparing and contrasting the guidelines of federal and state agencies that regulate the biotechnology industry.

3. Explaining the use of state, local, and industry regulations.

4. Explaining the use of current Good Laboratory Practice Standards (GLP) or Good Manufacturing Practices (GMP).

5. Listing the criteria that make a plant eligible for “notification” under governmental guidelines.

6. Explaining the precautions that must be taken to prevent release of bioengineered plants into the environment.

7. Identifying ethical issues pertaining to the development of bioengineered plants.

8. Summarizing the functions of patents.

9. Explaining why DNA sequences are considered patentable.