SPRINGFIELD TECHNICAL COMMUNITY COLLEGE

ACADEMIC AFFAIRS

Course Number: BIOT-251 Department: Biological Sciences

Course Title: Biotechnology Semester: Spring Year: 1997

Objectives/Competencies

Course Objective	Competencies
1. Understanding of current goals and trends in the biotechnology industry.	1. Recognize and discuss questions and concerns playing a role in the formulation of a biotechnological agenda
2. Understanding the role of DNA as genetic material for all living things.	1. Explain the classical experiments performed to determine the nature of DNA as hereditary material
3. Understanding of the process of DNA Replication.	1. Explain the process of DNA replication 2. Interpret results of experiments performed to determine the nature of the replication process 3. Design experiments to investigate the mechanism of DNA replication
4. Understanding of the control of Gene Expression.	1. Ability to compare and contrast the control of gene expression in prokaryotes and eukaryotes 2. Construct model genes suitable for expression in a laboratory setting based upon understanding of the function of each type of control element 3. Predict the effects of alteration in any single control

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	element on the expression of a given gene 4. Interpret the results of experiments aimed at deducing the nature of the genetic code 5. Recognize the relationship between the (3) levels of control: Transcriptional, Translational, Post-Translation 6. Describe and explain how restriction enzymes operate
5. Understanding the mechanisms and applications of Recombinant DNA technologies: a. Restriction Enzymes b. Plasmids c. Gene Closing d. Bio-pharmaceutical production	1. Review the role and importance of restriction enzymes in DNA technology 2. Construct a restriction map of a piece of DNA based upon a restriction pattern 3. Demonstrate proficiency in performing restriction enzyme analysis in the lab 4. DeScribe the components essential for the construction of a useful plasmid 5. Summarize the usefulness of plasmids in DNA technology 6. Exhibit skill in performing DNA mediated bacterial transformations 7. Describe and summarize the features of the different types of cloning vectors available 8. Design experiments utilizing each type of vector for a particular application 9. Evaluate the appropriateness of a particular vector for an experimental need 10. Demonstrate proficiency in designing cloning experiments given the overall goal and need 11. Compare and contrast the functionality and usefulness of genomic and cDNA libraries

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6. Current applications of Biotechnology (The Industry) a. Human Genetic Disease Diagnosis b. Polymerase Chain Reaction (PCR) c. DNA Sequencing / Genomics d. Transgenics: plant agriculture e. Transgenics: animal agriculture	1. Comprehend and summarize procedures for the production of a biologically generated pharmaceutical 2. Review the history of bio-pharmaceuticals, from insulin to modern-day applications 3. Identify all potential problems in designing a bio-pharmaceutical production methodology and apply possible solutions 4. Demonstrate ability to mass produce and purify a biological molecule in a simple prokaryotic system in the laboratory 5. Demonstrate ability to analyze and quantitate the production of biological molecules in the laboratory 1. Summarize the criteria required for the development of a diagnostic test for human diseases 2. Evaluate the appropriateness of each diagnostic technology for a given disease 3. Outline the advantages and disadvantages of each type of technology 4. Analyze the ethical ramifications of disease diagnosis and genetic counseling based upon the results of genetic tests 1. Summarize the theory and applications of the Polymerase Chain Reaction 2. Discuss the advantages and disadvantages of applying PCR technology to laboratory diagnostics 3. Evaluate the requirements for a successful PCR

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	experiment 4. Design and perform PCR reactions using purified DNA template as well as crude cell extracts 5. Demonstrate proficiency in interpretation of gel electrophoretic results of PCR experiments 1. Summarize the utility of DNA sequence information 2. Evaluate the effects of DNA sequence alterations on gene expression 3. Demonstrate proficiency in performing standard Di-deoxy DNA sequencing 4. Demonstrate ability to analyze segments of DNA for predicted protein coding domains and functionality using computer resources available via WWW 5. Understand the utility of the Human Genome Project 6. Discuss the benefits and costs of "Big" science projects, such as the Human Genome Project 1. Evaluate and discuss the different techniques available for the production of Transgenic plants 2. Design an experiment for the introduction of a foreign gene into a suitable plant host 3. Determine the suitability of a particular plant/gene combination for transgenic production 4. Summarize the species which have already been manipulated for the enhancement of crop production 5. Discuss the ethical dilemmas created by some transgenic crops

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	6. Discuss the economic impacts of transgenic plant crops from both a producer and consumer perspective 1. Evaluate and discuss the different techniques available for the production of Transgenic animals 2. Design an experiment for the introduction of a foreign gene into a suitable animal host 3. Determine the suitability of a particular animal/gene combination for transgenic production 4. Discuss the ethical dilemmas created through the use of some transgenic animal tissues 5. Discuss the economic impacts of transgenic herds from both a producer and consumer perspective
7. Molecular Medicine a. Antisense Technology b. Gene Therapy	1. Summarize the key features of antisense technology 2. Evaluate the utility of antisense technology for a particular disorder 3. Design a successful antisense strategy for the treatment of a given disorder given the nature of the disorder. 1. Summarize the key criteria of a genetic disorder for which gene therapy would be an ideal candidate for treatment 2. Evaluate the potential a given disorder would have to be treated using gene therapy 3. Discuss the limitations of gene therapy 4. Design a gene therapy approach to be used to combat AIDS and particular forms of cancer.

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