GAVILAN COLLEGE
5055 Santa Teresa Blvd
Gilroy, CA 95020

Course Outline

COURSE: BIOT 105 DIVISION: 10 ALSO LISTED AS:

TERM EFFECTIVE: Fall 2013 **Inactive Course**

SHORT TITLE: ADVANCED BIOTEC LAB

LONG TITLE: Advanced Biotechnology Laboratory

Units	Number of Weeks	Type	Contact Hours/Week	Total Contact Hours
4	18	Lecture:	2	36
		Lab:	6	108
		Other:	0	0
		Total:	8	144

COURSE DESCRIPTION:

This course is part of the Biotechnology program, and builds on skills learned in Biotechnology 103. Students will learn and apply techniques used in biotechnology research, investigation and production. This course provides hands-on experience with current techniques including DNA isolation and electrophoresis, immunological assays, PCR, cell culture, cloning and gene mapping, DNA extraction and purification, chromatography, and analysis of proteins. PREREQUISITE: BIOT 103, or BIO 1, or equivalent course.

PREREQUISITES:

Completion of BIOT 103, as UG, with a grade of C or better.
OR
Completion of BIO 1, as UG, with a grade of C or better.
OR
Completion of BIO 1, as UG, with a grade of C or better.

COREQUISITES:

CREDIT STATUS: D - Credit - Degree Applicable

GRADING MODES

L - Standard Letter Grade

REPEATABILITY: N - Course may not be repeated

SCHEDULE TYPES:

02 - Lecture and/or discussion
03 - Lecture/Laboratory

04 - Laboratory/Studio/Activity

STUDENT LEARNING OUTCOMES:

1. Review and apply previously acquired laboratory skills (including but not limited to aseptic technique, reagent, media and buffer preparation) ability to write and perform calculations to conduct experiments.
ILO: 2,7
Measure: demonstration
2. Use appropriate techniques (including but not limited to use of restriction enzymes, electrophoresis and computer programs) to isolate, purify and analyze DNA and RNA.
ILO: 7, 2, 4
Measure: demonstration, written exam, project (experiments, lab notebook)
3. Describe and demonstrate use of PCR to amplify and analyze DNA.
ILO: 7, 2, 4
Measure: demonstration, written exam, project
4. Discuss and demonstrate the use of techniques (including but not limited to electrophoresis, Western blotting, ELISA and computer programs) to analyze proteins.
ILO: 7, 4, 2
Measure: demonstration, written exam, project
5. Discuss the relationship between the development of biotechnology as a science and the increased understanding of life processes.
ILO: 7, 2
Measure: written exam
6. Describe techniques used to construct recombinant DNA.
ILO: 7, 2
Measure: demonstration, written exam
7. Discuss the application of biotechnology to human genetics.
ILO: 2, 7
Measure: written exam
8. Describe the relationship between biotechnology and agriculture, medicine and industry.
ILO: 2, 7
Measure: written exam

CONTENT, STUDENT PERFORMANCE OBJECTIVES, OUT-OF-CLASS ASSIGNMENTS

Inactive Course: 02/25/2013
1 lec Hours
History of Biotechnology: Students will be able to discuss the development of biotechnology or molecular biology as a science. Students will be able to describe how biotechnology incorporates physics and chemistry with direct observation of natural phenomena. Students will be able to relate historical events in molecular biology to the increased understanding of the biological world. Assignment: Read text and answer homework questions.

3 lab Hours
Review of biotechnology laboratory techniques: Students will be able to demonstrate techniques used in biotechnology, including safe lab protocol, micropipetting, microscope use, isolation and aseptic transfer of bacteria. Note: a lab notebook will be kept throughout the semester
5 lec Hours
Mendelian genetics; Discovery of DNA as the genetic material; Chemistry of biology
Students will be able to solve problems in demonstrating phenotype and genotype ratios. Students will be able to describe the four basic classes of biological molecules and their relationship to biological function. Students will be able to describe protein structure, protein synthesis and the relationship between DNA, RNA and protein. Students will be able to describe techniques used in protein analysis.
Assignment: Read text and answer homework questions (Problem sheet: genetics, atomic and molecular structure of biological molecules)
6 lab Hours
PAGE: Use of polyacrylamide gel electrophoresis to analyze protein: Students will demonstrate techniques used in PAGE, and characterize proteins using PAGE.
4 lecture Hours Basic tools of biotechnology: Students will be abl
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to discuss the use of restriction endonucleases to construct recombinant DNA, and the use of endonucleases and electrophoresis to analyze DNA. Students will be able to describe the process of transformation in bacteria and the role of plasmids as vectors of foreign DNA. Assignment: Read text and answer homework questions. (Problem set: use photographs of gels to determine fragment length and construct restriction maps.)
6 lab Hours Use of the spectrophotometer in protein analysis: Students will demonstrate the use of a spectrophotometer and analyze protein samples using a spectrophotometer.
6 lab Hours
DNA restriction analysis: Students will be able to analyze DNA using restriction endonucleases and electrophoresis.
6 lab Hours
Effects of DNA methylation on restriction: Students will be able demonstrate the effects of methylation in protecting DNA from restriction enzymes.
6 lec Hours
Advanced tools of biotechnology: Students will be able to define the term genomic library, and explain the use of bacteriophage vectors in creating genomic libraries. Students will be able to describe the role of probes and nucleic acid hybridization in analyzing a gene library. Students will be able to differentiate between DNA and cDNA. Students will be able to discuss hybridomas and the production of monoclonal antibodies. Students will be able to describe Southern and Northern

blotting and their applications. Assignment: Read text and develop a list of study questions.
6 lab Hours
Transformation of bacteria using plasmid DNA: Students will transform E. coli using plasmid DNA containing genes for antibiotic resistance.
6 lab Hours
Purification and Identification of plasmid DNA: Students will harvest and purify DNA from transformed bacteria. The purified DNA will be analyzed using restriction endonucleases and electrophoresis.
3 lec Hours
Gene Regulation in Development: Students will be able to discuss the mechanisms of control of gene expression, and relate these concepts to both embryonic development and biotechnology. Assignment: read text and develop an outline of important concepts.
9 lab Hours
Harvest of amylase, dialysis to buffer solution, ion exchange chromatography: Students will demonstrate techniques used to harvest protein from transformed bacteria, and the use of ion exchange chromatography to purify a protein.
3 lab Hours
Use of SDS-PAGE to identify protein: Students will use SDS-PAGE to determine if purification of protein using ion exchange chromatography was successful.
2 lec Hours
Molecular Biology of Cancer: Students will be able to describe the role of viruses in mammalian cancer. Students will be able to explain the oncogene theory. Students will be able to discuss possible mechanisms for oncogene activation. Assignment: Read text and answer homework questions.
6 lab Hours
Recombination of antibiotic resistance genes: Students will produce recombinant plasmids with multiple antibiotic resistance genes. Students will demonstrate use of restriction enzymes and ligation to produce recombinant plasmids, and use electrophoresis to demonstrate proper cutting and ligation.
6 lab Hours
Transformation of E. coli with recombinant DNA: Students will employ techniques to transform E. coli using recombinant plasmids produced in a previous lab. Students will demonstrate the use of positive selection to confirm that transformation has occurred.
5 lec Hours
Application of Biotechnology to Human Genetics: Students will describe and discuss the use of techniques such as PCR, use of restriction enzymes and electrophoresis, recombinant DNA technology and the application of these techniques to the Human Genome project, gene therapy, DNA fingerprinting and other uses. Assignment: Read text and outline chapter.
3 lab Hours

Replica plating to identify mixed E. coli populations: Students will employ replica plating technique to distinguish between single and dual-resistant colonies from the transformation experiment.
6 lab Hours
Purification and identification of recombinant DNA: Students will isolate plasmid DNA from transformed colonies, then digest the plasmids with restriction enzymes and electrophorese the fragments to analyze the DNA.
6 lab Hours
Southern Blotting: Students will conduct a DNA-PAGE gel, and use the gel to demonstrate a Southern blot. The blot will be visualized and analyzed.
6 lab Hours
Use of PCR to amplify regions of Lambda Phage DNA: Students will demonstrate the use of PCR to amplify a specific genome. Students will use electrophoresis to analyze PCR products.
4 lec Hours
Application of biotechnology to agriculture, medicine and industry: Students will be able to discuss how manipulations of specific DNA and proteins within living cells have been used to adapt living things. Students will be able to describe techniques to genetically alter plants and animals. Students will be able to describe techniques used to produce products such as insulin that are sued in human medicine. Students will be able tot discuss the use of biotechnology in the development of vaccines, antiviral medications. Students will be able to discuss the potential for gene therapy. Assignment: Read text and develop a list of products that are produced using biotechnology.
6 lab Hours
Use of ELISA and Western Blotting to analyze proteins: Students will demonstrate ELIZA and Western blotting to identify proteins from different samples. Students will analyze results.

METHODS OF INSTRUCTION:
Methods of instruction include lecture with use of audio and visual aids, discussion; conduction of laboratory exercises both individually and groups.

METHODS OF EVALUATION:
The types of writing assignments required:
Written homework
Lab reports
Essay exams
Other: Lab notebook.
The problem-solving assignments required:
Homework problems
Lab reports
Exams
The types of skill demonstrations required:
None

The types of objective examinations used in the course:
Multiple choice
True/false
Matching items
Completion
Other category:
None
The basis for assigning students grades in the course:
Writing assignments: 20% - 35%
Problem-solving demonstrations: 10% - 15%
Skill demonstrations: 0% - 0%
Objective examinations: 55% - 70%
Other methods of evaluation: 0% - 0%

REPRESENTATIVE TEXTBOOKS:
Required:
1. Micklos, David and Freyer, Greg, "DNA Science: A First Course" Cold Spring Harbor Laboratory Press, 2003
2. Daugherty, Ellyn, "Biotechnology: Science for the New Millennium", EMC Paradigm Publishing, 2006
3. Daugherty, Ellyn, "Biotechnology Laboratory Manual", EMC Paradigm Publishing, 2006
Reading level of text: 12 grade
Verified by: Mary McKenna

ARTICULATION and CERTIFICATE INFORMATION
Associate Degree:
CSU GE:
IGETC:
CSU TRANSFER:
Transferable CSU, effective 200770
UC TRANSFER:
Not Transferable

SUPPLEMENTAL DATA:
Basic Skills: N
Classification: A
Noncredit Category: Y
Cooperative Education:
Program Status: 1 Program Applicable
Special Class Status: N
CAN:
CAN Sequence:
CSU Crosswalk Course Department: BIOT
CSU Crosswalk Course Number: 105
Prior to College Level: Y
Non Credit Enhanced Funding: N
Funding Agency Code: Y
In-Service: N

Occupational Course: C
Maximum Hours:
Minimum Hours:
Course Control Number: CCC000435823
Sports/Physical Education Course: N
Taxonomy of Program: 043000