Los Angeles Pierce College
Office of Academic Affairs
Academic Senate Curriculum Committee

COURSE OUTLINE OF RECORD

Course Number and Title: Biology 40 - The Science of Biotechnology

CAN ___ Semester Hrs. 3 Lecture 2 Laboratory Hrs. 2

I. Type of Course and Approvals
II. Course Outline
III. Texts and Supporting References

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I. Type of Course and Approvals

A.	Type of Course	Credit	[X]	Non-Credit	[ ]		
	Certificate Applicable	Yes	[ ]	No	[ ]		
	Degree Applicable	Yes	[ ]	No	[ ]		
	Transferable	CSU	[X]	UC	[X]		

B: Approvals:

Department Chair _____ Date:_____
Chair of Department which offers
course with similar course content _____ Date:_____

Curriculum Committee Chair _____ Date:_____

Academic Senate President _____ Date:_____

Academic Dean _____ Date:_____
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II. Course Outline

A. Course Catalogue Description:

This course provides a comprehensive introduction to the science of biotechnology by providing both the theory and hands-on experience with laboratory protocols that parallel the isolattion, purification, and cloning of a gene.

B. Prerequisite, Co-requisite, or Advisory:

Prerequisite - Biology 6 and Chemistry 101

C. Entry Skills:

Before entering this course, the student is expected to:

1. Describe the significant chemical characteristics and biological functions of the following: Carbohydrates, Proteins, Lipids, Nucleic Acids
2. Describe the chemistry and importance of water in biological systems.
3. List the differences between prokaryotic and eukaryotic cells.
4. Describe the organelles found in a eukaryotic cell and the roles each play in the cell.
5. List and describe the methods materials enter and leave the cell through the cell's plasma membrane.
6. Describe the mechanisms, similarities and differences between mitosis and meiosis.
7. Solve monohybrid and dihybrid genetic crosses involving complete dominance, incomplete and co-dominance, multiple alleles, polygenic traits, sex linkage, and sex influenced traits.
8. Describe the mechanism of protein synthesis including transcription, mRNA editing and processing, and translation.
9. Describe genetic regulation in prokaryotes and eukaryotes.
10. Diagram and describe mechanism of regulation of the lac operon in *E. coli*.
11. Define the term *evolution* and describe the various factors resulting in evolution and how each affects the Hardy-Weinberg equilibrium
12. Describe and perform a bacterial transformation with a plasmid.
13. Demonstrate proper use of a digital micropipette.
14. Demonstrate proper aseptic technique when plating bacteria.
15. Demonstrate the proper way to pour and run an agarose electrophoresis apparatus.
16. Relate DNA fragment size with banding patterns from a photograph of a gel produced by electrophoresis.
17. Describe the role of restriction endonuleases in biotechnology.
18. Use conversion factors, including those of the metric system, in solving quantitative problems
19. Interpret common chemical symbols and nomenclature of simple compounds.
20. Write and balance chemical equations and carry out calculations (stoichiometry) using those equations, including limiting reagents.
21. Describe the properties of chemicals in solution and carry out

problems using solutions stoichiometry.

22. Describe the fundamentals of chemical bonding and demonstrate this knowledge by describing the structure of covalent molecules.
23. Describe the types of intermolecular forces and between which chemicals they occur.
24. Describe the concept of equilibrium as it applies to chemical systems and how to solve problems involving equilibrium constants.
25. Describe the principles of acids and bases, including pH, pH buffers and how to solve related calculations.

D. Course Objectives:

To provide the student with a comprehensive introduction to the science of biotechnology.
To provide hands-on experience with tools and techniques used to isolate, purify and clone DNA.
To analyze results of laboratory experiments and understand how similar information is used in current molecular biological research.

E. Course Content:
The content of this course will vary from instructor to instructor; but, at a minimum, must include material in the following areas:

Introduction to microvolumetrics and tools of biotechnology.
Bacterial culture techniques.
Restriction endonucleases: their history and use in research.
Agarose gel electrophoresis and DNA restriction analysis.
The structure of plasmids and their use as cloning vectors.
Bacterial transformation using a plasmid cloning vector.
Using a miniprep to purify a cloned plasmid.
Constructing a genomic library.
Screening a genomic library using a replica membrane and nonradioactive probe.
Using DNA amplification to identify a human allele.

F. Methods of Instruction:
Methods of instruction will vary from instructor to instructor, but methods may include any or all of the following:

Traditional lecture and text reading
Classroom discussions
Laboratory exercises

G. Methods of Evaluation:

Class participation
Laboratory notebook with experimental ayalysis

H. Exit Skills:
Upon completion of this course, the student will be able to:

Accurately measure and dispense microvolumes using tools of biotechnology.
Culture bacteria using sterile technique.
Identify the history, use, and nomenclature of restriction endonucleases.
Pour, load, and run agarose gels using electrophoresis.
Identify restriction fragments on gels.
Describe and draw the structure of plasmids as well as explain their use as cloning vectors.
Describe the steps of bacterial transformation using a plasmid as a cloning vector.
Describe the use of minipreps for purifying cloned plasmids.
Explain the construction of a genomic library.
Describe the steps used in screening a genomic library by means of a replica membrane and nonradioactive probe.
Describe how DNA is amplified to identify human alleles.

III. Texts and Supporting References:

A. Examples of Texts:

Bloom, Mark V., et. al. Laboratory DNA Science: an introduction to recombinant DNA techniques and methods of genome analysis. Benjamin / Cummings, 1995.

Glick, B. R. And J. J. Pasternak.1994. Molecular Biotechnology. American Society for Microbiology Press.

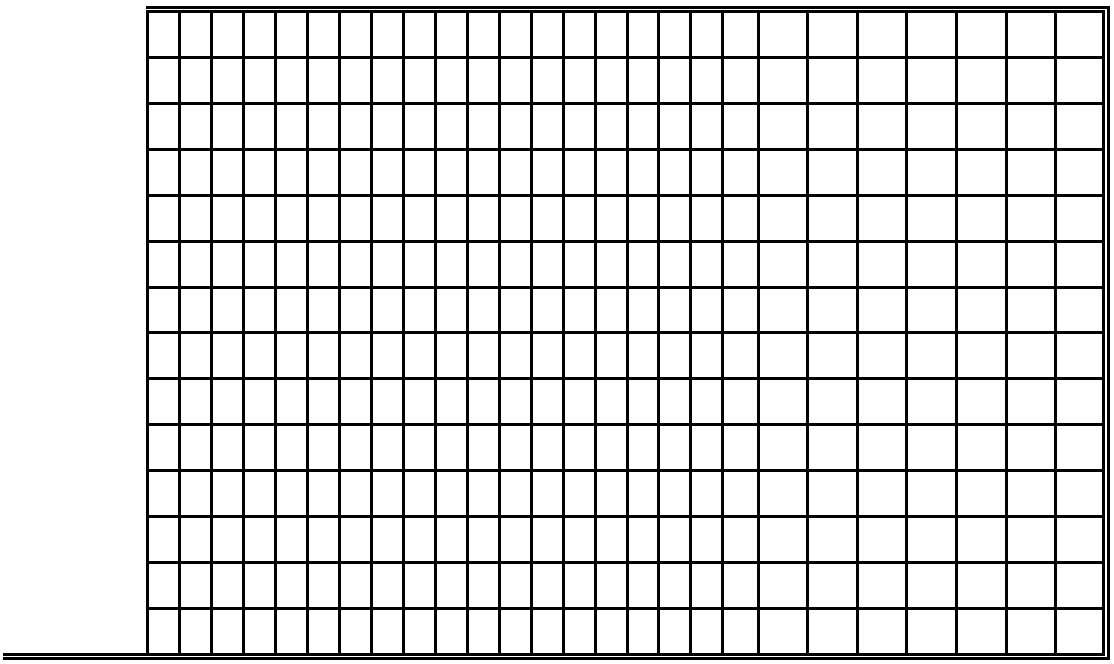
Watson, J. D., *et al*. 1992. Recombinant DNA. Scientific American Books. Second edition.

B. Examples of Supporting References:

Content Review Grid

Biology 6 exit skills - Biotechnology entry skills

ENTERING SKILLS																								
																	18	19	20	21	22	23	24	25



Biology Six Exit Skills

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

1. Describe the significant chemical characteristics and biological functions of the following: Carbohydrates, Proteins, Lipids, Nucleic Acids
2. Describe the chemistry and importance of water in biological systems.
3. List the differences between prokaryotic and eukaryotic cells.
4. Describe the organelles found in a eukaryotic cell and the roles each play in the cell.
5. List and describe the methods materials enter and leave the cell through the cell's plasma membrane.
6. Describe the mechanism and importance of chemiosmotic gradients in oxidative and photophosphorylation.
7. Describe and outline the major pathways of photosynthesis and cellular respiration.
8. Describe the mechanisms, similarities and differences between mitosis and meiosis.
9. Solve monohybrid and dihybrid genetic crosses involving complete dominance, incomplete and co-dominance, multiple alleles, polygenic traits, sex linkage, and sex influenced traits.
10. Describe the mechanism of protein synthesis including transcription, mRNA editing and processing, and translation.
11. Describe genetic regulation in prokaryotes and eukaryotes.
12. Diagram and describe mechanism of regulation of the lac operon in *E. coli*.
13. Define the term *evolution* and describe the various factors resulting in evolution and how each affects the Hardy-Weinberg equilibrium.
14. Use the compound microscope.
15. Identify and describe the major types of plant tissues and organs.
16. Identify and describe the major groups of protista.
17. Identify and describe the major groups of plants.
18. Identify and describe the major groups of invertebrate animals.
19. Describe and perform a bacterial transformation with a plasmid.
20. Demonstrate proper use of a digital micropipette.

21. Demonstrate proper aseptic technique when plating bacteria.
22. Demonstrate the proper way to pour and run an agarose electrophoresis apparatus.
23. Relate DNA fragment size with banding patterns from a photograph of a gel produced by electrophoresis.
24. Describe the role of restriction endonuleases in biotechnology.

Content Review Grid

Chemistry 101 exit skills - Biotechnology entry skills

	ENTERING SKILLS																							
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Chemistry 101 Exit Skills

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

1. Use conversion factors, including those of the metric system, in solving quantitative problems
2. Interpret common chemical symbols and nomenclature of simple compounds.
3. Write and balance chemical equations and carry out calculations (stoichiometry) using those equations, including limiting reagents.
4. Describe the properties of chemicals in solution and carry out problems using solutions stoichiometry.
5. Describe the principles governing the behavior of gases and know how to solve quantitative problems using these principles.
6. Describe the principles of thermochemistry and apply these principles to solve quantitative problems using these principles.
7. Describe the fundamentals of chemical bonding and demonstrate this knowledge by describing the structure of covalent molecules.
8. Describe the types of intermolecular forces and between which chemicals they occur.
9. Describe the concept of equilibrium as it applies to chemical systems and how to solve problems involving equilibrium constants.
10. Describe the principles of acids and bases, including pH, pH buffers and how to solve related calculations.