

OUTLINE OF COURSE OBJECTIVES
Introduction to Biotechnology
Biology 268

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1. COURSE DESCRIPTION AND RATIONALE:

An introduction of both the principles and the applications of molecular biology methods with an emphasis on the application of recombinant DNA technology to animals, plants and microbial organisms. This course describes the use of genetically engineered products to solve environmental problems and cure human diseases. *Pre-requisites* Biol 223.

2. COURSE OBJECTIVES:

Upon successful completion of this course the student should recognize the foundations of modern biotechnology and explain the principles that form the basis for recombinant DNA technology.

3. LEARNING OUTCOMES: By the end of the course, students should be able to:

1. understand the difference between old biotechnology and modern biotechnology
2. analyze a research problem and write clear, step-by-step instructions for conducting experiments or testing hypothesis.
3. provide examples of current applications of biotechnology and advances in the different areas like medical, microbial, environmental, bioremediation, agricultural, plant, animal, and forensic.
4. understand the concept of recombinant DNA technology or genetic engineering
5. describe DNA fingerprinting, and restriction fragment length polymorphism (RFLP) analysis and their applications
6. describe the steps involved in the production of biopharmaceuticals in microbial and mammalian cell systems
7. explain the concept and applications of monoclonal antibody technology
8. explain the general principles of generating transgenic plants, animals and microbes.

4. RESOURCES AVAILABLE TO STUDENTS

Three textbooks will be used to supplement the lectures. These are:

- DNA Science: A first course in recombinant DNA technology, David Micklos and Greg Freyer, Eds.
- Molecular Biotechnology, Primrose, Ed.
- Biotechnology: Demystifying the concepts, Bourgaize, Jewell, Buiser, Eds.

Alternative Resources:

- DNA Fingerprinting Dispute Laid To Rest, Nature, 27 Oct. 1994
- Freezing Human Embryos - Value Dilemmas, Bioscience, Jan. 1990
- Religious Leaders Oppose Patenting Genes and Animals, Science, 26 May 1995
- NIH Gets The Green Light On Embryo Research, Nature, 29 Sept. 1994
- Religious Leaders Prepare To Fight Patent On Genes, New York Times, 13 May 1995
- 'Humanized' Pig Hearts To Solve Supply Problem, St. Paul Pioneer Press, May 24, 1995

- Ethics and Embryos, Newsweek, June 12, 1995
- Helping Your Friends Make Genetic Engineering Choices, Nutrition Today, 4 July/August 1994
- Cloning: Where Do We Draw The Line?, Time, Nov. 8, 1993
- The Genetic Revolution, Time, Jan. 17, 1994
- Bioethics: Science, June 28, 1996

Internet Resources:

Human Genome Project Information:

http://www.ornl.gov/TechResources/Human_Genome/home.html

Biotechnology Information Center: <http://www.nal.usda.gov/bic/>

National Center for Biotechnology Information: <http://www.ncbi.nlm.nih.gov/>

UW Biotechnology Center: <http://www.ncbi.nlm.nih.gov/>

The Biotech BiblioNet: <http://highschoolhub.org/hub/hub.cfm>

Today's News Biotechnology: <http://biz.yahoo.com/news/biotechnology.html>

Science/Biology/Biotechnology: <http://dir.yahoo.com/Science/biology/biotechnology/>

5. GRADING CRITERIA

Exam I	20% of grade
Midterm	20% of grade
Project	15% of grade
Participation	5% of grade
Final Exam	40% of grade

6. SCHEDULE

Week	Topic	Assignments
1-2	(I).History of Biology and Biotechnology <ul style="list-style-type: none"> - Definitions of Biotechnology - Old Biotechnology - Beginnings of Modern Biotechnology 	<ul style="list-style-type: none"> - Chapters 1 and 2 in DNA Science (p. 1-37) - Chapter 1 in Molecular Biotechnology (p.3-9)
2-3	(I).History of Biology and Biotechnology <ul style="list-style-type: none"> - Biotechnological Process - Overview of Animal, Plant and microbial cultures - Single Cell Protein 	<ul style="list-style-type: none"> - Chapter 1 in Biotechnology (p. 1-22) - Chapter 6 in Molecular Biotechnology (p.78-79)
3-4	(II). Basic Principles of Recombinant DNA Technology <ul style="list-style-type: none"> - Describe the function and use of bacterial restriction endonucleases. - Describe the natural occurrence of cloning and the human applications of the process. - Explain the methods of cell transformation and selection of recombinants. 	<ul style="list-style-type: none"> - Chapter 3 in DNA Science (p. 39-60) - Chapter 2 Molecular Biotechnology (p. 13-26) - Chapter 8 in Biotechnology
5-6	(III).A-Common Methods and Applications of Animal, Human and Medical Biotechnology <ul style="list-style-type: none"> - Describe gene transfer methods in animals. - Define the role of transgenic animals - Discuss various methods of animal propagation 	<ul style="list-style-type: none"> - Chapter 9 in Biotechnology - Chapter 10 in Biotechnology
7-8	(III).B-Common Methods and Applications of Animal, Human and Medical Biotechnology <ul style="list-style-type: none"> - Describe the goals of the Human Genome Project (HGP). - List applications of HGP including genetic testing, screening and therapy - Review the process and use of gene therapy 	<ul style="list-style-type: none"> - Chapter 11 in Biotechnology (p.254-265) - Chapters 12 and 14 in Biotechnology
9-10	(III).C-Common Methods and Applications of Animal, Human and Medical Biotechnology <ul style="list-style-type: none"> - Monoclonal Antibody Technology - Compare and contrast the types of vaccines in use including their method of manufacture. - Molecular Biology of Cancer 	<ul style="list-style-type: none"> - Chapter 11 in Biotechnology (p.254-265) - Chapters 12 and 14 in Biotechnology

10-11	(IV). Common Methods and Applications of Plant Biotechnology - Describe the techniques used in plant tissue culture. - Identify a variety of uses of plant genetic engineering. - Review the safety issues that must be addressed with food plants	- Chapters 12 and 13 in Molecular Biotechnology (p. 153-177)
11-12	(V).A-Common Methods and Applications of Microbial and Environmental Biotechnology - Review the commercial production of methods using microorganisms. - Identify a variety of products from microorganisms.	- Chapters 5 and 6 in Molecular Biotechnology (p. 61-99, only material that relates to lecture)
12-13	(V).B-Common Methods and Applications of Microbial and Environmental Biotechnology - Describe examples of bioremediation and their impact on the environment - Discuss Biotechnological Advances in Wastewater Treatment	- Chapters 5 and 6 in Molecular Biotechnology (p. 61-99, only material that relates to lecture)

7. COURSE POLICY:

Students are expected to adhere to norms of academic integrity. Offences involving academic misconduct (cheating, plagiarism, dishonesty, in-class disruption) will be taken very seriously. Please refer to AUB policies, section 1 on the definitions of misconduct. Students are expected to attend lectures regularly and take an active role in this course. Class participation will be assessed through contributions to class discussions and attendance. This will contribute to 5% of your grade.