

BIOT 107: BIOTECHNOLOGY: TRANSFORMING SOCIETY THROUGH BIOLOGY

Discipline

BIOT - Biotechnology

Course Number

107

Course Title

Biotechnology: Transforming Society Through Biology

Catalog Course Description

This lecture course serves as an introduction to biology concepts and their application in the field of biotechnology. Lecture content will emphasize the biology, business, and legal/ethical issues surrounding biotechnology. The course is appropriate for a wide range of students, including non-majors, who would like to explore how biological solutions may be employed to address today's societal issues. Topics include molecular and cellular biology, genetic engineering, drug development, GMOs, and biofuels. 54 lecture hours.

Course Purpose

Degree Applicable

Instruction Type(s)

Lecture
Online Education Lecture

Minimum Qualifications

Biological Sciences, Biotechnology

General Education/Degree/Transfer Course**Transferable to CSU**

Yes

Transferable to UC

Yes - Approved

CSU GE Areas**CSU GE Areas**

Yes - Approved

CSU GE Area B: Physical Universe and its Life Forms

Life Science

IGETC Areas**IGETC Areas**

No

Course Units/Hours**Credits**

3

Lecture Hours

54

For every hour of lecture, student is expected to spend two hours of study outside of class.

Lab Hours

0

Hours Arranged

0

Is this course repeatable?

No

Maximum Enrollment (Lecture):

46

Grading Method

Standard Letter

Fee Information**Materials Fee**

No

Student Learning Outcomes

Upon satisfactory completion of the course, students will be able to:

Competencies

Communication

Outcome

Articulate an understanding of biological processes important for biotechnology using scientific terminology.

Assessment

through classroom discussion, in-class assignments, homework, quizzes, oral presentations, group projects

Competencies

Creative, Critical, and Analytical Thinking

Outcome

Formulate scientific hypotheses, analyze experimental data, and apply and synthesize biological mechanisms/concepts and their relation to biotechnology.

Assessment

through classroom discussion, in-class assignments, homework, quizzes, oral presentations, group projects

Competencies

Community/Global Consciousness and Responsibility

Outcome

Examine the impact human activities have had on the natural world, and apply an understanding of the use of biotechnology to provide solutions for societal challenges.

Assessment

through classroom discussion, in-class assignments, homework, quizzes, oral presentations, group projects

Course Objectives

Course Objectives

	Objective
1	Describe basic biological and chemical principles underlying biotechnology.
2	Describe how the genome of an organism can be modified using current biotechnology tools.
3	Explain evolution from a genetic perspective.
4	Explain the effect of mutations on cell function.
5	Evaluate a recent development in the field of biotechnology from an ethical perspective.
6	Demonstrate knowledge of a wide range of biotechnology applications to address societal challenges, including environmental and medical issues.
7	Explain how living systems can be used to manufacture products.
8	Outline the steps major involved in drug discovery and approval in the United States.
9	Demonstrate an understanding of the nature of scientific inquiry, especially the role of the scientific method.
10	Evaluate sources of scientific information.
11	Define and distinguish among the four major classes of biological molecules.
12	Compare and contrast structural and functional differences between prokaryotic and eukaryotic cells.
13	Compare and contrast metabolic processes and activities in animal, plant, and fungal cells.
14	Construct a flow diagram of gene expression from DNA to protein.
15	Identify factors that regulate the expression of genes in a cell.
16	Apply knowledge of protein structure to explain the activity of enzymes and sensitivity of proteins to environmental factors.

Course Content

Major Course Content

Scientific method and fostering scientific literacy

Characterizing life and its diversity

Biological molecules and their functions

1. Carbohydrates
2. Lipids
3. Proteins
4. Nucleic acids

Cellular organization

1. Cell theory
2. Prokaryotic cells: structure and function
3. Eukaryotic cells: structure and function

Energy production

1. Photosynthesis
2. Cellular respiration/fermentation

Reproduction

1. Cell division
2. Control of cell cycle and cancer

Gene expression

1. DNA structure and function
2. DNA replication and mutations
3. Transcription
4. Translation
5. Regulation of gene expression/Epigenetics

Evolution

1. Definition of evolution and natural selection
2. Examples of evolution

Ecology

1. Ecosystems
2. Effects of humans on natural systems

Biotechnology tools

1. Recombinant DNA
2. DNA sequencing
3. Stem cells
4. Immune system stimulation/modulation

Applications of biotechnology

1. Medical/Pharmaceutical
2. Forensics
3. Bioremediation
4. Fuels/Industrial
5. Agricultural

Ethical, legal, and business aspects of biotechnology

1. Regulatory oversight
2. Drug development and approval process
3. Intellectual property rights and patents

Requisites & Entrance Skills

Strongly Recommended

ENGL 101.

Methods of Assessment

Multiple measures may include, but are not limited to, the following typical classroom assessment techniques/required assignments:

Class Participation
Class Work
Group Projects
Home Work
Oral Presentation
Papers
Portfolios
Projects
Quizzes
Research Projects
Simulation

Methods of Instruction

Methods of Instruction

Audio Visual Presentations
Class Activities
Class Discussions
Collaborative Group Work
Computer-aided Presentation
Demonstrations
Group Discussions
Guest Speakers
Guided Instruction
Internet Research
Learning Modules
Reading Assignments
Web-based Presentations

Online Education

Describe how the assessment methods in the course outline will be adapted for use in the online education mode(s) previously described:

Most of these assessment modalities are easily delivered via Blackboard for online learning. For the oral presentations, students can record short videos to share with classmates for DE only offerings. Students can participate via Discussion Board threads. Group projects can be facilitated using Wikis.

Specify any adaptations in instructional methodology resulting from offering this course in the online learning mode(s) previously described as opposed to the face-to-face mode assumed by the current course outline.

Class discussions will be hosted using the Blackboard Discussion Board. Lectures will be provided as text and/or short video clips on Blackboard. Students will be able to collaborate via Wikis on Blackboard. Guest speakers will participate in person (hybrid mode) or via online tools (DE only).

Online Education Methods of Communication

E-mail
 Discussion Boards (Asynchronous Dialogue)
 Chat (Synchronous Dialogue)
 Office Hours

Describe how the method(s) will be effectively adapted for the online education mode(s) described previously:

Virtual office hours will be available at an appointed time each week. Feedback will be provided via Discussion Board comments. Students will have the ability to email the instructor and receive prompt replies.

Sample Assignment

Please give an example of an assignment that students will do in the distributed class format(s) previously described:

Students will research a new biotechnology tool, and write a description of the tool on Blackboard. Fellow students will then comment on the new advancement providing thoughts on its potential applications and ethical considerations.

Accessibility

Please describe how this course will meet the Section 508 requirements:

The course website and any outside material introduced will meet accessibility requirements. Examples include closed captioned videos, alt tag descriptions for images, and audio files will have back up text files.

Course Textbooks/Resources

Resource Type

Book

Formatting Style

MLA

Required or Supplemental

Required

Description

Thieman, W.J., Palladino, M.A..*Introduction to Biotechnology*, 3rd ed. Benjamin Cummings, 2012. Print.

Resource Type

Book

Formatting Style

MLA

Required or Supplemental

Required

Description

Daugherty, E..*Biotechnology: Science for the New Millennium*, EMC Paradigm, 2012. Print.

Course Assignments

Suggested reading other than required textbook:

Students will read popular science articles and entries on authoritative websites regarding recent biotechnology advancements and ethical considerations.

Examples of Outside Assignments:

Students will answer in-class and homework questions, such as: (1) Explain how *E. coli* was genetically engineered to produce human insulin. (2) Describe why microalgae are an ideal source for biofuels. (3) Propose one way to use biotechnology approaches to address the crisis of antibiotic resistance in bacteria.

Examples of Required Writing Assignments:

Students will write short essays reflecting on the ethical implications of new biotechnology advances that they identify from scientific news sources.

Classification & Codes