

Biotechnology

COURSE DESCRIPTION: Can we bring back extinct species? Will the cures for cancer, malaria, and other diseases come from the combination of natural materials and new technologies? How is science changing the foods we eat? Welcome to the world of biotechnology! In this course, you will explore the history of biotechnology, including early attempts at food preservation, the development of antibiotics, and changes to food crops around the world. You'll also learn more about some of the challenges of biotechnology, such as the growth of antibiotic resistant bacteria and questions about the safety of commercially produced genetically modified organisms (GMOs). Finally, you'll research new biotechnologies and how they are changing the world we live in.

COURSE OBJECTIVES:

- Recognize different types of cells.
- Categorize organisms.
- Define taxonomy and scientific naming of organisms.
- Explain the basics of evolutionary theory.
- Explain the differences between the Paleolithic and Neolithic.
- Describe how humans domesticated plants and animals.
- Categorize the regional variances in agriculture and domestication.
- Summarize the changes that occurred as humans domesticated plants and animals.
- Classify the various ways to store and preserve food.
- Describe the different types of fermentation.
- Explain the process of fermentation.
- Discuss the study of microbiology and the work of Pasteur.
- Discuss the importance of early collectors and their collections.
- Describe how collectors bred plants.
- Illustrate the importance of hybridization and the impact of hybrids.
- Explain how early breeding programs led to genetics.
- Discuss the function of genes.
- Summarize the historical development of the study of genetics.
- Describe Mendel's experiments and explain their significance.
- Create a timeline describing the history of genetics from Mendel's time through the late twentieth century.
- Summarize the developments in biotechnology that accompanied the Industrial Revolution.
- Identify the changes that occurred during the period defined as classical biotechnology.
- Explain the role of enzymes in an industrial setting.

- Describe how war drove productivity and innovation in biotechnology.
- Explain the origin of antibiotics.
- Arrange the timeline of antibiotic development.
- Describe how antibiotics treat bacterial infections.
- Discuss the concerns about antibiotic resistance and possible solutions.
- Describe the changes in agricultural biotechnology in the late nineteenth century.
- Explain how double crossbreeding changed plants.
- Report on the developments that led to the Green Revolution.
- Discuss how technological advances led to genetic modification in modern agriculture.
- Relate the history of the Human Genome Project.
- Recognize the accomplishments of the Human Genome Project.
- Describe developments since the completion of the Human Genome Project.
- Explain the potential for genetic research and understanding.
- Describe the modern industrial uses for enzymes.
- Recognize the role of genetics in modern industrial biotechnology.
- Explain how and why biofuels are important.
- List the environmental benefits of industrial biotechnology.
- Describe how organisms are genetically modified.
- Report on the prevalence of GMOs.
- Summarize the risks and benefits of GMOs.
- Develop an educated opinion about the role of GMOs in our food supply.
- Explain innovations in pharmaceutical biotechnology.
- Define the importance of genetically modified hormones, insulin, and other compounds typically produced in the body.
- Recognize the potential for new treatments for cancer and other illnesses.
- Describe the importance of vaccines.

PREREQUISITES: None

COURSE LENGTH: One Semester

REQUIRED TEXT: No required textbook for this course.

MATERIALS LIST: No required materials for this course.

COURSE OUTLINE:

Unit One: Biotechnology Basics

Unit Two: The Beginning of Biotechnology

Unit Three: Food Preservation & Fermentation

Unit Four: Collection & Breeding

Unit Five: The Beginning of Genetics

Unit Six: Early Industrial Discoveries

Biotechnology Midterm Exam

Unit Seven: The Discovery of Antibiotics

Unit Eight: Agricultural Biotechnology through the Green Revolution

Unit Nine: Mapping the Human Genome

Unit Ten: Modern Industrial Biotechnology

Unit Eleven: Modern Agricultural Biotechnology

Unit Twelve: Modern Pharmaceutical Biotechnology

Biotechnology Final Exam