GROSSMONT COLLEGE

COURSE OUTLINE OF RECORD

Curriculum Committee Approval: 05/18/2021

GCCCD Governing Board Approval: 06/15/2021

BIOLOGY 114 – HEREDITY, EVOLUTION AND SOCIETY

1. Course Number Course Title Semester Units

BIO 114 Heredity, Evolution and Society 3

Semester Hours

3 hours lecture 48-54 total hours 96-108 outside-of-class hours 144-162 total hours

2. Course Prerequisites

None

Corequisite

None

Recommended Preparation

None

3. Catalog Description

This course presents the basic principles of heredity and evolution. Following an introduction to scientific methods and characteristics of living systems, the student learns about the process of evolution and the mechanisms of heredity. These genetic studies will equip the student to better understand a number of current issues concerning medical genetics, genetic counseling, biotechnology, the cancer problem and human diversity.

4. Course Objectives

The student will:

a. Arrange and differentiate the basic steps of the scientific method to an objective understanding of how the physical world works.

b. Analyze the characteristics of living systems: what distinguishes living from nonliving; the chemical and structural aspects of the cell.

c. Define the biological concept of species.

d. Examine the process of organic evolution including

1. Historical aspects of the development of Charles Darwin’s mechanism for Evolution: Natural Selection
2. Evidence in support of Natural Selection to explain the diversity of life on Earth.
3. Differentiate between Evolution and other explanations for origin and continued development of life on Earth
4. Differentiate between Macro- and Microevolution

e. Describe our current knowledge of primate biology and the fossil record as it relates to an understanding of human origins.

f. Discuss the mechanisms of heredity at three levels: cellular, organismic, molecular.

1. Cellular – diagram the steps of cell division – mitosis and meiosis.
2. Molecular – Learn and analyze the Historic and biochemical basis of DNA.
3. Organismal – Problem solving using Mendelian and Non-Mendelian Inheritance patterns.

g. Apply the information acquired about genetics to a discussion of two areas of medical genetics: genetic counseling and biotechnology.

5. Instructional Facilities

a. Standard Classroom.

b. Access to dedicated laptops (1 per student) for use in computer simulations

6. Special Materials Required of Student

None

7. Course Content

a. The scientific method: its nature, its use, its limits.

b. Characteristics of living systems.

1) Unique attributes.

2) Chemical and structural aspects of life.

3) The cell.

4) The species.

c. The process of evolution.

1) How Evolution by Natural Selection explains the diversity of life on Earth.

2) Historical background.

3) Darwin’s Mechanism for Evolution, Natural Selection

4) Modern supporting evidence.

5) Addressing criticisms.

d. Human evolution.

1) Fossils and the fossil record.

2) The value of studying existing primate species.

3) Pre-human and human fossil discoveries in Africa, and elsewhere.

e. The mechanisms of heredity.

1) At the molecular level – DNA as the genetic material, gene expression, and mutations.

2) At the cellular level – chromosomes, mitosis, and meiosis.

3) At the organism level – inheritance of traits, Mendel’s discoveries.

f. More complex aspects of trait determination.

1) Population genetics.

2) Principles of Hardy-Weinberg equilibrium and calculation of allele frequencies.

3) Polygenic inheritance involving interactions between genetic and environmental factors.

4) Human diversity

g. Current areas of interest.

1) Biotechnology.

2) Genetic counseling.

8. Method of Instruction

a. Lecture and discussion.

b. A/V and computer-driven materials.

c. Use of library resources.

d. Computer simulations

9. Methods of Evaluating Student Performance

1. Written exams including the final (objective exams) requiring the use of proper English grammar and sentence structure and elementary algebra.
2. Written assignments requiring the proper use of English grammar and sentence structure, such as a description of a genetic disease and/or an explanation of mitosis versus meiosis.

10. Outside Class Assignments

1. Read assigned text pages.
2. Read supplementary materials
3. Complete projects
   1. Example: Select a Human Genetic Disease and provide information on (1) affected gene (2) symptomology & (3) treatment

11. Representative Texts

a. Representative Text(s):

1. OpenStax, *Biology*. OpenStax CNX. Mar 28, 2018 <https://openstax.org/details/books/biology-2e>. Licensed under a Creative Commons Attribution 4.0.
2. OpenStax, *Concepts of Biology*. OpenStax CNX. Jan 12, 2021 <https://openstax.org/details/concepts-biology>. Licensed under a Creative Commons Attribution 4.0.

b. Supplementary texts and workbooks:

None

Addendum: Student Learning Outcomes

Upon completion of this course, our students will be able to do the following:

1. Students will be able to identify the major Biological Events in Geological Time
2. Students will be able to calculate allele frequencies from population data and relate to Evolutionary change
3. Students will be able to define a gene in both molecular and phenotypic terms.
4. Students will be able to describe the link between changes in DNA and natural selection.
5. Students will be able to complete a Monohybrid Punnett Square comparing different genotypes of a specific non-linked trait.