

# North Hennepin Community College

## BIOL 1140: Introduction to Human Genetics and Origins

### A. COURSE DESCRIPTION

Credits: 4

Lecture Hours/Week: 0

Lab Hours/Week: 0

OJT Hours/Week: \*.\*

Prerequisites:

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Corequisites: None

MnTC Goals: Goal 03 - Natural Science

This course is an introduction to human genetics and origins including evolution and ancestry. Students are introduced to cell biology, inheritance, epigenetics, DNA, chromosomes, mutations, population genetics, genetics of health and behavior, genomics and genetic technologies. Students will use the process of scientific inquiry to analyze personal genetic data from direct-to-consumer DNA testing in a guided independent project. Testing with a direct-to-consumer (DTC) testing company will be done at the start of the course, or students may opt-out and use available genomes. Students who have previously tested with a DTC company should consult with the instructor. This course is suitable for both biology majors and non-majors. (3 hours lecture, 3 hours lab)

Prerequisite: ENGL 0990 or a 78 on the Accuplacer Reading Comprehension

**B. COURSE EFFECTIVE DATES:** 01/11/2016 - Present

### C. OUTLINE OF MAJOR CONTENT AREAS

1. Basics of Human Genetics (see course outline)
2. Students will actively learn about the types of genetic testing (mtDNA, Y-DNA, autosomal DNA testing, and STR and snp markers), and explore personal DNA testing results and how they may be used for ancestral and health purposes and other current applications. Future genetic technology applications may be explored and ethical, personal, social, and/or legal concerns will be discussed

## **D. LEARNING OUTCOMES (General)**

1. Describe the structure and function of DNA, genes, chromosomes, cells, and the human genome. (Goal 3abc, ELO 1, 2)
2. Distinguish between genes, genetics and genomics. (Goal 3a ELO 1, 2)
3. Apply the term genetics to the levels of: nucleic acids, chromosomes, cells, body parts, families, and populations. (Goal 3a, ELO 1, 2)
4. Describe the human life cycle and the processes of human development: from meiosis, to gamete maturation, fertilization, mitosis, development, and aging. (Goal 3a, ELO 1, 2)
5. Diagram the processes of DNA replication and gene expression and describe the factor of time in epigenetics. (Goal 3a, ELO 1, 2)
6. Demonstrate the transmission of traits from one generation to another following the basic models: Mendelian inheritance, incomplete dominance, codominance, epistasis, pleiotropic, linked, sex-linked, multifactorial, and other models. (Goal 3abc, ELO 1, 2)
7. Explain how genes can affect behavior and describe examples. (Goal 3a, ELO 1, 2)
8. Explain how genes can affect behavior and describe examples. (Goal 3a, ELO 1, 2)
9. Define karyotype and distinguish between autosomes and the sex chromosomes, explain how atypical number and structure of chromosomes can lead to disorders. (Goal 3a, ELO 1, 2)
10. Diagram the transmission of a trait in a family pedigree. (Goal 3abc, ELO 1, 2)
11. Diagram the transmission of a trait in a family pedigree. (Goal 3abc, ELO 1, 2)
12. Describe the inheritance of the X and Y chromosomes, discuss the special characteristics of each, and explain the purpose of X inactivation. (Goal 3a, ELO 1, 2)
13. Distinguish between mitochondrial DNA, autosomal DNA, and Y-DNA, how it is inherited, how it is tested, and how it is used in research and genetic genealogy. (Goal 3abcd, ELO 1, 2, 3, 4)
14. Describe the factors involved in genetic mutations, types of mutations, and DNA repair. (Goal 3a, ELO 1, 2)
15. Define gene pool and describe how allele frequencies in a population can be measured and applied to understand population structure, human migration, identify individuals, and predict disease risk. (Goal 3abcd, ELO 1, 2, 3, 4)
16. Describe the processes and applications of genetic technologies, genetic testing, and reproductive technologies and their personal, social, legal and ethical implications. (Goal 3abcd, ELO 1, 2, 3, 4)
17. Discuss the origin of humans, the concept of ancestry, and the measurement of genetic admixture (Goal 3abcd, ELO 1, 2, 3)
18. Design and conduct an independent, guided research project using personal DNA testing data. (Goal 3abcd, ELO 1, 2, 3, 4)

## **E. Minnesota Transfer Curriculum Goal Area(s) and Competencies**

### Goal 03 - Natural Science

1. Demonstrate understanding of scientific theories.
2. Formulate and test hypotheses by performing laboratory, simulation, or field experiments in at least two of the natural science disciplines. One of these experimental components should develop, in greater depth, students' laboratory experience in the collection of data, its statistical and graphical analysis, and an appreciation of its sources of error and uncertainty.
3. Communicate their experimental findings, analyses, and interpretations both orally and in writing.
4. Evaluate societal issues from a natural science perspective, ask questions about the evidence presented, and make informed judgments about science-related topics and policies.

## **F. LEARNER OUTCOMES ASSESSMENT**

As noted on course syllabus

## **G. SPECIAL INFORMATION**

1. Knowledge of Human Cultures and the Physical and Natural World; Through study in the sciences, mathematics, social sciences, humanities, histories, languages, the arts, technology and professions.
2. Intellectual and Practical Skills; Including: Inquiry and analysis; Critical and creative thinking; Written and oral communication; Quantitative literacy; Information literacy; Teamwork and problem solving.
3. Personal and Social Responsibility and Engagement; Including: Civic knowledge and involvement; campus, local and global; Intercultural knowledge and competence; Ethical reasoning and action; Foundations and skills for lifelong learning.
4. Integrative and Applied Learning; Including: Synthesis and advanced accomplishment across general education, liberal studies, specialized studies and activities in the broader campus community.