

Instructor: Dr. Sara Fenske

Course: Genetics and Society

Academic Year: 2009-2010

Course Philosophy: Genetics is the study of how DNA controls our development, function and behavior. This is not your typical genetics course. In this course you will learn the concepts and techniques of modern genetics, as well as discuss the impact that genetics has on our societies. We will explore the impact of genetic diseases, the history of genetics and the current controversies in genetics. We will do this through a mixture of lecture, labs, reading, discussion, and debate. The success of this course depends on your enthusiasm and participation.

Course Requirements:

- 1) Human Genetics and Society 4th edition, by Yashon and Cummings
- 2) Binder for Handouts and paper for notes
- 3) Pencil or Pen (blue or black)
- 4) All handouts
- 5) Netbooks and access to the Internet

Grading Procedure: Grades are based on a combination of major exams, tests, quizzes, writing assignments (including lab reports), and debates. Tests will be worth twice as much as quizzes and lab reports. As stated in the Student Handbook, "To emphasize the importance of growth through the school year, the weight of each trimester grade has been changed. The first trimester will count as 15%, the second as 25%, the third as 35%, the mid-year exam as 10%, and the final exam as 15%."

Grading Scale: As stated in the Student Handbook, letter grades are determined based on the following scale:

A- to A+: 90-100

D- to D+: 60-69

B- to B+: 80-89

F: 0-59

C- to C+: 70-79

Homework/ Classwork Policies:

1. All assignments must be completed by the assigned date. Any long-term projects should be worked on daily so that the task is completed on time and will earn the best grade.
2. Two major exams will be given, one mid-year, and one at the end of the year. Both will be cumulative.
3. All assignments should be turned in on the due date during the class period. The maximum score for any late assignments will decrease by 10% for every day late until the grade reaches a maximum score of 50%. Any work not turned in will receive a 0.
4. All work must be legibly written or typed, and grammatically correct.

5. Keep all handouts, homework, returned homework and exams in a binder.
6. Ask questions about any instructions that are not clear.

Classroom Policies:

1. Daily, *prepared* attendance is mandatory. The school's attendance policy will be strictly enforced.
2. You are solely responsible for any material covered or announcements made during your absence.
3. You are expected to treat everyone with respect at all times. Debates and discussions can become heated. It is fine to disagree. It is not okay to be rude.
4. Cheating or plagiarism will result in a 0 grade for that assessment and may require you to appear before the honor code committee.
5. During all labs, safety comes first! To ensure that you understand what safe laboratory conduct is, you will be asked to sign a lab safety contract.
6. Finally, you are expected to ask questions about any material that is not clear. Do not worry about a question being too simple. If you don't understand, chances are others don't also (Yes, this is really true).

Tentative Schedule:

Week	Topics	Chapters
1	Biology Basics: Cells and Cell Structure/ Structure and Replication of DNA	
2	Genes as DNA: How Genes Encode Proteins	Ch. 5
3	Mutation and Genetic Disorders	Ch. 5
4	Legal and Ethical Issues Associated with Genetic Disorders	Ch. 5
5	Sex and Development	Ch. 1
6	Legal and Ethical Issues Associated with Sex Determination	Ch. 1
7	Assisted Reproductive Technology	Ch. 2

8	Legal and Ethical Issues Associated with Assisted Reproductive Technology	Ch. 2
9	How Genes Are Transmitted from Generation to Generation	Ch. 4
10	Linked Disorders/ Legal and Ethical Issues Associated with Dominant and Recessive Genetic Conditions	Ch. 4
11	Changes in Chromosome Number	Ch. 3
12	Genetic Testing and Prenatal Diagnosis	Ch. 7
13	Thanksgiving Break	
14	Legal and Ethical Issues Associated with Chromosomal Abnormalities and Genetic Testing	Ch. 3, Ch. 7
15	DNA Forensics	Ch. 8
16	Legal and Ethical Issues Associated with DNA Forensics	Ch. 8
17-18	Christmas Break	
19	The Human Genome Project	Ch. 9
20	Legal and Ethical Issues Associated with Patent Law	Ch. 9
21	Biotechnology	Ch. 6
22	Legal and Ethical Issues Associated with Transgenic Organisms	Ch. 6
23	Review/ Mid-Year Exams	

24	Biology Basics: Genes, Populations, and The Environment	
25	Polygenic and Multifactorial Inheritance	Ch. 10
26	Cancer and the Cell Cycle	Ch. 11
27	Legal and Ethical Issues Associated with Cancer	Ch. 11
28	Genetics and Behavior/ Nature vs. Nurture	Ch. 12
29-30	Spring Break	
31	Legal and Ethical Issues of Genetics and Behavior	Ch. 12
32	Blood Types, Organ Transplants	Ch. 13
33	Genetics of HIV	Ch. 13
34	Genetics and Populations	Ch. 14
35	Stem Cell Research	Ch. 15
36	Cloning	Ch. 15
37	Human Genetics of the Future	Ch. 15
38	Review for Final Exam	
39	Final Exam Week	

Genetics and Society Outline:

- I. Cell Structure and Function
 - A. Cell Organelles
 - B. Function of Cell Structures
- II. DNA
 - A. Structure of DNA
 - B. DNA Replication
- III. Genes Encode for Protein
 - A. What is Protein
 - B. Transcription
 - C. Translation
 - D. Mutations
 - i. Effects of Mutations on Proteins
 - ii. Effects of Mutation on Phenotype
 - E. Legal and Ethical Issues of Genetic Disorders
- IV. Sex and Development
 - A. Sex Determination
 - B. Sex Determination Tests
 - C. Human Development
 - D. Sex Development
 - E. Legal and Ethical Issues of Sex Determination
- V. Assisted Reproductive Technology
 - A. Production of Gametes
 - B. Male Reproductive System
 - C. Female Reproductive System
 - D. Infertility
 - i. Causes of Infertility in Women
 - ii. Causes of Infertility in Men
 - E. Assisted Reproductive Technology Methods
 - F. Legal and Ethical Issues of ART
- VI. Inheritance of Genes

- A. Mendelian Genetics
- B. Mendelian Genetics in Humans
 - i. Pedigree Analysis
 - ii. Inheritance of Recessive Disorders
 - iii. Inheritance of Dominant Disorders
- C. Linked Inheritance
- D. Legal and Ethical Issues of Genetic Disorders
- VII. Changes in Chromosome Number
 - A. Chromosome Structure
 - B. Causes of Changes in Chromosome Number
 - C. Effects of Monosomy and Trisomy
 - i. Risk factors for trisomy
 - ii. Aneuploidy and sex chromosomes
 - D. How to identify Chromosomal Abnormalities in a Fetus
 - i. Tests for chromosomal abnormalities
 - a) amniocentesis
 - b) chorionic villus sampling
 - c) other prenatal genetic tests
 - ii. Testing for other chromosomal variations
 - iii. Testing for genetic conditions
 - a) prenatal testing
 - b) adult testing
 - E. Legal and Ethical Issues of Genetic Testing
- VIII. DNA Forensics
 - A. DNA Tests and Profiles
 - B. DNA Forensics in the U.S. Court
 - C. Other uses for DNA Profiles
 - D. Legal and Ethical Issues of DNA Forensics
- IX. The Human Genome Project
 - A. The Goals of the Human Genome Project
 - B. Gene Mapping

- C. Whole Genome Sequencing
 - i. Findings from the Human Genome Project
 - ii. How Information from the Human Genome Project can be used
- D. Gene Therapy and the Human Genome Project
- E. Legal and Ethical Issues of the Human Genome Project
- X. Biotechnology
 - A. What is Biotechnology?
 - i. Recombinant DNA Technology
 - ii. Transgenic Organisms
 - a) Safety of Transgenic Organisms
 - b) Transgenic Organisms and Human Disease
 - B. Legal and Ethical Issues of Biotechnology
- XI. Polygenic and Multifactorial Inheritance
 - A. Polygenic Traits
 - B. Multifactorial Traits
 - i. Spina Bifida
 - ii. Other Multifactorial Traits
 - C. Legal and Ethical Issues Related to Multifactorial Traits
- XII. Cancer and the Cell Cycle
 - A. What is Cancer?
 - B. Genes Involved in Cancer
 - C. Cell Cycle
 - D. Development of Breast Cancer
 - E. Environment and Cancer
 - F. Legal and Ethical Issues of Cancer
- XIII. Behavior
 - A. What is Behavior?
 - B. Effect of Genes on Behavior
 - C. Studying Genetics of Behavior
 - D. Legal and Ethical Issues of the Genetics of Behavior
- XIV. Blood Types, Organ Transplants, and HIV

- A. Organ Transplantation and the Immune System
- B. Legal and Ethical Issues of Organ Donation
- C. Blood Types
 - i. Inheritance of blood types
 - ii. Blood Transfusions
- D. Genetics of HIV Infection
 - i. Natural Resistance to HIV
 - ii. Natural Susceptibility to HIV
- E. Genetics of Allergies
- XV. Genetics and Populations
 - A. Why Geneticists Study Populations
 - B. Effect of Environmental Conditions on Genetic Traits in Populations
 - C. Measuring Allele Frequencies in a Population
- XVI. Stem Cell Research
 - A. What is a Stem Cell?
 - B. Pros of Stem Cell Research
 - C. Cons of Stem Cell Research
- XVII. Cloning
 - A. Organismal Cloning
 - B. Legal and Ethical Issues of Organismal Cloning
- XVIII. Genetics of the Future
 - A. Newest Technologies of Genetics
 - B. Ethical Issues of the Future