

Human Genetics

2021-2022 Course Guide

Course: Human Genetics

Location: Lab 425

Teacher: Dr. Wardisiani

Class Web Site: www.Wardisiani.com

Course Description: General education lab course that explores the basic principles of human genetics. Topics include the scientific method, Mendelian genetics, sex determination, karyotyping, molecular genetics, genetic counseling, The Human Genome Project, genetics of immunity and cancer, and population genetics.

Topics

Human Development

The life cycle and meiosis [L][SEP]

The reproductive system and the formation of gametes [L][SEP]

Prenatal development [L][SEP]

Cloning by nuclear transfer [L][SEP]

Mendelian Inheritance

Mendel's principles of dominance, segregation, and independent assortment [L][SEP]

Mendelian inheritance in humans and pedigree analysis [L][SEP]

Chromosomal basis of Mendelian inheritance [L][SEP]

Extensions of Mendelian inheritance

Multiple alleles and different dominance relations [L][SEP]

Penetrance, expressivity, and the influence of the environment [L][SEP]

Epitasis

Maternal inheritance, mitochondrial genes and mitochondrial disorders [L][SEP]

Linkage and gene mapping [L][SEP]

Sex-linked inheritance

Sex determination in human beings [L][SEP]

X-linked inheritance and X-linked disorders [L][SEP]

Inactivation of X-linked genes in female mammals [L][SEP]

The search for the genetic bases of sexual orientation

Multifactorial traits

Quantitative traits and continuous variation [L][SEP]

The concept of heritability [L][SEP]

Methods to study multifactorial traits: Twin studies [L][SEP]

The Structure of DNA

The chemical composition and structure of nucleic acids [L][SEP]

Chromosome structure: the nucleosome [L][SEP]

DNA replication and DNA repair [L][SEP]

Polymerase Chain Reaction (PCR) and its applications [L][SEP]

Gene Action

Transcription, splicing, and RNA processing [L][SEP]

Translation and the genetic code [L][SEP]

Gene Mutation

Phenotypic effects of mutation [L][SEP]

Spontaneous and induced mutations [L][SEP]

Different types of mutations [L][SEP]

Chromosomes

Prenatal diagnosis and cytological techniques [L][SEP]

Genetic counseling [L][SEP]

Abnormal chromosome number and structure [L][SEP]

Population Genetics

DNA fingerprinting [L][SEP]

Hardy-Weinberg equilibrium [L][SEP]

Changing allelic frequencies [L][SEP]

Natural selection and balanced polymorphism [L][SEP]

Human Origins and Evolution [L][SEP]

Molecular evolution and molecular clocks

The Human Genome Project (HGP)

The techniques used by the HGP: DNA cloning and DNA sequencing [L][SEP]

Ethical, legal, and social issues related to the HGP [L][SEP]

Eugenics [L][SEP]

The Genetics of Immunity

The immune response [L][SEP]

Abnormal immunity and AIDS [L][SEP]

The Genetics of Cancer

Genes that cause cancer: oncogenes and tumor-suppressor genes [L][SEP]

Prevention and treatment of cancer [L][SEP]

Bioengineering

Transgenic organisms [L][SEP]

Genetically modified organisms: economic, ecological, and evolutionary concerns [L][SEP]

Gene therapy

Somatic and germ-line gene therapy [L][SEP]

The methods of gene therapy [L][SEP]

Reproductive technologies a. Infertility [L][SEP] // Assisted reproductive technologies

Course Learning Outcomes

Upon successful completion of the course, the student will be able to:

- Recognize and explain the major concepts and principles of scientific theories of [L][SEP]Classic, Molecular and Population Genetics. More important, they should be able to [L][SEP]apply those concepts and principles to new situations in written exams. (2a, 3a) [L][SEP]
- Identify the basic steps of the scientific method by analyzing classic experiments that contributed to our current knowledge of genetics. They will also apply these steps in [L][SEP]laboratory and computer exercises. (2a, 2b, 2c, 3a, 3b) [L][SEP]
- Explain the genetic basis of some common medical disorders and the genetic [L][SEP]foundation of human diversity. (3a, 3d) [L][SEP]
- Gather information and compare and contrast different points of view surrounding a [L][SEP]controversial topic in contemporary genetics and they will be required to articulate, justify and defend their personal point of view by writing papers and by participating in class discussion of news article. (2d, 3a, 3c, 3d) [L][SEP]
- Translate verbal material to mathematical expressions, apply mathematical formulas, and interpret and construct charts and graphs. They will demonstrate these skills by solving problems in written exams and assigned problem sets. (2c, 3b) [L][SEP]
- Communicate their experimental findings through written communication by writing lab reports. (3)

General Policies

1. *Your attendance and participation to class are the greatest tools to your success. Frequent tardiness and absences WILL be reflected in your grade. Solve the problem...come to class and do something while you're here.*
2. *Student e-mail Etiquette: All email correspondence to the instructor will be conducted in a professional manner.*
3. *Address the recipient appropriately, using proper spelling, grammar, and punctuation,*
4. *Close with your full name, day of week and time of class you meet (Example: Bob Smith, 12:20pm to 1:45pm)*
5. *It is your responsibility to make up missed assignments / tests and quizzes as soon as you return.*

Academic Honesty:

“To foster a climate of trust and high standards of academic achievement, The PMSA Science and Mathematics Departments are committed to cultivating academic integrity and expects students to exhibit the highest standards of honor in their scholastic endeavors. Academic integrity is essential to the success of PMSA’s mission. As members of the academic community, our foremost interest is toward achieving noble educational goals and our foremost responsibility is to ensure that academic honesty prevails” Any instance of plagiarism, cheating, dishonesty or the facilitation thereof will result in a grade of 0 (zero points) for the assignment. Second offenses will be reported to the Department Head, Principal and students will fail the course (grade of F). Please refer to the PMSA student guide for academic integrity.

Attendance:

Students are expected to be present for every meeting of the classes in which they are enrolled. Only the instructor can excuse a student from a course requirement or responsibility. When conflicts or absences can be anticipated, the student should inform the instructor of the situation as far in advance as possible. For unanticipated or emergency absences when advance notification to an instructor is not possible, the student should contact the instructor as soon as possible by email, or by contacting the main office.

