

Mississippi Valley State University
Information Sheet
BI -311, Genetics

Instructor: Manju Pande, Ph.D.

Class/Days/Location:
MWF (Lecture)/ 9-9:50
R(Lab)/ 8-10:40/ 2210 (STB)

Office location:
Science &Tech: 2253
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Office Hours:
M-F – 10-11:00am,
MTWF-2-3:00pm

Course Description

This is an introduction to genetic principles in relation to the mechanisms of Inheritance. Role of genetics in the development of biotechnology and human welfare is analyzed.

**“I am the family face; Flesh perishes. I live on, Projecting trait and trace
Through time to times anon, And leaping from place to place over oblivion.”
Thomas Hardy (English novelist)**

Prerequisites

BI-111 and B1-112

Purpose

This course is intended for a first college course in genetics. This course is required for all Biology majors as well as Science Education majors. This course provides with bare essentials of major branches of the discipline. In addition to the core concepts of genetics the cutting edge discoveries, modern tools and analytic methods are also discussed. The focus of this course is on human genetics. A full appreciation and effective utilization of the basic concepts in genetics, the basic principles of human genetics, and combining the latest advances in research, all of which will enable a student to become a reflective thinker, a life long learner and an effective facilitator. The laboratory component of the course enables students to improve upon their problem solving ability and provides hands –on application and skill development of genetic techniques. The laboratories are designed to further re-enforce the course content, methodology, and the essential objectives of Holistic Transformer Model (HTM).

Course Objectives

1. An introduction of the different approaches to the study of genetics, the science of heredity.
2. To understand the basic principles of Inheritance using Mendel’s experiment.
3. To develop an understanding of human genetics. Use of pedigree analysis in determining the inheritance of traits in humans, and discuss the concept of variations in gene expression.
4. DNA structure and gene expression: the flow of genetic information from DNA to RNA to Protein.
5. A brief understanding of the chromosomal packaging, gene activity and chromosomal rearrangements.
6. To study mutations-the source of genetic variation. The factors affecting mutations, molecular basis of mutation, and the importance of DNA repair mechanism.

7. Biotechnology and society: examine the social, cultural and ethical implications associated with the use of genetic technology.

Linkage of the HTM and BI 311 Introductory Genetics

General Course goals	Holistic Transformer Model (HTM)			
	Scholar	Facilitator	Reflective thinker	Life long learner
1	*	*		*
2	*	*	*	
3	*	*	*	*
4	*	*	*	*
5	*	*	*	
6	*	*	*	*
7	*	*	*	*
8	*		*	*

COURSE CONTENT

Textbook: GENETICS from genes to genomes by Hartwell et al, Fourth Edition, (Look for the attached course content)

Recommended Additional Readings:

GENETICS A conceptual Approach by Benjamin A. Pierce ()

HUMAN HEREDITY Principles and Issues by Michael R. Cummings (Thompson, Brooks/Cole Publication)

ESSENTIAL CELL BIOLOGY by Alberts et Al, (Garland Science Publishing)

GENETICS by Weaver and Hedrick

OMIM Home – www.omim.org, www.ncbi.nlm.nih.gov/omim

Genetics, www.genetics.org

Inheritance patterns, <http://ghr.nlm.nih.gov/handbook/illustrations/patterns?show=autorecessive>

Journal of Human Genetics – Nature, www.nature.com/jhg

The American Journal of Human Genetics-cell, www.cell.com/AJHG/

Students Learning Outcome:

1. Students should be able to demonstrate the knowledge of Mendelian Principles of inheritance.
2. Students should be able to comprehend the knowledge of DNA structure and its expression.
3. Students should be able to demonstrate the knowledge of molecular basis of mutation.
4. Students should be able to demonstrate the knowledge of molecular techniques.

Use of Techonlogy

Technology is integrated into the course to enhance and facilitate the promotion and development of four attributes of HTM. The technology used includes but not limited to:

1. Computer and LCD projector, videos, and charts

2. Blackboard/Connect – An electronic system tied to the textbook to enhance the learning experience.
3. Compound light microscopes with computer and colored monitor
4. Gel Electrophoresis Chambers, Thermal Cyclers and other equipments
5. Use of Internet Searches – pubmed, infotrac
6. Computer applications for collecting, analyzing, and displaying data.

Major Student Activities

1. Laboratory Exercise topics:
 - a. Lab Safety
 - b. Mitosis and meiosis
 - c. Mendelian Genetics
 - d. Human Genetics
 - e. Cytogenetics – karyotyping
 - f. Pedigree Analysis
 - g. DNA isolation
 - h. Restriction Mapping
 - i. Bioinformatics module 1 and 11
 - j. DNA amplification by PCR
 - k. ELISA
2. Reports of Lab Exercises
3. Portfolio of Lab Exercises
 - a. Handouts
 - b. Assignments
 - c. Labeled drawings
 - d. Lab Worksheet
4. Term Paper and presentations
5. Content Examinations
 - a. Lecture Examinations
 - b. Lab Examinations

Course Basic Requirements

Each Student is required to:

1. Attend lecture and lab regularly on scheduled class days. In case of emergency or under Physician's care, a signed excuse from the student dean is required.
2. Complete all home works & assigned readings from the text and other sources.
3. Demonstrate knowledge of course content on each examination.
4. Submit home works and other assignments on the announced due dates

Method of Instructions

Course instruction will include classroom lectures, demonstrations and discussions. These will be complemented by use of video demonstrations, charts, microscope slides, overhead projectors, models, lab investigations using molecular techniques and online assignments.

This Course is integrated with Blackboard, Please call: Mr. Pendelton at 662-254-3114 for any questions you may have as well as to get your username and set up your password. Blackboard will have Lecture power points, Assignments and Quizzes.

Method of Evaluation

Quizzes - 50 points
3 Unit Test - 100 each
Final (comprehensive) - 100 points
Homework - 100 points
Term Paper/Presentation - 100 points. (Separate instructions will be given later in the class)

Lab Examination
Midterm Examination - 100 points
Laboratory reports/assignments -100 points
Portfolio - 50 points
Final Examinations - 100 points

Laboratory reports: are due at the end of each laboratory period.

Grading Scale

90-100	A
80-89	B
70-79	C
60-69	D
59- below	F

Make up work policy

It is the student's responsibility to make up lecture test, assignments or any other material missed due to absences. There will be no make up missed lab test, and lecture makeup exams are not necessarily easier. Only official or personal emergency absences (medical certificates) will be recognized.

Attendance and Withdrawal policy

Students are expected to attend and participate in all lecture and Laboratory classes assigned to be present before the completion of roll call. The instructor will follow the absentee policy in the college catalog. Absences more than 3 in lecture or lab will be notified to the Dean.

Academic Integrity

Academic dishonesty is defined to include, but is not limited to, any of the following:

1. Plagiarism: submitting as one's own work the product of someone else's research, writing, artistic conception invention, or design.
2. Cheating and dishonest practices in connection with examination, papers, and projects.
3. Forgery, misrepresentation or fraud

Violation of academic integrity will be handled according to Mississippi Valley State University Policy

Services for Students with Disabilities

Mississippi Valley State University is committed to providing reasonable accommodations for students with a documented disability. If you feel you are eligible to receive accommodations for a covered disability (medical, physical, psychiatric, learning, vision, hearing, etc.) and would like to request it for this course, you must be registered with the Services for Students with

Disabilities (SSD) program administered by University College. It is recommended that you visit the Disabilities Office located inside the EMAP Computer Lab in the Technical Education (IT) Building to register for the program at the beginning of each semester.

For more information or to schedule an appointment, please contact Mr. Billy Benson, Jr. via phone or email at 662-254-3005 or billy.benson@mvsu.edu.

Few Class rule

1. Please arrive on time and ready to work
2. No food and drink in the classroom
3. Turn off the pagers and the cell phones before coming to the classrooms
4. At the end of the Lab period, please clean up your work area. Return the microscopes in the designated area and slides to their trays.

Note: Please be reminded that the laboratory component is an essential part of this course and attending the lecture alone will not be enough to pass this class.

This Syllabus does not constitute a contract with the University. This contains guidelines for the course. I reserve the right to make changes (add or delete) as needed.

Course Content

Textbook: GENETICS From Genes to Genomes by Hartwell et al. Fourth Edition; McGraw Hill.

Major Areas of Study

Chapter 1: Genetics: The Study of Biological Information

- Genetics is the key to Biology
- Life is encoded in the DNA molecule
- Complex systems arise from DNA-Protein and Protein-protein interactions.
- All living things are closely related at the molecular level
- Genetic techniques permit the dissection.

Mendelian Inheritance

[In the ten years G. Mendel worked on his plants in the garden of monastery, he made the greatest discovery in biology that has been made in the last five hundred years. Thomas Hunt Morgan.](#)

Chapter 2: Mendel's Breakthrough: Patterns, Particles, and principles of heredity

- Background:
- Genetic analysis according to Mendel
- Mendelian inheritance in Humans
- Tools of genetics
- Genetics and society

Chapter 3: Extensions to Mendel: complexities in relating to genotype and phenotype

- Single gene inheritance
- Multifactorial Inheritance
- Genetics and Society

Chapter 4: The chromosome theory of inheritance

- Chromosome contains the genetic material
- Mitosis
- Meiosis

Gametogenesis requires both mitotic and meiotic divisions

Chapter 5: Linkage, recombination, and the mapping of genes on the chromosomes

Gene linkage and recombination

Mapping: locating genes on a chromosome

Tools of Genetics

Genetics and Society

Molecular Biology

[Nature has a short menu, but the items on it are quite reliable. Dagmar Ringe- Biologist](#)

Chapter 6: DNA: How the molecule of Heredity carries, replicates and recombines information.

Experiments designate DNA as the genetic material

The Watson-Crick model

DNA replication

Tools of genetics

Chapter 8: Gene Expression: The flow of genetic information from DNA to RNA to Protein.

The genetic code

Transcription

Translation

Genetics and Society

Chapter 9: Deconstructing the Genomes: DNA at high resolution

Fragmenting complex genomes into bite size pieces for analysis

Cloning fragments of DNA

Hybridization

Polymerase chain reaction

DNA sequencing analysis

Tools of Genetic

Genetics and Society

Chapter 13: The Eukaryotic chromosome: an organelle for packaging and managing DNA

The components of eukaryotic chromosome

Chromosome structure

How chromosomal packaging influences gene activity

[And nothin's quite sure as change. John Phillips](#)

Chapter 14: Chromosomal rearrangements and changes in chromosome number reshape eukaryotic genomes

Rearrangements of DNA sequences within chromosomes

Changes in chromosome number

A glimpse of the future: Emergent technologies in the analysis of chromosomal Changes.

Chapter 19: Variations and Selection in Populations

The Hardy Weinberg Law: Predicting genetic variations in populations

Causes of allele frequency changes

