

Montgomery County Community College
 BIO 260
 Genetics
 4-3-3

COURSE DESCRIPTION:

A study of the basic principles and problems of classical, biochemical, and molecular genetics; including Mendelian inheritance, chromosomes, mutation, linkage mapping, DNA structure, gene expression and an introduction to recombinant DNA technology. Laboratory experiments provide an introduction to genetics and molecular biology; including studies of inheritance using organisms such as *Drosophila*, cloning, gel electrophoresis and the polymerase chain reaction. This course is subject to a course fee. Refer to <http://mc3.edu/adm-fin-aid/paying/tuition/course-fees> for current rates.

REQUISITES:*Previous Course Requirements*

- BIO 152 Principles of Biology II with a minimum grade of "C"
- CHE 151 Principles of Chemistry I with a minimum grade of "C"

Concurrent Course Requirements

None

LEARNING OUTCOMES Upon successful completion of this course, the student will be able to:	LEARNING ACTIVITIES	EVALUATION METHODS
1. Describe the history of classical and molecular genetics.	Lecture Written Assignments/ Bibliographic Instruction	Quizzes Lecture Examinations Final Exam
2. Apply classic genetic techniques to current problems in biology and medicine.	Discussion Group Problem Solving Activities Laboratory Techniques in Classical and Molecular Genetics Computer-Based Instruction	Quizzes Lecture Examinations Departmental Exam
3. Define the predominant organisms used in genetic analyses, and describe the advantages and disadvantages of their use.	Lecture Group Problem Solving Activities Integrated Laboratory Techniques in Classical and Molecular Genetics Written Assignments/ Bibliographic Instruction in Genetics	Quizzes Lecture Examinations Final Exam

LEARNING OUTCOMES	LEARNING ACTIVITIES	EVALUATION METHODS
4. Define and describe molecular mechanisms of genetic control in prokaryotes and eukaryotes.	Lecture Class Discussion Group Problem Solving Activities Written Assignments/ Bibliographic Instruction in Genetics	Quizzes Lecture Examinations Departmental Final
5. Demonstrate proficiency in basic laboratory techniques utilized in molecular biology.	Integrated Laboratory Techniques in Classical and Molecular Genetics Computer-Based (Local and Internet) Instruction	Completion of Laboratory Experiments
6. Generate and critically analyze scientific data, and present logical conclusions.	Integrated Laboratory Techniques in Classical and Molecular Genetics Data Presentation Computer-Based (Local and Internet) Instruction Written Assignments/ Bibliographic Instruction in Genetics Group Problem Solving Activities	Quizzes Lecture Examinations Departmental Final Laboratory Experiments
7. Design experiments, generate and critically analyze data, and present logical conclusions to test hypotheses address relevant questions regarding applied and basic problems in classical and molecular genetics.	Lecture Class Discussion Group Problem Solving Activities Integrated Laboratory Techniques in Classical and Molecular Genetics Data Presentation Computer-Based (Local and Internet) Instruction Written Assignments/ Bibliographic Instruction in Genetics	Quizzes Lecture Examinations Departmental Final Laboratory Experiments
8. Generate and test hypotheses that address relevant questions relating to basic and applied problems in both classical and molecular genetics.	Class Discussion Group Problem Solving Activities Integrated Laboratory Techniques in Classical and Molecular Genetics Computer-Based (Local and Internet) Instruction	Quizzes Lecture Examinations Departmental Final

LEARNING OUTCOMES	LEARNING ACTIVITIES	EVALUATION METHODS
9. Design and perform relevant experiments that generate scientific data pertaining to the above outcome.	Class Discussion Group Problem Solving Activities Integrated Laboratory Techniques in Classical and Molecular Genetics Data Presentation Computer-Based (Local and Internet) Instruction	Quizzes Lecture Examinations Departmental Final Laboratory Experiments
10. Critique current literature in molecular and classical genetics, including clinical applications.	Class Discussion Computer-Based (Local and Internet) Instruction Written Assignments/ Bibliographic Instruction in Genetics	Essays and or Term Paper

At the conclusion of each semester/session, assessment of the learning outcomes will be completed by course faculty using the listed evaluation method(s). Aggregated results will be submitted to the Associate Vice President of Academic Affairs. The benchmark for each learning outcome is that *70% of students will meet or exceed outcome criteria.*

SEQUENCE OF TOPICS:

Lecture Topics

1. Simple Mendelian inheritance
2. Chromosome theory of inheritance
3. Meiosis
4. Advanced Mendelian inheritance: multiple alleles, incomplete dominance, etc.
5. Linkage and genetic mapping
6. Mapping in fungi, bacteria and viruses
7. Biological systems of genetic analysis: yeast, *Drosophila*, *Arabidopsis*, mice, humans
8. Population genetics
9. DNA structure
10. Transcription and Translation
11. Recombinant DNA technology
12. Regulation of gene expression in prokaryotes and eukaryotes
13. Regulation of gene expression during development
14. Genomics
15. Chromosomal and DNA mutations, transposable elements
16. Genetics of cancer

Laboratory Experiments

1. Biology of Drosophila
2. Drosophila Autosomal & Sex linked Cross (lasts for 3 weeks)
3. Probability & Statistics in Genetics*
4. Basic molecular genetic techniques: pipetting, restriction enzymes, gel electrophoresis
5. Karyotypes (Web Assignment)*
6. Complementation testing in Ascomycete genetics (yeast)
7. Arabidopsis Genetics: PCR detection and molecular phenotyping
8. Subcloning using pUC Vectors
9. Plasmid Miniprep and Restriction Enzyme Analysis
10. Blast Searches and Sequence Alignments (PC lab and out of class)
11. PCR Based DNA Fingerprinting

LEARNING MATERIALS:

Required Text:

Klug, Cummings, Spencer & Palladino. (2012). *Concepts of Genetics* (10th ed.).
Pearson Publishing.
CD & Internet Access

Other learning materials may be required and made available directly to the student and/or via the College's Libraries and/or course management system.

COURSE APPROVAL: 1/5/2000

Prepared by: Christopher Harendza, Ph.D.	Date: 9/1999
Reviewed by: Christopher Harendza, Ph.D.	Date: 1/2004
Revised by: Christopher Harendza, Ph.D.	Date: 4/2011
Revised by: Christopher Harendza, Ph.D.	Date: 7/2012
VPAA/Provost or designee Compliance Verification: Victoria L. Bastecki-Perez, Ed.D.	Date: 7/30/2012
Revised by: Christopher Harendza, Ph.D.	Date: 10/30/2012
VPAA/Provost or designee Compliance Verification: Victoria L. Bastecki-Perez, Ed.D.	Date: 4/25/2013
Revised by: Debbie Dalrymple	Date: 6/27/2016
VPAA/Provost or designee Compliance Verification: Victoria L. Bastecki-Perez, Ed.D.	Date: 6/27/2016

This course is consistent with Montgomery County Community College's mission. It was developed, approved and will be delivered in full compliance with the policies and procedures established by the College.