

University of Arkansas – Fort Smith
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General Syllabus

BIOL 3801 GENETICS LABORATORY

Credit Hours: 1 Lecture Hours: 0 Laboratory Hours: 3

Prerequisite or corequisite: BIOL 3803 Genetics

Effective Catalog: 2018- 2019

I. Course Information

A. Catalog Description

Heredity and the patterns of inheritance will be studied in detail including data collection and analysis of experimental crosses. DNA isolation and analysis using modern Recombinant DNA technology and Polymerase Chain Reaction (PCR) will be performed and data will be collected and analyzed. Recombinant DNA, transcription, and translation will be analyzed at the molecular level.

II. Student Learning Outcomes

A. Subject Matter

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

1. Design proper experimental crosses to analyze inheritance pattern.
2. Develop hypotheses pertaining to experimental outcomes.
3. Isolate and analyze DNA from living cells.
4. Clone DNA using PCR.
5. Analyze data collected via experimental crosses and/or molecular techniques.
6. Prepare and run gel electrophoresis.
7. Demonstrate how traits are passed on by Mendelian principles.
8. Illustrate how proteins are synthesized by the processes of transcription and translation.
9. Explain the importance of molecular biology and genetic engineering in the modern society.
10. Understand the relationship between DNA, Genetics, and the processes of Evolution.

B. University Learning Outcomes

BIOL 3801 Genetics Lab enhances student abilities in the following areas:

Analytical Skills

Quantitative Reasoning: Students will interpret data and predict how certain traits are passed in a population. Students will need to calculate percentages and perform statistical analyses of data collected, and recognize the limitations of their quantitative analysis.

Communication Skills (written and oral)

Students will communicate proficiently. Students will communicate with their lab partners the lab results, and connect results to key relevant course topics.

Ethical Decision Making

The students will conduct themselves in an ethical manner and evaluate ethical considerations during discussions of genetic research activities and manipulations common to the discipline.

Global & Cultural Perspectives

Student will demonstrate how genetics research impacts or is impacted by different cultures.

III. Major Course Topics

- A. Plant DNA isolation and analysis
 - 1. Purifying genomic DNA from plants
 - 2. Selecting plant species for genomic DNA isolation
 - 3. Grinding and lysing plant tissue
 - 4. Concentrating extracted DNA
 - 5. Measuring DNA concentration, yield, and purity
- B. Forensic DNA fingerprinting
 - 1. Restriction digestion of DNA
 - 2. Agarose gel electrophoresis
- C. Crime scene investigation
 - 1. Allele frequencies
 - 2. STR analysis
 - 3. Polymerase chain reaction
 - 4. DNA Gel electrophoresis
- D. p-GLO bacterial transformation
 - 1. Sterile technique
 - 2. Bacterial growth and plating
 - 3. Antibiotic resistance
 - 4. Transformation efficiency
 - 5. Gene-environment interactions
- E. Human chromosome 16 – PV92 polymerase chain reaction
 - 1. Cheek cell DNA isolation
 - 2. PCR amplification
 - 3. Complementary DNA strand hybridization

4. DNA strand synthesis via DNA polymerase
 5. DNA gel electrophoresis
 6. Location of an Alu repetitive element within an intron
 7. Allelic frequencies
- F. GMO foods
1. Detecting genetically-modified (GM) foods by PCR
 2. DNA extraction from food samples
 3. PCR amplification
 4. DNA gel electrophoresis