Prepared by the Department of Natural Science and Applied Technology
Date of Departmental Approval: October 3, 2016
Date approved by Curriculum and Programs: November 23, 2016 Effective: Fall 2017

1. Title: BIO242 Molecular Genetics
BIO242L Molecular Genetics Laboratory

2. Course Description
This course fulfills the requirements of a second year elective for a CCCC degree in Biology. It builds upon the foundational principles of molecular biology and genetics introduced in BIO151 (General Biology I). Topics covered will include cellular replication; chromosomal structure and inheritance; gene expression, regulation and development; and biotechnology. The laboratory features activities and experiments that reinforce the concepts presented in lecture. (3 class hours/ 3 laboratory hours)

3. Student Learning Outcomes (Instructional Objectives, Intellectual skills)
Upon completion of the course, the student is able to:

- Describe and discuss inheritance patterns including Mendelian, co- and incomplete dominance, and sex-linked variations using mono- and dihybrid crosses.
- Construct simple prokaryotic and eukaryotic chromosome maps.
- Describe, with detail, the structure and function of the DNA molecule; its replication, recombination, packaging and expression in both prokaryotic and eukaryotic cells.
- Distinguish between the regulation of gene expression in prokaryotes and eukaryotes.
- Discuss gene mutations, their effect and the method of DNA repair.
- Define and discuss gene families that are important in the development of plants and animals.
- Describe recombinant DNA technology and discuss its applications in bacterial, plant and animal systems, including ethical implications of modern biotechnological practices.
- Display proficiency in various cellular and molecular biological techniques and summarize laboratory data in standard report format.

4. Credits: 4 credits

5. Satisfies General Education Requirement: No

6. Prerequisite(s): BIO151 (General Biology I)

7. Semester(s) Offered: Spring

8. Suggested Guidelines for Evaluation: Four full-period exams, weekly quizzes, two lab practical exams, lab reports

9. General Topical Outline of the Course:

I. Basic Genetics
Mitosis and Meiosis
Classic Mendelian Inheritance
Exceptions to Mendelian Inheritance

II. Chromosomal Heredity
Chromosomal Mapping in
- Eukaryotes
- Bacteria
- Bacteriophages

Sex Determination and Sex-linked Inheritance
Chromosomal Mutations

III. DNA Structure and Function
DNA Structural Analysis
Method of DNA Replication
Chromosomal Structure

IV. Gene Expression and Regulation
Transcription
Translation and the Genetic Code
Gene Mutation and Repair
Regulation of Gene Expression in
- Prokaryotes
- Eukaryotes

V. Developmental Genetics
Homeotic Genes
Regulation of the Cell Cycle

VI. Biotechnology
Recombinant DNA Technology
Genomics, Bioinformatics and Proteomics
Ethical Applications of Genetic Modification