COMMON COURSE OUTLINE: Course discipline/number/title: BIOL 2300: Genetics

A. CATALOG DESCRIPTION
   1. Credits: 4
   2. Hours/Week: 3 hours lecture and 2 hours lab per week
   3. Prerequisites (Course discipline/number): BIOL 1220 and CHEM 1127 or PHYS 1117
   4. Co-requisites (Course discipline/number): None
   5. MnTC Goals (if any): Goal 2/Critical Thinking; Goal 3/Natural Sciences

   This course presents the fundamental concepts of classical transmission genetics and modern molecular genetics. Topics include Mendelian genetics, linkage and mapping, chromosomal anomalies, population and evolutionary genetics, biotechnology and nucleic acid analysis.

B. DATE LAST REVISED (Month, year): April, 2013

C. OUTLINE OF MAJOR CONTENT AREAS:
   1. Cell reproduction
      a) Mitosis and the cell cycle
      b) Meiosis and gametogenesis
   2. Mendelian genetics
      a) Mono- and dihybrid crosses
      b) Probability
      c) Allelic systems resulting in modified Mendelian ratios
   3. Linkage and recombination
      a) Three-point crosses
      b) Gene mapping
   4. Chromosome variations
      a) Sex determination
      b) Chromosome structure and number anomalies
   5. Molecular genetics
      a) DNA structure, replication; transcription; translation
      b) Mutation and mutagenesis
   6. Biotechnology
      a) Restriction enzymes and gene cloning
      b) Electrophoretic analysis of nucleic acids
      c) Polymerase chain reaction
   7. Population and evolutionary genetics
      a) Allele frequencies, genotype frequencies, Hardy-Weinberg equilibrium
      b) Natural selection, genetic drift, other evolutionary forces, speciation

D. LEARNING OUTCOMES (GENERAL): The student will be able to:
   1. Solve one-, two- and three-factor crosses involving both linked and unlinked genes.
   2. Apply the concepts of probability to the statistical analysis of cross data.
   3. Describe the ways in which genes and gene products interact to produce phenotypes.
   4. Describe the molecular processes of DNA replication and of transcription and translation.
   5. Explain the basic methods of nucleic acid analysis and gene cloning.
   6. Evaluate the genetics of populations and the resulting evolutionary forces.
E. LEARNING OUTCOMES (MNTC):
Goal 2/Critical Thinking: The student will be able to:
1. Gather factual information and apply it to a given problem in a manner that is relevant, clear, comprehensive, and conscious of possible bias in the information selected.
2. Imagine and seek out a variety of possible goals, assumptions, interpretations, or perspectives which can give alternative meanings or solutions to given situations or problems.
3. Analyze the logical connections among the facts, goals, and implicit assumptions relevant to a problem or claim; generate and evaluate implications that follow from them.

Goal 3/Natural Sciences: The student will be able to:
1. Demonstrate understanding of scientific theories.
2. Formulate and test hypotheses by performing laboratory or simulation experiments requiring the collection of data and its graphical analysis; gain an appreciation of uncertainty and sources of error in data collection and analysis.
3. Communicate their experimental findings, analyses, and interpretations both orally and in writing.

F. METHODS FOR EVALUATION OF STUDENT LEARNING:
1. A lecture exam for each of the major units covered.
2. A written laboratory report is required for several of the laboratory exercises

G. RCTC CORE OUTCOME(S) Addressed:
- Communication
- Critical Thinking
- Global Awareness/Diversity
- Civic Responsibility
- Personal/Professional Accountability
- Aesthetic Response

H. SPECIAL INFORMATION (if any):
The initial lab session explains and familiarizes the student with general safety hazards and safety equipment in the lab. During the pre-lab discussion, the hazardous characteristics of any materials used during the lab are discussed. In addition, if the lab involves any potentially infectious material, the students will be instructed on the proper use and disposal. The instructor will direct all students to wear necessary protective equipment while working with any hazardous materials. A copy of Material Safety Data Sheets for chemicals used is available in the lab.