BIOL A283: GENETICS

Item	Value
Curriculum Committee Approval Date	12/08/2021
Top Code	040100 - Biology, General
Units	4 Total Units
Hours	72 Total Hours (Lecture Hours 72)
Total Outside of Class Hours	0
Course Credit Status	Credit: Degree Applicable (D)
Material Fee	No
Basic Skills	Not Basic Skills (N)
Repeatable	No
Grading Policy	Standard Letter (S)
Associate Arts Local General Education (GE)	• OC Physical/Biological Sci - AA (OB)
Associate Science Local General Education (GE)	• OCC Physical/Biological Sci-AS (OSB)
California General Education Transfer Curriculum (Cal-GETC)	• Cal-GETC 5B Biological Sciences (5B)
Intersegmental General Education Transfer Curriculum (IGETC)	• IGETC 5B Biological Sciences (5B)
California State University General Education Breadth (CSU GE-Breadth)	• CSU B2 Life Science (B2)

Course Description

This course covers the principles of Mendelian inheritance; gene transmission in prokaryotes and eukaryotes; recombination and mutation; gene regulation, replication, and expression; cell division; and biochemical genetics. Additional emphasis is placed on problem solving. PREREQUISITE: BIOL A180 or BIOL A180H; and CHEM A180. Transfer Credit: CSU; UC.

Course Level Student Learning Outcome(s)

1. Describe Mendelian genetic concepts and analyze data to solve problems involving heritable traits in prokaryotic and eukaryotic organisms.
2. Describe methods used to analyze an organism's genome or proteome and be able analyze data to construct physical, genetic, or sequence maps in prokaryotic and eukaryotic organisms.
3. Describe the structure, organization, and transmission of genetic information at the molecular level and assess the impact of DNA mutation from gene to protein to organism.

Course Objectives

- 1. Describe Mendelian inheritance and its extensions as well as apply these principles to genetic problem solving.
- 2. Describe chromosomes, chromosome theory, mitosis, meiosis and apply principle to solve genetic problems.
- 3. Describe gene linkage, recombination, and gene mapping and apply principles to solve genetic problems.
- 4. Describe DNA, mutation, gene function and expression and be able to apply these principles to solving problems.
- 5. Describe gene mapping and be able to apply the principles learned to problem solving.
- 6. Describe prokaryotic genetics and be able to apply principles to solving problems.
- 7. Describe advances in modern genomics.
- 8. Describe common model organisms and how they are used in the field of genetics.

Lecture Content

1. Mendelian inheritance a. A. History b. Mendelian Genetic Analysis (1) Probability (2) Independent assortment c. Pedigree analysis 2. Extensions to Mendel a Genotype to Phenotype (1) Single Gene Inheritance (2) Multifactoral Inheritance 3. Chromosomal Theory of Inheritance a. Chromosome and Chromosomal Theory b. Mitosis c. Meiosis and Gametogenesis d. Sex Linkage 4. Linkage and Recombination a. Linked Genes b. Chi Square Test c. Recombination d. Recombination frequency 5. Gene Mapping a. 2 point cross b. Genetic vs. physical map c. Tetrad Analysis in Neurospora and Saccharomyces cerevisiae 6. DNA a. Structure b. Transformation c. Replication d. Crossing Over 7. Mutation a. Types of b. Causes c. Complementation 8. Gene Function/ Biochemical Pathways a. One gene/One enzyme b. Protein structure c. Genotype to phenotype 9. Gene Expression a. Cracking the genetic code b. Gene coding/codons c. Transcription d. Translation 10. DNA techniques a. Recombinant DNA techniques/Gene Cloning b. DNA hybridization c. Electrophoresis d. PCR COURSE CONTENT AND SCOPE/ TOPIC OUTLINE, continued 12. Genomes and Proteomes a. Linkage Maps b. Physical maps c. DNA arrays 13. Genome Wide Variation and Trait analysisa. Genetic variants- analysis and detection b. Positional cloning c. Gene to function 14. Chromosomal Rearrangements a. Deletions b. Duplications c. Inversions d. Translocations e. Transposition/ Transposable elements f. Aneuploidy/Non-disjunction g. Chromos omal basis of human disease 15. Prokaryotic genetics a. Genome b. Gene transfer (transformation, conjugation, transduction) c. F plasmid/Hfr 16. Population genetics a. Hardy-Weinberg Law b. Natural Selection c. Macroevolution/Microevolution

Method(s) of Instruction

- Lecture (02)

Instructional Techniques

Lecture on key concepts Applications of concepts by discussion problem solving.

Reading Assignments

Students will be expected to spend on average 5 hours per week on assigned reading from the course textbook and other appropriate sources.

Writing Assignments

Students will be expected to spend on average 2-3 hours per week on written analyses.

Out-of-class Assignments

Students will be expected to spend on avegarge 2-3 hours per week on problem sets and quantitative analyses.

Demonstration of Critical Thinking

Exams and problem sets

Required Writing, Problem Solving, Skills Demonstration

Exams and problem sets

Eligible Disciplines

Biological sciences: Masters degree in any biological science OR bachelors degree in any biological science AND masters degree in biochemistry, biophysics, or marine science OR the equivalent. Masters degree required.

Textbooks Resources

1. Required Hartwell, L. et al.. Genetics from Genes to Genomes, 6th ed. Chicago: McGraw-Hill, 2018 Rationale: *