



BIOL 2030

Division: Natural Science and Mathematics

Department: Biology

Course: BIOL 2030

Title: Introductory Genetics

Catalog Description:

This course introduces transmission, population, and quantitative genetics incorporating both molecular and classical aspects of genetic studies.

General Education Requirements: Individual Choice

Semesters Offered: Fall

Credit/Time Requirement: Credit: 3; Lecture: 3; Lab: 0

Clock/Hour Requirements: 0

Offered for Non-Credit: No

Prerequisites: Any biology core course such as BIOL 1010, 1050, 1610, etc., or instructor permission.

Corequisites: BIOL 2035 (formerly BIOL 276L)

Justification:

The Introductory Genetics lecture course (BIO 2030) and laboratory (BIO 2035) are part of the biology majors lower division core. These courses are taught at every institution except Utah Valley State College. At Weber State University and Utah State University, the courses are ZOO 3300 and BIOL 3200, respectively. Our students receive credit for the Utah State University lecture course and for the lab course BIOL 4100. The University of Utah has only the lecture course BIOL 2030. Some of the institutions have not yet changed the course designations and numbers. In order for Snow College students to transfer as juniors on track in their majors programs to these institutions, genetics should be offered. The laboratory component of this course (BIO 2035) is to give additional learning opportunities to our students so that they should be well prepared to transfer to the four year institutions. "Labs for Learning" is a hallmark of Snow College.

Student Learning Outcomes:

Upon successful completion of this course, students will:

- understand basic gene function in prokaryotes and eukaryotes, cell division processes of fission and mitosis, recombination in viruses and bacteria and in eukaryotes (meiosis and molecular techniques), and how these relate to mechanisms of inheritance and gene expression in both individuals and populations
- begin to understand how the mathematical models and simple statistics are used in applying the scientific method to basic concepts in genetics
- be introduced to current computer programs for genetic manipulation and genome analysis as well as some laboratory instrumentation including microscopes, computers, thermocyclers, microcentrifuges, laminar flow hoods, safety cabinets, etc., and to aseptic technique and other laboratory procedures for

manipulating genetic material

- have a basic understanding from which to evaluate critical issues surrounding "genetic engineering" and the Human Genome Project.

Content:

This course will include:

- nature of the hereditary material
- DNA structure
- DNA replication in prokaryotes; contrast eukaryote replication prokaryote/eukaryote genes
- RNA transcription
- repressible *lac* operon and inducible *trp* operon regulation
- post transcriptional processing
- genetic code
- translation or protein synthesis
- post translational processing
- colinearity of genes and polypeptides
- mutations -- point, frameshift, small deletions and duplications, insertion
- deletion mapping
- enzymes and cell metabolism
- DNA and RNA manipulations
 - restriction digests
 - Southern blot
 - Northern blot
 - PCR primer analysis
 - plasmid preparation
 - transformation
 - isolation and purification, etc.
- applications of laboratory techniques to genetic analysis
- chromosome structure and morphology (pro-/eukaryote)
- binary fission
- mitosis
- meiosis
- contrast mitosis and meiosis
- Mendel's laws of dominance, segregation, independent assortment
- relate meiosis to segregation and independent assortment
- introduce probability concepts
- Punnett Square, forking or foiling methods for gametic and zygotic ratios
- genotypes/phenotypes
- Chi squares goodness of fit statistical testing
- binomial and Poisson distributions in statistical analyses
- penetrance/expressivity
- partial or incomplete dominance, multiple alleles, codominance, lethals
- quantitative traits introduced
- pleiotropy
- epistasis -- distinct patterns

- linkage groups
- two and three point mapping
- interference
- random spore and tetrad analyses
- map distance versus physical distance
- unequal crossing over and dosage effects
- nondisjunction and aneuploidy
- polyploidy
- chromosomal aberrations -- inversions, translocations, deletions, duplications
- genetic variation
- Hardy-Weinberg equilibrium and assumptions
 - mutation
 - selection
 - migration
 - genetic drift (bottleneck, founder effect)
- selection mutation balance
- inbreeding and inbreeding coefficient
- phenotypic assortative mating
- natural selection
- heterozygote advantage
- cytoplasmic inheritance/maternal effect
- artificial selection (plant and animal breeding)
- inbred lines, heterosis, estimating genetic and environmental variances
- heritability
- pesticide/pest resistance
- "genetic engineering"
- Human Genome and other projects.

General Education Outcomes:

2) Write clearly, informatively, and persuasively.

Student written responses, both answers and problem solving approaches, to the take home tests noted above will be evaluated for clarity and appropriate brevity, and for accuracy.

4) Retrieve, evaluate, interpret, and deliver information through a variety of traditional and electronic media.

Students will complete one major laboratory project which will require the use of traditional and electronic media. Homework and tests often require additional research as well.

7) Apply scientific reasoning to a variety of contexts.

Students will demonstrate scientific reasoning throughout the various topics considered in course content in their responses to tests, homework, projects, discussions, etc.

Key Performance Indicators:

- Homework problems are assigned, graded and returned. Homework and homework presentation is worth 25% of the total grade. The tests are take-home, open-book, open-note containing story problems

(mathematical essays) and essay questions. These are worth 50% of the total grade. The final exam is comprehensive by nature and worth the remaining 25% of the grade.

- Percentages are approximate.

Representative Text and/or Supplies:

- Klug and Cummings, *Concepts of Genetics*, current edition, Pearson Education, Inc., Upper Saddle River, NJ.
- Leland H. Hartwell et al., *Genetics from Genes to Genomes*, current edition, McGraw-Hill Higher Education, Boston.
- Anthony J. F. Griffiths et al., *An Introduction to Genetic Analysis*, current edition, W. H. Freeman, New York.
- Benjamin A. Pierce, *Genetics: A Conceptual Approach*, current edition, W. H. Freeman, New York.

Optimum Class Size: 12

Maximum Class Size: 24

Signatures:

I hereby submit this course syllabus:

Allan Stevens, , Professor

I hereby find this course consistent with the goals and resources of the Biology Department:

Allan Stevens, , Professor, Chair

I hereby find this course consistent with the goals and resources of the Natural Science and Mathematics Division:

Dan Black, EdD, Associate Professor, Dean

I have discussed the need for library resources related to this class with the person submitting the syllabus:

Lynn Anderson, MLIS, Technical Services Librarian (Main Campus)

Michelle Olsen, MLS, Campus Librarian (Richfield Campus)