BIOL 1010

Division: Natural Science and Mathematics
Department: Biology
Course: BIOL 1010
Title: General Biology
Catalog Description:

General biology is a fundamental course in the underlying principles of life to include the method of obtaining knowledge (scientific method), molecular components of cellular structures and their functions, genetics and speciation, diversity of living organisms with surveys of the three domains and eukaryote kingdoms, and an introduction to ecology and the role of humankind in the biosphere.

General Education Requirements: Life Science
Semesters Offered: Fall, Spring, Summer
Credit/Time Requirement: Credit: 3; Lecture: 3; Lab: 0
Clock/Hour Requirements: 0
Offered for Non-Credit: No
Prerequisites: none

Corequisites: none

Justification:

General Biology (BIOL 1010) is a basic biology course which provides non-life science majors with a general survey of the science of biology. It is designed to transfer to other schools in the state to fulfill Biology General Education (GE) requirements. It is required for some majors at the four-year colleges and universities.

Student Learning Outcomes:

Students will know the essential qualities and key processes commonly found in life forms.

Students will have begun to understand the diversity of living organisms and their myriad interrelationships in the biological world.

Students will have some understanding of the role that biology plays in modern life as well as past history.

Content:

Scientific Method

- empirical observations, hypothesis formulation, testing by experimentation, theory and law

- limitations of science

Simple Chemistry

- basic chemistry
    - atoms, molecules, ions; covalent, ionic and hydrogen bonding; solutions, mixtures, colloids; pH and buffers
      biological chemistry
    - carbon chains and rings, functional groups, polymers; lipids, carbohydrates, amino acids and proteins, nucleic acids

Cell Structure and Function

- cell theory
- cell structures in prokaryotes and eukaryotes
      functions of eukaryote cell structures
    - cell wall components
    - membrane components
        - diffusion, osmosis, facilitated diffusion, active transport, chemiosmotic theory
    - cytoplasmic organelles
    - cytoskeleton and related structures

Metabolism

- energy transformation; endothermic and exothermic chemical reactions; enzymes
- photosynthesis--pigments, light (photophosphorylation) and dark (Calvin-Benson Cycle) reactions in chloroplast thylakoid membranes (grana) and stroma
    - C3, C4 and CAM plants
- cellular respiration and fermentation--glycolysis,Krebs Cycle and oxidative phosphorylation in mitochondrion matrix and cristae, lactic acid and alcoholic fermentation
- cell cycle
- mitosis in detail
- cytokinesis
- meiosis in detail and gamete production
    - contrast mitosis with meiosis
    - nondisjunction of chromosomes
    - common human syndromes caused by chromosomal nondisjunction

Simple Genetics

- Mendelian genetics
    - learn basic vocabulary in Mendelian genetics to understand up to dihybrid cross results in F2 generation--dominant or recessive alleles in complete dominance, incomplete dominance, codominance, sex linkage, segregation, independent assortment, sex- limited and sex-influenced traits, pleiotrophy, epistasis, polygenic or quantitative traits
- relate meiosis to transmission (Mendelian) genetics
- pedigrees for human genetic diseases

Central Dogma

- classical DNA experiments elucidating structure, replication, mutations and repair
- transcription and RNA processing
- translation or protein synthesis
    - genetic code, mRNA, tRNA, rRNA, ribosomes
- genetic regulation
- some ramifications of genetic engineering (molecular biology)

Speciation and Evolution

- introduce Hardy-Weinberg equilibrium and assumptions
    - mutation and independent assortment as causes of genetic variation
- natural selection and differential reproduction
- types of selection
    - directional, stabilizing, disruptive
- mechanisms of speciation
    - allopatric, sympatric, parapatric
- convergent evolution, parallel adaptation, adaptive radiation, divergent evolution
- outline organic evolution
- others ideas on origin of life
- punctuated equilibrium versus gradualism

Systematics and Taxonomy

- classification of life (3 domains and eukaryote kingdoms) and the binomial system
- introduce dichotomous keys
- archae- and eubacteria
    - major groups, key traits, diseases, benefits and ecology
- disease control triangle
- viruses as non-living parasites
- endosymbiosis
- protists
    - major phyla, key traits, diseases and ecology
- fungi
    - major phyla, key traits, beneficials and harmfuls, ecology
- chromists and red algae introduced
- plants
    - major phyla, key traits, representative examples and evolving complexities, ecology
- animals
    - major phyla and classes, and particularly important classes and orders in Arthropoda, Chordata, etc.
        - key traits, representative examples and evolving adaptive strategies or complexities, ecology

Ecology

- factors influencing population dynamics, niche, community, habitat, ecosystem, energy flow and nutrient recycling, trophic levels and food webs, predation, competitive exclusion, resource partitioning or niche specialization

General Education Outcomes:

1) Read effectively, constructively, and critically.

Students read the text throughout the course and primary literature in their library project. Projects, test essay questions, discussions, etc. are evaluated on synthesis and critical thinking processes.

2) Write clearly, informatively, and persuasively.

Students will complete at least one library project and several test essay questions over the course of the semester that will be evaluated for skills in writing as well as in the areas of synthesis and critical thinking.

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

Students will complete at least one library project which requires the use of either or both traditional and electronic media.

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, quizzes, projects, discussions, etc.

Key Performance Indicators:

Since several different faculty and adjunct faculty including those teaching concurrent enrollment courses teach the lecture course, teaching styles will vary as will evaluation methods. The biology department allows a variable number of quizzes and tests, projects, etc. in the evaluation process. The department encourages essay questions to be given.

The departmental final exam covers the following topics weighted at the given percentage:

5% Scientific Method

10% Simple Chemistry

10% Cell Structure and Function

10% Metabolism

15% Central Dogma

15% Simple Genetics

5% Speciation and Evolution

25% Systematics (Taxonomy) for the 3 domains and eukaryote kingdoms

5% Ecology.

The departmental final must count for 20 -- 25% of the final grade in the lecture course. The student must pass this departmental final exam with 60% to pass the course. To account for some differences in faculty coverage of topics, there is a 10-point essay question on the final exam that brings the test value to 110%. It has been noted that this departmental exam has reduced grade inflation in part-time and concurrent enrollment BIOL 1010 courses. This exam appears to have also encouraged students to be more diligent in their studies.

The biology department also requires at least one library project which may be a paper (includes abstract writing) or poster. Some do more than one project.

Representative Text and/or Supplies:

Purves, Sadava, Orians & Heller. *Life: the Science of Biology*, 6th ed. or current edition. Sinauer Associates, Inc. W. H. Freeman and Company.

Starr & Taggart. *Biology: the Unity and Diversity of Life*, 10th ed. or current edition. Thomson Learning, Inc. Brooks/Cole of the Wadsworth Group.

Optimum Class Size: 24
Maximum Class Size: 48

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)