

MIDDLESEX COUNTY COLLEGE
EDISON, NEW JERSEY

Course Title: **General Biology II**

Catalog #: **BIO-124**

Class Hours: 3

Laboratory Hours: 3

Credit Hours: 4

Department Chair: _____ Division Dean: _____ Date: 2007-2008

Prerequisite: BIO-123 or Equivalent

Textbooks for Course:

<u>Author</u>	<u>Title</u>	<u>Publisher</u>	<u>Copyright</u>
Freeman, Scott	Biological Science 2 nd edition	Pearson/Prentice Hall	2005
Morgan, Carter, Brown, <i>et al</i>	Symbiosis Biology 124 Lab Manual	Benjamin Cummings/ Pearson Custom Publishing	2005
Rust, Thomas	Guide to General Biology Laboratory	Southwestern Ed. Enterprises	1986
Smith, David A. Schenk, Michael P.	A Dissection Guide and Atlas to the Fetal Pig, 2 nd ed.	Morton	2003

Catalog Description:

A continuation of General Biology I with emphasis on plant and animal systems, evolution and ecology.

Course Goals:

This course parallels a four-year college or university introductory level biology course. For students who will major in the biological sciences, this course is a basic preparation for higher level courses. The course partially fulfills the science requirement for non-major students. It also partially fulfills the general education requirement.

Course Requirements:

Students must attend every lecture and laboratory session. Lecture performance is evaluated by exams, homework assignments, and quizzes. Laboratory performance is measured by practical examinations, laboratory reports, quizzes and observation of student laboratory technique.

COURSE OUTLINE

I. EVOLUTION

A. Early Theories of Evolution

1. Greeks
2. Special Creation
3. Catastrophism
4. Inheritance of Acquired Characteristics

B. Natural Selection

1. Overview of the work of Charles Darwin
2. Contributions by Alfred Wallace
3. Features of natural selection; fitness

C. Evidence for Evolution

1. Artificial selection
2. Fossil record
3. Comparative anatomy; homologies and vestigial structures
4. Embryology
5. Biogeography
6. Molecular biology
7. Industrial melanism (or other example of evolutionary change in progress)

D. Population Genetics

1. Modern synthesis
2. Genetic equilibrium
 - a. Applications of the Hardy-Weinberg Law
 - b. Assumptions of the Hardy-Weinberg Law
3. Sources of genetic variation in populations
4. Microevolution
5. Types of natural selection acting on populations

E. Origin of Species

1. Morphological and biological concepts of species
2. Allopatric speciation
 - a. Geographical isolation
 - b. Diverging mechanisms
 - c. Prezygotic and postzygotic isolating mechanisms
3. Sympatric speciation
4. Adaptive radiation
5. Macroevolution
6. Gradualism versus Punctuated Equilibrium

F. Origins of Life (**Optional**)

1. Hypotheses
 - a. Special Creation
 - b. Cosmozoic
 - c. Oparin-Haldane
2. Abiotic synthesis of organic molecules
3. Protobionts- features- role of RNA and DNA
3. First cells- prokaryotic (stromatolites) and eukaryotic

II. ECOLOGY

A. Abiotic Factors in Biosphere

B. Biomes:

- | | | |
|---------------------------|-------------------------------|-----------|
| 1. Desert | 4. Temperate deciduous forest | 7. Tundra |
| 2. Grassland and Savannah | 5. Tropical rain forest | |
| 3. Chaparral | 6. Taiga | |

C. Aquatic Ecosystems (**Optional**)

- | | |
|-----------------------|--------------|
| 1. Ponds and Lakes | 3. Estuaries |
| 2. Streams and Rivers | 4. Oceans |

D. Flow of Energy and Materials Through Ecosystems

1. Food chains and webs
2. Energy pyramids (biological magnification)
3. Biogeochemical cycles

a. Carbon	c. Nitrogen
b. Water	d. Phosphorus
4. Greenhouse effect
5. Ozone depletion

E. Ecological Succession

1. Primary succession (pioneer community)
2. Secondary succession

F. Relationships in Communities

1. Competition (effect on population growth)
2. Predator-Prey
3. Mutualism
4. Commensalism
4. Parasitism

III. ANIMAL STRUCTURE AND FUNCTION: GENERAL

A. Animal Tissues: Features, location and functions

- | | |
|---------------|-----------|
| 1. Epithelial | 3. Muscle |
| 2. Connective | 4. Nerve |

B. Metabolic Rate

1. Basal metabolic rate (also standard metabolic rate)
2. Factors affecting metabolic rate

C. Homeostasis

1. Examples
2. Negative feedback mechanisms

5. Positive feedback mechanisms

IV. NUTRITION AND DIGESTION

A. Animal Nutritional Types

1. carnivore
2. herbivore
3. omnivore

B. Nutrients (**Optional**)

1. Macronutrients: Proteins, carbohydrates, fats and nucleic acids
2. Micronutrients: vitamins and minerals

C. Evolutionary Trends

1. Intracellular digestion
2. Gastrovascular cavity
3. Complete digestive tracts

D. Mammalian Digestive Systems

1. Mouth: roles of teeth, tongue and salivary glands
2. Pharynx- swallowing
3. Esophagus
4. Stomach (also roles of crop, gizzard and ruminant stomach)
5. Small intestine (roles of enzymes, absorption)
6. Pancreas
7. Liver and gall bladder
8. Large intestine (also role of cecum)

E. Control of Digestion

1. Hormonal
2. Nervous

V. ANIMAL TRANSPORT MECHANISMS

A. Evolutionary Trends

1. Cyclosis and simple diffusion
2. Gastrovascular cavity
3. Heart and open circulation
4. Heart and closed circulation
 - a. Single circulation- Fish
 - b. Double circulation- three and four chambered hearts

B. Mammalian Heart

1. Structure
2. Pathway of blood
3. Control of heart rate
 - a. intrinsic- SA node
 - b. extrinsic- autonomic nervous system
4. Coronary circulation
6. Risk factors in heart disease
- 7.

C. System Circulation

1. Artery and vein structure
2. Changes in blood pressure and velocity
3. Capillaries and capillary exchange

- 4. Venous return
- D. Blood
 - 1. Plasma- components
 - 2. Cells- structural and functional differences
 - 3. Red blood cell production- hemostasis
 - 4. Blood clotting
- E. Lymphatic System
 - 1. Lymphatic vessels
 - 2. Lymph fluids
 - 3. Lymph organs- nodes, spleen and thymus gland

VI. GAS EXCHANGE

- A. Evolutionary Trends
 - 1. Plants
 - 2. Air vs. Water
 - 3. Body or cell surface
 - 4. Gills
 - 5. Tracheal system
 - 6. Lungs
- B. Mammalian Respiratory System
 - 1. Structural components
 - 2. Ventilation
 - 3. Oxygen transport- loading and unloading- respiratory pigments
 - 4. Carbon dioxide transport
 - 5. Control of respiration

VII. IMMUNOLOGY

- A. Non-specific Defenses
 - 1. Skin and mucous membranes
 - 2. Inflammatory response
 - 3. Interferons
 - 4. Stomach acids
- B. Specific Defenses- Humoral (Antibody) Mediated Immunity
 - 1. Antigens- features
 - 2. Production and maturation of B lymphocytes
 - 3. Primary immune response
 - a. Antigen recognition- role of macrophages, MHC
 - b. Clone development- role of Helper T cells and macrophages
 - c. Antibody production- features of antibodies
 - d. Methods of destroying antigens- including complement reaction
 - 4. Secondary immune response
 - a. Role of memory cells
 - b. Vaccines
 - 5. Anti-sera
- C. Specific Defenses- Cell Mediated Immunity

1. Production and maturation of T lymphocytes
2. Primary response
3. Secondary response
- D. Autoimmunity (**Optional**)
- E. Cancer (**Optional**)
- F. Allergies (**Optional**)
- G. Immune Deficiency Diseases
 1. AIDS
 2. SCIDS (**Optional**)

VIII. CONTROLLING THE INTERNAL ENVIRONMENT

- A. Osmoregulation
 1. Osmoconformers versus osmoregulators
 2. Maintaining osmotic balance- Evolutionary trends
 - a. marine environment
 - b. freshwater environment
 - c. terrestrial environment
- B. Removal of Nitrogenous Wastes
 1. Types of wastes
 2. Influence of environmental type
- C. Kidney
 1. Structural features
 2. Filtration
 3. Reabsorption
 4. Secretion
 5. Role in osmoregulation
 6. Hormonal influences
- D. Thermoregulation
 1. Adaptations by Ectotherms
 2. Adaptations by Endotherms

IX. REPRODUCTION

- A. Asexual Reproduction

1. Budding	4. Vegetative Propagation
2. Fission	5. Regeneration
3. Spore Formation	6. Parthenogenesis
- B. Sexual Reproduction
 1. Evolution in Eukaryotes
 2. Significance of meiosis and fertilization
 3. Roles of male and female
- C. Human Reproductive System (**Optional**)
 1. Male reproductive system
 2. Female reproductive system
 3. Hormonal influences
 4. Methods of birth control
 5. Sexually transmitted diseases

X. CHEMICAL REGULATION IN ORGANISMS

A. Pheromones

B. Animal Hormones

1. Features of hormones and mechanisms of action
2. Features of endocrine glands
3. Role of the hypothalamus
4. Role of the pituitary gland
5. Role of one gland illustrating negative feedback control through hypothalamus and pituitary gland e.g. thyroid gland
6. Role of one gland showing alternate feedback mechanism e.g. pancreas

C. Plant Hormones (optional)

1. Auxins
2. Gibberellins
3. Cytokinins
4. Abscissic Acid
5. Ethylene
6. Flowering hormone

XI. NERVOUS REGULATION IN ORGANISMS

A. Evolutionary Trends

1. Centralization
2. Increase in sense organs
3. Increased complexity
4. Cephalization
5. One way conduction of impulses

B. Organization of Vertebrate Nervous System

1. Central Nervous System
 - a. Brain
 - b. Spinal Cord
2. Peripheral Nervous System
 - a. Sensory-somatic
 - b. Autonomic

C. Neuron

1. Structural features
2. Types
3. Nerve impulse generation and transmission
4. Synaptic transmission of impulses
5. Reflexes

D. Vertebrate Brain

1. Evolutionary trends
2. Functions of brain parts