**STATE UNIVERSITY OF NEW YORK**
**COLLEGE OF TECHNOLOGY**
**CANTON, NEW YORK**

# COURSE OUTLINE

# BIOL 155 - COLLEGE BIOLOGY II

**Prepared by: Ken Erickson, DVM**

**SCHOOL OF SCIENCE, HEALTH, AND CRIMINAL JUSTICE**
**SCIENCE DEPARTMENT**
**APRIL 2015**

**BIOL 155 - COLLEGE BIOLOGY II**

**A.** **TITLE**: College Biology II

**B.** **COURSE NUMBER**: BIOL 155

**C.** **CREDIT HOURS**: 4

**D.** **WRITING INTENSIVE COURSE**: No

**E.** **COURSE LENGTH**: 15 weeks

**F.** **SEMESTER OFFERED**: Spring

**G.** **HOURS OF LECTURE, LABORATORY, RECITATION, TUTORIAL, ACTIVITY**:
3 hours lecture, 3 hours lab per week

**H.** **CATALOG DESCRIPTION**: This course consists of the study of the evolutionary history of biological diversity, plant form and function, and aspects of animal form and function including the immune system, nervous systems, homeostasis and chemical signals. The laboratory includes structural and functional studies of representative plants and animals, bacterial transformation, photosynthesis, plant growth and development, animal tissues, and population dynamics.

**I.** **PRE-REQUISITE**: College Biology I (BIOL 150) or permission of instructor.

**J.** **GOALS (STUDENT LEARNING OUTCOMES)**: By the end of this course, the student will:

| *Course Objective* | *Institutional SLO* |
|---|---|
| 1. Describe how populations evolve, mechanisms of speciation, and how biologists trace the evolutionary history of a species; identify the major features of current scientific thinking on the origin of life . | 2. Crit. Thinking<br>3. Prof. Competence |
| 2. Describe aspects of the structure, function, genetics, diversity, phylogeny, evolution and ecology of viruses, prokaryotes, protists, plants, fungi, and animals. | 3. Prof. Competence |
| 3. Describe the major features of plant form, function, growth, transport, reproduction, development, energetics (photosynthesis) and control. | 3. Prof. Competence |
| 4. Describe the function of regulatory systems and | 2. Crit. Thinking |

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|---|---|
| chemical signals in animals; how nonspecific and specific defenses protect the body; how nervous systems function and how they mediate interactions with the environment. | 3. Prof. Competence |
| 5. Apply the scientific method in the conduct of laboratory exercises; develop proficiency with laboratory equipment, techniques, and methodology; apply biological data, concepts, and models; analyze data and draw meaningful conclusions (lab). | 2. Crit. Thinking<br>3. Prof. Competence |

**K.** **TEXTS**: Urry, et al., *Biology in Focus*, 1st edition, Benjamin Cummings, 2013.
Erickson, et al., *Laboratory Exercises*.

**L.** **REFERENCES**: Internet sites too numerous to cite.

**M.** **EQUIPMENT**: Appropriate laboratory materials.

**N.** **GRADING METHOD**: A - F

**O.** **MEASUREMENT CRITERIA/METHODS**:

- Exams
- Quizzes
- Laboratory assignments/reports
- Laboratory quizzes.

P. **SPECIFIC TOPIC OUTLINE**:

**BIOL 155 College Biology II**

I. Evolution of Populations/Origin of Species.
   a. Mechanisms that alter allele frequencies.
   b. Modes of selection.
   c. Intra- and intersexual selection
   d. Species concepts.
   e. Reproductive barriers.
   f. Allopatric and sympatric speciation.
   g. Hybrid zones.
   h. Exaptation, heterchrony, and paedomorphosis.

II. The History of Life.

a. Categories of ideas.
b. The early Earth and its atmosphere.
c. The four stages of chemical evolution.
d. Abiotic synthesis of monomers.
e. Abiotic polymerization.
f. Formation of primitive cells.
g. Evolution of a self-replication system.
h. The progenote.
i. Metabolic characteristics of the earliest cells.
j. The time frame.
k. Endosymbiosis.
l. Mass extinction, plate tectonics, adaptive radiation.

III. Phylogeny and Classification.
a. How species are named.
b. The hierarchy of life and its organization.
c. Primitive and derived characters.
d. Homology and analogy.
e. Constructing phylogenetic trees.
f. Molecular data: protein and DNA similarities.
g. Approaches to classification: phenetics, classical, cladistics.
h. Genome evolution.

IV. Viruses.
a. Structure.
b. Classification and characteristics.
c. Infection cycle of a typical animal virus.
d. Lytic cycle.
e. Lysogenic cycle.
f. Emerging viruses.
g. Viruses and cancer.
h. Plant viruses.
i. Prions.
j. Origins.

V. Prokaryotes: bacteria and Archaea.
a. Classification.
b. Morphology.
c. Reproduction.
d. Archaea & Bacteria.
e. Metabolism and metabolic diversity.
f. Transformation.
g. Transduction.

h. Conjugation.
i. Mapping genes.
j. Plasmid genes.

VI. Eukaryotic Origins.
a. Trends toward increasing complexity.
b. Endosymbiosis.
c. Protistan characteristics.
d. Life cycles.
e. Phylogeny of protists.
f. *Plasmodium* life cycle.
g. Phylogenetic lessons from the protistans.

VII. Plant Diversity.
a. Characteristics of plants.
b. Alternation of generations.
c. Adaptations to land.
d. Plant phylogeny.
e. Nonvascular plants.
f. Vascular seedless plants.
g. Vascular seed plants: gymnosperms & angiosperms.

VIII. Fungi.
a. Characteristics.
b. Nutrition & habits.
c. Structure.
d. Growth.
e. Reproduction.
f. Phylogeny.
g. Lifestyles: molds, yeasts, lichens, mycorrhizae.

IX. The Rise of Animal Diversity.
a. Characteristics of animals.
b. Animal origins.
c. The Cambrian Explosion and animal diversification.
d. Radiation of aquatic animals.
e. Features of animal phylogeny.
f. Bilaterian radiation I: Invertebrates.
g. Bilaterian radiation II: Aquatic vertebrates.
h. The Colonization of land

X. Plant Structure and Growth.
a. Basic plant morphology.
b. The root system.

c. The shoot system.
d. Plant tissues.
e. Leaf anatomy.
f. The vascular system.
g. Plant growth.

XI. Photosynthesis.
a. Overall dynamics.
b. Site of photosynthesis.
c. Chlorophyll.
d. Photosystems.
e. Electron transport chain.
f. ATP synthase & chemiosmosis.
g. Light-dependent reactions: cyclic flow.
h. Light-dependent reactions: noncyclic flow.
i. Chemiosmotic phosphorylation.
j. Light-independent reactions: the Calvin cycle.
k. Photorespiration.
l. C4 photosynthesis.
m. CAM photosynthesis.

XII. Plant Resource Acquisition and Growth.
a. Overview of the three levels of transport.
b. Water potential.
c. Bulk flow.
d. Transpiration.
e. Root absorption and transport to the xylem.
f. Water movement in the stem.
g. Water movement in the leaf.
h. Guard cell structure, function and mechanism of opening & closing.
i. Phloem transport.

XIII. Plant Reproduction and Development.
a. Anatomy of the flower.
b. Pollination & pollinators.
c. Sexual activity in flowers.
d. Events in the ovary.
e. Events in the anther.
f. Seed development.
g. Seed dormancy.
h. Seed dispersal.
i. Germination and growth of seedlings.
j. Asexual reproduction.

XIV. Animal Form and Function.
   a. Body plans and the external environment.
   b. Regulating the internal environment.
   c. Feedback circuits.
   d. Ectotherms and endotherms.
   e. Thermoregulatory mechanisms.

XV. Chemical Signals and Cell-Cell Communication.
   a. Comparison of nervous and endocrine regulation.
   b. Types of chemical signals: hormones, pheromones, local regulators.
   c. Stages of the hormonal response.
   d. Steroid and peptide hormones.
   e. Cyclic AMP.
   f. Signal amplification & specificity.
   g. Cytoplasmic $Ca^{2+}$ and signal transduction.
   h. Insect development and molting.
   i. Glucose homeostasis in vertebrates.

XVI. The Body's Defenses.
   a. Nonspecific primary, chemical, and cellular defenses.
   b. Features of the specific defenses.
   c. Cells and tissues of the specific defenses.
   d. Antibodies & antigens.
   e. Clonal selection.
   f. Memory cells.
   g. Self-nonself recognition.
   h. The humoral and cell-mediated responses.

XVII. Nervous Systems, Neurons, Synapses, and Signaling.
   a. Overview of nervous function.
   b. Cells of the nervous system.
   c. The action potential.
   d. Establishing a polarized state: the resting potential.
   e. Generating an action potential.
   f. Repolarization.
   g. Ion channels & gates.
   h. Myelin and impulse velocity.
   i. Synapses.
   j. Synaptic events.

**Q. <u>LABORATORY OUTLINE</u>**:

I. Domain Bacteria

II. Protists - “Protozoa”

III. Protists - Algae

IV. Bacterial Transformation

V. Plant Growth Experiment I

VI. Plant Diversity: Bryophytes

VII. Plant Diversity: Vascular Plants

VIII. Plant Growth Experiment II

IX. Plant Anatomy

X. Plant Pigments: Chlorophylls

XI. Animal Tissues

XII. Population Size Estimation

XIII. Human Blood Typing & Genetics

XIV. Nervous Systems