



ILLINOIS VALLEY COMMUNITY COLLEGE

COURSE OUTLINE

DIVISION: Natural Sciences and Business

COURSE: BIO 1004 Biological Diversity

Date: Spring 2023

Credit Hours: 4

Complete all that apply or mark "None" where appropriate:

Prerequisite(s): None

Enrollment by assessment or other measure? Yes No
If yes, please describe:

Corequisite(s): None

Pre- or Corequisite(s): None

Consent of Instructor: Yes No

Delivery Method: **Lecture** **3 Contact Hours** (1 contact = 1 credit hour)
 Seminar **0 Contact Hours** (1 contact = 1 credit hour)
 Lab **3 Contact Hours** (2-3 contact = 1 credit hour)
 Clinical **0 Contact Hours** (3 contact = 1 credit hour)

Offered: **Fall** **Spring** **Summer**

CATALOG DESCRIPTION and IAI NUMBER (if applicable):

The course will include the structure, function, evolutionary relationships and ecology of major groups of microorganisms, protists, fungi, animals, and plants. **IAI Equivalent: BIO 910**

ACCREDITATION STATEMENTS AND COURSE NOTES:

None

COURSE TOPICS AND CONTENT REQUIREMENTS:

Systematics and Phylogeny

- a. Evolutionary relationships
- b. Cladistics
- c. Classification and Taxonomy

Viruses

- a. Virus structure
- b. Virus Classification and examples
- c. Bacteriophages-structure, lysogenic and lytic cycles
- d. Influenza, HIV, Ebola
- e. Prions

Bacteria

- a. Prokaryotes- diversity, Bacteria vs. Archaea
- b. Classification characteristics
- c. Horizontal gene transfer- transformation, transduction, and conjugation
- d. Human bacterial disease
- e. Beneficial bacteria
- f. Importance of bacteria in genetic engineering

Protists

- a. Endosymbiosis
- b. Diversity of Protists, problems with their classification
- c. Excavata
- d. Chromalveolata
- e. Rhizaria
- f. Archaeplastida
- g. Amoebozoa and Opisthokonta
- h. Evolutionary importance of choanoflagellates

Fungi

- a. Fungi reproduction and nutrition
- b. Ecological importance
- c. Chytridiomycota
- d. Zygomycota
- e. Basidiomycota
- f. Ascomycota

Animal Diversity

- a. Evolution of the animal body plan-tissues, symmetry, body cavity, patterns of development, segmentation
- b. Metazoan classification (traditional)
- c. Evolutionary developmental biology- multinucleate vs. colonial flagellate theories
- d. Noncoelomate Invertebrates
- e. Porifera, Cnidaria, Ctenophora
- f. Platyhelminthes
- g. Nematoda

Animal Diversity

- a. Coelomate Invertebrates
- b. Mollusca

c. Polyplacophora, Gastropoda, Bivalvia, Cephalopoda

d. Annelida

Animal Diversity

a. Coelomate Invertebrates

b. Arthropoda

c. Echinodermata

Vertebrates

a. Chordata

b. Urochordata

c. Cephalocordata

d. Vertebrata

e. Fishes-evolutionary importance of the group

f. Lobe-finned vs Ray finned

g. Amphibians

h. Amniotes

i. Primates

Plants

a. Evolution of plants

b. Life cycle features

c. Mosses, ferns, gymnosperms, angiosperms

Community Ecology

a. Competition

b. Predator-prey relationships

c. Energy flow and chemical cycling in ecosystems

INSTRUCTIONAL METHODS:

Textbook

Lab Manual

Laboratory Software

Videos

Journal articles

EVALUATION OF STUDENT ACHIEVEMENT:

Exams

Quizzes

Homework

Assignments

Laboratory exercises

Lab practicals

INSTRUCTIONAL MATERIALS:

Textbooks

Understanding Biology, Mason et al., McGraw Hill

Biology Laboratory Manual, Vodopich and Moore, McGraw Hill

Resources

Biology, Raven et al., McGraw Hill

Investigating Biology through Inquiry, Melville et al., Vernier

LEARNING OUTCOMES AND GOALS:

Institutional Learning Outcomes

- 1) Communication – to communicate effectively;
- 2) Inquiry – to apply critical, logical, creative, aesthetic, or quantitative analytical reasoning to formulate a judgement or conclusion;
- 3) Social Consciousness – to understand what it means to be a socially conscious person, locally and globally;
- 4) Responsibility – to recognize how personal choices affect self and society.

Course Outcomes and Competencies

1. Explain the relationships between organisms and how they are classified.
 - 1.a Explain the difference between systematics and phylogeny.
 - 1.b Properly and draw cladograms using phenotypic, geographic and molecular data.
 - 1.c Compare and contrast monophyletic, paraphyletic and polyphyletic.
 - 1.d Explain the hierarchy of biological classification.
 - 1.e Use the binomial nomenclature system properly.
2. Explain basic properties of prokaryotes and eukaryotes.
 - 2.a Describe the structures of bacteria, archaea, and eukaryotes.
 - 2.b Describe the evolutionary relationships between bacteria, archaea and eukaryotes.
3. Describe viruses.
 - 3.a Describe structure and function of basic viral forms including genetic information.
 - 3.b Distinguish between lytic and lysogenic cycles of bacteriophages.
 - 3.c Describe some common viral infections
 - 3.d Describe HIV and the process of cellular infection.
 - 3.e Explain frequent mutations found in Influenza.
4. Describe bacteria.
 - 4.a Identify the three basic shapes of bacteria.
 - 4.b List the steps of the Gram staining process and explain the results.
 - 4.c Identify the structure of a bacterial cell.
 - 4.d Explain characteristics used to classify bacteria.
 - 4.e Explain conjugation, transduction and transformation.
 - 4.f Describe some common bacterial infections.
5. Describe Kingdom Protista.
 - 5.a Explain the origins of the nucleus, endoplasmic reticulum, mitochondria and chloroplasts..
 - 5.b Describe the evidence from endosymbiosis.
 - 5.c Explain why members of Protista are grouped together.
 - 5.d Explain basic characteristics amongst the members of Protista.
 - 5.e Describe the following groups in Protista: Excavata, Chromalveolata, Rhizaria, Archaeplastida, Amoebozoa, and Opisthokonta.
 - 5.f Explain novel evolutionary adaptations found in Protista.
 - 5.g Describe parasitic Protista.
6. Describe Kingdom Fungi.
 - 6.a Describe fungal structures.
 - 6.b Describe fungal cell division and reproduction.
 - 6.c Describe ecological impacts of fungi.

- 6.d Describe common fungal pathogens.
- 6.e Describe the life cycles of the following groups in Fungi: Zygomycota, Ascomycota, and Basidiomycota.
- 7. Describe Kingdom Plantae.
 - 7.a Explain characteristics needed for plants to transition from water to land.
 - 7.b Distinguish between sporophyte and gametophyte stages as well as haploid and diploid stages.
 - 7.c Describe the major evolutionary adaptations in the plant kingdom.
 - 7.d Describe the life cycles of the following groups in Plantae: Bryophytes, Ferns, Gymnosperms, and Angiosperms.
- 8. Describe Kingdom Animalia.
 - 8.a Describe shared characteristics amongst animals.
 - 8.b Describe symmetry, body cavities, and segmentation in animals.
 - 8.c Compare and contrast protostomes and deuterostomes.
 - 8.d. Describe evolutionary adaptations and the features of the following groups in Animalia: Porifera, Cnidaria, Platyhelminthes, Mollusca, Annelida, Nematoda, Arthropoda, Echinodermata, and Chordata.
 - 8.e Describe the shared characteristics of the vertebrates.
 - 8.f Explain the transition from water to land for animals.
 - 8.g Explain the key evolutionary adaptations for the following groups: Fishes, Amphibians, Reptiles, Birds and Mammals.
 - 8.h Distinguish among the major groups of primates.
 - 8.i Describe the evolution of hominids.
- 9. Describe community ecology.
 - 9.a Describe predator-prey relationships.
 - 9.b Describe examples of symbiosis.
 - 9.c Describe key biogeochemical cycles.
 - 9.d Explain how energy flows through an ecosystem.