



# **ILLINOIS VALLEY COMMUNITY COLLEGE**

## **COURSE OUTLINE**

**DIVISION: Natural Science and Business**

**COURSE: BIO 1004 Biological Diversity**

Date: Fall 2019

Credit Hours: 4

Prerequisite(s): None

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)**  
 **Online**  
 **Blended**

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

IAI Equivalent –**Only for Transfer Courses**-go to <http://www.itransfer.org>: BIO 910

### **CATALOG DESCRIPTION:**

The course will include the structure, function, evolutionary relationships and ecology of major groups of microorganisms, protists, fungi, animals, and plants.

## GENERAL EDUCATION GOALS ADDRESSED

*[See last page for Course Competency/Assessment Methods Matrix.]*

### Upon completion of the course, the student will be able:

*[Choose up to three goals that will be formally assessed in this course.]*

- To apply analytical and problem solving skills to personal, social, and professional issues and situations.
- To communicate successfully, both orally and in writing, to a variety of audiences.
- To construct a critical awareness of and appreciation for diversity.
- To understand and use technology effectively and to understand its impact on the individual and society.
- To develop interpersonal capacity.
- To recognize what it means to act ethically and responsibly as an individual and as a member of society.
- To recognize what it means to develop and maintain a healthy lifestyle in terms of mind, body, and spirit.
- To connect learning to life.

### EXPECTED LEARNING OUTCOMES AND RELATED COMPETENCIES:

*[Outcomes related to course specific goals. See last page for more information.]*

### Upon completion of the course, the student will be able to:

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 form 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.

## MAPPING LEARNING OUTCOMES TO GENERAL EDUCATION GOALS

[For each of the goals selected above, indicate which outcomes align with the goal.]

Goals	Outcomes
First Goal	
To apply analytical and problem solving skills to personal, social, and professional issues and situations.	1. Explain the relationships between organisms and how they are classified. 3. Describe viruses 4. Describe bacteria 9. Describe community ecology

### 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:**

Lecture

Discussion

Active learning activities

Laboratory

Case Studies

**INSTRUCTIONAL MATERIALS:**

Textbook  
Lab Manual  
Laboratory Software  
Videos  
Journal articles

**STUDENT REQUIREMENTS AND METHODS OF EVALUATION:**

A= 90-100  
B= 80-89  
C= 70-79  
D= 60-69  
F= 0-59

Exams  
Quizzes  
Homework  
Assignments  
Laboratory exercises  
Lab practicals

**OTHER REFERENCES**

*Understanding Biology*, Mason et al., McGraw Hill  
*Biology Laboratory Manual*, Vodopich and Moore, McGraw Hill  
*Biology*, Raven et al., McGraw Hill  
*Investigating Biology through Inquiry*, Melville et al., Vernier

# Course Competency/Assessment Methods Matrix

(Dept/# Course Name)	Assessment Options																															
For each competency/outcome place an "X" below the method of assessment to be used.	Assessment of Student Learning	Article Review	Case Studies	Group Projects	Lab Work	Oral Presentations	Pre-Post Tests	Quizzes	Written Exams	Artifact Self Reflection of Growth	Capstone Projects	Comprehensive Written Exit Exam	Course Embedded Questions	Multi-Media Projects	Observation	Writing Samples	Portfolio Evaluation	Real World Projects	Reflective Journals	Applied Application (skills) Test	Oral Exit Interviews	Accreditation Reviews/Reports	Advisory Council Feedback	Employer Surveys	Graduate Surveys	Internship/Practicum /Site Supervisor Evaluation	Licensing Exam	In Class Feedback	Simulation	Interview	Written Report	Assignment
	Direct/ Indirect	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	I	I	I	I	D	D						
Assessment Measures – Are direct or indirect as indicated. List competencies/outcomes below.																																
1.a Explain the difference between systematics and phylogeny.									X																							
1.b Properly and draw cladograms using phenotypic, geographic and molecular data.				X					X																							
1.c Compare and contrast monophyletic, paraphyletic and polyphyletic.									X																							
1.d Explain the hierarchy of biological classification.		X							X																							
1.e Use the binomial nomenclature system properly.									X																							
2.a Describe the structures of bacteria, archaea, and eukaryotes.									X																							





5.d Explain basic characteristics amongst the members of Protista.					X					X																				
5.e Describe the following groups in Protista: Excavata, Chromalveolata, Rhizaria, Archaeplastida, Amoebozoa, and Opisthokonta.					X					X																				
5.f Explain novel evolutionary adaptations found in Protista.					X					X																				
5.g Describe parasitic Protista.					X					X																				
6.a Describe fungal structures.					X					X																				
6.b Describe fungal cell division and reproduction.					X					X																				
6.c Describe ecological impacts of fungi.										X																				
6.d Describe common fungal pathogens.										X																				
6.e Describe the life cycles of the following groups in Fungi: Zygomycota, Ascomycota, and Basidiomycota.					X					X																				
7.a Explain characteristics needed for plants to transition from water to land.										X																				
7.b Distinguish between sporophyte and gametophyte stages as well as haploid and diploid stages.					X					X																				
7.c Describe the major evolutionary adaptations in the plant kingdom.										X																				



9.b Describe examples of symbiosis.									X																												
9.c Describe key biogeochemical cycles.									X																												
9.d Explain how energy flows through an ecosystem.									X																												