BIO-1510: PRINCIPLES OF BIOLOGY II

Cuyahoga Community College

Viewing: BIO-1510: Principles of Biology II

Board of Trustees:
2018-05-24

Academic Term:
2018-08-27

Subject Code
BIO - Biology

Course Number:
1510

Title:
Principles of Biology II

Catalog Description:
Designed for science majors. The diversity of life, animals, plants, and ecology are explored in both lecture and laboratory settings. Topics include the origin and evolution of life, systematics, classification, structural and functional variations in animals and plants, populations, communities, and ecosystems.

Credit Hour(s):
4

Lecture Hour(s):
3

Lab Hour(s):
3

Other Hour(s):
0

Requisites

Prerequisite and Corequisite
BIO-1500 Principles of Biology I, or BIO-150H Honors Principles of Biology I; or departmental approval: equivalent knowledge or skills.

I. ACADEMIC CREDIT

Academic Credit According to the Ohio Department of Higher Education, one (1) semester hour of college credit will be awarded for each lecture hour. Students will be expected to work on out-of-class assignments on a regular basis which, over the length of the course, would normally average two hours of out-of-class study for each hour of formal class activity. For laboratory hours, one (1) credit shall be awarded for a minimum of three laboratory hours in a standard week for which little or no out-of-class study is required since three hours will be in the lab (i.e. Laboratory 03 hours). Whereas, one (1) credit shall be awarded for a minimum of two laboratory hours in a standard week, if supplemented by out-of-class assignments which would normally average one hour of out-of-class study preparing for or following up the laboratory experience (i.e. Laboratory 02 hours). Credit is also awarded for other hours such as directed practice, practicum, cooperative work experience, and field experience. The number of hours required to receive credit is listed under Other Hours on the syllabus. The number of credit hours for lecture, lab and other hours are listed at the beginning of the syllabus. Make sure you can prioritize your time accordingly. Proper planning, prioritization and dedication will enhance your success in this course.

The standard expectation for an online course is that you will spend 3 hours per week for each credit hour.

II. ACCESSIBILITY STATEMENT

If you need any special course adaptations or accommodations because of a documented disability, please notify your instructor within a reasonable length of time, preferably the first week of the term with formal notice of that need (i.e. an official letter from the Student Accessibility Services (SAS) office). Accommodations will not be made retroactively.
III. ATTENDANCE TRACKING

Regular class attendance is expected. Tri-C is required by law to verify the enrollment of students who participate in federal Title IV student aid programs and/or who receive educational benefits through other funding sources. Eligibility for federal student financial aid is based in part on enrollment status.

Students who do not attend classes for the entire term are required to withdraw from the course(s). Additionally, students who withdraw from a course or stop attending class without officially withdrawing may be required to return all or a portion of their financial aid based on the date of last attendance. Students who do not attend the full session are responsible for withdrawing from the course(s).

Tri-C is responsible for identifying students who have not attended a course before financial aid funds can be applied to students’ accounts.

Therefore, attendance is recorded in the following ways:

- For in-person and blended-learning courses, students are required to attend the course by the 15th day of the semester (or equivalent for terms shorter than five weeks) to be considered attending. Students who have not met all attendance requirements for in-person and blended courses, as described herein, within the first two weeks or equivalent, will be considered not attending.
- For online courses, students are required to login at least two times per week and submit one assignment per week for the first two weeks of the semester, or equivalent to the 15th day of the term. Students who have not met all attendance requirements for online courses, as described herein, within the first two weeks or equivalent, will be considered not attending.

At the conclusion of the first two weeks of a semester or equivalent, instructors report any registered students who have "Never Attended" a course. Those students will be administratively withdrawn from that course. However, after the time period in the previous paragraphs, if a student stops attending a class or wants or needs to withdraw, for any reason, it is the student’s responsibility to take action to withdraw from the course. Students must complete and submit the appropriate Tri-C form by the established withdrawal deadline.

Tri-C is required to ensure that students receive financial aid only for courses that they attend and complete. Students reported for not attending at least one of their registered courses will have all financial aid funds held until confirmation of attendance in registered courses has been verified. Students who fail to complete at least one course may be required to repay all or a portion of their federal financial aid funds and may be ineligible to receive future federal financial aid awards. Students who withdraw from classes prior to completing more than 60 percent of their enrolled class time may be subject to the required federal refund policy.

If illness or emergency should necessitate a brief absence from class, students should confer with instructors upon their return. Students having problems with coursework due to a prolonged absence should confer with the instructor or a counselor.

IV. LEARNING OUTCOMES ASSESSMENT

Occasionally, in addition to submitting assignments to their instructors for evaluation and a grade, students will also be asked to submit completed assignments, called ‘artifacts,’ for assessment of course and program outcomes and the College’s Essential Learning Outcomes (ELOs). The artifacts will be submitted in Blackboard or a similar technology. The level of mastery of the outcome demonstrated by the artifact DOES NOT affect the student’s grade or academic record in any way. However, some instructors require that students submit their artifact before receiving their final grade. Some artifacts will be randomly selected for assessment, which will help determine improvements and support needed to further student success. If you have any questions, please feel free to speak with your instructor or contact the Learning Outcomes Assessment office.

V. CONCEALED CARRY STATEMENT

College policy prohibits the possession of weapons on college property by students, faculty and staff, unless specifically approved in advance as a job-related requirement (i.e., Tri-C campus police officers) or, in accordance with Ohio law, secured in a parked vehicle in a designated parking area only by an individual in possession of a valid conceal carry permit.

As a Tri-C student, your behavior on campus must comply with the student code of conduct which is available on page 29 within the Tri-C student handbook, available athttp://www.tri-c.edu/student-resources/documents/studenthandbook.pdf. You must also comply with the College’s Zero Tolerance for Violence on College Property available athttp://www.tri-c.edu/policies-and-procedures/documents/3354-1-20-10-zero-tolerance-for-violence-policy.pdf

Outcomes
Course Outcome(s):
Diversity: Analyze the diversity of life on Earth resulting from evolution.
Objective(s):
1. Describe the scientific explanations for the origin of life and the key events in evolution of life on Earth, including evolution of photosynthesis, eukaryotic cells, multicellularity, and land adaptations.
2. Explain how systematics, classification, and phylogenetics are used to categorize and describe the unity and diversity of life.
3. Explain the evolutionary relationships among Archaea, Bacteria, and Eukarya.
4. Describe prokaryotic diversity.
5. Describe the diversity and phylogeny of unicellular eukaryotes and the multiple independent origins of multicellular eukaryotes.
6. Describe the diversity of multicellular eukaryotes including algae, fungi, plants, and animals.

Course Outcome(s):
Animals: Compare the structural and functional organization of animal bodies and the mechanisms used to maintain homeostasis.

Objective(s):
1. Describe how the structure of the vertebrate brain has evolved, and explain the functional significance of those changes.
2. Describe the major events in the generation and conduction of a nerve impulse and synaptic transmission.
3. Describe neural and hormonal control of digestion, respiration, circulation, osmoregulation, and reproduction.
4. Explain the interdependence of the muscular and skeletal systems for movement, support, and locomotion.
5. Explain the physiology of muscle contraction.
6. Describe and compare the different types of animal digestive systems.
7. Describe digestion, absorption and elimination in the vertebrate digestive tract and the evolutionary adaptations to accommodate different diets.
8. Describe the respiratory adaptations for gas exchange in aquatic and terrestrial environments.
9. Explain the role of blood in transport, regulation, and defense.
10. Describe evolutionary changes in the heart and circulation in vertebrates and explain the functional significance of those changes.
11. Differentiate between an osmoconformer and osmoregulator, and describe the various osmoregulatory structures of invertebrates and vertebrates.
12. Describe the vertebrate urinary system and explain the role of the kidney nephron in the process of filtration, reabsorption, and secretion.
13. Distinguish between sexual and asexual methods of reproduction in animals.
14. Compare external and internal fertilization, and explain different strategies for embryonic and fetal development.
15. Describe and explain various types of animal behavior.
16. Describe the organization of the animal body, including body plans, tissues, symmetry, body cavities, developmental patterns, and segmentation.
17. Explain and provide examples of negative feedback and positive feedback.
18. Differentiate between ectotherms and endotherms and their temperature regulation mechanisms.

Course Outcome(s):
Plants: Compare the structural and functional organization of plants and the mechanisms used to maintain homeostasis.

Objective(s):
1. Recognize the major evolutionary lineages in plants.
2. Describe the successive adaptations to terrestrial environments that characterize land plant evolution.
3. Explain co-evolution with respect to plant-animal interactions and angiosperm diversity.
4. Differentiate between the characteristics of monocots and eudicots.
5. Identify and explain the functions of the major plant cells and tissues.
6. Describe primary and secondary growth in plants.
7. Compare the tissue organization of roots and stems in monocots and eudicots.
8. Compare the tissue organization of leaves in monocots, eudicots, and conifers.
9. Explain the responses of plants to light, gravity, mechanical stimuli, water, and temperature.
10. Describe the roles of the major plant hormones.
11. Provide examples of plant chemical and physical defenses.
12. Identify the nutrients required by plants and describe the adaptations for acquiring these nutrients.
13. Explain the transpiration-cohesion theory of water movement in plants.
14. Explain mass-flow transport of carbohydrates in plants.
15. Explain the haplodiplontic life cycle of plants and compare variations in the life cycles of major plant lineages.
16. Explain the unique reproductive structures in the major plant lineages.

Course Outcome(s):
Ecology: Analyze the relationships and interactions between living things and their environment.

Objective(s):
1. Analyze a population growth curve, and explain the factors that affect population growth.
2. Describe the interactions between populations within a community.
3. Explain how chemicals cycle through the various compartments of an ecosystem.
4. Explain how energy flows through the trophic levels in an ecosystem.
5. Compare and contrast the biotic and abiotic characteristics of the major terrestrial and aquatic ecosystems.

Methods of Evaluation:
1. Quizzes
2. Examinations
3. Laboratory practicals
4. Written reports
5. Research papers
6. Projects (individual or group)
7. Presentations (individual or group)
8. Article discussions/reviews/summaries
9. Discussion boards
10. Homework assignments
11. Case studies

Course Content Outline:
1. Concepts:
   a. Phylogenetic systematics
   b. Classification and taxonomy using the Linnaean hierarchy
   c. Origin of life hypotheses
   d. Key events in the evolutionary history of life on Earth
   e. Evolutionary tree of life
   f. Lateral gene transfer
   g. Major domains of life (Bacteria, Archaea, and Eukarya)
   h. Extremophiles
   i. Modes of nutrition
   j. Endosymbiosis
   k. Diversity of eukaryotes, including unicellular and multicellular forms
   l. Major phyla of Animalia, Fungi, and Viridiplantae
   m. Plant adaptations to land
   n. Life cycles of plants and fungi
   o. Ecological roles of fungi
   p. Key innovations in animal evolution (symmetry, tissues, body cavity, developmental patterns, and segmentation)
   q. Organization of the animal body
      r. Animal tissues (epithelium, connective, muscle, nervous)
      s. Homeostasis and feedback regulation (positive and negative)
      t. Temperature regulation (endothermic and ectothermic)
      u. Evolution of animal nervous systems
      v. Nerve impulse transmission (resting potential and action potential)
      w. Saltatory and continuous conduction
      x. Synapses and neurotransmitters
      y. Reflex arc
      z. Organization of the vertebrate nervous system (central, peripheral, autonomic, somatic, sympathetic, and parasympathetic)
      aa. Evolution of the vertebrate brain
      bb. Sensory-motor integration
      cc. Link between nervous and endocrine systems
      dd. Endocrine glands and major animal hormones
      ee. Skeletal systems (endoskeleton, exoskeleton, hydroskeleton)
      ff. Bone structure
      gg. Skeleton and muscle interaction
      hh. Sliding filament theory of muscle contraction
         ii. Role of calcium ions in muscle contraction
         jj. Modes of animal locomotion (terrestrial, aerial, aquatic)
      kk. Comparative animal digestive systems
ll. Structures and functions of vertebrate digestive organs
mm. Mechanical and chemical digestion
nn. Absorption of nutrients
oo. Roles of accessory organs in digestion
pp. Factors affecting the rate of diffusion across a membrane.
qq. Comparative animal respiratory structures
rr. Mechanisms for breathing in amphibians, reptiles, birds, and mammals
ss. Countercurrent exchange
tt. Transport of respiratory gases and regulation of breathing
uu. Open and closed circulatory systems
vv. Organization of vertebrate cardiovascular system
ww. Composition of blood
xx. Evolution of the chambered heart
yy. Structure and function of vessels (arteries, veins, and capillaries)
zz. Connection between cardiovascular and lymphatic system
aaa. Comparative animal excretory systems
bbb. Osmolarity and osmotic balance
ccc. Osmoregulatory organs (flame cells, nephridia, Malpighian tubules, kidneys)
ddd. Nephron structure and function
eee. Nitrogenous wastes (ammonia, urea, uric acid)
fff. Hormonal control of osmoregulation
ggg. Sexual and asexual reproduction in animals
hhh. Sex determination in animals
iii. Structure and function of reproductive organs
jjj. Strategies for embryonic and fetal development (oviparity, ovoviviparity, viviparity)
kkk. Plant adaptations to land
lll. Haplodiplontic life cycle of plants
mmm. Heterosporous life cycle of seed plants
nnn. Bryophytes
ooo. Ferns & fern allies
ppp. Gymnosperms
qqq. Angiosperms (monocots & eudicots)
rrr. Sexual & asexual reproduction in seedless and seed plants
sss. Vascular tissue (xylem and phloem)
ttt. Ground tissue (parenchyma, collenchyma, sclerenchyma)
uuu. Dermal tissue (epidermal, trichomes, root hairs, guard cells)
vvv. Meristem tissue (apical & lateral)
www. Primary and secondary growth in plants
xxx. Leaf, stem, and root structure (internal & external) and function
yyy. Modified leaves, stems, and roots
zzz. Flower, fruit, & seed structure, function, and diversity
aaaa. Transpiration
bbbbb. Guard cell regulation of stomata
ccccc. Casparian strip
ddd. Absorption and movement of water, minerals, and nutrients in plants
eeee. Plant dormancy and life span (evergreen, deciduous, annual, perennial)
ffff. Pollination (self-pollination & cross-pollination)
gggg. Double fertilization of angiosperms
hhhhh. Fruit and seed dispersal
iiii. Adaptive advantage of seeds
jjjj. Germination in plants
kkkk. Major plant hormones
llll. Tropisms in plants (photo-, thigmo-, and gravitropism)
mmmm. Reversible sensory reactions in plants (circadian clocks, solar tracking, leaf action)
nnnn. Plant nutrients & special nutritional strategies (nitrogen fixation, mycorrhizae, carnivorous plants, parasitic plants)
oooo. Plant physical and chemical defenses
pppp. Levels of ecological organization (populations, communities, ecosystems, and the biosphere)
qqqq. Population growth models
   rrrr. Factors affecting population growth rates
   ssss. Population distribution
   tttt. Carrying capacity
   uuuu. Survivorship curves
   vvvv. r-selected and k-selected life history models
wwwww. History of and predictions for human population growth
   xxxx. Ecological footprints
   yyyy. Ecological niche
   zzzz. Competition
   aaaaa. Competitive exclusion principle
   bbbbb. Predator/prey relationships
   cccccc. Batesian and Mullerian mimicry
dddddd. Symbiotic relationships, including commensalism, mutualism, and parasitism
eeeeee. Coevolution
   fffff. Community disturbances
ggggg. Keystone species
   hhhhh. Primary and secondary succession
   iiii. Biogeochemical cycles: water, carbon, nitrogen, phosphorus
   jjjjj. Energy flow through trophic levels
   kkkkk. Productivity (primary and secondary) and biomass
   lllll. Species richness and relative abundance
mmmmm. Climate (latitude, atmospheric circulation, altitude, ocean currents, etc.)
nnnnn. Terrestrial biomes and aquatic ecosystems
ooooo. Pollution
ppppp. Eutrophication
qqqqq. Biological magnification
   rrrrr. Invasive species
sssss. Current environmental issues
2. Skills:
   a. Prepare a wet mount for examination under a compound light microscope.
   b. Construct or use dichotomous keys.
   c. Construct or interpret phylogenies or cladograms.
   d. Evaluate evolutionary hypotheses.
   e. Sample the environment for microorganisms.
   f. Distinguish among representative bacteria and protists using a microscope.
   g. Distinguish among plant phyla and identify representatives of each group.
   h. Distinguish among fungal phyla and identify representatives of each group.
   i. Distinguish among animal phyla and identify representatives of each group.
   j. Distinguish among chordate clades and identify representatives of each group.
   k. Identify basic types of animal tissues and key cells.
   l. Identify the type of skeleton in various animal specimens.
   m. Dissect and identify the major components of the following animal systems: digestive, respiratory, circulatory, urinary, nervous, and reproductive.
   n. Assign representative plant specimens as nonvascular, seedless vascular, gymnosperm, or angiosperm.
   o. Identify the internal and external anatomy of leaves, stems, and roots, using live, preserved, and microscopic specimens.
   p. Differentiate between monocots and eudicots, based on their anatomy.
   q. Dissection of flowers, seeds, and fruits.
   r. Determine the mechanism of seed dispersal based on the fruit of an angiosperm.
   s. Identify the parts of a flower and describe their roles in reproduction.
   t. Trace the path of water through vascular plants, starting in the soil and exiting the stomata.
   u. Construct a population growth curve.
   v. Analyze population pyramids.
   w. Estimate population size using mark-recapture and/or quadrat sampling.
3. Issues:
   a. Origin of life hypotheses
   b. The nature of viruses
c. Natural vs. unnatural taxonomic groups
d. Inherent anthropocentric bias in classification systems
e. Fluctuating nature of classification
f. Complexity is not necessarily better than simplicity
g. Modern challenges to taxonomy
h. Separation of cytogamy and karyogamy
i. Ancestral vs. derived characteristics
j. Not all animals are mammals
k. Majority of animals are invertebrates
l. Common misconceptions about plants
m. Plants respond to internal and external stimuli
n. Oxygen requirement of plants
o. Photosynthesis is not unique to plants
p. Plant mass is derived from carbon dioxide
q. Human population growth and sustainability
r. Human impacts on biodiversity
s. Interconnectedness of terrestrial and aquatic ecosystems
t. Global warming

Resources


Resources Other
1. NOVA -http://www.pbs.org/wgbh/nova/
5. Tree of Life Web Resource -www.tolweb.com (http://www.tolweb.com/)
7. Digital morphology at the University of Texas -http://digimorph.org/
11. Tom Volk’s Fungi: Dept. of Biology, Univ. of Wisconsin-LaCrosse -http://botit.botany.wisc.edu/toms_fungi/

Instructional Services

OAN Number:
TMNS, OSC004, and OSC024 (2 of 2 courses, both must be taken)

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