BIOL G183: BOTANY

Item	Value
Curriculum Committee Approval Date	05/21/2024
Top Code	040200 - Botany, General
Units	4 Total Units
Hours	108 Total Hours (Lecture Hours 54; Lab Hours 54)
Total Outside of Class Hours	0
Course Credit Status	Credit: Degree Applicable (D)
Material Fee	Yes
Basic Skills	Not Basic Skills (N)
Repeatable	No
Open Entry/Open Exit	No
Grading Policy	Standard Letter (S)
Local General Education (GE)	• Area 5 Natural Sciences (GB1)
California General Education Transfer Curriculum (Cal-GETC)	• Cal-GETC 5B Biological Sciences (5B) • Cal-GETC 5C Laboratory Activity (5C)
Intersegmental General Education Transfer Curriculum (IGETC)	• IGETC 5B Biological Sciences (5B) • IGETC 5C Laboratory Activity (5C)
California State University General Education Breadth (CSU GE-Breadth)	• CSU B2 Life Science (B2) • CSU B3 Laboratory Activity (B3)

Course Description

Formerly: BIOL G190 – General Botany. This course is intended for biology majors and covers comparative diversity, structure, and function of plant, fungal, and protistan phyla. Topics include: fundamentals of chemistry and biochemistry; cytology, with an emphasis on plant cytology; fundamentals of biological energy: catalysis, cellular respiration and photosynthesis; Mendelian and molecular genetics; ethnobotany; evolution and speciation; plant, population, and community ecology; systematics and taxonomy, with light surveys of (taxonomic) Kingdoms Archaebacteria, Eubacteria, Fungi, and Protista - emphasis is on Kingdom Plantae: plant histology, anatomy, physiology, morphology and diversity; and principles of plant culture (cultivation). PREREQUISITE: Course taught at the level of intermediate algebra or appropriate math placement. ADVISORY: BIOL G180. Transfer Credit: CSU; UC. C-ID: BIOL 155. **C-ID:** BIOL 155.

Course Level Student Learning Outcome(s)

1. Course Outcomes
2. Identify morphological and physiological characteristics of plants, fungi, and photosynthetic protistans.
3. Describe the life cycles of major plant, fungi, and photosynthetic protistan taxa.
4. Describe the organization and interactions of organisms within selected populations and communities.
5. Describe major metabolic processes of botanical organisms such as cellular transport, photosynthesis, biosynthesis, digestion, cellular respiration, reproduction growth and development.

Course Objectives

- 1. Identify characteristics of plants, fungi, and photosynthetic protistans and their phylogenic relationships.
- 2. Describe major metabolic processes of botanical organisms such as C3, C4, and CAM photosynthetic pathways.
- 3. Construct and interpret phylogenies.
- 4. Describe the structural organization of plants, fungi, and photosynthetic protistans.
- 5. Describe various ecosystem processes such as energy flow and nutrient cycling.
- 6. Describe the organization and interactions of organisms within selected populations and communities.
- 7. Provide evidence of evolution in plants, fungi, and photosynthetic protists.
- 8. Apply the scientific method as a researcher, reporting findings in a scientific paper that includes all sections of a typical manuscript (introduction, methodology, results, and discussion), including citations that support the hypothesis and findings.

Lecture Content

Organization of living systems. Organelles to the biosphere. Taxonomic organization of living things. Locations of plants, fungi, and photosynthetic protists relative to each other and other taxa. Interpreting cladograms. Scientific method. Experimental design. Observational study design. Scientific writing. Introduction to botany and the plant body. Organelles and their functions. C3, C4, and CAM photosynthesis. Cell cycle. Mitosis. Meiosis. Tissues. Simple tissues: anatomy and function. Complex tissues: anatomy and function. Physiology. Characteristics of solutions. Water potential hypothesis. Pressure potential. Osmotic potential. Pressure-flow hypothesis. Organ systems. Root. Roots: anatomy and development. Shoot. Stems: anatomy and development. Leaves: anatomy and development. Survey of algae. Life cycles. Synapomorphies for established taxa. Human interactions. Survey of kingdom Fungi. Life cycles. Anatomy. Human interactions. Survey of kingdom Plantae Taxonomic relationships among plant groups. Life cycles including reproduction. Anatomy. Land adaptations. Synapomorphies. Human interactions. Focus on angiosperms. Fruits. Flowers. Seeds. Taxonomic survey of commonly encountered families. Plant growth and development. Four categories o f growth hormones. Functions. Movement in plants. Theory of evolution. Significant contributors. Methods of allele frequency change. Rates of evolution. General trends in evolution. Hardy-Weinberg equilibrium. Taxonomy and systematics. Plant speciation. Mass extinctions. Ecology. Population ecology. Population structure. Population growth. Population size fluctuation. Regulation of population growth. Community ecology. Community structure and succession. Interspecific interactions. Symbiosis. Mutualism. Commensalism. Predation. Parasitism. Predation. Intraspecific and interspecific interaction. Competition. Ecosystem ecology. Ecosystem structure. Trophic levels. Energy flow. Nutrient cycling. Carbon cycle. Hydrologic cycle. Nitrogen cycle. Ecosystem diversity: biomes survey. Conservation. Species focused. Ecosystem focused.

Lab Content

Community interaction observational study. Experimental design. Observational study. Experiment. Evolution simulation focusing on natural selection and genetic drift. Survey of examples of convergent evolution and adaptive radiation. Comparative study of photosynthetic protists. Morphology. Developmental stages. Biodiversity. Comparative study of fungi. Morphology. Developmental stages. Biodiversity. Comparative study of major plant taxa. Morphology. Developmental stages. Biodiversity. Field observations of plant morphology. Student-generated scientific study. Scientific method. Experimental design. Observational study or experiment. Construction of a scientific manuscript. In-text references. Standard five sections: abstract, introduction, methods, results, and discussion. Analysis of data and graphic generation showing data trends. Critical thinking in interpretation of results and discussion of why those results were obtained. Oral presentation of project to class. Poster presentation to the public at large.

Method(s) of Instruction

- Lecture (02)
- DE Live Online Lecture (02S)
- DE Online Lecture (02X)
- Lab (04)
- DE Live Online Lab (04S)
- DE Online Lab (04X)

Reading Assignments

Textbook

Writing Assignments

Scientific project proposal. Scientific paper styled manuscript. Construction of a PowerPoint (or other) presentation that will support them in an in-class oral presenting of their research project. Design of a scientific conference styled poster that will be use in a conference styled poster session that is open to the public.

Out-of-class Assignments

Guided research assignment that includes experimental design, execution of experiment or observational study, and analysis of data.

Demonstration of Critical Thinking

Generation of 3 experimental designs as part of a lab exercise in the scientific method. Design of an investigation using either an experiment or an observational study. Interpretation of data as part of a scientific style manuscript that discussed the student's project.

Required Writing, Problem Solving, Skills Demonstration

Microscope skills demonstration Generation of 3 experimental designs as part of a lab exercise in the scientific method. Project proposal of a student-designed test of a hypothesis. Scientific style manuscript written about their project, including analysis and interpretation of novel results.

Eligible Disciplines

Biological sciences: Master's degree in any biological science OR bachelor's degree in any biological science AND master's degree in biochemistry, biophysics, or marine science OR the equivalent. Master's degree required.

Textbooks Resources

1. Required Raven, Evert, and Eichorn. Biology of Plants, 8th ed. W. H. Freeman (latest), 2012 Rationale: This is the most recent edition of the Raven's book as of 4 April 2024 (latest) 2. Required Rushforth et all. A Photographic Atlas for the Botany Laboratory, 7th ed. Morton (latest), 2016 Rationale: As of 8 Feb 2023, this is the most recent edition of the book. 3. Optional Borror. Dictionary of Roots and Combining Forms, 1st (classic) ed. Mayfield Publishers, 1960 Rationale: .