BIOL 241 - General Botany Course Outline

Approval Date: 3/10/2022
Effective Date: 8/11/2023

SECTION A

Unique ID Number	CCC000235297
Discipline(s)	Biological Sciences
Division	Science and Engineering
Subject Area	Biology
Subject Code	BIOL
Course Number	241
Course Title	General Botany
TOP Code/SAM Code	0402.00 - Botany, General / -
Rationale for adding this course to the curriculum	Updating math prerequisite. Changing schedule to 3 hours of lecture and 6 hours of lab per week; no change in units. Adding hybrid mode to instructional methods. Added a more recent textbook.
Units	5
Cross List	*N/A*
Typical Course Weeks	18

Total Instructional Hours

	Contact Hours
Lecture	54.00
Lab	108.00
Activity	0.00
Work Experience	0.00
Outside of Class Hours	108.00

Total Contact Hours	162
Total Student Hours	270
Open Entry/Open Exit	No
Maximum Enrollment	
Grading Option	Letter Grade or P/NP
Distance Education	On-Campus
Mode of Instruction	Hybrid

SECTION B

General Education Information:

SECTION C

Course Description

Repeatability May be repeated 0 times

Catalog Description An integrated study of contemporary plant biology and principles of ecology. The course includes the life cycles, anatomy, physiology, evolution and ecology of protists, fungi, and plants. Intended for biology majors.

Schedule Description An integrated study of plant biology and ecology, intended for biology majors.

SECTION D

Condition on Enrollment

1a. Prerequisite(s)

- BIOL 120 with a minimum grade of C or better and
- CHEM 120 with a minimum grade of C or better and
- Intermediate Algebra, MATH-95, or appropriate placement.

1b. Corequisite(s): *None*

1c. Recommended: *None*

1d. Limitation on Enrollment: *None*

SECTION E

Course Outline Information

1. Student Learning Outcomes:

A. Describe the basic anatomy of a flowering plant.
B. Understand ecological adaptations in plant species that allow them to survive in their habitat.
C. Relate principles of ecology and evolution to the distribution of species.

2. Course Objectives: Upon completion of this course, the student will be able to:

A. Examine the basis of plant, fungal, and algal classification and outline the evolutionary relationships of the major taxonomic groups.
B. Distinguish the life cycles of each organism studied.
C. Examine and diagram the anatomy of each organism studied, including its cells, tissues, and organs.
D. Describe the molecular basis of plant cell life, including metabolism, heredity, and nutrition.
E. Identify the unique tissues important to plant development and discuss how each is specialized to perform its function.
F. Describe the physiological basis of plant function including water relations, transport, and plant hormones.
G. Define fundamental ecological principles such as habitat, niche, succession, and carrying capacity.
H. Assess interactions between organisms and their abiotic and biotic environments at the population, community, and ecosystem levels.
I. Critically evaluate experimental designs, scientific results and the broader impacts of scientific findings.
J. Discuss how the study of botany is relevant to modern society in regard to agriculture, basic science, and ecology.
K.

3. Course Content

A. Lecture

1. Overview and Evolutionary History of Plants, Algae and Fungi
2. The Plant Cell
3. Molecular and Physiological Basis of Plant Function

- a. Respiration
- b. Photosynthesis
- c. Water
- d. Soils
- e. Transport
- f. Tropisms
- g. Plant hormones
- h. Nutrition
- i. Cell cycle
- j. Inheritance

4. Plant Morphology
   - a. Plant tissues
   - b. Roots
   - c. Shoots
   - d. Secondary growth
   - e. Leaves
   - f. Flowers
5. Plant Development
   - a. Embryo and seed formation
   - b. Germination
   - c. Development of the adult plant
6. Classification and Evolution
   - a. Phylogenetic principles
   - b. Protists
   - c. Fungi
   - d. Bryophytes
   - e. Ferns
   - f. Gymnosperms
   - g. Angiosperms
   - h. Paleobotany
   - i. Evolution of angiosperms
   - j. Coevolution
   - k. Speciation
7. Reproduction and Life Cycles
   - a. Asexual and sexual reproduction
   - b. Alternation of generations
8. Ecological Principles
   - a. Abiotic and biotic environments
   - b. Biomes
   - c. Habitat and niche
   - d. Adaptation
   - e. Populations
   - f. Biological communities
   - g. Trophic relationships
   - h. Ecological succession
   - i. Ecosystems
9. Plants and Humans
   - a. Agriculture

b. Plant variation
c. Biotechnology
d. Ecological management and conservation

B. Laboratory

1. Plant Cellular Biology
   a. Microscopic observation and structural analysis of plant tissues
   b. Plant tissue preparation: epidermal peels
   c. Stomatal density measurement and statistical analysis
   d. Florescence and electron microscopy theory and applications
   e. Growth rate calculation in a monocot plant
2. Plant Anatomy and Histology
   a. Sectioning and staining techniques
   b. Observation and identification of structural elements:
      i, roots
      ii, stems
      iii, leaves
      iv, flowers
4. Classification, Evolution and Life Cycles
   a. Protists
   b. Fungi
   c. Bryophytes
   d. Ferns
   e. Gymnosperms
   f. Angiosperms
4. Physiology
   a. Experiment: Temperature effect on yeast growth
5. Field Studies
   a. Field trip to local nature reserve
   b. Germination and cultivation projects in the college greenhouse and garden
6. Ecology and Applications
   a. Analysis of plant adaptive strategies
   b. Applications of mathematical models in ecology
   c. Environmental and genetic variation: discussion, lab and field observations
   d. Plant domestication and breeding programs
   e. Comparison of agricultural plants and their wild progenitors: garden project
   f. Speciation: literature review and discussion

4. Methods of Instruction:

Discussion: Instructor- and student-led discussions of reading assignments.
Field Trips: Class field trips to local habitat areas and botanical preserves.
Lab: Observation, analysis and experiments conducted in the laboratory and garden/greenhouse facilities.
Lecture: Spoken lectures with visual media and interactive discussion.

Observation and Demonstration: Instructor-led demonstrations in the laboratory.
Online Adaptation: Discussion, Lecture
Explain how the online adaptation of the methods of instruction aligns with the course outcomes: Online lectures will use instructor-narrated Powerpoint presentations supplemented with additional instructional materials posted weekly on the course Canvas website. The lectures will closely follow the course content outline and course objectives which are directly aligned with the course learning outcomes. Online discussions will serve to engage student participation and explore certain topics in greater depth with selected reading assignments.

2. Methods of Evaluation: Describe the general types of evaluations for this course and provide at least two, specific examples.

Typical classroom assessment techniques

Exams/Tests -- Midterm exams consisting of multiple choice, short answer, and essay questions on material covered in the lectures. Example: Lecture Exam 1 will cover aspects of plant cellular biology as well as physiological topics including water relations, hormones, and nutrition. Laboratory exams consisting of identification of plant specimens, tissues and anatomical structures. Example: Laboratory Exam 2 will cover identification of plant tissues in roots, shoots, and organs containing secondary growth.
Research Projects -- Research paper or presentation on a contemporary topic in plant biology.
Lab Activities -- Assessment of microscopy drawings and tissue labeling. Progress evaluations on laboratory manual. Discussion of post-lab questions.
Final Exam -- Cumulative review of material in the form of short answer, essay, illustration, and fill-in-the-blank questions.

Letter Grade or P/NP

3. Assignments: State the general types of assignments for this course under the following categories and provide at least two specific examples for each section.

A. Reading Assignments
Reading assignments from the textbook,laboratory manual, and supplemental primary literature.

Example 1: Read Chapters 16 and 17 of the textbook as preparation for the lecture on bryophytes and seedless vascular plants.

Example 2: Read Exercise 14 in the laboratory manual and the introduction and methods section of the scientific article provided prior to doing laboratory exercise 14 on flowers.

B. Writing Assignments
Laboratory reports, research paper, grant proposal

Example 1: Craft a research grant proposal justifying your choice for plant species to be included in the community garden. Focus on experimental possibilities and the broader impacts of your selection.

Example 2: Outline your research paper using the experiment and statistical tests covered in lab today, focusing on your hypothesis evaluation in the discussion.

C. Other Assignments
Plant collections, garden/greenhouse work, independent research project, group discussion.

4. Required Materials

A. EXAMPLES of typical college-level textbooks (for degree-applicable courses) or other print materials.

Book #1:	
Author:	Evert, R.F., S.E. Eichhorn
Title:	Raven Biology of Plants
Publisher:	W.H. Freeman and Co.
Date of Publication:	2013
Edition:	8th
Book #2:	
Author:	Evert, R.F., S.E. Eichhorn, J. Perry
Title:	Laboratory Topics in Botany
Publisher:	W.H.Freeman and Co.
Date of Publication:	2013
Edition:	8th
Book #3:	
Author:	McMahon, M., J.
Title:	Plant Science: Growth, Development, and Utilization of Cultivated Plants
Publisher:	Pearson
Date of Publication:	2020
Edition:	6th

B. Other required materials/supplies.