

## NORTHWESTERN CONNECTICUT COMMUNITY COLLEGE COURSE SYLLABUS

**Course Title:** GENERAL BOTANY **Course #:** BIO\* 155

**Course Description:** 4 semester hours (3 class hours/3 laboratory hours). General Botany provides an introduction to the study of the structure, reproduction, and physiology of plants. The evolutionary development of the plant kingdom will be stressed, as will their ecological and economical significance. Laboratory classes will include fieldwork and field trips to provide hands-on experience in identification of plant species and the role of plants in nature. Projects in lab will emphasize the importance of plants in human society. This course fulfills the requirement for a laboratory science course and is transferable.

**Pre-requisite/Co-requisite:** Eligibility for, or completion of, ENG\* 101.

**Goals:** The goal of this course is to provide an introduction to the study of plants as a basis for understanding broader biological principles.

**Outcomes (Lecture):** At the end of the course, students should be able to:

- Describe the steps in the scientific method and use the scientific method to evaluate information and problems
- List the characteristics of plants and explain why plants are believed to have descended from green algae
- Trace the evolutionary advances and distinguish the characteristics between the major groups of plants
- Describe atomic structure and bonding and provide examples of ionic, covalent and hydrogen bonds
- Explain the chemical basis of living organisms
- Describe the structure of water and properties and significance to plant life
- Define pH in terms of hydrogen ion concentration and be able to identify and given pH as acid, alkaline, or neutral; describe how pH changes are minimized by buffers
- Identify macro- and micronutrients important for plants
- Differentiate between the molecular structure of carbohydrates, lipids, proteins and nucleic acids; provide examples of each; and identify the role they play in the plant cell
- Describe enzyme structure and activity and the role of enzymes in metabolism
- Compare and contrast the structure and function of the major components of prokaryotic cells and organelles of eukaryotic cells, with specific emphasis on the difference between plant and animal cells
- Describe the fluid mosaic model of the membrane and the various mechanisms (passive diffusion, osmosis, facilitated diffusion, active transport and membrane assisted transport) that materials use to cross this structure
- Describe how the basic structure and growth of vascular plants are adapted to their function
- Describe the tissue systems found in vascular plants
- Describe the cell types found in plants
- Explain plant transport systems
- Contrast water and land as environments for plants
- Recognize the differences between monocotyledons and dicotyledons
- Describe the different reproductive mechanisms found in plants

- Explain the various functions of a root system and distinguish between the differing systems
- Describe the components of soils and the importance of soils to terrestrial plants
- Summarize the sequence of events that occur in primary and secondary growth
- Describe plant growth and communication in scientific terms
- List the functions of stems and leaves and describe the various leaf development patterns
- Describe the processes of respiration and compare and contrast photosynthesis within C3, C4, and CAM plants
- Explain the mechanisms of transport through the xylem and phloem
- Explain the role of the five kinds of plant hormones and list where each is produced
- Explain what factor influences how a plant responds to hormones
- Relate the responses of plants to day length, gravity, touch, and other environmental cues
- Discuss how pollination and fertilization occur in flowering plants
- Name the parts of a flower and a seed
- Describe the conditions necessary for seed germination
- Explain the advantages of asexual propagation
- Discuss the basic principles of genetics and solve genetics problems as it applies to plant inheritance
- Explain Mendel's laws of inheritance and define the following terms: gene, allele, locus, dominant, recessive, codominant, linkage, phenotype, genotype, homozygous, and heterozygous
- Describe the structure of DNA and the process of DNA replication
- Describe roles of RNA and its structure and describe the process of transcription
- Explain the gene-protein relationship, the process of protein synthesis; the control of gene-expression in both prokaryotic and eukaryotic organisms; and protein processing
- Identify and describe the events that occur during the stages of the cell cycle, mitosis, binary fission and meiosis and the role of cell cycle control for plants
- Explain botanical biotechnology techniques and discuss their applications
- Describe evolutionarily important plant species
- Describe the interrelationships among plants, micro-organisms, and animals in the functioning of ecosystems
- Discuss the fundamental roles of plants in ecosystems, including the production of food energy, replenishment of oxygen, and water and nitrogen cycles
- Explain spatial and temporal patterns of variation in plant community structure and the determinants of such patterns, including concepts of biome, community and succession
- Demonstrate the ability to follow oral and written instructions effectively
- Demonstrate the ability to access course resources and complete assignments on-line using computer technology
- Demonstrate the ability to complete assignments and examinations ethically

**Outcomes (Lab):** At the end of this laboratory course component, the student should be able to:

- Use basic equipment effectively, handle and analyze plant materials appropriately, and work safely in the laboratory
- Explain the importance of field, laboratory, and microcosm experimentation in botany
- Describe the importance and history of interpretive natural history in botany
- Identify the species and parts of plants used to manufacture everyday items
- Properly carry out soil sampling and analysis
- Properly carry out population and community structure sampling and analysis, both quantitatively and qualitatively

- Identify representative plant cells, tissues and organs
- Explain basic and biological botanical chemistry and plant metabolism
- Identify the basics of taxonomy and how it applies to the plants
- Identify the major parts of leaves, stems, and roots
- Describe plant reproduction and know the parts of a flower and seed
- Recognize life histories, reproductive cycles, and ecological relationships of the major plant groups
- Formulate hypotheses, collect and analyze data, and present results in the standard format of a scientific report.
- Identify experimental error and suggest solutions
- Identify and evaluate the importance of native plants
- Design a native habitat rain/buffer garden space that will benefit the natural and human community of NCCC

**Evaluation:**

Mastery of outcomes will be evaluated through a mix of projects, writing assignments, a research paper, lab assignments, discussions, and quests/exams. Please see the Grading Structure below for details.