



Course Description

BOT3015 | Survey of Plant Diversity | 3.00 credits

This course explores the plant kingdom and emphasizes structure, function and genetics of plants. Students will learn the evolutionary relationships, natural history, ecological adaptations, physiology, morphology and reproductive biology of gymnosperms and angiosperms. Prerequisites: BSC2010, 2010L, 2011, 2011L. Corequisite: BOT3015L.

Course Competencies:

Competency 1: The student will demonstrate knowledge of plant taxa, starting with bryophytes and finishing with angiosperms, including their morphology and physiology by:

1. Describing the distinguishing features of bryophytes as a group and the different phyla in this group
2. Describing the fundamental differences between angiosperms and gymnosperms
3. Describing the distinguishing features of seedless vascular plants and the four phyla of seedless vascular plants

Competency 2: The student will demonstrate knowledge of similarities and differences between vascular and non-vascular plants by:

1. Defining vascular and non-vascular plants
2. Differentiating vascular and non-vascular plants in terms of morphology and ecology
3. Describing the structure of conducting tissues of plants and the function of each cell component

Competency 3: The student will demonstrate knowledge of the structure and function of leaves, stems, and root systems in higher plants, including a comparison between monocots and dicots by:

1. Describing the root regions and their functions
2. Explaining the specific functions of the endodermis and the pericycle
3. Describing and comparing the differences among the various types of specialized roots
4. Describing the tissues that develop from shoot apices and the meristems from which each tissue is derived
5. Distinguishing between primary and secondary tissues
6. Describing the function of vascular cambium, cork cambium, stomata, and lenticels
7. Distinguishing between the stems of herbaceous and woody dicots and that of monocots
8. Describing the functions of a typical leaf and the specific tissues and cells that contribute to those functions
9. Identifying the differences between pinnate, palmate, and dichotomous venation and the differences between simple and compound leaves
10. Describing tendrils, spines, storage leaves, reproductive leaves, floral leaves, and different types of insect trapping leaves
11. Explaining why deciduous leaves turn various colors in the fall and how much leaves are shed

Competency 4: The student will demonstrate knowledge of the structure and types of flowers and fruits, including a comparison between monocots and dicots by:

1. Identifying the parts of a typical flower and the function of each part
2. Explaining the features that distinguish monocot and dicot reproductive structures
3. Distinguishing between fruits and vegetables
4. Identifying types of fleshy and dry fruits and will know how simple, aggregate, and multiple fruits are derived from the flowers
5. Explaining the adaptations of fruits and seeds to the agents by which they are dispersed
6. Explaining the changes that occur when a seed germinates and the environmental conditions necessary
7. Explaining the factors that control dormancy and describing how these may be broken both naturally and

artificially

Competency 5: The student will demonstrate knowledge of the morphological development of vascular plants throughout geological history by:

1. Describing and outlining the early development of evolutionary concepts
2. Explaining the various lines of evidence for evolution
3. Explaining the human and ecological relevance of ferns
4. Contrasting and identifying the basic differences between angiosperms and gymnosperms
5. Explaining the life cycle of a flowering plant, including the shift from haploid to diploid cells and vice versa
6. Explaining and contrasting the development of the male and female gametophytes
7. Outlining the co-evolution of pollinators and the associated characteristics of the flowers

Competency 6: The student will demonstrate knowledge of plant growth, reproduction, and responses by:

1. Contrasting growth, differentiation, and development
2. Describing the role of plant hormones in plant growth
3. Listing and describing the different factors that affect plant growth and development
4. Explaining phototropism, gravitropism, thigmotropism and thigmomorphogenesis
5. Describing photoperiodism and circadian rhythms
6. Explaining how an integrated control system can regulate plant processes like flowering
7. Explaining what phytochrome is and how it functions
8. Differentiating between vegetative reproduction and sexual reproduction in plants
9. Contrasting the reproduction and lifecycles of phylum pinophyte, phylum lycophyte, phylum equisetophyta, and phylum polypodiophyta
10. Explaining “alterations of generations in plants

Competency 7: The student will demonstrate knowledge of the processes of photosynthesis and cellular respiration by:

1. Explaining the light-dependent and light-independent reactions of photosynthesis
2. Describing the significant consequences of photorespiration
3. Differentiating between the C₃, C₄, and CAM pathways of carbon fixation and their ecological relevance
4. Explaining the possible fates of photosynthetic products

Competency 8: The student will demonstrate knowledge of the flow of energy in the environment from plants through the various consumers and interactions in an ecosystem by:

1. Explaining the role of producers, primary consumers, secondary consumers, and decomposers in an ecosystem
2. Describing/outlining energy flow through an ecosystem
3. Explaining the cycling of carbon and nitrogen
4. Defining succession and how it may start with rocks or with water
5. Illustrating and explaining ecotype, secondary succession, eutrophication, and climax vegetation
6. Explaining the human and ecological relevance of ferns
7. Describing ways in which humans have disrupted ecosystems
8. Demonstrating the interactions in an ecosystem such as pollination, plant defenses, and inter/intra specific competitions
9. Identifying three asexual and/or sexual plant reproductive strategies
10. Identifying three standard horticultural methods for propagating plants
11. Demonstrating knowledge on the ecological, aesthetical, and economic importance of plants

Competency 9: The student will demonstrate knowledge of organisms in the Protista, Fungi, Monera, and Archaea Kingdoms as well as Viruses by:

1. Identifying key individuals and their contributions to the study of botany as well as the processes

of botanical study

2. Describing the distinguishing features of kingdoms, Protista, Fungi, Monera, and Archaea
3. Describing the features that kingdom Protista share with one another and note the fundamental ways in which they differ
4. Describing the different taxa of algae and their human, ecological, and economic significance.
5. Identifying the major different taxa of fungi
6. Describing the classification of bacteria and the forms of nutrition in bacteria
7. Explaining the different ways bacteria are helpful as well as harmful to humans
8. Describing the characteristics of viruses and how they differ from bacteria in form and reproduction

Learning Outcomes:

- Communicate effectively using listening, speaking, reading, and writing skills
- Solve problems using critical and creative thinking and scientific reasoning
- Describe how natural systems function and recognize the impact of humans on the environment