
Botany Syllabus

UNIT I BASIC PLANT BIOLOGY

A. Introduction

- i. What are plants?
- ii. Review cell structure.
- iii. Compare and contrast animal and plant cells.

B. Monocots and Dicots – cellular differences

- i. cotyledons and seeds
- ii. leaf structure
- iii. stems and roots
 - a. woody vs herbaceous
 - b. meristems
 - c. twig anatomy – nodes and internodes

C. movement of molecules across membranes

- i. diffusion, osmosis, and active transport
- ii. the role of particle size and electrostatic forces

UNIT II PHYSIOLOGY

A. photosynthesis

- i. photosystems
- ii. light and dark reactions
- iii. energy and energy transfer and storage
- iv. light energy
- v. respiration as a metabolically related reaction
- vi. plant pigments
- vii. chromatography and gel filtration as a way to “see” relative sizes of molecules

B. transport in plants

- i. xylem, phloem, stomates, and guard cells
- ii. root uptake and soil composition
 - a. role of soil ions
 - b. role of soil pH
 - c. nutrient uptake and transport
- iii. tonicity
- iv. energy and chemical requirements and the role of enzymes

D. chemical regulators of plant growth

- i. from within – hormones
- ii. from the environment – allelopathic agents

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UNIT III – REPRODUCTION

- A. Importance of observation and keeping a journal
- B. Basic Floral structure
 - i. parts of the flower and relevant terms
 - ii. hypogynous and epigynous ovaries
 - iii. perfect, imperfect, complete and incomplete flowers
 - iv. actinomorphic and zygomorphic corollas
 - v. role of mutation and adaptation in flower structure
 - vi. microdissection and drawing and journaling flowers
- C. Gametogenesis
 - i. meiosis in plants
 - ii. differentiation
 - iii. oogenesis and spermatogenesis

UNIT IV – PLANT ECOLOGY

- A. Plants as the foundation of natural communities
 - i. important indicators of environmental conditions
 - ii. data
 - a. collection
 - b. presentation
 - c. storage
 - d. reading sample graphs
 - iii. leaf size as a product of ambient light
- B. Community relationships
 - i. competition
 - ii. succession
 - iii. adaptation to various habitats
 - iv. plants as r-strategists
- C. Limiting factors
 - i. plant responses / adaptations
 - ii. water in dry climates as an example of a limiting factor
 - iii. adaptation of leaf structure in response to water stress
- D. Inventory and density
 - i. dominant plant species as the identity of communities
 - ii. estimating density in the field
- E. Precision vs Accuracy
 - i. chi-square as a measure of accuracy
 - ii. density and canopy coverage in the field

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UNIV V – TAXONOMY

- A. Plant history and evolution
 - i. role of constant mutation and the gene pool
 - ii. fossil record and other evidence
 - iii. extinction
 - iv. geologic time
 - v. time line of the appearance of various major plant groups
- B. Role of the environment in evolution
 - i. environmental selects phenotype and not genotype
 - ii. role of genetic diversity
 - iii. appearance of the grasses as an example
- C. Major characteristics of select plant divisions and families
 - i. how classification illustrates descent from a common ancestry
 - ii. how plant classification differs from and compares to animal classification
 - iii. importance of classification to identification of specimens
 - iv. need for specific vocabulary
- D. The Asteraceae and the secret to their success
 - i. The basic design of their highly evolved floral structure
 - ii. How the environment might have favored their floral structure
 - iii. Comparison of composite flowers to a non-composite flower

UNIT VI – DETAILED EXAMINATION OF SELECT PLANT FAMILIES

- A. Many adaptations of a few simple structures
 - i. the role of genetic diversity and natural selection
 - ii. leaves and vestiture and how they relate to natural selection
 - iii. stem types and placement of leaves and flowers on stems
- B. Family Brassicaceae – the mustards
 - i. regular flowers with superior ovaries
 - ii. 4-merous and 5-merous floral arrangements
 - iii. variations on ovary / fruit types
 - a. silicles
 - b. siliques
- C. Family Onagraceae
 - i. regular flowers with inferior ovaries
 - ii. placentation
- D. Family Fabaceae
 - iii. zygomorphic corolla
 - iv. how the environment might favor an irregular corolla

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E. Family Asteraceae

- iv. detail of various modifications found in this family
- v. inflorescence
- vi. F

F. Families Boraginaceae and Scrophulareaceae

- vii. more inflorescence types
- viii. determinate vs indeterminate inflorescences

G. Family Poaceae

- ix. monocots – lilies, grasses, and others
- x. 3-merous floral structure
- xi. root structure

H. Putting your knowledge to use

- xii. plant identification on your own
- xiii. the dichotomous key
 - a. what is available in your region and where do you go to look?
 - b. Artificial vs evolutionary keys
- xiv. developing a simple key to see how dichotomous keys work
- xv. practice keying plant families from an artificial key