

Syllabus

Course Name: Plant Biology

Course No.: 1805109

Credits: 3

Hours: Total 48 hours

Time Assignment: 46 hours for teaching or instruction, 2 hours for review and answering questions

Instructor: SUN Zheng

I. Course introduction

The course of Plant Biology is an important professional basic course, and the basic concept and theory of plant biology should be systemically and comprehensively introduced in the teaching process. Individual development should be introduced based on the biological theory of development and the contents of biological diversity and evolution should be enhanced properly in respect of macroscopic scale. Related content will be analyzed with dialectical opinion. In the process of plant development - - there are interrelation and interaction between cell and cell, cell and tissue, tissue and tissue, tissue and organ, organ and organ, morphological structure and physiological function, vegetative growth and reproductive development, and plant and environment, and meanwhile they also have different own features. The morphological structures of plant body and its cells, tissues and organs are matched with their respective physiological functions. There is a series of growth and development process for entire life cycle of individual plant, and teacher should pay a special attention to guiding students to establish viewpoint on development while understanding the morphological structure construction and function change rules of plant body.

II. Teaching content

Introduction

(1 hour)

Main content: plant kingdom, importance of plant, brief development history of plant science, the objectives and methods to learn plant biology

Study requirement: learn about the basic features of plant and division in plant kingdom

Chapter I

Plant cells and tissues

(6 hours)

Main content: Basic features, basic structure and function of cell, cell proliferation, growth and differentiation; type and tissue system of plant tissue.

Study requirements: Emphatically understand the formation, chemical composition, structure and specialization of cell wall; concept and type of pit and its influence on plasmodesmus; basic structure of plasmalemma and structure of organelle; structure of cell nucleus; type of ergastic

material. Concept of cell cycle; cell division methods and features. Grasp the concepts of tissue and meristematic tissue, and understand the mechanical, protective, thin wall, conduction and secretory tissues in mature tissue and understand tissue system.

Chapter II Seeds and seedling (1 hour)

Main content: Structure and type of seeds, seed germination and seedling formation.

Study requirements: Grasp the structure and type of seeds; understand the concept of seed dormancy, reasons for dormancy and methods for breaking seed dormancy; learn about the life and storage conditions of seed; learn about the external conditions of seed germination, the process of seeds growing into seedlings and type of seedlings.

Chapter III Vegetative organs of plant (10 hours)

Main content: Development, primary structure, secondary growth and secondary structure of root (4 hours); physiological function and its utilization, morphology, secondary growth and secondary structure of stem (3 hours); physiological function, economic utilization, morphology, development and structure of leaf (3 hours).

Study requirements: Learn about the physiological function and utilization of root, types of root and root system; understand structure and development of root tip; grasp the primary structures of root: epidermis, cortex and vascular column, and the secondary growth and secondary structure of root. Learn about the physiological function and utilization, form of stem; grasp the primary structure, secondary growth and secondary structure of stem. Learn about the physiological function and utilization of leaf; understand the form of leaf and grasp basic structure of leaf.

Chapter IV Marine and freshwater plants (2 hours)

Main content: Plant resources, phytoplankton, ecological system, seaweed breeding and cultivation in freshwater and ocean.

Study requirements: Learn about life history, ecological habit and protonema cultivation, marine cultivation and artificial seeding of macro and micro algae.

Chapter V Algal metabolites (2 hours)

Main content: Algal carotenoid, grease, fatty acid and phycobiliprotein.

Study requirements: Learn about the structure, classification, verification methods and newest biological functions of typical algal compound, and the application of these plant sources in the partial industrial fields.

Chapter VI Water physiology of plants (6 hours)

Main content: Physiological basis for moisture absorption, transpiration and

correct irrigation of plant cells and root system.

Study requirements: Grasp the concept of water potential, and moisture absorption method of plant cells, understand the moisture absorption method, power and production mechanism of root system; grasp the approaches and power for moisture transportation; understand transpiration and its regulation and control mechanism.

Chapter VII Mineral nutrition of plant (6 hours)

Main content: Mineral element absorption of plant, mineral substance transportation and distribution in plant body, nitrogen, sulfur and phosphorus assimilation of plant, and physiological basis for rational fertilization.

Study requirements: Understand the physiological action of essential elements of plant, grasp the trans-membrane ion transportation approach of plant inside plant cell; learn about the mineral element absorption, transportation and distribution in plant body; understand the mechanism of mineral element assimilation by plant.

Chapter VIII Botanical photosynthesis (12 hours)

Main content: Chloroplast and its pigment, photosynthesis process, and light utilization of plant.

Study requirements: Learn about the importance of photosynthesis, structure and composition of chloroplast, chemical and optical characteristics of photosynthetic pigments, the formation of chlorophyll, the process of photosynthesis, light respiration, factors affecting photosynthesis, and light utilization by plant.

Review and answering questions (2 hours)

III. Basic teaching requirements

Enable students to systemically grasp the basic concept, basic structure and basic principles of the course content in the teaching process.

Enable students to learn about the basic morphology of plant, the name of various organs and tissues, the knowledge in respect of plant cultivation biology, new progress of plant biology field by teaching, and get the basic acquaintance of frontier topics on modern plant science on the basis of comprehensively understanding the morphological anatomy, individual development and phylogeny of plant.

IV. Teaching methods

The course is taught and introduced via instructional media (including textbooks and multimedia courseware) by case analysis, comparison, comprehensive method and other teaching methods.

Final examination and usual performance assessment methods are applicable. Final examination result (closed-book) accounts for 60% and usual performance

assessment accounts for 40%. Usual performance assessment includes attendance (70%) and after-class assignments (30%).

V. References and reading list

- (1) Plant Biology (2nd Edition), by LU Shiwan, XU Xiangsheng, SHEN Minjian, 2011, Higher Education Press.
- (2) Plant Physiology (7th Edition), by PAN Ruichi, 2012, Higher Education Press.
- (3) Plant Physiology (4th Edition), translated by SONG Chunpeng, WANG Xuelu, et al, 2009, Science Press.
- (4) Stern's Introductory Plant Biology (12th Edition), by Bidlack JE, Jansky SH. 2013, McGraw-Hill.
- (5) Biochemistry & Molecular Biology of Plants (2nd Edition), by Buchanan BB, Gruissem W, Jones R. 2015, Wiley Blackwell.

VI. Connection and division of the course with other courses

Plant biology is the basic subject for studying the growth and development, morphological structure, phylogeny and classification of plant, has close relation with chemical and physical sciences, and lays a good and necessary foundation for studying phycology, cytobiology, biology of heredity and development, histoembryology and other subsequent courses.

Drafted by SUN Zheng

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