هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission
اعتماد
NCAAA
2024
TP-153

Course Specification
(Bachelor)

Course Title:	**Plant Anatomy and Physiology**
Course Code:	BIO- **1322**
Program:	**BIOLOGY**
Department:	**BIOLOGY**
College:	**SCIENCE**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**1**
Last Revision Date:	**-**

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A. General information about the course:

1. Course Identification

1. Credit hours: 3 (Lecture 2+ Lab 2)					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: (Level 5, 3rd Year)					
4. Course General Description:					
The Course introduces the students to the principles of plant anatomy and physiology. The topics include the structure of the various types of plant cells, tissues and organs. This course emphasizes the major vital physiological processes and their mechanistic pathways that take place in the diverse plant species. These vital processes encompass photosynthesis and responses to light and stresses, water relations and internal transport, primary and secondary growth, adaptations to different environmental factors, mineral nutrition, regulation of growth and development. In addition, the developmental stages of flowers, fruit, and seeds in relation to their structure and function, senescence and dormancy are emphasized. The life cycle of flowering plants is employed as a model for investigating the principal physiological processes incorporated in the survival, growth, and reproduction of plants. The designed Lab sessions provide the students with in-hand experience and practical skills on the main physiological processes such as photosynthesis, seed germination, and water potential using living plant specimens. The group and lab work and reports emphasize analysis, presentation, and interpretation of physiological data.					
5. Pre-requirements for this course (if any)**:**					
BIO- 1251					
6. Co-requisites for this course (if any)**:**					
None					

7. Course Main Objective(s):

The main aim of the course is to present the basic knowledge of Plant Anatomy and Physiology to the students of Biology Program. One of the course ojectives is to provide the fundamental knowledge of the structure and functions of plants which constitutes the essential prerequisite to get aquanted with the knowledge submitted in other curriculm courses. These include the courses dealing with other scientific disciplines, such as Genetics, Cell Biology, and Biotechnology. To achieve the targeted objectives, the course is divided into major sections that describe the organizational structure in relation to the functions starting from the plant cell to the level of the whole plant organs. The designed lab sessions support and greatly enforce the acquired knowledge and give the students the opportunity to have in-hand experience to recognize the principal anatomical characteristics of plants and the main relevant physiological processes.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	√	100%
2	E-learning	-	-
3	Hybrid • Traditional classroom • E-learning	-	-
4	Distance learning	-	-

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	30
2.	**Laboratory/Studio**	30
3.	**Field**	-
4.	**Tutorial**	-
5.	**Others (specify)**	-
Total		60

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	**Outline the major anatomical structures and their functions in the higher plants at the level of cells, tissues, and organs.**	K1	-Weekly lectures -Group discussions	-Homework -Quizzes -Assignments -Data search -Presentations -Attendance -Exams
1.2	**Recognize the macroscopic characters and the microscopic morphological features of plant tissues.**	K2	-Weekly lectures -Group discussions	-Homework -Quizzes -Assignments -Data search -Presentations -Attendance -Exams
1.3	**Describe the various central physiological processes that are vital for growth and reproduction of plants.**	K3	-Weekly lectures -Group discussions	-Homework -Quizzes -Assignments -Data search -Presentations -Attendance -Exams
1.4	**Explain the diverse structure-function inter-relationships that enable plants to perform the vital processes and adapt to different environments**	K2-K3	-Weekly lectures -Group discussions	-Homework -Quizzes -Assignments -Data search -Presentations -Attendance -Exams
2.0	**Skills**			
2.1	**Relate and utilize the acquired knowledge of plant anatomy and physiology in the**	S1	-Weekly lectures -Group discussions	-Field reports -Presentations

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
	various relevant fields.			
2.2	**Design and conduct research work in the field of plant physiology using the proper tools and techniques**	S2	-Lab work	-Lab reports -Presentations
2.3	**Analyze and interpret the experimental and field data using the appropriate statistical methods.**	S3	-Lab work -Field surveys	-Lab reports -Presentations
3.0	Values, autonomy, and responsibility			
3.1	**Demonstrate the ability to work independently and cooperate with a team**	V1	-Lab and field work	-Lab reports -Presentations
3.2	**Share in the specialized meetings and present the scientific data either orally or in written formats**	V2	-Lab and field work	-Lab reports -Presentations
3.3	**Adhere to the ethics and regulations while performing a research work in the field of plant physiology.**	V3	-Lab and field work	-Lab/field reports -Presentations

C. Course Content (Lectures)

No	List of Topics	Contact Hours
1.	Introduction to Plant Anatomy: -Overview of plant structure and function -Importance of plant anatomy in botany and agriculture -Basic tools and techniques for studying plant anatomy (microscopy, staining, etc.)	2
2.	Plant Cell Structure: -Structure and function of plant cell organelles -Differences between plant and animal cells -Cell wall composition and function	2
3.	Plant Tissues – Meristematic and Permanent Tissues: -Types of meristematic tissues (apical, lateral, intercalary) -Classification of permanent tissues (simple and complex) -Functions of parenchyma, collenchyma, and sclerenchyma	2
4.	Plant Tissues – Vascular Tissues: -Structure and function of xylem and phloem -Primary and secondary growth in plants -Differences between monocot and dicot vascular bundles	2
5.	Root Anatomy: -Internal structure of roots (monocot vs. dicot) -Root modifications and their functions -Role of roots in water and nutrient absorption	2
6.	Stem Anatomy: -Internal structure of stems (monocot vs. dicot) -Stem modifications and their functions -Role of stems in support and transport	2
7.	Leaf Anatomy: -Internal structure of leaves (monocot vs. dicot) -Adaptations of leaves for photosynthesis and transpiration -Leaf modifications and their functions	2

8.	**Transition to Pant Physiology:** **-Introduction to plant physiology: scope and importance** **Water Relations in Plants:** **-Overview of physiological processes in plants** **-Properties of water and its role in plants** **-Water potential, osmosis, and plasmolysis** **-Absorption and transport of water**	**2**
9.	**Mineral Metabolism:** **-Essential mineral elements and their functions** **-Mechanisms of nutrient uptake and transport** **-Role of mycorrhizae and nitrogen-fixing bacteria**	**2**
10.	**Photosynthesis:** **-Light and dark reactions of photosynthesis** **-Factors affecting photosynthesis** **-Adaptations for photosynthesis in different environments**	**2**
11.	**Respiration:** **-Glycolysis, Krebs cycle, and electron transport chain** **-Aerobic vs. anaerobic respiration in plants** **-Factors affecting respiration**	**2**
12.	**Plant Hormones and Growth Regulation:** **-Types of plant hormones (auxins, gibberellins, cytokinins, ethylene, abscisic acid)** **-Roles of hormones in growth, development, and stress responses**	**2**
13.	**Plant Movements and Tropisms:** **-Types of plant movements (tropic and nastic)** **-Mechanisms of phototropism, gravitropism, and thigmotropism**	**2**
14.	**Stress Physiology:** **-Plant responses to abiotic stresses (drought, salinity, temperature)** **-Mechanisms of stress tolerance and adaptation**	**2**
15.	**Reproduction and Senescence:** **-Physiological aspects of flowering, pollination, and seed development** **-Senescence and programmed cell death in plants**	**2**
Total		**30**

Course Content (Labs)

No	List of Topics	Contact Hours
1	-Introduction to the microscope and slide preparation -Observation of plant cells and tissues	2
2	-Microscopic examination of plant cells (e.g., onion epidermis, Elodea) -Staining techniques for cell wall visualization	2
3	-Identification of meristematic and permanent tissues in plant sections -Comparative study of tissue types in stems, roots, and leaves	2
4	-Microscopic examination of xylem and phloem in stem and root cross-sections -Demonstration of secondary growth in woody plants	2
5	-Study of root cross-sections and root hairs -Observation of root modifications (e.g., storage roots, prop roots)	2
6	-Microscopic examination of stem cross-sections -Observation of stem modifications (e.g., rhizomes, tubers, tendrils)	2
7	-Microscopic examination of leaf cross-sections -Observation of leaf modifications (e.g., spines, tendrils, succulent leaves)	2
8	-Demonstration of physiological processes (e.g., osmosis, diffusion)	2
9	-Experiments on osmosis and water potential -Demonstration of root pressure and guttation	2
10	-Hydroponics experiment to study nutrient deficiency symptoms -Analysis of soil and plant nutrient content	2
11	-Experiments on the rate of photosynthesis (e.g., light intensity, CO2 concentration) -Chromatography of photosynthetic pigments	2

12	-Measurement of respiration rate in germinating seeds -Demonstration of fermentation in plant tissues	2
13	-Experiments on hormone effects (e.g., auxin on root growth, ethylene on fruit ripening) -Experiments on tropic responses (e.g., phototropism in seedlings)	2
14	-Experiments on stress responses (e.g., effect of salinity on seed germination)	2
15	-Observation of flower structure and seed development -Experiments on seed dormancy and germination	2
	Total	30

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	First Semester Exam	5th week	15%
2.	Second Semester Exam	10th week	15%
3.	Assignments, presentations, data search, attendance, participations	During the course period	10%
4.	Final Lab Exam	15th week	20%
4.	Final Exam	16th week	40%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	Taiz L, Zeiger E. Plant Physiology. 5th ed. Sunderland, MA: Sinauer Associates, Inc. Publishers; 2010. ISBN: 978-0-87893-866-7.

	Raven PH, Evert RF, Eichhorn SE. Biology of Plants. 8th ed. New York: W.H. Freeman and Company; 2013. ISBN: 978-1-4292-1961-7. Moore R, Clark WD, Vodopich DS. Botany. 3rd ed. New York: McGraw-Hill Education; 2010. ISBN: 978-0-07-122212-9.
Supportive References	Beck CB. An Introduction to Plant Structure and Development: Plant Anatomy for the Twenty-First Century. 2nd ed. Cambridge: Cambridge University Press; 2010. ISBN: 978-0-521-51805-5. Raven PH, Evert RF, Eichhorn SE. Biology of Plants. 8th ed. New York: W.H. Freeman and Company; 2013. ISBN: 978-1-4292-1961-7. Mauseth JD. Plant Anatomy: An Applied Approach. Oxford: Blackwell Publishing; 2008. ISBN: 978-1-4051-2679-3.
Electronic Materials	-
Other Learning Materials	-

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms, Laboratories
Technology equipment (projector, smart board, software)	Projector, smart board
Other equipment (depending on the nature of the specialty)	-

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Direct
Effectiveness of Students assessment	Faculty Members	Indirect
Quality of learning resources	Peer Reviewers	Indirect
The extent to which CLOs have been achieved	Peer Reviewers	Indirect
Other	-	-

Assessors (Students, Faculty, Program Leaders, Peer Reviewers, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	
REFERENCE NO.	
DATE	