

Course Specification

— (Postgraduate Programs) عبدالمحسن بن عبدالعزيز آل سعود

Course Title: Plant Environmental Physiology

Course Code: BIO-6036

Program: Master of Science in Applied Biology (Industrial and Environmental Biotechnology & sustainability)

Department: Biology عبدالمحسن بن عبدالعزيز آل سعود

College: Science

Institution: Imam Mohammad Ibn Saud Islamic University

Version: 1

Last Revision Date: *Pick Revision Date.*

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عبد المحسن بن أحمد الحزبي بن عبد الله بن محمد بن الناصر





A. General information about the course:

1. Course Identification:

1. Credit hours: 2 (Lecture 2 + Lab 0)

2. Course type

A. ☐ University ☐ College ☐ Department ☒ Track

B. ☐ Required ☒ Elective

3. Level/year at which this course is offered: (Undetermined level)

4. Course general Description:

This postgraduate course provides the candidates with a deep understanding of how plants respond to and interact with their environment. Understand the basic principles of plant environmental physiology. Comprehend the importance of studying plant responses to environmental factors for agriculture, ecology, and conservation. Analyze how plants uptake, transport, and utilize water. Evaluate adaptations of plants to water stress and different soil conditions. Grasp the processes involved in photosynthesis. Understand how light influences plant growth and development. Analyze how plants optimize photosynthesis under different light conditions. Examine the effects of temperature on plant growth and metabolism. Evaluate plant responses to cold and heat stress. Understand photoperiodic responses and vernalization. Explore nutrient uptake and transport mechanisms. Analyze the role of essential nutrients in plant growth and development. Identify nutrient deficiencies and toxicities in plants. Analyze plant interactions with pathogens and pests. Understand plant defense mechanisms and responses to herbivory. Explore symbiotic relationships that benefit plant health. Examine how environmental cues influence plant development. Understand the role of plant hormones in growth and responses to stimuli. Explore the molecular mechanisms underlying plant responses to environmental signals. Recognize the impact of climate change on plants. Understand how pollution affects plant physiology. Explore conservation strategies and sustainable practices in the context of plant environmental physiology. Develop critical thinking skills in analyzing complex physiological processes. Apply knowledge to solve problems related to plant responses to environmental challenges. Conduct independent research on specific aspects of plant environmental physiology. Effectively communicate research findings through presentations and reports. Understand the implications of plant environmental physiology in addressing global challenges such as food security and biodiversity conservation. Gain hands-on experience through laboratory work, field studies, and experiments. Apply theoretical knowledge to practical situations.

5. Pre-requirements for this course (if any):

6. Co-requisites for this course (if any):



7. Course Main Objective(s):

The objective of this course is to provide the students with a fundamental theoretical understanding of complex Epigenetic Phenomena. The course familiarizes the student with the current technology and drives principles of epigenetics. Among the course aims is to allow the students to identify the state-of-the-art experimental approaches in "Epigenetics and Chromatin Research".

عبدالمطعم بن أحمد العزوي بن عبد الله بن رحيمة الناصر

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	-
3.	Field	-
4.	Tutorial	-
5.	Others (specify)	-
	Total	30



B. Course Learning Outcomes, Teaching Strategies, Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Distinguish principles of plant environmental physiology, importance of studying plants responses to environmental factors for agriculture, ecology, and conservation		Two credits weekly lectures	-Quizzes -Presentations -Assignments -written exams
1.2	List the various water relations in plants, nutrient acquisition, metabolism, environmental signals and plant development		Two credits weekly lectures	Quizzes -Presentations -Assignments -written exams
1.2	Outline the global environmental issues, climate change, understand how pollution affect plants physiology.		Two credits weekly lectures	Quizzes -Presentations -Assignments -written exams
2.0	Skills			
2.1	Interpret and analyze how plants uptake, transport, and utilize water.		-Two credits weekly lectures -Tutorials	-Presentations -Assignments -written exams
2.2	Relate between various environmental stimuli and plants response and metabolism including biotic and abiotic		-Two credits weekly lectures -Tutorials	-Presentations -Assignments -written exams
2.3	Design a research study in plant environmental physiology using critical thinking and the acquired skills		-Two credits weekly lectures -Tutorials	-Presentations -Reports
3.0	Values, autonomy, and responsibility			
3.1	Show independence and responsibility and cooperate		Group discussions	-Presentations -Reports

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No	List of Topics	Contact Hours
1.	Fundamental Concepts: Understand the basic principles of plant environmental physiology. Comprehend the importance of studying plant responses to environmental factors for agriculture, ecology, and conservation. Water Relations: Analyze how plants uptake, transport, and utilize water. Evaluate adaptations of plants to water stress and different soil conditions.	4
2.	Photosynthesis and Light Responses: Grasp the processes involved in photosynthesis. Understand how light influences plant growth and development. Analyze how plants optimize photosynthesis under different light conditions.	4
3.	Temperature Responses: Examine the effects of temperature on plant growth and metabolism. Evaluate plant responses to cold and heat stress. Understand photoperiodic responses and vernalization.	3
4.	Environmental Signals and Plant Development: Examine how environmental cues influence plant development. Understand the role of plant hormones in growth and responses to stimuli. Explore the molecular mechanisms underlying plant responses to environmental signals.	4
5.	Global Environmental Issues: Recognize the impact of climate change on plants. Understand how pollution affects plant physiology.	3

	Explore conservation strategies and sustainable practices in the context of plant environmental physiology.	
6.	Critical Thinking and Problem-Solving: Develop critical thinking skills in analyzing complex physiological processes. Apply knowledge to solve problems related to plant responses to environmental challenges.	4
7.	Research and Presentation skills Conduct independent research on specific aspects of plant environmental physiology. Effectively communicate research findings through presentations and reports.	2
Total		30

D. Students Assessment Activities:

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Midterm exam-1	5 th week	20%
2.	Midterm exam-2	10 th week	20%
3.	Assignments, presentations, attendance, data search, participation	Throughout the course duration	20%
4.	Final exam	16 th 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	Lincoln Taiz, Ian Max Moller, Angus Murphy, Eduardo Zieger (2022). Plant Physiology and Development. Sinauer Associates.
	Taiz, Lincoln, and Eduardo Zeiger. Plant Physiology. Sinauer Associates, 2010.
	Fitter, A. H., & Hay, R. K. M. (2002). Environmental Physiology of Plants. Academic Press.
	Wünschiers, R. (2013). Computational Biology: A Practical Introduction to BioData Processing and Analysis with Linux, MySQL, and R. Wiley-Blackwell.



Supportive References

1. **Plant Physiology Online (American Society of Plant Biologists)**
 - Offers a variety of educational resources, including animations, teaching tools, and articles. (<https://plantae.org/education/>)
2. **NCBI Bookshelf - Plant Physiology Section**
 - Provides access to various online books related to plant physiology. (<https://www.ncbi.nlm.nih.gov/books/>)
3. **BioMan Biology: Plant Physiology Simulations**
 - Interactive simulations and virtual experiments for plant physiology concepts. (<https://biomanbio.com/HTML5Simulations/plantPhysMain.html>)
4. **Virtual Plant Cell (University of North Carolina)**
 - An interactive resource providing insights into plant cell structure and function. (<https://www.bio.unc.edu/faculty/hugheslab/vpc/vpc.htm>)

Electronic Materials

Other Learning Materials

2. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classroom
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	Indirect
Effectiveness of students assessment	Faculty	Direct
Quality of learning resources	Faculty	Direct
The extent to which CLOs have been achieved	Faculty	Direct
Other		



Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval Data:

COUNCIL /COMMITTEE	BIOLOGY DEPARTMENT COUNCIL
REFERENCE NO.	23
DATE	23/8/1445

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