هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification
(Bachelor)

Course Title:	*Plant Physiology*
Course Code:	*BIO1310*
Program:	*Bachelor of Science in Biology*
Department:	*Department of Biology*
College:	*Faculty of Science*
Institution:	*University of Tabuk*
Version:	***Course Specification Version Number***
Last Revision Date:	*September 2023*

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
3 Credit (2 theoretical + 1 practical) hours					
2. Course type					
A.	☐University	☐ College	☒ Department	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: (6th Level / 3rd year)					
4. Course general Description:					
The course aims to give students a detailed and comprehensive idea of the basics of the various processes within the plant. The course will cover a comprehensive knowledge of plant organ functions including plant cell water relations, uptake of water and minerals, translocation of solutes, definition, and importance of enzymes, photosynthesis, and respiration as well as plant growth and hormones, and plant tissue culture.					
5. Pre-requirements for this course (if any)**:**					
General Botany 2 (BIO1301)					
6. Co-requirements for this course (if any)**:**					
None.					
7. Course Main Objective(s):					
By the end of this course, the students should be able to: - This course provides an introduction of the major concepts of plant physiology. - Identifies how plant structures are related to its function. - Describes the fundamental functions of plants at all levels; cells, tissues, organs, and the whole plant systems growth and development.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	2	50%
2	E-learning		
3	Hybrid • Traditional classroom		

No	Mode of Instruction	Contact Hours	Percentage
	• E-learning		
4	Distance learning		
5	**Others (Lab work)**	2	50%

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 CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	Recognize the concept and importance of plant water relations and related processes.	K1	-Lectures. -Class discussion. -Group discussion. -Case studies.	-Quizzes -Midterm examination. -Final examination. -Class discussion and participation. - Homework (Problem-solving).
1.2	Describe the relationship between water potential, solute potential,	K2	-Lectures. -Class discussion. -Group discussion. -Homework assignments.	-Quizzes -Midterm examination.

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	turgor pressure and movement of water and solutes in plants		-Case studies.	-Final examination. -Class discussion and participation. -Homework assignments.
2.0	**Skills**			
2.1	Prepare different types of solutions and identify the deficiency of macro- and micronutrients in plants.	S1	-Lectures. -Lab work. -Class discussion. -Group discussion. -Brainstorming.	-Quizzes -reports -Final examination. -Class discussion and participation. - Homework (Problem-solving).
2.2	Compare between types of growth and differentiation stages as well as classes and types of growth regulators.	S2	-Lectures. - Lab work. -Class discussion. -Group discussion. -Brainstorming.	-Quizzes -reports -Final examination. -Class discussion and participation. - Homework (Problem-solving).
2.3	Describe the types and techniques of plant tissue culture for conservation and micro propagation.	S3	-Lectures. -Lab work. -Class discussion. -Group discussion.	-Quizzes -reports -Final examination.

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
			-Brainstorming.	-Class discussion and participation. - Homework (Problem-solving).
3.0	**Values, autonomy, and responsibility**			
3.1	Work independently and as part of a team	V1	-Lab demonstration. -Short essay -Class discussion. -Group discussion.	-Class discussion and participation. -Homework (Problem-solving).

C. Course Content

No	List of Topics	Contact Hours
1.	Course introduction	2
2.	**Introduction to the concept of Plant Physiology:** General Processes, Structure of plant cell, protoplast, structure and properties of water, pH value, solutions &buffer solution, colloidal systems	2
3.	**Plant Cell-Water Relations:** Water in Plant Life, Water-movement processes (imbibition, diffusion, and osmosis), Plant-Cell Osmotic System, relation between water potential, solute potential, and turgor pressure, Factors affecting the osmotic pressure of plant cells, Membranes and Permeability.	2
4.	**Plant- Water Relations:** Water in the soil, Types of water absorption by roots, Factors affecting water absorption, Water transport through the Xylem, to leaf and to the atmosphere (Transpiration), Factors affecting transpiration	2
5	**Mineral Nutrition:** Micronutrition, Nutritional deficiencies, Symptoms and plant disorders, Treating nutritional deficiencies, Soil, roots, and microbes interactions	2
6.	**Mineral Nutrition**: macro nutrition, Nutritional deficiencies, Symptoms and plant disorders, Treating nutritional deficiencies, Soil, roots, and microbes interactions	2

7.	**Introduction to Enzymes:** General characteristics & distribution of enzyme, Factors affecting enzyme activity	2
8.	**Introduction to Enzymes:** Classification of enzymes, Relationship between enzyme Structure and enzyme activity, Enzyme-Catalysed Reactions, Assays of Enzymes	2
9.	**Photosynthesis:** The Light Reactions (Key Experiments in Understanding Photosynthesis, Organization of the Photosynthetic Apparatus, Organization of Light-Absorbing Antenna Systems, Mechanisms of Electron Transport)	2
10.	**Photosynthesis:** The Carbon Reactions (Calvin-Benson Cycle, C_2 Oxidative Photosynthetic Carbon Cycle, C4 Carbon Cycle, CAM Cycle),Physiological and ecological considerations of photosynthesis	2
11.	**Translocation in the Phloem:** Pathways of Translocation, Patterns of Translocation: Source to Sink, Materials Translocated in the phloem, The Pressure-Flow Model- a Passive Mechanism for Phloem Transport, Phloem Loading & Unloading and Sink-to-Source Transition	2
12.	**Respiration:** Glycolysis, The Oxidative pentose phosphate pathway, The Citric acid cycle, Mitochondrial electron transport and ATP synthesis	2
13.	**Lipid Metabolism:** Lipid Metabolism, Role fats and oils in plants, Fatty acid and Glycerolipids biosynthesis in Plants	2
14.	**Introduction to Plant Growth and Development:** Definition, types, and importance, Role of Plant Hormones and Plant Growth Regulators (Auxin, Gibberellins, Cytokinins, Ethylene, Abscisic acid, Brassinosteroids)	2
15.	**Introduction to Plant Tissue Culture**: Definition, History, types of techniques/cultures, and importance	2
Total		**30**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Class Participation	During whole teaching period	5
2.	Homework (Problem-solving)	3 to 13	5
3.	Short Exams (Quizzes)	During whole teaching period	5

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
4.	Midterm Theoretical Examination	8-9	20
4.	Reports (For Practical)	During whole teaching period	10
5.	Final Practical Examination	15	15
6.	Final Theoretical Examination	17	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 Møller, Angus Murphy, and Eduardo Zeiger (2022): Plant Physiology and Development. 7th Edition. Oxford University Press. - William G. Hopkins and Norman P. A. Hüner. (2009): Introduction to plant physiology. 4th ed., Wiley. - Practical Plant Physiology Paperback –(2018) by Frederick Keeble and M.C. Rayner. White Press.
Supportive References	- General Plant Physiology - Part II - reform, Mohammad Omar, Ali Crescent, Mohammed Hamad Al Wahaibi - King Saud University Press for publishing scientific and presses - Riyadh (2002). - Saudi Digital Library.
Electronic Materials	- www.ucalgary.ca/plantmetabolism - www.ecomii.com/.../plant-metabolism - www.ufv.br/dbv/pgfvg/.../metabolism/NMR.pdf
Other Learning Materials	- Microsoft office package.

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Well-equipped classrooms and laboratories that accommodate a sufficient number of students.
Technology equipment (projector, smart board, software)	Multimedia projectors and smart boards.
Other equipment (depending on the nature of the specialty)	- Lecture slides. - Reference Book.

Items	Resources
	- Well-equipped biology laboratory

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	- Students. - Faculty members.	Indirect & direct: - Questionnaires. - Meetings.
Effectiveness of Students assessment	- Quality and development committee. - Department chair.	- Course report. - Program annual report.
Quality of learning resources	- Plan and program committee. - Students. - Staff members.	Indirect & direct: - Questionnaires. - Meetings. - Reports.
The extent to which CLOs have been achieved	- Quality and development committee. - Peer Reviewer. - Program leaders.	Indirect & direct: - Questionnaires. - Meetings. - Reports.
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	PROGRAMS AND STUDY PLANS COMMITTEE
REFERENCE NO.	
DATE	SEPTEMBER 2023