

## Course Description Form

1. Course Name:	
Plant physiology	
2. Course Code:	
PLPH210	
3. Semester / Year:	
First Semester (Autumn) / 2024-2025	
4. Description Preparation Date:	
1/9/2024	
5. Available Attendance Forms:	
Presence	
6. Number of Credit Hours (Total) / Number of Units (Total)	
(2 theoretical + 3 practical = 5 hours) × 15 weeks = 75 hours / 3.5 units	
7. Course administrator's name (mention all, if more than one name)	
Name: Assist. Prof. dr. Omar A. Abdulqader	
Email: <a href="mailto:edu3ab@uomosul.edu.iq">edu3ab@uomosul.edu.iq</a>	
Name: Assist. Lect. Saddam Ibrahim Yahya	
Email: <a href="mailto:saddam.alobaidi@uomosul.edu.iq">saddam.alobaidi@uomosul.edu.iq</a>	
8. Course Objectives	
<b>Theoretical:</b> <ul style="list-style-type: none"> <li>- Enable the student to understand how plant organs and tissues and cell work.</li> <li>- Enable the student to understand the impact of the mechanism environmental conditions on the work of plant organs and tissues and cells.</li> <li>- Enable the student to understand the mechanism in which metabolisms processes (anabolism and catabolism) take place and the factors affecting them.</li> <li>- Enable the student to detect cells and tissues using a microscope.</li> <li>- Enable the student to detect the progress of metabolism processes and the outcome of the total metabolism in plants.</li> </ul>	<b>Practical:</b> <ul style="list-style-type: none"> <li>- Enable the student to identify the most important laboratory methods in detecting plant cells and tissues.</li> <li>- Enable the student to identify the most important laboratory methods in the preparation of solutions and their types, and the method of mixing and adjusting the concentration of solutions, and measuring their concentration.</li> <li>- Enable the student to learn how to measure: water potential, inflationary pressure, water equilibrium, water productivity, water consumption efficiency, transpiration rate, growth, zero growth, daily growth rate, cumulative temperatures, photosynthesis, net photosynthesis,</li> </ul>

<ul style="list-style-type: none"> <li>- The student can judge and evaluate the speed of metabolism processes and their impact on the growth rate and yield.</li> </ul>	respiratory rate, pigment measurement and diagnosis, anabolism, catabolism. <ul style="list-style-type: none"> <li>- Enable the student to identify the diagnosis of nutrient deficiency through the symptoms that affect plants.</li> </ul>
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## 9. Teaching and Learning Strategies

### Theoretical:

- Interactive Lecture
- Brainstorming
- Dialogue and discussion
- Assignment and report
- Presentations of models of the effects of environmental changes and their impact on crop growth and metabolism processes in those crops.
- It is mandated to prepare a report on one of the topics of plant physiology and to discuss it in it.
- Scientific visits.

### Practical:

- Commissioning teamwork to reveal leadership skills.
- Assigning tasks and a report for each experiment.



## 10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2Theoretical 3Practical	<b>Theoretical(a1, c1):</b> The student learns about the function of the components of cells, tissues and organs, how to apply the concepts and functions of cells, tissues and organs with the environmental conditions <b>Practical(b1):</b> examines and distinguishes cells and tissues of all kinds	<b>Theoretical:</b> Plant cells, tissues and organs: introduction, plant cell components and functions, laboratory safety. <b>Practical:</b> Electron Microscopy, Laboratory Safety Instruments	<b>Theoretical:</b> auditory styles, blackboard writing style, direct dialogue style <b>Practical:</b> assignment and report	Quizzes, assignments, discussions
2	2Theoretical 3Practical	<b>Theoretical(a2, c2):</b> The student gets acquainted with the solutions and adjusts their concentrations, preparing and adjusting the concentration of solutions in line with the needs of plants. <b>Practical(c7):</b> determines the concentration and type of solution	<b>Theoretical:</b> Solutions: types of solutions, properties of Cell Sap, how to distinguish the type of solutions. <b>Practical:</b> preparation and adjustment of the concentration of solutions	<b>Theoretical:</b> auditory styles, blackboard writing style, direct dialogue style <b>Practical:</b> assignment and report	Quizzes, assignments, discussions



3	2Theoretical 3Practical	<b>Theoretical(a3):</b> Knows what spread, imbibition and osmotic solution <b>Practical(b2):</b> Using dyes, it reveals fusion, osmotic and imbibing	<b>Theoretical:</b> Mechanism of fluid transport: diffusion, Imbibition, osmosis. <b>Practical:</b> Diffusion - Osmotic and Imbibition Experiments	<b>Theoretical:</b> auditory styles, blackboard writing style, direct dialogue style <b>Practical:</b> assignment and report	Quizzes, assignments, discussions, field assessment
4	2Theoretical 3Practical	<b>Theoretical(a4):</b> The student recognize by the morphology of the plants on the stage of growth or phase that the plant passes through <b>Practical(b3):</b> Measures growth and its rates	<b>Theoretical:</b> plant growth and development, plant cell detection: growth stages, growth measures, Differentiation. <b>Practical:</b> Measuring Growth	<b>Theoretical:</b> auditory styles, blackboard writing style, direct dialogue style, scientific visit <b>Practical:</b> assignment and report	Quizzes, assignments, discussions, report l
5	2Theoretical 3Practical	<b>Theoretical(a5):</b> The student understands the nature of growth in plants through the metabolism of demolition and construction in plants <b>Practical(b4):</b> reveals the phase and growth in plants	<b>Theoretical:</b> metabolism, catabolism and anabolism: primary metabolites, secondary metabolites. <b>Practical:</b> Measuring the curve of growth and its forms	<b>Theoretical:</b> auditory styles, blackboard writing style, direct dialogue style <b>Practical:</b> assignment and report	Quizzes, assignments, discussions, report l, field assessment
6	2Theoretical 3Practical	<b>Theoretical (a6,c3):</b> Identify the importance of secondary metabolic compounds and their role in protecting plants; identify problems of low photosynthesis processes, identify and treat the causes of high respiration <b>Practical(b5):</b> Distinguish primary and secondary metabolic compounds and their functional roles in plants	<b>Theoretical:</b> Water and plants: methods of water absorption, efficiency of water consumption. <b>Practical:</b> Measuring Water Consumption Efficiency and Water Balance	<b>Theoretical:</b> auditory styles, blackboard writing style, direct dialogue style <b>Practical:</b> assignment and report	Semester test, assignment, discussions
7	2Theoretical 3Practical	<b>Theoretical(a7, c4):</b> The student learns about the mechanism of transpiration and how direct and indirect factors are affected by it, determining the zero-growth and the carbon neutrality point and determining the times of photosynthesis based on that, predicting the date of flowering, maturity and water consumption based on the indicators of anabolism, catabolism and growth rates. <b>Practical(b6):</b> Reveals the types, amount and	<b>Theoretical:</b> Transpiration and the factors affecting it: an introduction to the movement of water in plants, types of transpiration, stomata envelopes. <b>Practical:</b> Measurement of transpiration velocity, detection of plant stomata	<b>Theoretical:</b> auditory styles, blackboard writing style, direct dialogue style <b>Practical:</b> assignment and report	Quizzes, assignments, discussions

		speed of transpiration in different parts of plants			
8	2Theoretical 3Practical	<b>Theoretical (a8,c5):</b> Illustrates the method of measuring the growth of plants, adjusting and determining the flowering and maturity period based on aggregate temperatures. <b>Practical(b7):</b> Tests daily growth and net photosynthesis	<b>Theoretical:</b> growth and methods of measurement, stages and phases of growth. <b>Practical:</b> Relationship of transpiration to growth, use of stomata envelopes	<b>Theoretical:</b> auditory styles, blackboard writing style, direct dialogue style, scientific visit <b>Practical:</b> assignment and report	Quizzes, assignments, discussions
9	2Theoretical 3Practical	<b>Theoretical(a9):</b> Aware of the absorption water by plants and how it is transmitted within plants <b>Practical(b8):</b> Conducts experiments on plants that demonstrate the mechanism of water absorption by plants	<b>Theoretical:</b> water absorption and transport within plants: water channels, negative absorption, Active absorption. <b>Practical:</b> Water Absorption Experiments	<b>Theoretical:</b> auditory styles, blackboard writing style, direct dialogue style <b>Practical:</b> assignment and report	Quizzes, assignments, discussions
10	2Theoretical 3Practical	<b>Theoretical(a10,c6):</b> Identify the mechanism of absorption of nutrients by plants, addressing the causes of low water consumption efficiency <b>Practical(b9):</b> Examines the absorption of salt-sensitive and tolerance plants in solutions of different concentrations	<b>Theoretical:</b> absorption of nutrients and factors affecting them, absorption of nutrients and factors affecting them <b>Practical:</b> Nutrient Solutions	<b>Theoretical:</b> auditory styles, blackboard writing style, direct dialogue style <b>Practical:</b> assignment and report	Quizzes, assignments, discussions
11	2Theoretical 3Practical	<b>Theoretical(a11):</b> Recognizes the Disadvantages of Photosynthesis Science in C. Plants <b>Practical(c1):</b> Determines the preference for the growth of C4 and C3 crops in climatically different regions	<b>Theoretical:</b> Photosynthesis and Factors Affecting it <b>Practical:</b> Measuring the content and index of chlorophyll	<b>Theoretical:</b> auditory styles, blackboard writing style, direct dialogue style <b>Practical:</b> assignment and report	Semester test , assignment, discussions
12	2Theoretical 3Practical	<b>Theoretical(a12):</b> Understands the mechanism of respiratory at every stage of growth and its relationship to senescence <b>Practical(b10):</b> Measures aerobic and anaerobic respiration	<b>Theoretical:</b> respiration and Factors Affecting it <b>Practical:</b> calculation of respiration in plants of all kinds	<b>Theoretical:</b> auditory styles, blackboard writing style, direct dialogue style <b>Practical:</b> assignment and report	Quizzes, assignments, discussions
13	2Theoretical 3Practical	<b>Theoretical(a13):</b> Justifies and judges a scientific debate about the causes of seed dormancy and their importance in the spread of plants in nature	<b>Theoretical:</b> Seed dormancy, seed germination <b>Practical:</b> Germination Experiments	<b>Theoretical:</b> auditory styles, blackboard writing style, direct dialogue style	Quizzes, assignments, discussions



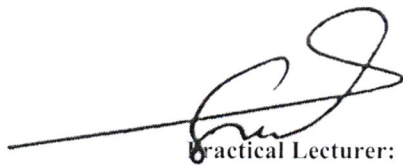
		<b>Practical(c2):</b> Seed tests determine their vitality and readiness for sowing		<b>Practical:</b> assignment and report	
14	2Theoretical 3Practical	<b>Theoretical(a14):</b> Identifying the Positive and Negative Role of Using Growth Regulators <b>Practical(c8):</b> Determines the type and concentration of growth regulators needed to produce different effects of growth	<b>Theoretical:</b> Growth Regulators <b>Practical:</b> Preparing Growth Regulators	<b>Theoretical:</b> auditory styles, blackboard writing style, direct dialogue style <b>Practical:</b> assignment and report	Quiz, assignment, discussions
15	2Theoretical 3Practical	<b>Theoretical(a15):</b> Distinguish the types of enzymes in plants and their functional importance in plants <b>Practical(b11):</b> Distinguish the effects of different enzymes	<b>Theoretical:</b> Enzymes, their types and mechanism of action <b>Practical:</b> Enzyme Detection	<b>Theoretical:</b> auditory styles, blackboard writing style, direct dialogue style <b>Practical:</b> assignment and report	Quiz, assignment, discussions, practical field project

## 11. Course Evaluation

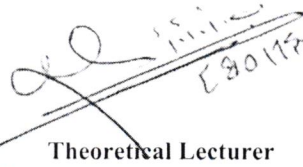
No.	Evaluation methods	Calendar date (week)	Grade	Relative weight %
1	Report 1	Fourth week	2.5	2.5
2	Report 2	Fifth week	2.5	2.5
3	Quiz (1)	Sixth week	2	2
4	Quiz (2)	Fourteenth week	2	2
5	Quiz (3)	Fifteenth week	1	1
6	Semester Exam (1)	Sixth week	7.5	7.5
7	Semester Exam (2)	The first week is difficult	7.5	7.5
8	Final theoretical test	Final Semester Exams	40	40
9	Practical field project	Fifteenth week	5	5
10	Field Assessment	Third and fifth week	2	2
11	Practical Quiz (1)	First week	1	1
12	Practical Quiz (2) Quiz	Fourth week	0.5	0.5
13	Practical Quiz (3) Quiz	Fourteenth week	1	1
14	Homework and discussions	All weeks	5.5	5.5
15	Final Practical Test	Final Semester Exams	20	20

	Total	100	100%	100%
<b>12. Learning and Teaching Resources</b>				
Required textbooks (curricular books, if any)	Lectures prepared by the subject teacher			
Main references (sources)	<p><b>Lambers, H., Chapin, F. S., &amp; Pons, T. L. (2008).</b> Plant physiological ecology (Vol. 2, pp. 11-99). New York: Springer.</p> <p><b>Mohr, H., &amp; Schopfer, P. (Eds.). (2012).</b> Plant physiology. Springer Science &amp; Business Media.</p> <p><b>Kochhar, S. L., &amp; Gujral, S. K. (2020).</b> Plant physiology: Theory and applications. Cambridge University Press.</p> <p><b>THOMAS LAZAR, Taiz, L. and Zeiger, E.(2003).</b> Plant physiology. 3rd edn., Annals of Botany, Volume 91, Issue 6, May, Pages 750–751.</p> <p><a href="https://doi.org/10.1093/aob/mcg079">https://doi.org/10.1093/aob/mcg079</a></p>			
Recommended books and references (scientific journals, reports...)	<p><b>Bajracharya, D. 1999.</b> Experiments in Plant Physiology – A Laboratory Manual. New Delhi: Narosa Publishing House.</p> <p><b>Bhatla, S. C. and Lal, M. A.. 2018.</b> Plant Physiology, Development and Metabolism. Singapore: Springer.</p> <p><b>Dennis, D. T. et al. 1997.</b> Plant Metabolism. New York: Addison Wesley/Longman.</p> <p><b>Devlin, R. M. 2017.</b> Outline of Plant Physiology. India: MedTech.Google Scholar</p> <p><b>Devlin, R. M., Witham, F. H., and Blaydes, D. F.. 2017.</b> Exercises in Plant Physiology. 2nd ed. India: MedTech.</p> <p><b>Fitter, A., and Hay, R.. 2012.</b> Environmental Physiology of Plants. 3rd ed. Academic Press.</p> <p><b>Maheshwari, S. C. 2003.</b> 'A Rise of Experimental Plant Physiology in India–A Personal View'. Souvenir: 2nd International Congress of Plant Physiology, New Delhi, India. 1–13.Google Scholar</p> <p><b>Mauseth, J. D. 2019.</b> Botany–An Introduction to plant Biology. 6th ed. Boston: Jones and Bartlett Publishers.Google Scholar</p> <p><b>Narwal, S. S. et al. 2009.</b> Plant Biochemistry. Studium Press, LLC.Google Scholar</p> <p><b>Nelson, D. L., and Cox, M. M.. 2017.</b> Lehninger Principles of Biochemistry. 7th ed. Machmillan Higher Education.Google Scholar</p> <p><b>Kärrin, Nickelsen, and Govindjee, . 2011.</b> The Maximum Quantum Yield Controversy: Otto Warburg and the 'Midwest-Gang'. Bern Studies in the History and Philosophy of Science, University of Bern. Switzerland: Institut für Philoshie.</p> <p><b>Voet, D., and Voet, J. G.. 2019.</b> Fundamentals of Biochemistry. 5th ed. New York: John Wiley Sons Inc.</p>			
Electronic Websites	References,	<p>Plant Physiology Journal – American Society of Plant Biologists</p> <p><a href="https://academic.oup.com/plphys/advance-articles">https://academic.oup.com/plphys/advance-articles</a></p> <p>Plant &amp; Cell Physiology (PCP)</p> <p><a href="https://academic.oup.com/pcp/advance-articles">https://academic.oup.com/pcp/advance-articles</a></p> <p>American Society of Plant Biologists</p> <p><a href="https://aspb.org/">https://aspb.org/</a></p> <p>Journal of Plant Physiology</p>		

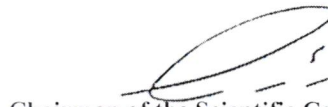
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<https://www.springer.com/journal/40502>  
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<https://cms.botany.org/home.html>  
Botany- Canadian Science Publishing  
<https://cdnsiencepub.com/journal/cjb>  
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Practical Lecturer:  
Assist. Lec. Saddam Ibrahim Yahya

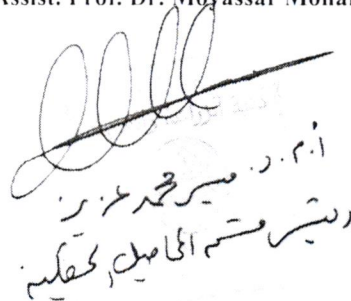


Theoretical Lecturer  
Assist. Prof. Dr. Omar A. Abdulqader



Chairman of the Scientific Committee  
Prof. Dr. Weam Yahya Rashid

Head of Field Crops Dep.  
Assist. Prof. Dr. Moyassar Mohammed Aziz



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