



RAFFLES
UNIVERSITY

TEACHING PLAN: Fundamental of Crop Physiology

SCHOOL: (SOAS) SCHOOL OF AGRICULTUR AL SCIENCES		ACADEMIC SESSION: 2023-2024		FOR STUDENTS' BATCH: 1 st Year 2 nd Semester		
1	Course No.	ACP-T-101				
2	Course Title	Fundamental of Crop Physiology				
3	Credits	2				
4	Learning Hours		Contact Hours	72		
			Assessment	9		
			Guided Study	9		
			Total hours	90		
5	Course Objective	1. Impart the knowledge of physiological phenomenon in plant cells, absorption of water, transpiration, diffusion, osmosis, imbibitions, mineral nutrition of plants, plant growth and regulators, etc. 2. Develop the understanding of mechanisms of various metabolic processes in plants - photosynthesis, respiration, fat metabolism, plant growth, nutrient absorption, etc. 3. Develop an ability to identify C3, C4 and CAM plants, analyze the physical and chemical factors regulate plant growth, evaluate visual symptoms of nutrients deficiency in plants, etc.				
6	Course Outcomes	1. Role of crop physiology in crop health plant cell diffusion osmosis and absorption of water 2. Identification of deficiency symptoms of nutrients and mineral nutrition 3. To understand the metabolic and synthetic pathway of bio molecules photosynthesis 4. To know the difference between C3, C4 and CAM plant respiration glycolysis and fat metabolism 5. To understand Importance of growth hormone in plant and its function and type of plant hormone				
7	Outline syllabus:					
7.01	Paper Code	Unit	Introduction		Page Numbers ¹	Lect ures
7.02	AGP-T-101	Unit I	Unit-1: Introduction to crop physiology and its importance in Agriculture Unit-2: Plant cell: an Overview; Diffusion and osmosis; absorption of water Unit-3: Transpiration and stomata physiology		1-62	1 to 3
7.03		Unit II	Unit-1: Mineral nutrition of plants Unit 2: Functions and deficiency symptoms of nutrients Unit-3: Nutrient uptake mechanisms; photosynthesis Unit-4: Light and Dark reactions, C3, C4 and CAM plants		63-126	3 to 7
7.04		Unit III	Unit-1: Respiration: Glycolysis		127-150	7 to

			Unit-2: TCA cycle and electron transport chain Unit-3: Fat Metabolism Unit-4: Fatty acid synthesis and breakdown		11
7.05		Unit IV	Unit-1: Plant growth regulators: Unit-2: Physiological roles and agricultural uses Unit-3: Physiological aspects of growth and development of major crops Unit-4:Growth analysis Unit-5:Role of physiological growth parameters in crop productivity	180-229	11 to 14
8	Course Evaluation				
8.1	CA: 10%				
8.11	Attendance	25%			
8.12	Homework	2 Assignments-50%			
8.13	Quizzes	2 Quizzes, 25%			
8.14	Projects				
8.15	Presentation				
8.16	Any other	Practical examination-15%			
8.2	MTE	30%			
8.3	End-term examination: 50%				
9	Text Books & References				
9.1	Text book	Fundamental of Crop physiology TNAU publication			
9.2	References	1. Jain, J.K. 2007. Fundamentals of plant physiology, S.Chand & Company Ltd., New Delhi. 2. Pandey, S. N. and B. K.Sinha, 2006. Plant Physiology. Vikas Publishing House Private Limited, New Delhi. 3. Purohit, S.S, 2005. Plant physiology, Student edition, Jodhpur. 4. Ray Noggle, G. and Fritz, G. J., 1991. Introductory Plant Physiology. Prentice Hall of India Pvt. Ltd., New Delhi. 5. Taiz. L. and Zeiger. E., 2006. Plant Physiology. Publishers: Sinauer Associates, Inc., Massachusetts, USA 6.Fundamental of crop physiology by N.K Gupta and Sunita Gupta 7.Fundamental of crop physiology by Dr Rayees Ahmad and Dr Vinay Pratap singh			
9.3	Video References	1. https://www.youtube.com/watch?v=VGIZFk23JQ&t=211s 2. https://www.youtube.com/watch?v=4kkkVOZherU&t=138s 3. https://www.youtube.com/watch?v=cgQUhin849o&t=2808s 4. https://www.youtube.com/watch?v=vUjAcu-6DQ0 5. https://www.youtube.com/watch?v=n1e4mXYLq0U&t=11s			

Mapping of Outcomes v. Topics

Outcome no. → Syllabus topic↓	1	2	3	4	5
Paper Code.Unit I (1)	✓				
Paper Code. Unit I (2)	✓				
Paper Code. Unit I (3)	✓				
Paper Code.Unit II (1)		✓			
Paper Code. Unit II(2)		✓			
Paper Code. Unit II(3)			✓	✓	
Paper Code.Unit II (4)			✓		
Paper Code. Unit III(1)				✓	
Paper Code. Unit III(2)				✓	
Paper Code.Unit III (3)				✓	
Paper Code. Unit III(4)				✓	
Paper Code. Unit IV(1)					✓
Paper Code.Unit IV (2)					✓
Paper Code. Unit IV(3)					✓
Paper Code. Unit IV(4)					✓
Paper Code. Unit IV(5)					✓

Question Bank

Unit-I

A) Multiple choice questions

1. The rate of transpiration will _____ if the atmospheric pressure is low
 - a. Increase
 - b. Decrease
 - c. Stay unchanged
 - d. Can't be determined
2. The main function of guard cells is to help with _____
 - a. Transpiration
 - b. Guttation
 - c. Transcription
 - d. None of the above
3. Transpiration is regulated by the movements of _____
 - a. Parenchyma cells
 - b. Guard cells
 - c. Epithelial cells
 - d. None of the above
4. The steroid hormones easily pass through the plasma membrane through simple diffusion because they are _____
 - a. Gaseous
 - b. Carbon-based
 - c. Water Soluble
 - d. Lipid Soluble
5. Living cells placed in an isotonic solution tend to retain their shape and size. This is based on the principle of
 - a. Diffusion
 - b. Transpiration
 - c. Osmosis
 - d. None of the above

6. Girdling around the trunk of a tree can cause it to _____ if it cannot regrow to bridge the wound
- Stop absorbing water
 - Stop growing
 - Die
 - None of the above

B) Write short notes on the following

1. Define transpiration. Briefly explain types of transpiration in plants
- 2 Briefly explain the process of diffusion.
- 3 Which color of light is most efficient in photosynthesis and why?
- 4 Define photosynthesis along with its equation and write its significance to mankind
- 5 Explain water absorbing structures in plants
- 6 Differentiate between macro and micro nutrients of plants

C) Descriptive question

1. What does the discipline of crop physiology deals with? Explain its importance in agriculture.
2. Which hormone is known as stress hormone? Explain the mechanism of stomatal closure due to this hormone during drought stress.
3. Differentiate between C3 and C4 plants.
4. Differentiate between Respiration and Photosynthesis.

Unit-II

A) Multiple choice questions

1. How many essential nutrients does a plant require?
(a) 15
(b) 17
(c) 16
(d) 20
2. Which of the following minerals plays a major role in energy storage and transfer of ADP into ATP molecules?
(a) Phosphorus
(b) Magnesium
(c) Molybdenum
(d) None of the above
3. Plants absorb nutrients through their _____.
(a) Roots
(b) Stem
(c) Leaves
(d) Flowers
4. Which of the following minerals helps in improving both the quantity and quality of dry matter in leafy vegetables and protein in grain crops?

- (a) Iron
- (b) Copper
- (c) Nitrogen
- (d) Molybdenum

B) Write short notes on the following

1. Explain the phenomenon of apical dominance in plants
2. Differentiate between climacteric and non – climacteric fruits.
3. Differentiate between symport and antiport.
4. How carrier proteins help in the uptake of mineral nutrient through roots?
5. Explain movement of water when a resin is put in distilled water.

C) Descriptive question

1. Explain the mechanism of C₃ cycle in plants.
2. Explain Z scheme of photosynthesis.
3. What is LEA protein? How ABA promotes desiccation tolerance in seeds
4. Explain ion exchange mechanism of uptake of mineral nutrient in plants.

Unit-III

A) Multiple choice questions

1. Photosynthesis occurs in
 - a. Chloroplast
 - b. Golgi body
 - c. Endoplasmic reticulum
 - d. Nucleus
2. The optimum temperature for photosynthesis is
 - a. 25-35°C
 - b. 10-15°C
 - c. 35-40°C
 - d. 20-25°C
3. Photorespiration occurs in
 - a. Four cell organelles
 - b. Two cell organelles
 - c. One cell organelle
 - d. Three cell organelle
4. Reduction of NADP occurs in
 - a. Oxidative photophosphorylation
 - b. Cyclic photophosphorylation
 - c. Non-cyclic photophosphorylation
 - d. None
5. Kranz anatomy is found in the leaves of
 - a. Wheat
 - b. Mustard
 - c. Potato
 - d. Sugarcane

B) Write short notes on the following

1. Define phytohormone. Explain with the help of a suitable diagram the avena coleoptile curvature test for auxin.
2. Describe the effect of gibberellins on Thompson's seedless variety of grapes.
3. Write a brief note on bolting, vernalization, florigen, stratification and scarification
4. Explain the structure of chloroplast with the help of a suitable diagram.
5. What is a callus? Discuss the morphogenesis in callus when auxin : cytokinin is less than 1, greater than 1 and equal to 1.

C) Descriptive question

1. Explain the factors affecting rate of photosynthesis in plants.
2. Give examples of CAM plants. Explain the mechanism of photosynthesis in CAM plants to conserve water.
3. Briefly describe the physiological role of brassinosteroids in plants.
4. What do mean by Hypertonic, Hypotonic and Isotonic solution
5. Briefly explain tank farming. What are the drawbacks of tank- farming?

Unit-IV**A) Multiple choice questions**

1. C₃ and C₄ plants differ with respect to
 - a. Number of ATP molecules consumed
 - b. First product
 - c. The substrate which accepts carbon dioxide
 - d. All
2. In Calvin cycle, 1 molecule of glucose is formed from
 - a. $6\text{CO}_2 + 30\text{ATP} + 12\text{NADPH}$
 - b. $6\text{CO}_2 + 12\text{ATP}$
 - c. $6\text{CO}_2 + 18\text{ATP} + 12\text{NADPH}$
 - d. $6\text{CO}_2 + 18\text{ATP} + 30\text{NADPH}$
3. Light reaction takes place in
 - a. Grana
 - b. Stroma
 - c. Cytoplasm
 - d. Endoplasmic reticulum
4. Electrons from the excited chlorophyll molecules of PS-II are first accepted by
 - a. Pheophytin
 - b. Ferredoxin
 - c. Cytochrome f
 - d. Cytochrome b
5. Non-cyclic photophosphorylation results in the production of
 - a. NADH

- b. NADPH
 - c. ATP
 - d. ATP and NADPH
6. DCMU inhibits
- a. PS-I
 - b. PS-II
 - c. Oxidative phosphorylation
 - d. It destroys chloroplast

B) Write short notes on the following

1. Write a short note on hydroponics and aeroponics
2. Discuss the effect of carbon dioxide concentration and temperature on the rate of respiration.
3. Differentiate between PS I and PS II.
4. Briefly describe Red drop effect and Enhancement effect in photosynthesis
5. Which hormone is present in coconut milk? Explain its effect in delaying leaf senescence.

C) Descriptive question

1. What will be the effect on plants when excess of urea is placed in their root zone? Explain the physiological process
2. Explain the factors affecting rate of photosynthesis in plants.
3. Explain the role of salicylic acid in plant defense
4. Explain the physiological role of cytokinin in plants.
5. Explain plasmolysis along with a suitable diagram