



UNIVERSITI TEKNOLOGI MARA

AGR499: CROP SCIENCE

Course Name (English)	CROP SCIENCE APPROVED
Course Code	AGR499
MQF Credit	3
Course Description	Principles of physiological, ecological, and environmental responses that may affect growth, development and yield formation of cultivated crops under plantation sector. To provide students with an understanding and appreciation of the fundamental processes at the cellular, leaf, whole-plant, and crop canopy levels that are ultimately integrated to agronomic practices and management leading to better crop productivity and economic yield.
Transferable Skills	Knowledge, Communication, leadership, teamwork, life long learning
Teaching Methodologies	Lectures, Blended Learning, Journal/Article Critique
CLO	CLO1 Discuss the fundamental processes at the cellular, leaf, whole-plant, and crop canopy levels for the improvement of crop productivity and economic yield CLO2 Explain the principles of physiological, ecological, and environmental responses that impact growth, development and yield formation of cultivated crops under plantation sector CLO3 Collaborate, motivate and truthful with team members in the classroom and Apply the concepts, principles and theories of plant physiology to manage and improve plant growth
Pre-Requisite Courses	No course recommendations
Topics	
1. Plant Morphology and Anatomy 1.1) 1.1 Overview on Cell and Tissue morphology and anatomy: 1.2) 1.2 The Plant Body; Roots, Stems, Leaves and Buds, Flowers 1.3) 1.3 Pollination and fertilization processes, and life cycle 1.4) 1.4 Fruits and Seeds development (pre- and post-harvest physiology)	
2. Photosynthesis and Respiration 2.1) 2.1 Light and Dark Reactions of Photosynthesis 2.2) 2.2 Photosynthetic types and environmental adaptations (C3, C4, and CAM) 2.3) 2.3 Factors limiting photosynthesis in the field (water, nitrogen) 2.4) 2.4 Sun shade species and photo inhibition 2.5) 2.5 The relationship between photosynthesis and yield 2.6) 2.6 Photorespiration 2.7) 2.7 Respiration; growth and maintenance respiration 2.8) 2.8 Environmental effects on respiration	
3. Growth, Phenology and Development 3.1) 3.1 Growth, development and morphogenesis 3.2) 3.2 Phenological development and internal and environmental controls of phenology 3.3) 3.3 Quantitative Crop Growth Analysis (Individual & communities) and Growth analysis indices; Relative growth rate, Net assimilation rate, Leaf Area ratio, 3.4 Crop growth rate, Leaf area index, 3.4) 3.4 Light interception and canopy architecture, leaf angle and orientation	
4. Assimilate/Biomass Partitioning and Yield Components 4.1) 4.1 Assimilate translocation: pathways and patterns, Phloem Transport, loading and unloading 4.2) 4.2 Assimilate partitioning and remobilization: 4.3) 4.3 source-sink interaction, harvest index and yield limitation 4.4) 4.4 Assimilate partitioning and yield components improvement	

5. Mineral Nutrition of Crops

- 5.1) 5.1 Nutrient uptake and transport within plants
- 5.2) 5.2 Nitrogen and Phosphate assimilation
- 5.3) 5.3 Biological nitrogen fixation and its regulation
- 5.4) 5.4 Nutrient use efficiencies
- 5.5) 5.5 Root microbe interaction

6. Crop Water Relations

- 6.1) 6.1 Properties of water and the soil plant continuum (SPAC)
- 6.2) 6.2 The concept of water potential and the availability of water
- 6.3) 6.3 Stomatal function and its control over water and carbon exchange
- 6.4) 6.4 Transpiration and factors affecting
- 6.5) 6.5 Measurements of Plant Water Status
- 6.6) 6.6 Water use Efficiency; physiology and agronomy perspective

7. Growth Hormones and Plant Growth Regulators

- 7.1) 7.1 Growth hormones and plant control and development
- 7.2) 7.2 Natural hormones and PGR; Auxin, Gibberelic Acid, cytokinin, ethylene, abscisic acid
- 7.3) 7.3 Commercial PGR in agriculture

8. Crop Stress Physiology

- 8.1) 8.1 Water deficit and drought tolerance
- 8.2) 8.2 Temperature stress: heat
- 8.3) 8.3 Flooding and hypoxic stress: the suffocation of plant tissues
- 8.4) 8.4 Salinity stress: the salt injury
- 8.5) 8.5 Abiotic; heavy metals, pollutants

Assessment Breakdown	%
Continuous Assessment	60.00%
Final Assessment	40.00%

Details of Continuous Assessment	Assessment Type	Assessment Description	% of Total Mark	CLO
	Assignment	Poster	25%	CLO2
	Online Quiz	Chapter 1 and Chapter 2	10%	CLO1
	Presentation	Video Presentation	25%	CLO3

Reading List	Recommended Text	<ul style="list-style-type: none"> • Hay R and Porter J 2006, <i>The Physiology of Crop Yield</i>, 2nd ed. Ed., Blackwell Publishing Ltd Oxford, UK
	Reference Book Resources	<ul style="list-style-type: none"> • Taiz L & Zigler E 2006, <i>Plant Physiology</i>, 4th Ed Ed., Sinaeur • William G. Hopkins and Norman P. A. Haeuner 2004, <i>Introduction to plant physiology</i>, 3rd ed. Ed., John Wiley & Sons • Lambers, Chapin and Pons 2008, <i>Plant Physiological Ecology</i>, 2nd ed Ed., Springer • Hay and Walker 1990, <i>An Introduction to the Physiology of Crop Yield</i>, Longman Scientific and Technical Harlow, England • Glass M and Parker R 2009, <i>Fundamentals of Plant Science</i>, 1st ed Ed., Cengage learning
Article/Paper List	This Course does not have any article/paper resources	
Other References	This Course does not have any other resources	