



UNIVERSITI TEKNOLOGI MARA

AGR569: BIOTECHNOLOGY FOR PLANTATION CROPS

Course Name (English)	BIOTECHNOLOGY FOR PLANTATION CROPS APPROVED
Course Code	AGR569
MQF Credit	3
Course Description	This course presents an overview of the techniques and underlying theory of plant tissue culture and genetic engineering, research and commercial applications, and issues/challenges in the area of plantation crop biotechnology. The students are not expected to be technically competent in the various areas discussed, but should be aware of the potential use of biotechnology in providing alternative, environment-friendly, cost-effective and sustainable solutions to various issues faced by plantation sector. The course will also introduce students to the use of plant biotechnology to genetically manipulated crop-plants and their potential applications focusing on the plantation crops. Among the topics discussed will be the use of genetic manipulation to improve plantation crops, to create value-added crop products, use of tissue culture in somatic breeding programmes and ethical issues associated with the application of plant biotechnology.
Transferable Skills	Critical Thinking and Problem Solving Skills
Teaching Methodologies	Lectures, Blended Learning, Field Trip, Discussion, Computer Aided Learning
CLO	CLO1 State, write and explain the concepts and applications of biotechnology in agriculture. CLO2 Verbally and visually relate and discuss the basic concept of biotechnology in solving problems related plantation crops production. CLO3 Communicate to peers and team members, in the classroom and in the fieldwork verbally and to the facilitator in writing the basic molecular biology in plant genetic transformation, plant cloning, plant tissue culture for somatic breeding program, concept and application of biotechnology in solving problems related to plantation crops production.
Pre-Requisite Courses	No course recommendations
Topics	
1. Introduction to Biotechnology 1.1) 1.1 Definition 1.2) 1.2 A Brief History of Biotechnology 1.3) 1.3 Types of Biotechnology	
2. Principles of Gene Manipulation 2.1) 2.1 Basic Molecular Biology - DNA, RNA, Proteins, Enzymes – Structure and Function 2.2) 2.2 Basic DNA Replication, RNA and Protein Synthesis 2.3) 2.3 Introduction to Recombinant DNA Technology and DNA Cloning	
3. Transgenic Plants 3.1) 3.1 Methods Used in Transgenic Plants 3.2) 3.1.1 Agrobacterium-mediated Transformation 3.3) 3.1.2 Microinjection 3.4) 3.1.3 Direct Transformation 3.5) 3.2 Application of Genetic Engineering in Agriculture 3.6) 3.2.1 Engineering herbicide resistance 3.7) 3.2.2 Engineering stress resistance 3.8) 3.2.3 Engineering nutritional quality 3.9) 3.3 Conventional breeding vs. transgenic plants	

4. Plant Tissue Culture 4.1) 4.1 Introduction to Cells and Tissue Culture 4.2) 4.2 Concept of Totipotency 4.3) 4.3 Laboratory Requirements and General Techniques 4.4) 4.4 Tissue Culture Media, Constituents and Preparation 4.5) 4.5 Initiation of Aseptic Culture
5. Plant Tissue Culture Application 5.1) 5.1 Suspension Culture, Somatic Embryogenesis 5.2) 5.2 Organogenesis, Micro Propagation 5.3) 5.3 Haploid Production and Its Application & Limitations. 5.4) 5.4 Short Term & Long Term Germplasm Conservation 5.5) 5.5 Somaclonal Variations
6. Production of Chemicals from Plants 6.1) 6.1 Productions of Primary Metabolites 6.2) 6.2 Productions of Secondary Metabolites 6.3) 6.3 Strategies for enhancing the product yield
7. Applications for plantation crops 7.1) 7.1 Oil palm 7.2) 7.2 Rubber 7.3) 7.3 Paddy
8. Ethical issues and biosafety 8.1) 8.1 Extrinsic Concerns 8.2) 8.2 Intrinsic Concerns
9. Field visit 9.1) n/a

Assessment Breakdown	%
Continuous Assessment	60.00%
Final Assessment	40.00%

Details of Continuous Assessment	Assessment Type	Assessment Description	% of Total Mark	CLO
	Assignment	Quiz	10%	CLO1
	Presentation	individual video presentation	20%	CLO2
	Test	Online test	30%	CLO1

Reading List	Recommended Text
	• Thieman WJ and Palladino MA 2013, <i>Introduction to Biotechnology</i> , 3rd Edition Ed., Pearson Benjamin Cummings

Article/Paper List
This Course does not have any article/paper resources

Other References
<ul style="list-style-type: none"> • Book Acquah G 2004, <i>Understanding Biotechnology: An Integrated and Cyber-based Approach</i>, Pearson Prentice Hall, New Jersey, United States of America • Book Borem A, Santos FR and Bowen DE 2006, <i>Understanding Biotechnology</i>, Pearson Prentice Hall, New Jersey, United States of America • Book Herren RV 2013, <i>Introduction to Biotechnology: An Agricultural Revolution, 2nd Edition</i>, Cengage Learning • Book Barnum SR 2005, <i>Biology: An Introduction, 2nd Edition</i>, Cengage Learning