UNIVERSITI TEKNOLOGI MARA

AGR506: AGRICULTURAL BIOTECHNOLOGY

Course Name (English)	AGRICULTURAL BIOTECHNOLOGY APPROVED
Course Code	AGR506
MQF Credit	3
Course Description	The course is intended to provide an introduction to the alternative solutions and value-added benefits offered by biotechnology to the plantation sector. 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, environmental-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. Among the topics discussed will be the use of genetic manipulation to improve crops, to create value-added crop products, use of tissue culture in somatic breeding programmes, biological control agent as an alternative to pesticides, the use bio fertilizers and application of biotechnology in solving energy crisis and degradation of agricultural wastes and residuals.
Transferable Skills	communication skills, problem solving skill, team skills
Teaching Methodologies	Lectures, Lab Work, Practical Classes, Discussion
CLO	CLO1 State, write and explain the concepts and applications of biotechnology in agriculture CLO2 Verify, assess and employ the concept and theory of biotechnology in agriculture. CLO3 Communicate to peers and team members, in the classroom and in the fieldwork verbally and to the facilitator in writing the basic molecular plant biology in plant genetic transformation, plant cloning, plant tissue culture for somatic breeding program and the concept of biotechnology in solving problems related to food production and energy crisis.
Pre-Requisite Courses	No course recommendations

Topics
1. Introduction to Biotechnology 1.1) 1.1 Introduction 1.2) 1.2 Importance of biotechnology 1.3) 1.2.1 Importance of Biotechnology to Agriculture 1.4) 1.3 Applications of Biotechnology in Agriculture 1.5) 1.3.1 Biopesticide 1.6) 1.3.2 Nutritional quality 1.7) 1.3.3 Shelf-life 1.8) 1.3.4 Yield enhancement 1.9) 1.3.5 Resistant plants 1.10) 1.4 Examples of Agricultural Biotechnology products
2. Principles of Gene Manipulation 2.1) 2.1 Basic structure of DNA, RNA and Protein 2.2) 2.2 Replication, Transcription and Translation 2.3) 2.3 Post-translational modification 2.4) 2.4 Application of Genetic Manipulation 2.5) 2.5 Examples of genetically modified organisms
3. Genetic Manipulation in Plants 3.1) 3.1 Mechanism of manipulation 3.2) 3.2 Example of manipulation

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4. Biological Control Agents 4.1) 5.1 Definition 4.2) 5.2 Types of biocontrol agents (Fungi, Bacteria, Virus, Nematodes, vertebrates) 4.3) 5.3 Importance of biocontrol agents 4.4) 5.4 Examples of Biocontrol agents 4.5) 5.4 Comparison between chemical control and biological control
5. Plant Tissue Culture 5.1) 4.1 Lab requirement, Aseptic environment and sterilization 5.2) 4.2 Media preparation, 5.3) 4.3 Sources of Explants 5.4) 4.4 Basic Methods 5.5) 4.5 Hardening 5.6) 4.6 Applications
6. Biofertilizers 6.1) 5.1 Definition 6.2) 5.2 Types of biofertilizers, constituents 6.3) 5.3 Importance of biofertilizers 6.4) 5.4 Examples of biofertilizers 6.5) 5.4 Comparison between chemical fertilizers and biofertilizers
7. Energy and Environment 7.1) 6.1 Bioenergy, sources and examples 7.2) 6.2 Biofuel- biodiesel, bioethanol, etc 7.3) 6.2 Statistical usage and comparison 7.4) 6.4 Carbon footprint, greenhouse gases, pollution 7.5) 6.5 Methods of harvest and production of bioenergy and biofuel

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Assessment Breakdown	%
Continuous Assessment	60.00%
Final Assessment	40.00%

Details of Continuous Assessment

Assessment Type	Assessment Description	% of Total Mark	CLO
Assignment	Students are required to write on the technical part of Biotechnology that relates to agriculture and its application.	20%	CLO2
Presentation	Video presentation pertinent of the subject matter.	10%	CLO3
Test	Online test	30%	CLO1

Reading List

Recommended Text

- **Herren Ray V 2003, *Introduction to Biotechnology : An Agricultur*, Delmar Learning New York**
- **Xu, J. and Wu, Q 2006, *Essentials of Life Science*, Thomson Learning Singapore**

Reference Book Resources

- **Acquaah, G 2004, *Understanding Biotechnology : An Integrated a*, Pearson Prentice Hall**
- **Slater, A., Scott, N.W., and Fowler, M.R 2003, *Plant Biotechnology*, Oxford University Press.**
- **Tsan, F.Y., and Awal, A 2009, *Agricultural Biotechnology Laboratory Manual*, UPENA, UiTM Shah Alam**

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

Other References: This Course does not have any other resources

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