APPROVED

AGRI S9Z02: Crop Biotechnology

Module Details

Module Code:	AGRI S9Z02
Full Title:	Crop Biotechnology APPROVED
Valid From::	Semester 1 - 2019/20 (June 2019)
Language of Instruction:	English
Duration:	1 Semester
Credits::	7.5
Module Owner::	Caroline Gilleran
Departments:	Unknown
Module Description:	The aims of this module are to provide students with knowledge of the detailed principles of crop biotechnology, with particular emphasis on genetically engineering crops for biotic stress tolerance, crop productivity and quality improvement. In addition, an interactive learning environment will be created to encourage students to develop an appreciation of using innovative biotechnological approaches relating to bioenergy crops, forestry and applications of crop biotechnology to human and animal health. This module offers a combination of interactive practical classes, field trips and lectures that will cater for a wide range of cognitive abilities on highly pertinent and legislative topics that will integrate information from various agricultural, environmental and ethical disciplines.

Module Learning Outcome	
On successful completion of this module the learner will be able to:	
#	**Module Learning Outcome Description**
MLO1	Critically assess and evaluate advanced and innovative technologies utilised in crop biotechnology.
MLO2	Investigate, appraise and constructively criticise the ethical, social and biosafety implications raised by genetically engineering crops.
MLO3	Interpret outcomes of previous crop biotechnological investigations and legislative actions, and demonstrate an ability to formulate hypothesises, determine associated risks and inform change based on the information obtained.
MLO4	Perform lab practicals effectively and efficiently and demonstrate an appreciation of the relationship between current and developing biotechnological techniques and their creative application in crop production systems.

Pre-requisite learning
Module Recommendations *This is prior learning (or a practical skill) that is strongly recommended before enrolment in this module. You may enrol in this module if you have not acquired the recommended learning but you will have considerable difficulty in passing (i.e. achieving the learning outcomes of) the module. While the prior learning is expressed as named DkIT module(s) it also allows for learning (in another module or modules) which is equivalent to the learning specified in the named module(s).*
No recommendations listed

Module Indicative Content
Introduction to soil and crop science Land utilisation; Soil nutrient management; Soil biology; Yield formation; Current and future biostimulants in agriculture; Production and application of biofertilisers; Molecular and systems biology of plants; Integrated pest management (Legislation, health concerns, biotech alternative to traditional chemistry); Entomology; Biopesticides; Ecological plant physiology; Molecular phytopathology.
Genetic engineering Plant protection and bioengineering; Gene editing; Molecular breeding; Tissue culture methods for crop improvement; Plant metabolic engineering; Plants as bioreactors. Bioinformatics for plant biotechnology. Methods of genetic engineering for; Manipulation of the rhizosphere (enhancing plant roots, symbiotic relationships); biotic stress tolerance (insects, viruses, weeds); crop productivity (manipulation of nutrient uptake); quality improvement (food nutritive value, protein, lipids, carbohydrates).
Forestry biotechnology Breeding technologies and genetic engineering technologies; Lignin-modified transgenic Trees; Fungal strategies for lignin degradation; Fibre modification, lignin reduction and extraction, and sterility; Forestry productivity; enhancement of bio-based products; gene flow and introgression.
Non traditional crops Bioenergy crop production; Fibre, hemp, flax, algae and fibre modification. Barriers to bioenergy development; Energy crop models; Production of valuable proteins for food supplements and pharmaceuticals; Alternative protein sources for fuel and food sources.
Ethics of crop biotechnology industry Risk analysis; International regulation of crop biotechnology; Case studies: GM event integration into established agricultural systems.
Possible field site visits Alltech; Teagasc; DAFM

Module Assessment

Assessment Breakdown	%
Course Work	40.00%
Final Examination	60.00%

Module Special Regulation

Assessments

Full Time On Campus

Course Work

Assessment Type	Other	**% of Total Mark**	20
Marks Out Of	0	**Pass Mark**	0
Timing	Sem 2 End	**Learning Outcome**	1,4
Duration in minutes	0		

Assessment Description
Practical skills/evaluation and report. Practical classes on plant pathology and key biotechnological techniques in crop protection.

Assessment Type	Written Report	**% of Total Mark**	20
Marks Out Of	0	**Pass Mark**	0
Timing	Sem 2 End	**Learning Outcome**	2
Duration in minutes	0		

Assessment Description
Students will conduct an assessment of the risk associated with novel GM techniques similar to the considerations of legislative bodies.

No Project

No Practical

Final Examination

Assessment Type	Formal Exam	**% of Total Mark**	60
Marks Out Of	0	**Pass Mark**	0
Timing	End-of-Semester	**Learning Outcome**	1,2,3
Duration in minutes	0		

Assessment Description
End of semester exam

Module Workload

Workload: Full Time On Campus					
Workload Type	*Contact Type*	*Workload Description*	*Frequency*	*Average Weekly Learner Workload*	*Hours*
Lecture	Contact	Weekly lectures relating to various aspects of crop biotechnology and the possible applications.	Every Week	2.60	2.5999999046325684
Practical	Contact	Two master classes (laboratory practicals)	Twice per semester	0.40	3
Directed Reading	Non Contact	Directed reading on all aspects of crop biotechnology	Every Week	3.00	3
Independent Study	Non Contact	No Description	Every Week	5.00	5
Online Contact	Contact	Online Discussion Forum	Every Week	0.50	0.5
				Total Weekly Learner Workload	11.50
				Total Weekly Contact Hours	3.50

This module has no Part Time On Campus workload.

Module Resources

Recommended Book Resources

A. Altman, Paul M. Hasegawa. (2012), Plant Biotechnology and Agriculture: Prospects for the 21st Century.
Jennie S. Popp, Marty D. Matlock, Molly M. Jahn, Nathan P. Kemper. (2012), The Role of Biotechnology in a Sustainable Food Supply.
Lindsay M. Grover. (2011), Genetically Engineered Crops: Biotechnology, Biosafety and Benefits.

Supplementary Book Resources

Khalid Rehman Hakeem, Parvaiz Ahmad, Munir Ozturk. (2013), Crop Improvement: New Approaches and Modern Techniques.
Gabriela Pechlaner. (2012), Corporate Crops: Biotechnology, Agriculture, and the Struggle for Control.
Eric Lichtfouse. (2011), Alternative Farming Systems, Biotechnology, Drought Stress and Ecological Fertilisation.
Stuart J. Smyth, Peter W.B. Phillips, David Castle. (2014), Handbook on Agriculture, Biotechnology and Development.
Wuger, D. and Cottier, T.. (2013), Genetic Engineering and the World Trade System: World Trade Forum.

This module does not have any article/paper resources

This module does not have any other resources