University of Management & Technology
School of Science & Technology
Department of Life Sciences

BT402: Agricultural Biotechnology

Lecture Schedule	Monday and Thursday 8:00am	**Semester**	Spring 2021
Pre-requisite	--	**Credit Hours**	3 hours
Instructor(s)	Muhammad Irfan Fareed	**Contact**	irfan.fareed@umt.edu.pk
Office	2	**Office Hours**	Displayed

Course Description	Manipulation of plants for better crop yield can assure food security. This course includes current knowledge of plant Biochemistry that will not only enhance the knowledge of the undergraduate students but it will also give them insights into the industrial applications of plant biotechnology. 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
Potential Outcomes	The students will be able to discuss how current molecular genetic approaches have caused tremendous advances in plant science. Students will be exposed to state-of-the-art genetic engineering techniques in plants. They will also get to know the importance of plant biochemistry for food security. The course will cover different approaches available in modern plant biotechnology. How transgenic plants are made? How tissue culturing is done for plant propagation? Answers to such questions will be explored. *Agrobacterium tumefaciens* and the genetic engineering of plants - mechanism of gene transfer from *Agrobacterium* to plants, strategies for gene transfer in plants, selected topics pertaining to plant genetic engineering. Recently developed discipline of plant synthetic biology will also be discussed. Insights on ethical issues about Genetically Modified food (GMOs) will also be included.

Content	• Plant Tissue Culture and Micro propagation • Hydroponics • Role of plant hormones in Organogenesis • Somatic embryogenesis • Transfer and sub-culturing of explants into multiplication and rooting media • Epigenetic variation • Genetic variation • Applications of somaclonal variation • Identification of somaclonal variations • **Vector design and construction** • **Promoters/Enhancers** • **CRISPR/CAS9 DNA editing technique** • Primers Design • Selectable/screenable markers • Why do we need to make transgenic plants? • Construction of transgenic plants • Floral dip transformation of *Arabidopsis thaliana* • *Agrobacterium tumefaciens* and the genetic engineering of plants • Agrobacterium Ti plasmid • Molecular mechanism of Gall formation • Cloning and Cloning Vectors • Analyzing Plant Gene Expression with Transgenic Plants • Microprojectile bombardment-mediated transformation • Selection and regeneration of transgenic plants • **Small RNAs/miRNA** • Virus Induced Gene Silencing • **Plant Disease and Protection** • Mating systems in sexually reproducing plants • Biometrical genetics and plant breeding • Gene Expression and Signal Transduction

Text book & Reference book(s)	1. **Plant Biotechnology: The genetic manipulation of plants** 2nd Edition. By Adrian Slater, Nigel Scott and Mark Fowler. Publisher: Oxford University Press. 2. **Gene Cloning and DNA Analysis** 6th Edition by T.A. Brown. Publisher: Blackwell Publishing. 3. **Plant Physiology** Third Edition by L. Taiz and E. Zeiger
Grading Policy	Assignments + Quizzes: 20% Midterm: 30% Presentation: 05% Final: 45%