MBTCR 8212T/P: Plant Biotechnology

No. of Credits	6
Theory/Composite	Composite
No. of periods assigned	4 Theory/ 3 Practical

Course description/objective:

The course is designed to

1. impart a comprehensive overview of the basic principles of plant, breeding, plant tissue culture and and introduce students to the basic methods of plant genetic engineering and transformation.
2. provide knowledge about complexity and diversity of breeding methods both in terms of genesis as well as evaluation for suitability.
3. familiarize students with an advanced understanding of specific topics in plant manipulation in vitro
4. provide a comprehensive overview of certain aspects of enhancements of plant genotypes and to enable the students to get a strong conceptual understanding of the same.

Module A (25 Marks) (2 classes / week)

UNIT I: Plant Breeding:Mass selection and Pure line selection; Bulk method, Pedigree method and Back cross method; Heterosis; Male sterility and its use in plant breeding; Molecular Marker Assisted Breeding and Genomics assisted Breeding. Introductory idea on plant phenomics.

Unit II: Concepts of plant tissue culture: History, concept, scope and culture media, Plant Growth Regulators, Aseptic techniques and laboratory safety; Concept of plant stem cells, totipotency, Micropropagation –methods, stages; Production of virus free plants; Callus culture - growth and maintenance; suspension culture - growth, maintenance and use; Single cell culture –methods and applications; Embryo culture and embryo rescue –procedures and applications; Endosperm culture and triploid plants, Cryopreservation

Unit III: Applications of plant tissue culture: Somatic embryogenesis and application; Anther and pollen culture for production of haploids; Somaclonal variation; Protoplast culture and somatic cell hybridization.

Module B (25 Marks) (2 classes / week)

UNIT IV: Gene transfer methods in plants - Direct and Indirect. *Agrobacterium* mediated gene transfer, T - DNA insertional mutagenesis, Transgene Stability and Transgene Silencing. Engineering abiotic and biotic-stress tolerant plants

UNIT V: Chloroplast transformation:chloroplast genome, advantages of chloroplast transformation, marker genes, transformation methods, designing of plastid transformation vectors and expression cassettes, homoplastomic and heteroplastomic lines, applications and limitations

Practical: 40 marks (3 classes per week)

Practical Syllabus (3 classes)

1.Isolation of genomic DNA from plant specimens
2.Extraction of protein from plant specimens
3. Plant Tissue Culture
   A. Preparation of plant tissue culture media
   B. Surface sterilization of explants
   C. Preparation of different explants and initiation of culture, study of organogenesis

Teachers Involved: SG and ARB

Recommended Texts:

1. Plant Tissue Culture: Basic and Applied - T.B. Jha and B. Ghosh
2. Introduction to Plant Biotechnology – H. S. Chawla
3. Plant Biotechnology – P. K. Gupta
4. Introduction to Plant Tissue Culture – Razdan
5. Applied and Fundamental Aspects of Plant Cell, Tissue and Organ Culture. Reinert, J. and Bajaj, Y.P.S.
6. The Genetic Manipulation of Plants - Adrian Slater, Nigel W. Scott, Mark R. Fowler
7. Plant Breeding: Principles and Methods – B. D. Singh
8. Review articles will be provided

Q.Paper Structure for End SemTheory

Module A (25)

[1 question of 10 marks (Any 1 from 2);
3 questions of 5 marks (Any 3 from 5)]
With suitable subparts

Module B (25):

[1 question of 10 marks (Any 1 from 2);
3 questions of 5 marks (Any 3 from 5)]
With suitable subparts.