

Course Code	Course Name	Credits
26BY601	PLANT BREEDING AND HORTICULTURE	04

Course Objectives

- To explain the principles of plant breeding, selection methods and hybridization
- To explain the resistance mechanisms in plants against diseases
- To understand the scopes and importance of horticulture
- To study about the different types of plant propagation and various post-harvest technology for horticultural Crops

Learning Outcomes

Upon successful completion of this course it is intended that a student will be able to:

- Know in detail about breeding systems
- Learn the techniques of Hybridization and the selection methods for self-pollinated, cross-pollinated plants
- Evaluate and devise suitable techniques for crop improvement programmes.
- Learn the importance of horticulture – career and occupational opportunities

Unit 1 - Principles of Plant Breeding (12 Hrs.)

History, objectives, scope, and achievements of plant breeding. Centers of origin. Genetic basis of variation and selection. Germplasm collection, conservation, evaluation, and utilization. Plant genetic resources and gene banks. Intellectual Property Rights (IPR) and Plant Variety Protection.

Unit 2 – Breeding Methods (12 Hrs.)

Selection methods- mass selection, pure line, clonal selection. Hybridization techniques and breeding procedures. Pedigree, bulk, single seed descent, and backcross methods. Heterosis and hybrid vigor. Inbreeding depression. Polyploidy breeding and mutation breeding. Quantitative genetics- heritability, genetic advance, combining ability. Breeding for biotic (disease) and abiotic (drought) stresses, vertical and horizontal resistances of biotic stress.

Unit 3 - Molecular Plant Breeding and Biotechnology (12 Hrs.)

Marker-assisted selection (MAS). QTL mapping and association mapping. Genomic selection. Tissue culture in crop improvement. Somaclonal variation. Haploids and doubled haploids. Protoplast fusion and somatic hybridization. Transgenic crops and biosafety. CRISPR-Cas genome editing in plants.

Unit 4 – Fundamentals of Horticulture (12 Hrs.)

Scope and importance of horticulture. Classification of horticultural crops. Propagation methods- seed propagations, hybrids, apomixis, polyembryony, chimeras. Asexual method of propagations- Cutting methods, layering methods, budding methods, grafting methods, micropropagation. Hydroponics, aeroponics, and vertical farming. Basics of greenhouse design.

Unit 5 – Post-Harvest Technology and Entrepreneurship (12 Hrs.)

Post-harvest technology for horticultural Crops- flower and fruit packaging for transport/export, Treatments of fruits and flowers prior to shipment viz., chlorination, waxing, chemicals, bio-control agents and natural plant products. Organic horticulture. Nursery business management and agri-entrepreneurship

Reference Books:

1. Allard R W (1995) *Principles of Plant Breeding*. John Wiley and Sons, Inc
2. Ghahal G S and Gosal S S (2002) *Principles and procedures of Plant Breeding*. Narosa Publishing House
3. Sharma J R (1994) *Principles and practices of Plant Breeding*. Tata McGraw-Hill Publishers Company Ltd
4. Singh B D (1996) *Plant Breeding: Principles and methods*. Kalyani Publications
5. Bose TK, Mitra SK & Sadhu MK (1991) *Propagation of Tropical and Subtropical Horticultural Crops*, Naya Prokash.
6. Chadha KL and Pareek OP Edited (1996) *Advances in Horticulture*, Vols. III, IV, Malhotra Publishing House.
7. Frankel OH and Hawkes JG (1975) *Crop Genetic Resources for Today and Tomorrow*, Cambridge University Press
8. Haid NF and Salunkhe SK (1997) *Post Harvest Physiology and Handling of Fruits and Vegetables*, Grenada Publ.
9. Hartmann HT and Kester DE (1989) *Plant Propagation – Principles and Practices*, Prentice Hall of India.