

Course Title: Innovative Approaches In Fruit Breeding
Course Code: FSC 601
Credit Hours: 3 (3+0)

THEORY

Block 1: Introduction

UNIT I:

Current Trends and Status: Modern trends in fruit breeding –with major emphasis on precocity, low tree volume, suitability for mechanization, health benefits etc.

Block 2: Genetic Mechanisms

UNIT I:

Inheritance Patterns and Breeding Systems: Genetics of important traits and their inheritance pattern, variations and natural selection, spontaneous mutations, incompatibility systems in fruits.

Block 3: Breeding for Specific Traits

UNIT I:

Plant Architecture, Stress Tolerance and Fruit Quality: Recent advances in crop improvement efforts- wider adaptation, plant architecture, amenability to mechanization, fruit quality attributes, stress tolerance, crop specific traits ; use of apomixis, gene introgression and wide hybridization (alien genes).

Block 4: Fast- Track Breeding

UNIT I:

Transgenics, Markers and Genomics: Molecular and transgenic approaches in improvement of selected fruit crops ; fast track breeding – marker assisted selection and breeding (MAS and MAB), use of genomics and gene editing technologies.

CROPS: Mango, banana, guava, papaya, Citrus, grapes, pomegranate, litchi, apple, pear, strawberry, kiwifruit, plums, peaches, apricot, cherries, nectarines, nut crops

Course Title: Modern Trends In Fruit Production

Course Code: FSC 602

Credit Hourss: 3(3+0)

Block 1: Introduction

UNIT I:

General Concepts and Current Scenario: National and International scenario, national problems.

Block 2: Advanced Technologies

UNIT I:

Propagation, Planting Systems and Crop Regulation: Recent advances in propagation - root stocks, planting systems, High density planting, crop modeling, Precision farming, decision support systems - aspects of crop regulation- physical and chemical regulation.

Block 3: Management Practices

UNIT I:

Overcoming Stress and Integrated Approaches: Effects on physiology and development, influence of stress factors, strategies to overcome stress effects, integrated and modern approaches in water and nutrient management, Physiological disorders, Total quality management (TQM) - Current topics. CROPS: Mango, Banana, Grapes, Citrus, Papaya, Litchi, Guava, Pomegranate, Apple, Pear, Peach, Plum, Apricot, Cherry, Almond, Walnut, Pecan, Strawberry, Kiwifruit

Course Title: Arid And Dryland Fruit Production
Course Code: FSC 605
Credit Hours:2 (2+0)

THEORY

Block 1: Introduction

UNIT I:

General Concepts and Current Scenario: Characteristics features and major constraints of the arid and dryland region, distinguishing features of the fruit species trees for adaptation in adapting to the region, nutritional and pharmaceutical importance, national problems.

Block 2: Advanced Technologies

UNIT I:

Propagation, Planting Systems and Crop Regulation: Recent advances in propagation - root stocks, planting systems, High density planting, crop modelling, Precision farming, decision support systems - aspects of crop regulation- physical and chemical regulation, effects on physiology and development, influence of stress factors.

Block 3: Management Practices

UNIT I:

Stress Mitigation and Integrated Approaches: Strategies to overcome stress effects, integrated and modern approaches in water and nutrient management, total quality management(TQM) - Current topics

CROPS:Aonla, Annonas, ber, bael, jamun, date palm, cactus pear, khejri, kair, pilu, lasoda, manila, tamarind, monkey jack, mahua, khirni, amra, seabuckthorn, chilgoza, cafel, rhododendron, box myrtle, chironji, phalsa, karonda, woodapple, paniala and other minor fruits of regional importance

Course Title: Biodiversity And Conservation Of Fruit Crops

Course Code: FSC 607

Credit Hours: 3 (2+1)

THEORY

Block 1: GENERAL ASPECTS

UNIT I:

Issues, Goals and Current Status: Biodiversity and conservation; issues and goals needs and challenges; present status of gene centres; world's major centres of fruit crop domestication; current status of germplasm availability/database of fruit crops in India

Block 2: Germplasm Conservation

UNIT I:

Collection, Maintenance and Characterization: Exploration and collection of germplasm; sampling frequencies ; size and forms of fruit and nut germplasm collections; active and base collections. Germplasm conservation- in situ and ex situ strategies, on farm conservation; problem of recalcitrancy- cold storage of scions, tissue culture, cryopreservation, pollen and seed storage.

Block 3: Regulatory Horticulture

UNIT I:

Germplasm Exchange, Quarantine and Intellectual Property Rights: Regulatory horticulture, inventory and exchange of fruit and nut germplasm, plant quarantine, phytosanitary certification, detection of genetic constitution of germplasm and maintenance of core collection. IPRs, Breeder's rights, Farmer's rights, PPV&FR Act. GIS and documentation of local biodiversity, Geographical indications, GIS application in horticultural mapping and spatial analyses of field data; benefits of GI protection; GI tagged fruit varieties in India.

PRACTICALS

1. Documentation of germplasm- maintenance of passport data and other records of accessions (2)
2. Field exploration trips and sampling procedures(2)
3. Exercise on ex situ conservation – cold storage, pollen/seed storage(2)
4. Cryopreservation(2)
5. Visits to National Gene Bank and other centers of PGR activities(2)
6. Detection of genetic constitution of germplasm(2)
7. Germplasm characterization using a standardised DUS test protocol(2)
8. Special tests with biochemical and molecular markers(2)

Course Title: Smart Fruit Production
Course Code: FSC 608
Credit Hours:2 (2+0)

THEORY

Block 1: Introduction

UNIT I:

Importance and Overview: Introduction and importance; concepts and applications of artificial intelligence systems; case studies in horticulture

Block 2: Crop Modelling and Forecasting

UNIT I:

GIS, Sensors and Wireless Systems: Application of sensors in fruit production, crop monitoring – crop load and stress incidence forecast modules, remote sensing, Geographical Information System (GIS), Differential Geo-Positioning System (DGPS) hi-tech nursery production of fruit crops under protected conditions, ultra modern wireless based drip irrigation network,

Block 3: Nanotechnology

UNIT I:

Concepts and Methods: Nanotechnology for smart nutrient delivery in fruit farming, concepts and methods, practical utility, nano-fertilizers, nano-herbicides; nano-pesticides

Block 4: Innovative Approaches

UNIT I:

Mechanization, Automation and Robotics: Production systems amenable to automation and mechanization; automated protected structures (turn-key systems); hydroponics, aeroponics, bioreactors for large scale plant multiplication; Use of drones and robotics in fruit growing – robotic planters, sprayers, shakers, harvesters, stackers etc. Visit to Hi-tech facilities.
