# FSC-501: Tropical Fruit Production (2+1)

## THEORY

### Block 1: Introduction

Unit I: Importance and Background: Importance, origin and distribution, major species, rootstocks and commercial varieties of regional, national and international importance, ecophysiological requirements.

### Block 2: Agro - Techniques

Unit I: Propagation, Planting and Orchard Floor Management: Asexual and sexual methods of propagation, planting systems and planting densities, training and pruning methods, rejuvenation, intercropping, nutrient management, water management, fertigation, use of biofertilizers, role of bio-regulators, abiotic factors limiting fruit production.

### Block 3: Crop Management

Unit I: Flowering, Fruit-Set and Harvesting: Physiology of flowering, pollination management, fruit set and development, physiological disorders - causes and remedies, crop regulation, quality improvement by management practices; maturity indices, harvesting, grading, packing, storage and ripening techniques; insect and disease management.

**CROPS** Mango, Banana, Guava, Pineapple, Papaya, Avocado, Jackfruit, Annonas, Aonla and Ber

## PRACTICALS

1.Distinguished features of tropical fruit species, cultivars and rootstocks (2)
2. Demonstration of planting systems, training and pruning (3)
3. Hands on practices on pollination and crop regulation (2)
4. Leaf sampling and nutrient analysis (3)
5. Physiological disorders-malady diagnosis (1)
6. Physico-chemical analysis of fruit quality attributes (3)
7. Field/Exposure visits to tropical orchards (1)
8. Project preparation for establishing commercial orchards (1)

# FSC-502: Sub-Tropical and Temperate Fruit Production (2+1)

**THEORY**

**Block 1: Introduction**

Unit I: Importance and Background: Origin, distribution and importance, major species, rootstocks and commercial varieties of regional, national and international importance, ecophysiological requirements.

**Block 2: Agro - Techniques Unit I: Propagation, Planting and Orchard Floor Management:**

Propagation, planting systems and densities, training and pruning, rejuvenation and replanting, intercropping, nutrient management, water management, fertigation, use of bio-fertilizers, role of bio-regulators, abiotic factors limiting fruit production.

**Block 3: Crop Management**

Unit I: Flowering, Fruit-Set and Harvesting: Physiology of flowering, pollination management, fruit set and development, physiological disorders- causes and remedies, crop regulation, quality improvement by management practices; maturity indices, harvesting, grading, packing, storage and ripening techniques; insect and disease management.

**CROPS**: Citrus, Grapes, Litchi, Pomegranate, Apple, Pear, Peach, Plum, Apricot, Cherries, Berries, Persimmon, Kiwifruit, Nuts- Walnut, Almond and Pecan

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1. Distinguished features of fruit species, cultivars and rootstocks (2)
2. Demonstration of planting systems, training and pruning (3)
3. Hands on practices on pollination and crop regulation (2)
4. Leaf sampling and nutrient analysis (3)
5. Physiological disorders-malady diagnosis (1)
6. Physico-chemical analysis of fruit quality attributes (3)
7. Field/Exposure visits to subtropical and temperate orchards (1)
8. Project preparation for establishing commercial orchards (1)

# FSC-503: Propagation and Nursery Management of Fruit Crops (2+1)

## THEORY

### Block 1: Introduction

**Unit 1**: **General Concepts and Phenomena:**

Introduction, understanding cellular basis for propagation, sexual and asexual propagation, apomixis, polyembryony, chimeras. Factors influencing seed germination of fruit crops, dormancy, hormonal regulation of seed germination and seedling growth. Seed quality, treatment, packing, storage, certification and testing.

### Block 2: Propagation

**Unit I:Conventional Asexual Propagation:**

Cutting– methods, rooting of soft and hardwood cuttings under mist and hotbeds. Use of PGR in propagation, Physiological, anatomical and biochemical aspects of root induction in cuttings. Layering – principle and methods. Budding and grafting – principles and methods, establishment and management of bud wood bank. Stock, scion and inter stock relationship - graft incompatibility, physiology of rootstock and top working.

**Unit II: Micro propagation:**

Micro-propagation – principles and concepts, commercial exploitation in horticultural crops. Techniques - *in vitro* clonal propagation, direct organogenesis, embryogenesis, micrografting, meristem culture, genetic fidelity testing. Hardening, packaging and transport of micro-propagules.

### Block 3: Nursery

**Unit I:** Management Practices and Regulation: Nursery – types, structures, components, planning and layout. Nursery management practices for healthy propagule production. Nursery Act, nursery accreditation, import and export of seeds and planting material and quarantine.

## PRACTICAL

1. Hands on practices on rooting of dormant and summer cuttings (3)
2. Anatomical studies in rooting of cutting and graft union(1)
3. Hands on practices on various methods of budding and grafting (4)
4. Propagation by layering and stooling (2)
5. Micropropagation- explant preparation, media preparation, culturing – meristem tip culture, axillary bud culture, micro-grafting, hardening (4)
6. Visit to commercial tissue culture laboratories and accredited nurseries (2)

# FSC-504* :Breeding of Fruit Crops (2+1)

## THEORY

**Block 1:Introduction**

**Unit I:** Importance, Taxonomy and Genetic Resources: Introduction and importance, origin and distribution, taxonomical status - species and cultivars, cytogenetics, genetic resources.

**Block 2: Reproductive Biology**

**Unit I**: Blossom Biology and Breeding Systems: Blossom biology, breeding systems – spontaneous mutations, polyploidy, incompatibility, sterility, parthenocarpy, apomixis, breeding objectives, ideotypes.

**Block 3: Breeding Approaches**

**Unit I:** Conventional and Non-Conventional Breeding: Approaches for crop improvement – direct introduction, selection, hybridization, mutation breeding, polyploid breeding, rootstock breeding, improvement of quality traits, resistance breeding for biotic and abiotic stresses, biotechnological interventions, achievements and future thrusts.

**CROPS** Mango, Banana, Pineapple, Citrus, Grapes, Litchi, Guava, Pomegranate, Papaya, Apple, Pear, Plum, Peach, Apricot, Cherries, Strawberry, Kiwifruit, Nuts

## PRACTICAL

1. Exercises on bearing habit, floral biology (2)
2. Pollen viability and fertility studies(1)
3. Hands on practices in hybridization(3)
4. Raising and handling of hybrid progenies(2)
5. Induction of mutations and polyploidy(2)
6. Evaluation of biometrical traits and quality traits(2)
7. Screening for resistance against abiotic stresses (2)
8. Developing breeding programme for specific traits (2)
9. Visit to research stations working on fruit breeding (1)

# FSC-506: Canopy Management in Fruit Crops (1+1)

## THEORY

### Block 1: Canopy Architecture

**UNIT I:** Introduction, Types and Classification: Canopy management - importance and factors affecting canopy development. Canopy types and structures, canopy manipulation for optimum utilization of light and its interception. Spacing and utilization of land area - Canopy classification.

### Block 2: Canopy Management

**UNIT I:** Physical Manipulation and Growth Regulation: Canopy management through rootstock and scion. Canopy management through plant growth regulators, training and pruning and management practices. Canopy development and management in relation to growth, flowering, fruiting and fruit quality.

## PRACTICALS

1. Study of different types of canopies (2)
2. Training of plants for different canopy types(2)
3. Canopy development through pruning (2)
4. Understanding bearing behaviour and canopy management in different fruits (2)
5. Use of plant growth regulators (2)
6. Geometry of planting (1)
7. Development of effective canopy with support system (2)
8. Study on effect of different canopy types on production and quality of fruits(2)

# FSC-508: Nutrition of Fruit Crops (2+1)

## THEORY

### Block 1: Introduction

**UNIT I: General Concepts and Principles:**

Importance and history of nutrition in fruit crops, essential plant nutrients, factors affecting plant nutrition; nutrient uptake and their removal from soil.

### Block 2: Requirements and Applications

**UNIT I:** Diagnostics, Estimation and Application: Nutrient requirements, root distribution in fruit crops, soil and foliar application of nutrients in major fruit crops, fertilizer use efficiency. Methods and techniques for evaluating the requirement of macro- and microelements, Diagnostic and interpretation techniques including DRIS. Role of different macroand micro-nutrients, their deficiency and toxicity disorders, corrective measures to overcome deficiency and toxicity disorders.

### Block 3: Newer Approaches

**UNIT I:** Integrated Nutrient Management (INM): Fertigation in fruit crops, bio-fertilizers and their use in INM systems.

## PRACTICALS

1. Visual identification of nutrient deficiency symptoms in fruit crops (2)
2. Identification and application of organic, inorganic and bio-fertilizers(1)
3. Soil/tissue collection and preparation for macro- and micro-nutrient analysis(1)
4. Analysis of soil physical and chemical properties- pH, EC, Organic carbon(1)
5. Determination of N,P,K and other macro- and micronutrients (6)
6. Fertigation in glasshouse and field grown horticultural crops(2)
7. Preparation of micro-nutrient solutions, their spray and soil applications(2)

# FSC-513: Minor Fruit Production (2+1)

## THEORY

### Block 1: Introduction

**UNIT I:** Occurrence, Adoption and General Account: Importance – occurrence and distribution, climate adaptation in fragile ecosystem and wastelands.

### Block 2: Agro-Techniques

**UNIT I:** Propagation and Cultural Practices: Traditional cultural practices and recent development in agro-techniques; propagation, botany-floral biology, growth patterns, mode of pollination, fruit set, ripening, fruit quality.

### Block 3: Marketing and Utilization

**UNIT I:** Post-Harvest Management: Post harvest management, marketing; minor fruit crops in terms of medicinal and antioxidant values; their uses for edible purpose and in processing industry

**CROPS**: Bael, chironji, fig, passionfruit, jamun, phalsa, karonda, wood apple, Cactus pear, khejri, kair, pilu, lasoda, loquat, tamarind, dragon fruit, monkey jack, mahua, khirni, amra, kokum, cape gooseberry, kaphal, persimmon, pistachio, sea buckthorn, hazel nut and
Other minor fruits of regional importance

## PRACTICALS

1. Visits to institutes located in the hot and cold arid regions of the country(2)
2. Identification of minor fruits plants/cultivars(2)
3. Collection of leaves and preparation of herbarium(1)
4. Allelopathic studies(2)
5. Generating know-how on reproductive biology of minor fruits(4)
6. Fruit quality attributes and biochemical analysis(3)
7. Project formulation for establishing commercial orchards in fragile ecosystems(1)