**Course: M.Sc., Horticulture and Landscape Management**

**(**For The Academic Year **2020 - 2021** Only)

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| **1st Semester- Theory.** | |
| Core Paper 101 | Fundamentals of Horticulture |
| Core Paper 102 | Plant propagation and Nursery management |
| Core Paper 103 | Green House Management |
| Core Paper 104 | Pomology |
| **Practical** |  |
| Practical Paper 101 | Corresponding to Paper 101 &102 |
| Practical Paper 102 | Corresponding to Paper 103 &104 |

**Core Paper 101: Fundamentals of Horticulture**

**(**For The Academic Year **2020 - 2021** Only)

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| **1** | Definition of horticulture, importance of horticulture in terms of economy, production, employment generation, environmental protection and human resource development. Scope for horticulture in India. Nutritive value of horticultural crops. Divisions of horticulture with suitable examples and their importance |
| **2** | Classification of horticultural crops based on soil and climatic requirements. Vegetable gardens nutrition and kitchen garden, truck garden, vegetable forcing, market gardens and roof gardens. Establishment of orchards – Explanation of points to be kept in mind while selecting site for the establishment of orchards. Different steps in planning and layout of orchards. |
|  | **Assignment (not included in paper setting): Different steps in establishment of orchards and management of orchards. Different systems of planting orchards-square, rectangle, quincunx, hexagonal and contour systems of planting-their merits and demerits** |
| **3** | Calculation of planting densities in different systems of planting. Definition of pruning, objectives of pruning, principles and methods of pruning of fruit crops. Definition of training, objectives and training, principles and methods of training of fruit crops-open centre, closed centre and modified leader systems their merits and demerits. Definition of irrigation-Different methods of irrigation followed in horticultural crops, their merits and demerits |
| **4** | Definition of manures and fertilizers-different methods of application of manures and fertilizers to horticultural crops. Cropping systems-inter cropping and multi-tier cropping, their merits and demerits with suitable examples |
|  | **Assignment (not included in paper setting): Definition of mulch-objectives of mulching-different types of mulches-organic and inorganic mulches with suitable examples. Definitions of fruitfulness and unfruitfulness-factors influencing the fruitfulness and unfruitfulness with suitable examples.** |

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| **PRACTICALS:** | |
| 1 | Study of features of orchard/fruit garden |
| 2 | Lay out of different planting systems |
| 3 | Preparation of nursery beds for sowing of vegetables seeds |
| 4 | Digging of pits for fruit plants |
| 5 | Study of different methods of Training |
| 6 | Study of different methods of pruning |
| 7 | Preparation of fertilizer mixtures and field application |
| 8 | Lay out of different irrigation systems |
| 9 | Identification and management of nutritional disorders in vegetables |
| 10 | Study of bearing habits in horticultural crops |

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| **S.no** | **Name of the book** | **Publications** |
| 1. | Fundamentals of Horticulture | Edmond, j.b, sen, T.L, Andrews, F.S and Halfacre R.G, 1963.Tata McGraw hill Publishing Co., New Delhi |
| 2. | Introduction to Horticulture | Kumar, N 1990. Rajayalakshmi Publications, Nagarcoil, Tamilnadu |
| 3. | Basic Horticulture | Jitendra Singh, 2002 Kalyani Publishers, Hyderabad |

**Core Paper 102: Plant Propagation & Nursery Management**

**(**For The Academic Year **2020 - 2021** Only)

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| **1** | Propagation, Need and Potentialities for plant multiplication, sexual and asexual methods of propagation, advantages and disadvantages. Definition of a nursery, different types of nursery beds-flat beds, raised beds and sunken beds, their merits and demerits. Different nursery techniques and their management. |
| **2** | Seed dormancy – means to break seed dormancy (Stratification and Scarification) – internal and external factors and seed treatment for germination and disease control; use of growth regulators to overcome the seed dormancy. |
|  | **Assignment (not included in paper setting): Nursery tools and implements. Propagation by division – suckers, rhizomes, corms, tubers, cloves and bulbs.** |
| **3** | Propagation structures: Mist chamber, humidifier, greenhouses, glasshouses, cold frames, hot beds and poly houses. Propagation by cutting – Hard wood, Semi-hard wood, Herbaceous – physiological and bio-chemical basis of rooting; Use of growth regulators in rooting of cuttings. Propagation by layering – types of layering; establishment of layers in the field; Use of growth regulators in layering. |
| **4** | Methods of grafting – Approach grafting; Veneer grating; Wedge grafting; Saddle grafting; Tongue grafting; Whip grafting; Bridge grafting; Epi-cotyl grafting; Soft wood grafting. Methods of budding – ‘T’ budding, Inverted ‘T’budding, Shield budding; Chip budding; Flute budding; Ring budding; ‘I’ budding. Selection of mother plant –Establishment of progeny orchard/mother plant block; - pre-curing of scion. |
|  | **Assignment:** Micro propagation – Choice of explant (totepotency); media-MS-media, Growth regulators in culture, sterilization of the explant, sub-culturing of the callus, Hardening of plants |

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| **PRACTICALS:** | |
| 1 | Study of various propagation media for nursery beds, pots and mist chamber. |
| 2 | Preparation of nursery beds (raised and flat beds) and sowing of seeds. |
| 3 | Raising of root stocks of different fruit plants like Mango, Citrus, Cashew . |
| 4 | Preparation of plant material for planting |
| 5 | Hardening of plants in the nursery – different methods like reducing Irrigation, Shade, exposure for short periods to sun . |
| 6 | Study and practicing of different propagation methods by cutting. |
| 7 | Study and practicing of different propagation methods by layering. |
| 8 | Study and practicing of different propagation methods by grafting |
| 9 | Study and practicing of different propagation methods by budding |
| 10 | Study and practicing of different propagation methods by divisions |
| 11 | Application of nutrients and plant protection chemicals in the nursery |

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| **S.no** | **Name of the book** | **Publications** |
| 1. | Plant Propagation –  Principles and Practices. | Hartman,HT and Kester, D.E. 1976.Prentice Hall Of India Pvt. Ltd., Bombay |
| 2. | Plant Propagation. | Sadhu, M.K. 1996.New age International Publishers, New Delhi. |
| 3. | Propagation of Fruit Crops | Mukherjee, S.K. and Mujumadar, P.K, 1973.ICAR, New Delhi. |
| 4. | Propagation of Horticulture Crops  (Principles And Practices) | Sarma, R.R 2002.Kalyani Publishers, New Delhi. |

**Core Paper 103: Greenhouse Management**

**(**For The Academic Year **2020 - 2021** Only)

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| 1 | Introduction to greenhouses – history – definition – greenhouse effect – advantages of greenhouses. Brief description of types of greenhouses – greenhouses based on shape, utility, construction, covering materials and cost, shade nets |
| 2 | Plant response to greenhouse environments – light, temperature, relative humidity, ventilation and carbon dioxide and environmental requirement of agriculture and horticulture crops inside green houses. Equipment required for controlling greenhouse environment – summer cooling and winter heating, natural ventilation, forced ventilation and computers |
|  | Assignment: Planning of green house facility – site selection and orientation, structural design and covering materials |
| 3 | Materials for construction of greenhouses – wood, galvanized iron, glass, polyethylene film, poly vinyl chloride film, tefzel T2 film, fiberglass reinforced plastic rigid panel and acrylic and polycarbonate rigid panel. Design criteria and constructional details of greenhouses – construction of pipe framed greenhouses – material requirement – preparation of materials and procedure of erection |
| 4 | Greenhouse heating and distribution systems – greenhouse utilization – off-season drying of agricultural produce – economic analysis of greenhouse production – capital requirement, economics of production and conditions influencing returns |
|  | Assignment: Irrigation system used in greenhouses – rules of watering – hand watering, perimeter watering, overhead sprinklers, boom watering and drip irrigation. |

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| **PRACTICALS:** | |
| 1 | Study of different types of greenhouses based on shape |
| 2 | Study of different types of greenhouses based on construction |
| 3 | Study of materials for construction of greenhouses |
| 4 | Study of construction of pipe framed green house |
| 5 | Measurement of environmental parameters inside greenhouse |
| 6 | Calculation of ventilation rates in active summer cooling system |
| 7 | Calculation of rate of air exchange in active winter cooling system |

**References:**

1. Chakraborthy, A. and De, D.S. 1981. Post-Harvest Technology of Cereals and Pulses. Oxford & IBH Publishing Co., New Delhi. Jagadishwar
2. Sahay 1992. Elements of Agricultural Engineering. Agro Book Agency, Patna.
3. Kennard, S. and Nelson, B.A. 1977. Greenhouse Management for Flowers and Plant Production. International Printers and Publishers Inc., Illinois. Micheal,
4. A.M. and Ojha, T.P. 2008. Principles of Agricultural Engineering. Jain Brothers, New Delhi

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| **S.no** | **Name of the book** | **Publications** |
| 1. | Green House Management For Horticulture Crops | S. Prasad and U. Kumar, 2007, Agrobios (India), Jodhpur |
| 2. | Greenhouse Technology and Management | RadhaManohar, K. and Igathinathane, C. 2000.. BS Publications, Hyderabad |
| 3. | Greenhouse Technology | Tiwari, G.N and Goyal, R.K. 1998..Narosa Publishing House, New Delhi |

**Core Paper 104: Pomology**

**(**For The Academic Year **2020 - 2021** Only)

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| **1** | Classification of Fruits based on climatic factors. Mango Varieties: Commercial varieties – Table varieties, Juicy varieties, Table and Juicy Varieties, Pickle Varieties. Propagation: Commercial propagation by Epicotyl grafting, Veneer grafting planting Density; High Density Planting system. Nutritional and Irrigation requirement; Role of Major & Minor nutrients, Inter cultivation; Intercropping, Weed management. Harvesting & Yield: Sapota: Varieties and hybrids; Production Technology: Climatic & Soil requirements; Propagation, Root Stocks, Planting Density, methods of irrigation, nutrient management, Interculture, weed management and intercropping.Maturity Indices, Harvest & Yield; Handling, Grading, Packing, Transport, Marketing, Ripening and Storage. |
| **2** | Banana and Plantains: Production Technology: Climate, Soil requirements. Propagation by Suckers, Treatement of suckers before planting; Micro propagation: Planting density Irrigation, Fertilizer doses and application. Management of Banana crop: Desuckering, Ratoon sucker selection, Weed control, Mulching, Earthing up. Leaf removal, Provision of Wind breaks; Bunch management: Propping of bunches, Wrapping, Trimming, Removal of Male bud, Bunch covering |
|  | **Assignment:** Production Technology: Climatic & Soil requirements of important citrus groups. Varieties: Citrus Indian and Exotic varieties of Sweet Oranges, Mandarins, Grape Fruit and Pummelo, Lemons, Limes. Propagation: Seedling stocks, Root stocks, methods of propagation. Planting Densities, Irrigation, Root Stocks, Age & Bearing Capacity; Nutrient management: Major & Minor nutrients, Deficiencies, Weed Management; Root pruning and Bahar Treatment (Ambebahar, MrigBahar and Hasthbahar) Harvesting: Maturity Indices, Yield of fruits, |
| **3** | Guava: Varieties, Hybrids; Production Technology: Soil & Climatic requirements, propagation by Vegetative methods (Air layering, Ground layering and Stooling); Planting, Planting density, Irrigation, Nutrient management, training and pruning. Bahar treatment (Ambebahar, Mrigbahar and Hasta bahar), Harvesting & Yield. Papaya: Varieties: (Pusa varieties, Coimbatore varieties, Taiwan varieties etc.); Sex expression and Sex identification. Production Technology: Soil & Climatic requirements, Propagation, Planting, Irrigation & Nutrient management. Maturity indices, Harvesting, Yield and Storage. Pine Apple: Varieties Production Technology: Soil & Climatic requirements; Propagation by shoot suckers, Ground suckers, slips, crowns, stumps, micro propagation, High Density Planting, Water and Nutrient management, Interculture, flowering and fruiting. Use of chemicals and plant growth regulators. For improving the flowering and fruiting, Maturity indices, Harvesting for local market and Distant markets Yield. |
| **4** | Pomegranate: Varieties: Hard seeded and soft seeded. Production technology: Soil & climatic requirements; Propagation, Planting, Training and Pruning, Irrigation, Nutrient Management, Bahar treatment, Flowering, flower and Fruit thinning, Harvesting indices, Yield, and storage. Physiological disorders – Fruit cracking. Custard Apple: *Annonasquamosa, A muricata, A. reticulate, A.cherimola, Atemoya* Hybrid; Varieties & Groups – Green fruit & Red fruit; Production Technology: Soil and Climate; Propagation: Seed, Vegetative Planting, Planting density; Irrigation & Nutrient management, Flowering time, Fruit Development, Stone Fruit formation and their control, Harvest, Yield, Storage. |
|  | **Assignment:** Ber: Economic Importance, Nutritive value, Origin & Distribution, Area & Production, Species & varieties; Adaptive features of Ber, Production technology: Soil & climatic requirements; Training and Pruning, irrigation and nutrient management; Flowering & fruit set, Fruit drop and its control, maturity indices, yield. Rain fed Horticulture: Scope and Importance of Arid Fruit Culture, Special Characteristics: of Fruit crops which make them suitable for Arid Zone- 1) Ber 2) Anola 3) Annona 4) Jamun 5) Wood Apple 6) Pomegranate 7) Carissa 8) Date Palm 9) Phalsa 10) Fig 11) Bael 12) Tamarind |

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| **PRACTICALS:** | |
| **1** | Description and identification of varieties of Mango and Banana based on flower and Fruit morphology. |
| 2 | Description and identification of varieties of Citrus. |
| 3 | Description and identification of varieties of Papaya, Sapota, Guava and pine apple. |
| 4 | Description and identification of varieties of Pomegranate, Ber. |
| 5 | Training and Pruning of Mango, Guava and Citrus. |
| 6 | Pre-treatment of Banana suckers and desuckering in Banana |
| 7 | Manure & Fertilizer application including Bio-fertilizers in different fruit crops (Methods of application, calculation of the required Manure & Fertilizers based on the nutrient content). |
| 8 | Visit to commercial orchards. |

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| **S.no** | **Name of the book** | **Publications** |
| 1. | Fruits : Tropical & Sub- Tropical | Bose, T.K. Mitra, S.k. and Sanyal,  NayaUdyog Publishers, Vol-I, II and III |
| 2. | Text book on Pomology  (fundamentals of fruit growing) | Chattopadhyay, T.K 1997.  Kalyani Publishers, Hyderabad |
| 3. | Hand book of Horticulture | Chandra, K.L. (ICAR) 2002, 2001. ICAR, New Delhi. |