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**ANDHRA UNIVERSITY DEPARTMENT OF BOTANY**

**M.SC., HORTICULTURE AND LANDSCAPE MANAGEMENT COURSE STRUCTURE, SCHEME OF INSTRUCTION AND EXAMINATION PATTERN**

**(*With effect from 2017-2018 Admitted Batch*)**

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| **Paper Code** | **Title of the Paper** | **L** | **T** | **P** | **Total (hrs)/ Week** | **Duration of Exam (hrs)** | **Max. Marks** | **Mid. Sem./ Internal****Marks** | **Total Marks** | **Credits** |
| **I-SEMESTER** |
| **P-101** | **Fundamentals of Horticulture** | **4** | **1** | **3** | **8** | **3** | **80** | **20** | **100** | **4** |
| **P-102** | **Plant Propagation & Nursery Management** | **4** | **1** | **3** | **8** | **3** | **80** | **20** | **100** | **4** |
| **P-103** | **Green House Management** | **4** | **1** | **3** | **8** | **3** | **80** | **20** | **100** | **4** |
| **P-104** | **Pomology** | **4** | **1** | **3** | **8** | **3** | **80** | **20** | **100** | **4** |
| **Lab.I** | **Paper Codes: 101&102** |  |  | **4** | **80** | **20** | **100** | **4** |
| **Lab.II** | **Paper Codes: 103&104** |  |  | **4** | **80** | **20** | **100** | **4** |
|  | **Viva-Voce** |  |  |  |  |  | **25** |  |
| **Total Marks and Credits for I Semester** | **625** | **24** |
|  **II-SEMESTER** |
| **P-201** | **Olericulture and Vegetable Seed Production** | **4** | **1** | **3** | **8** | **3** | **80** | **20** | **100** | **4** |
| **P-202** | **Commercial Floriculture** | **4** | **1** | **3** | **8** | **3** | **80** | **20** | **100** | **4** |
| **P-203** | **Plantation Crops, Spices and Condiments** | **4** | **1** | **3** | **8** | **3** | **80** | **20** | **100** | **4** |
| **P-204****\*P-205** | **Medicinal and Aromatic Crops****Non-Core Paper** | **4****4** | **1** | **3** | **8****4** | **3****3** | **80****80** | **20****20** | **100****100** | **4****4** |
| **Lab.III** | **Paper Codes: 201&202** |  |  | **4** | **80** | **20** | **100** | **4** |
| **Lab.IV** | **Paper Codes: 203&204** |  |  | **4** | **80** | **20** | **100** | **4** |
|  | **Viva-Voce** |  |  |  |  |  | **25** |  |
| **Total Marks and Credits for II Semester** | **725** | **28** |
|  **III-SEMESTER** |
| **P-301** | **Principles of Landscape Gardening** | **4** | **1** | **3** | **8** | **3** | **80** | **20** | **100** | **4** |
| **P-302** | **Ornamental Gardening**  | **4** | **1** | **3** | **8** | **3** | **80** | **20** | **100** | **4** |
| **P-303** | **Landscape Management and Lawn Management** | **4** | **1** | **3** | **8** | **3** | **80** | **20** | **100** | **4** |
| **P-304****\*P-305** | **Plant Growth Regulators in Horticulture****Non-Core Paper** | **4****4** | **1** | **3** | **8****4** | **3****3** | **80****80** | **20****20** | **100****100** | **4****4** |
| **Lab.V** | **Paper Codes: 301&302** |  |  | **4** | **80** | **20** | **100** | **4** |
| **Lab.VI** | **Paper Codes: 303&304** |  |  | **4** | **80** | **20** | **100** | **4** |
|  | **Viva-Voce** |  |  |  |  |  | **25** |  |
| **Total Marks and Credits for III Semester** | **725** | **28** |
|  **IV- SEMESTER** |
| **P-401** | **Integrated Pest and Disease Management** | **4** | **1** | **3** | **8** | **3** | **80** | **20** | **100** | **4** |
| **P-402** | **Post Harvest Technology of Horticultural Crops** | **4** | **1** | **3** | **8** | **3** | **80** | **20** | **100** | **4** |
| **P-403** | **Principles of Fruit and Vegetables Preservation** | **4** | **1** | **3** | **8** | **3** | **80** | **20** | **100** | **4** |
| **P-404** | **Recent Advances in Horticulture** | **4** | **1** | **3** | **8** | **3** | **80** | **20** | **100** | **4** |
| **Lab.VII** | **Paper Codes: 401&402** |  |  | **4** | **80** | **20** | **100** | **4** |
| **Lab.VIII** | **Paper Codes: 403&404** |  |  | **4** | **80** | **20** | **100** | **4** |
|  | **Viva-Voce** |  |  |  |  |  | **25** |  |
| **Total Marks and Credits for IV Semester** | **625** | **24** |
| **Grand Total marks and Credits for I,II,III&IV Semesters** | **2700** | **104** |

**L: Lecture hours; T: Tutorial hours; P: Practical hours**

**\*: Non- Core subject under CBCS (To be opted by the student from among the papers offered by other Departments)**

**Scheme of Examination at the end of each semester**

**Theory Pass Minimum : 40%**

**Practical Pass Minimum : 50% ( Including Practical & Record)**

**Aggregate : 50%**

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| **Semester-I** |
| **Paper Code: 101: Fundamentals of Horticulture** |
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| **THEROY** |
| 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.
 |
| 1. 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
 |
| 1. 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.
 |
| 1. 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
 |
| 1. Calculation of planting densities in different systems of planting. Definition of pruning, objectives of pruning, principles and methods of pruning of fruit crops.
 |
| 1. 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.
 |
| 1. 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.
 |
| 1. 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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| **SUGGESTED READINGS AND TEXT BOOKS** |
| **1.** | Denisen, E. L.1957. Principles of Horticulture. Macmillan Publishing Co, New York |
| **2.** | Gardner, V.R., Bradford, F. C and Hooker, Jr. H.D. 1957. Fundamentals of Fruit Production. Mac Graw Hill Book Co., New York. |
| **3.** | Edmond, J.B., Senn, T. L., Andrews, F. S and Halfacre, R. G. 1963. Fundamentals of Horticulture. Tata Mac Graw Hill Publishing Co. |
| **4.** | Kumar, N. 1990. Introduction to Horticulture. Rajyalakshmi Publications Nagarcoil, Tamilnadu. |
| **5.** | ICAR. Hand Books of Horticulture |
| **6.** | Edmond, J. B., Sen, T. L, Andrews, F. S and Halfacre R. G. 1963. Fundamentals of Horticulture. Tata McGraw hill Publishing Co., New Delhi. |
| **7.** | Kumar, N. 1990. Introduction to Horticulture. Rajayalakshmi Publications, Nagarcoil, Tamilnadu. |
| **8.** | Jitendra Singh, 2002. Basic Horticulture. Kalyani Publishers, Hyderabad. |

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| **Semester-I** |
| **Paper Code: 102: Plant Propagation & Nursery Management** |
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| **THEROY** |
| 1. Propagation, Need and Potentialities for plant multiplication, sexual and asexual methods of propagation, advantages and disadvantages
 |
| 1. 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.
 |
| 1. 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.
 |
| 1. Nursery tools and implements. Propagation by division – suckers, rhizomes, corms, tubers, cloves and bulbs
 |
| 1. Propagation structures: Mist chamber, humidifier, greenhouses, glasshouses, cold frames, hot beds and poly houses.
 |
| 1. 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.
 |
| 1. 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.
 |
| 1. Micro propagation – Choice of explant (totipotency); 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 etc. |
| **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 etc. |
| **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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| **SUGGESTED READINGS AND TEXT BOOKS** |
| **1.** | Garmer, R. J and Choudhri, S. A. 1972. Propagation of Tropical Fruit Trees. Oxford & IBH Publishing Co., New Delhi. |
| **2.** | Mukherjee, S. K and Majumder, P. K. 1973. Propagation of Fruit Crops. ICAR, New Delhi. |
| **3.** | Hartman, H. T and Kester, D. E. 1976. Plant Propagation – Principles and Practices Prentice Hall of India Pvt. Ltd. Bombay. |
| **4.** | Sadhu, M. K. 1996. Plant Propagation. New Age International Publishers, New Delhi. |
| **5.** | Singh, P. 1989. Mist Propagation. Metropoliton Book. Co. |
| **6.** | Peter, K. V. 2008. Basics of Horticulture. New India Publ. Agency. |
| **7.** | Rajan, S and Baby, L. M. 2007. Propagation of Horticultural Crops. New India Publ. Agency. |
| **8.** | Bose, T. K., Mitra, S. K and Sadhu, M. K. 1991. Propagation of Tropical and Subtropical Horticultural Crops. Naya Prakash. |
| **9.** | Hartman, H. T and Kester, D. E. 1976. Plant Propagation – Principles and Practices. Prentice Hall Of India Pvt. Ltd., Bombay. |
| **10.** | Sadhu, M. K. 1996. Plant Propagation. New age International Publishers, New Delhi. |
| **11.** | Mukherjee, S. K. and Mujumadar, P.K. 1973. Propagation of Fruit Crops. ICAR, New Delhi. |
| **12.** | Sarma, R.R 2002. Propagation of Horticulture Crops (Principles And Practices). Kalyani Publishers, New Delhi. |

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| **Semester-I** |
| **Paper Code: 103: Green House Management** |
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| **THEROY** |
| 1. Introduction to green houses – history – definition – greenhouse effect – advantages of green houses 114. Brief description of types of green houses – greenhouses based on shape, utility, construction, covering materials and cost, shade nets.
 |
| 1. Plant response to greenhouse environments – light, temperature, relative humidity, ventilation and carbon dioxide and environmental requirement of agriculture and horticulture crops inside green houses.
 |
| 1. Equipment required for controlling green house environment – summer cooling and winter heating, natural ventilation, forced ventilation and computers.
 |
| 1. Planning of green house facility – site selection and orientation, structural design and covering materials.
 |
| 1. Materials for construction of green houses – wood, galvanized iron, glass, polyethylene film, poly vinyl chloride film, tefzel T2 film, fiberglass reinforced plastic rigid panel and acrylic and polycarbonate rigid panel.
 |
| 1. Design criteria and constructional details of greenhouses – construction of pipe framed greenhouses – material requirement – preparation of materials and procedure of erection.
 |
| 1. 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.
 |
| 1. Irrigation system used in greenhouses – rules of watering – hand watering, perimeter watering, overhead sprinklers, boom watering and drip irrigation. Threshing – types of threshers – parts – threshers for different crops –terminology.
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| **PRACTICALS** |
| **1.** | Study of different types of green houses based on shape |
| **2.** | Study of different types of green houses 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 |
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| **SUGGESTED READINGS AND TEXT BOOKS** |
| **1.** | Alex Laurie, B., Kiplinger, D. C and Nelson, K. S. 1979. Commercial Flower Forcing. Mc Graw Hill. Co., New York. |
| **2.** | Woodley, J. W. 1981. Commercial Greenhouse. Ball Publishing, USA. |
| **3.** | Aldrich, R.A and Bartok, J. W. 1990. Greenhouse Engineering. Ball Pub., USA. |
| **4.** | Nelson, P.V. 1991. Greenhouse Operation and Management. Ball Pub., USA. |
| **5.** | S. Prasad and Kumar, U. 2007. Green House Management For Horticulture Crops. Agrobios (India), Jodhpur. |
| **6.** | Radha Manohar, K and Igathinathane, C. 2000. Greenhouse Technology and Management. BS Publications, Hyderabad. |
| **7.** | Tiwari, G. N and Goyal, R. K. 1998. Greenhouse Technology. Narosa Publishing House, New Delhi. |

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| **Semester-I** |
| **Paper Code: 104: Pomology** |
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| **THEROY** |
| 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.
 |
| 1. 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.
 |
| 1. 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, Mrig Bahar and Hasth bahar) Harvesting: Maturity Indices, Yield of fruits.
 |
| 1. 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.
 |
| 1. 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, Mrig bahar 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.
 |
| 1. 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.
 |
| 1. 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, Harvest indices, Yield, and storage. Physiological disorders – Fruit cracking. Custard Apple: *Annona squamosa, 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.
 |
| 1. Ber: Economic Importance, Nutritive value, Origin & Distribution, Area & Production, Spices & 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) Aonla 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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| **SUGGESTED READINGS AND TEXT BOOKS** |
| **1.** | Hyes, W.B. 1953. Fruit Growing in India. Kitabistan, Allahabad. |
| **2.** | Bose, T.K and Mitra, S. K. 1990. Fruits Tropical and Subtropical. Naya Prakash, Calcutta. |
| **3.** | Ranjit Singh, 1992. Fruits. N.B.T., New Delhi. |
| **4.** | Shoemaker, 1934. Small Fruit Culture. Mac Graw Hill book Co., New York. |
| **5.** | Mitra, S.K., Rathore, D. S and Bose, T. K. 1992. Temperate Fruits. Horticulture and Allied Publishers, Calcutta. |
| **6.** | Bose, T. K and Mitra, S. K. Tropical Horticulture. Naya Prakash, Calcutta. |
| **7.** | Chattopadhyay, T. K 1997. Text book on Pomology (Fundamentals of fruit growing). Kalyani Publishers, Hyderabad. |
| **8.** | Chandra, K. L. (ICAR) 2002, 2001. Hand book of Horticulture. ICAR, New Delhi. |

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| **Semester-II** |
| **Paper Code: 201: Olericulture and Vegetable Seed Production** |
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| **THEROY** |
| 1. Olericulture–definition- Importance of vegetables: Economic and nutritional importance of vegetables. **Tomato** (Botanical Name): Description of Cultivars 9Indian / Exotic) Determinate, Semi – Determinate and Indeterminate types; Cultivars suitable for Hills and Cultivars suitable for Processing-Exotic Cultivars.
 |
| 1. Production Technology: Method of raising the crop Nursery Vs Direct Sowing, Seed Rate Nursery techniques – Main field preparation – Basal Application of Nutrients – Transplanting, Spacing – Irrigation – Nutrition – Fertilizers Schedule, Major Nutrients, Minor Nutrients, Deficiency of Nutrients and harvesting. Inter cultivation – Weed Control Mulching. Effect of Chemicals & Growth Substances on various growth and Yield Parameters. **Brinjal** (Botanical Name): Brinjal; Flower types based on Style Length-cultivars Production Technology: Soil and Climate; Cultivation; Seed Rate, Seed Treatment and Raising of Nursery, Land Preparation, Transplanting, spacing, Irrigation, Manures and fertilizers-inter culture and rationing in Brinjal harvesting and seed production.
 |
| 1. **Chilli** (Botanical Name): Taxonomy-Cultivars. Production Technology: Soil and Climate-Methods of raising the crop-Nursery Vs. Direct Sowing, Seed Rate-nursery techniques – Main field preparation-Spacing-Irrigation-nutrition-Fertilizers Scheduling, Bio-Fertilizers-Inter cultivation. Harvesting and yield-drying and Storage seed production. **Okra** (Botanical Name): Okra-cultivars and hybrids. Production Technology: Soil & climate; cultivation; land preparation, sowing season, seed rate, spacing, nutrition, irrigation and inter culture. Use of growth substances-stage of harvest, harvesting & yield, storage; seed production.
 |
| 1. **Cucurbits:** Cultivation details of Cucumber, Pumpkin and **squashes** – production technology – soil and climate-cultivars-propagation and planting methods –seed rate, spacing, irrigation, nutrient management – inter culture–Weed control, Mulching,–harvesting and yield. **Cucurbits:** Cultivation details of gourds - Production technology – soil and climate – cultivars – propagation and planting methods – seed rate, spacing, irrigation, nutrient management – Inter culture – Weed Control, Mulching– harvesting and yield.
 |
| 1. **Cucurbits:** Cultivation details of melons - Production technology – soil and climate – cultivars – propagation and planting methods – seed rate, spacing, irrigation, nutrient management – Inter culture – Weed Control, Mulching, harvesting and yield – Production of seedless watermelons. **Cucurbits:** Cultivation details of **Coccinia & Chowchow**- Production technology – soil and climate – cultivars – propagation and planting methods –spacing, irrigation, nutrient management – Inter culture – Weed Control, Mulching, plant growth regulators – maturity indices – harvesting and yield.
 |
| 1. **French Bean:** (Botanical Name)Production Technology: Climate and Soil-cultivars-Season-Seed Rate, Seed Inoculation, Spacing, Nutrition, Irrigation and Inter-cultivation; maturity standards, Harvesting, Yield, Storage-Seed Production. **Lab-Lab (Dolichos) bean** (Botanical Name) : climate and soil, seeds and sowing, season, spacing, nutrient requirements, irrigation, intercropping; harvesting, yield, seed production.
 |
| 1. **Cluster Bean**(Botanical Name) : climate and soil; seed rate sowing, spacing, nutrition, irrigation-stage of harvest based on the purposes, yield and storage-seed production and economics. **Drumstick / Moringa** (Botanical Name) : Introduction, Origin, Composition of Pods, Leaves and uses of Moringa-cultivars-soil and climate; Propagation and planting methods-seed rate – field preparation-sowing/planting-nutrition, Irrigation and inter culture; pruning for extension of cropping season- harvesting and yield.
 |
| 1. **Leafy Vegetables:** Importance of leafy vegetables and types of leafy vegetables **Amaranthus:** Introduction, Origin, Area, Nutritive value –cultivars-soil & climate land preparation, sowing seed rate, spacing, irrigation and nutrition – methods of harvesting and yield. **Curry Leaf** (Botanical Name) : Introduction, Origin Area and Nutritive value -cultivars soil & climate, cultivation - land preparation, nursery raising-sowing/ Planting, seed rate, spacing, Irrigation, nutrition –harvesting and yield.
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| **PRACTICALS** |
| **1.** | Classification of vegetable crops |
| **2.** | Nursery techniques for vegetable production and Hi-tech vegetable nursery production |
| **3.** | Identification and description of Solanaceous vegetable varieties |
| **4.** | Methods of main field preparation and transplanting of nursery grown seedlings |
| **5.** | Nutritional deficiencies and physiological disorders in tropical and sub tropical vegetables |
| **6.** | Identification and description of Okra and Legume vegetables |
| **7.** | Identification and description of varieties of cucurbits |
| **8.** | Harvesting indices and maturity standards in tropical vegetables |
| **9.** | Visit to vegetable farmers fields, Visit to vegetable markets for study of marketing problems |
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| **SUGGESTED READINGS AND TEXT BOOKS** |
| **1.** | Thompson, H. C and Kelly, W. C. 1959. Vegetable Crops. Tata Mc Graw Hill Publishing Co. Ltd., Bombay.  |
| **2.** | Premnath Velyudhan, S and Singh, D. P. 1987. Vegetables for the Tropical Region ICAR, New Delhi. |
| **3.** | Shanmugavelu, K. G. 1989. Production Technology of Vegetable Crops. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.  |
| **4.** | Chaudhary, B. 1992. Vegetables. National Book Trust, New Delhi. |
| **5.** | Bose, T. K and Mitra, S. K. Tropical Horticulture. Naya Prakash, Calcutta. |
| **6.** | Bose, T. K et al. 2003. Vegetables Crops. Naya Udyog Publishers, Kolkata.  |
| **7.** | Shanmugavelu, K. G. 1989. Production Technology of Vegetable Crops. Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi. |
| **8.** | Choudhury, B. (ICAR). 1990. Vegetables. 8th Edition, National Book Trust, New Delhi. |

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| **Semester-II** |
| **Paper Code: 202: Commercial Floriculture** |
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| **THEROY** |
| 1. Scope and importance of commercial floriculture in India. Present status, Future prospects and strategies needed for improvement. Area, production and exports.
 |
| 1. **Rose**: Classification, species and varieties, climate and soil requirements, propagation – Rootstocks, Stock scion compatibility, land preparation, planting Manures and fertilizers, cultural operations (pruning, pinching and mulching) use of growth regulators, physiological disorders, harvesting and yield. **Marigold**: Species and varieties, F1 Hybrids, climate and soil requirements, propagation, land preparation, planting Manures and fertilizers, cultural operations, (pinching and disbudding) use of growth regulators, harvesting, and yield.
 |
| 1. **Chrysanthemum**: Classification, species and varieties, climate and soil requirements, propagation, land preparation, planting Manures and fertilizers, cultural operations, (pinching and disbudding) use of growth regulators, harvesting, and yield. **Gladiolus**: Classification of varieties, species and varieties, climate and soil requirements, propagation, land preparation, planting Manures and fertilizers, cultural operations, physiological disorders, harvesting, and yield.
 |
| 1. **Jasmine**: Classification, species and varieties, climate and soil requirements, propagation, land preparation, planting Manures and fertilizers, cultural operations, harvesting and yield.
 |
| 1. **Crossandra**: Species and varieties, climate and soil requirements, propagation, land preparation, planting Manures and fertilizers, cultural operations, use of growth regulators, harvesting and yield.
 |
| 1. **Gerbera**: Introduction, origin and distribution, classification, species and varieties, climate and soil requirements, propagation, land preparation, planting Manures and fertilizers, cultural operations, defoliation, soil loosening, shading, harvesting and yield.
 |
| 1. **Tuberose**: Introduction, origin and distribution, classification, species and varieties, climate and soil requirements, propagation, land preparation, planting Manures and fertilizers, cultural operations, harvesting and yield.
 |
| 1. **Dahlia**: Introduction, origin and distribution, classification, species and varieties, climate and soil requirements, propagation, land preparation, planting Manures and fertilizers, cultural operations, (pinching and disbudding) harvesting and yield.
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| **PRACTICALS** |
| **1.** | Propagation methods in chrysanthemum |
| **2.** | Preparation of nursery bed for flower seeds sowing. |
| **3.** | Identification of important flower crops and their varieties |
| **4.** | Training and Pruning of Roses in open and polyhouses |
| **5.** | Propagation of rose by cutting and budding |
| **6.** | Layering methods for Jasmine propagation |
| **7.** | Visit to green house to study protected cultivation of Gerbera |
| **8.** | Field visit to commercial flower growing area |
|  |  |
| **SUGGESTED READINGS AND TEXT BOOKS** |
| **1.** | Alex Laurie Kiplinger, D. C and Kennard Nelson, S. 1976. Commercial Flower Forcing. McGraw Hill Company, New York. |
| **2.** | Lersen, R. A. 1981. Introduction to Floriculture. Academic press, New York. |
| **3.** | Chadha, K. L and Chaudhury, B. 1986. Ornamental Horticulture In India. Publications and information division, ICAR, New Delhi. |
| **4.** | Randhawa, G. S and Mukhopadhyaya, A. 2004. Floriculture in India. Allied Publishers Pvt. Ltd., New Delhi. |
| **5.** | Bose, T. K and Yadav, L. P. 1989. Commercial Flowers. Nayaprakash, Calcutta. |
| **6.** | Pal, B.P. 1991. The Rose in India. Publications and Information Division ICAR, New Delhi. |
| **7.** | Aora, J. S. 2006. Introductory Ornamental Horticulture. Kalyani Publishres, Ludhiana – 141 008. |
| **8.** | Prof. Bhattacharjee, S. K. Advanced Commercial Floriculture. Aavishkar Publishers Distributor, Jaipur – 320003. |

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| **Semester-II** |
| **Paper Code: 203: Plantation Crops, Spices and Condiments** |
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| **THEROY** |
| 1. **Coconut:** Uses, Varieties- Tall x dwarf hybrids (TxD), Dwarf x tall hybrids (DxT), Tall x tall hybrids (T x T). Soil, Climate, Propagation – Seed propagation, Selection of seed nuts, selection of seedling for planting. Preparation of pits and planting, Irrigation, Manuring and fertilization, methods of application of fertilizers, weeding. Harvesting, Yield, Storage. **Oil Palm:** Introduction, uses, varieties, seed propagation, Climate – Sunshine and Temperature requirement Types of soils for oil palm growing regions, Spacing, Planting, Irrigation, Manuring, Weeding and Mulching Harvesting and yield
 |
| 1. **Cocoa:** Introduction, products/Byproducts chocolate, varieties, Climate, Soil, Seed and Vegetative propagation, Cuttings, preparation of land, provision of Shade, Spacing, planting-Cocoa under Natural Shade, Intercropping Irrigation, Manuring, weeding, types of branching, training and pruning, Harvesting. **Cashew Nut:** Introduction, uses, Climate, Soils, varieties/ hybrids, Propagation – Vegetative propagation, Epi-cotyl grafting and Cuttings. Planting, Branching Pattern, Irrigation, weeding, Manuring, Training and pruning, Rejuvenation, flowering, Harvesting, Yield.
 |
| 1. **Coffee:** Introduction, soil, Climate, types- differences Arabica/robusta, branching, varieties, propagation, Raising nurseries. Preparation of main field and planting, Provision of shade, Advantages of shade, Disadvantages of shade, Irrigation, Manuring, Training and pruning – Trenching, Mulching, Weeding, Liming, Flowering- season of flowering, Fruit set and harvesting and Yield.
 |
| 1. **Black Pepper**: Uses, Botany, varieties, soil and intercrop and mixed crop. Propagation with seed, Cuttings, Rapid Multiplication Method. Planting of the vines, shade and shade regulation, Training and pruning of pepper vines. Nutritional management, Irrigation, weed control, harvesting and yield. **Cardamom**: Uses, Botany, varieties, types of cardamom like, Malabar, Mysore and Vazukka soil and climate, selection of site and repartition, propagation seed and vegetative method like suckers. Mixed cropping planting, shade and shade regulation, Nutrient management, Irrigation, Weeding, Intercultural Operations like Thrashing, Mulching Earthling up Racking, Harvesting indices, and yield.
 |
| 1. **Ginger**: Uses , Botany, varieties, soil and climate, propagation, preservation of seed rhizome, selection of land and preparation, Planting season, Seed rate Spacing, Methods – bed system and ridge and furrow system seasons – Irrigation, Nutrient Management. Weeding, Intercultural Operations like Mulching, Harvesting indices, and yield.
 |
| 1. **Turmeric**: Uses, Botany, varieties, soil and climate, propagation, preservation of seed rhizome, selection of land and preparation. Methods of cultivation like bed system ridge and furrow system Planting – Seasons Seed rate, Spacing Mulching, Irrigation, Nutrient Management, Weeding and Intercultural Operations, Shade provision Harvesting – indices, yield .
 |
| 1. **Clove**: Uses, Botany, varieties, Soils and Climate, Propagation by seed – Raising of the nursery Planting, Weeding, Staking, Manuring, Intercultural, Irrigation, Pruning, Harvesting, curing and yield. **Cinnamon**: Uses, Botany, Varieties, Propagation – Seed, Cuttings, Tree stumps, Pruning, Soil and Climate, Planting, Weeding. Manuring, Harvesting, and Storage yield.
 |
| 1. **Vanilla:** Uses, Botany, Varieties, constraints of production, Propagation by Cuttings Soil and Climate, Land preparation, Staking, Planting, Manuring, Flowering and Pollination Hand Pollination, Harvesting, Curing and processing, Storage and yield.
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| **PRACTICALS** |
| **1.** | Description and identification of coconut, &oil palm varieties/ Hybrids |
| **2.** | Description and identification of cashew nut varieties/ Hybrids.  |
| **3.** | Description and identification of cacao varieties/ Hybrids. |
| **4.** | Selection of mother palm, seed nuts and planting of seed nuts in the nursery of coconut.  |
| **5.** | Layout and planting of coconut, oil palm.  |
| **6.** | Description and identification of coffee varieties |
| **7.** | Description and identification of Black pepper varieties |
| **8.** | Description and identification of turmeric varieties. |
| **9.** | Description and identification of Cardamum |
| **10.** | Visit of commercial plantations in the district |
|  |  |
| **SUGGESTED READINGS AND TEXT BOOKS** |
| **1.** | Jain, S. K. 1983. Medicinal plants. National Book Trust, New Delhi. Dastur J F 1982. Medicinal plants of India and Pakistan. Taraporevala sons and Co. Pvt. Ltd., Bombay. |
| **2.** | Atal, E. K and Kapur, B. M. 1982. Cultivation and Utilization of medicinal and aromatic plants. CSIR, New Delhi. |
| **3.** | Dastur, J. F. 1982. Medicinal plants of India and Pakistan. Taraporevala sons and Co. Pvt. Ltd., Bombay. |
| **4.** | Wood, G. A. R. 1975. Cacao. Longman, London.  |
| **5.** | Shanmugavelu, K. G and Madhava Rao, V. N. 1977. Spices and Plantation Crops Popular Book Depot, Madras. |
| **6.** | Nair, M. N. Bhaslara Rap, E. V. V and Nambiar, M. N and Nambiar, M. C. 1990. Cashew. CPCRIK, Kasargod, Kerala.  |
| **7.** | Nair, M. K and Nampoothiri, K. V. K. 1996. Oil Palm Production Technology. CPCRI, Kasargod, Kerala.  |
| **8.** | Pruthi, J. S 1976. Spices and Condiments. National Book Trust, New Delhi.  |
| **9.** | Purseglove, J. W. E. G., Brown Gren, C. L and Robbins, S. R. J. 1980. Spices Vol. I. Academic Press, New York.  |
| **10.** | Purseglove, J. W. E. G., Brown Gren, C. L and Robbins, S. R. J. 1980. Spices Vol. II. Academic Press, New York. |
| **11.** | Shanmugavelu, K. G. Kumar, N and Nad Peter, K.V. 2005. Production Technology of Spices and Plantation Crops. Agrosis, Jodhpur. |
| **12.** | Pruthi, J. S. 1993. Major Spices of India - Crop Management Post Harvest Technology. ICAR, New Delhi. |
| **13.** | Kumar, N.B., Md Abdul khaddar, M., Ranga swamy, P and Iruiappan, I. 1997. Introduction To Spices, Plantation Crops And Aromatic Crops. Oxford & IBH, New Delhi. |
| **14.** | Pruthi, J. S. 2001. Minor Spices And Condiments – Crop Management And Post Harvest Technology. ICAR, New Delhi. |

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| **Semester-II** |
| **Paper Code: 204: Medicinal and Aromatic crops** |
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| **THEROY** |
| 1. **Aloe:** Importance and uses, description of plant, species and varieties, soil, climate, land preparation, propagation crop duration, spacing & planting, manuring, irrigation, inter-cultivation, harvesting, yield and chemical composition. **Aswagandha:** Importance and uses, description of plant, varieties, soil, climate, propagation manures, fertilizers and inter cultivation Harvesting, crop duration, method of harvesting drying, grading and yield, chemical constituents.
 |
| 1. **Cinchona:** Importance and uses, varieties, soil, climate, land preparation, propagation, spacing, planting, manures and fertilizers, weeding, cover cropping, staking, harvesting – method of harvesting and yield of bark. **Isabgol:** Importance and uses, description of plant, varieties, soil, climate propagation, manures & fertilizers, irrigation, harvesting, yield, chemical composition.
 |
| 1. **Long Pepper:** Importance and uses, botany, wild species and varieties, soil, climate land preparation, propagation, spacing & planting, manures & fertilizers, irrigation, interculture, mulching, harvesting, drying & yield.
 |
| 1. **Rauvolfia, Morinda and Citronella:** Importance and uses, botany, varieties, soil, climate propagation spacing, planting, manuring, irrigation, weeding, harvesting, root yield
 |
| 1. **Senna:** Importance and uses, botany varieties, soil, climate land preparation propagation, sowing, manures and fertilizers, crop rotation and intercropping, irrigation, weeding and inter-culture, harvesting, drying & storage, yield.
 |
| 1. **Citronella & Lemongrass:** Importance and uses, botany, varieties, soil, climate, land preparation, propagation, spacing, planting, manures and fertilizers, irrigation, interculture, harvesting & yield of herb and oil.
 |
| 1. **Geranium:** Importance and uses, origin, distribution, botany, varieties, soil, climate, propagation, spacing, planting and after care, manures and fertilizers, harvesting & yield.
 |
| 1. **Mint:** Importance and uses, distribution, description of species of mint, varieties, chemical composition and uses, seasons, soil, climate, land preparation, propagation, spacing, planting, manures and fertilizers, irrigation, interculture, harvesting & yield.
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| **PRACTICALS** |
| **1.** | Collection of locally available medicinal plants, plant description and preparation of herbarium  |
| **2.** | Collection of locally available aromatic plants, plant description and preparation of herbarium – two classes |
| **3.** | Propagation and nursery techniques for important aromatic crops – two classes  |
| **4.** | Propagation techniques for two important medicinal plants |
| **5.** | Important cultural aspects and harvesting techniques for important medicinal plants. |
| **6.** | Important cultural aspects and Harvesting techniques for important aromatic crops |
| **7.** | Visit to commercial farms |
|  |  |
| **SUGGESTED READINGS AND TEXT BOOKS** |
| **1.** | Jain, S. K. 1983. Medicinal plants. National Book Trust, New Delhi. Dastur J F 1982. Medicinal plants of India and Pakistan. Taraporevala sons and Co. Pvt. Ltd., Bombay. |
| **2.** | Atal, E. K and Kapur, B. M. 1982. Cultivation and Utilization of medicinal and aromatic plants. CSIR, New Delhi. |
| **3.** | Dastur, J. F. 1982. Medicinal plants of India and Pakistan. Taraporevala sons and Co. Pvt. Ltd., Bombay. |
| **4.** | Shanmugavelu, K. G. Kumar, N. Nad Peter, K.V. 2005. Production Technology of Spices and Plantation Crops. Agrosis, Jodhpur. |
| **5.** | Shanmugavelu, K. G. and Madhava Rao. Spices and Plantation Crops.  |
| **6.** | Kumar, N.B., Md Abdul khaddar, M., Ranga swamy, P and Iruiappan, I. 1997. Introduction To Spices, Plantation Crops And Aromatic Crops. Oxford & IBH, New Delhi. |
| **7.** | Pruthi, J. S. 1993. Major Spices of India - Crop Management Post Harvest Technology. ICAR, New Delhi. |
| **8.** | Pruthi, J. S. 2001. Minor Spices And Condiments – Crop Management and Post Harvest Technology. ICAR, New Delhi. |

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| **Semester-III** |
| **Paper Code: 301: Principles of Landscape Gardening** |
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| **THEROY** |
| 1. Definition of land scape and land scaping – Historical back ground of land scaping – Principles of land scape gardening – Initial approach – Axis – Focal Point – Mass effect – Unity – Space – Divisional Lines – Proportion and Scale – Texture – Time and Light – Tone and Colour – Mobility – Rhythm – Balance – Contract – Harmony – Vista – Style.
 |
| 1. Garden components or features –Garden walls – Retaining wall – Fences and Gates – Steps – Garden Drives (Gravel and Asphalt) and Paths (Gravel, Brick, Grass, Stone, Crazy pavings) – Arches and Pergolas – Screens – Bridges – Outdoor garden rooms (Gazebos, garden pavilions, band stand, bower and thatched huts) – Garden components or features – Hedges and Edges – Flower bed – Borders – Carpet Bedding.
 |
| 1. Garden adornments via., – Garden Seats – Ornamental tubs, urns and Vases – Bird baths – Sun dials – Floral Clocks – Japanese Lanterns – Ornamental Stones – Fountains – statues – Towers – Wells – Plants Containers – Plant Strands.
 |
| 1. Types of garden – Formal – Informal – Wild Garden – Styles of garden in the world – Mughal Garden – Site and design – Walls and gates – Terrace – Running water – Baradari – Trees and Flowers.
 |
| 1. Features of English – Italian – French – Persian Gardens – Japanese Garden – Types of Japanese Garden – Hill – Flat – Tea – Passage – Sand Gardens – Features of Japanese Garden – Ponds – Streams – Waterfalls – Fountains – Islands – Bridges – Water Basins – Stone Lanterns – Stones – Pagodas – Fences and Gates – Vegetation (Ever green, Deciduous and Flowering plants)
 |
| 1. Rock Garden – Types of rock Garden – Selection of site – Construction of the Rockery – Planting – Management of the Rockery – Plants for rock garden – Examples of Cacti and succulents, ferns, shrubs, herbaceous plants, bulbs, flowering annuals.
 |
| 1. Roof garden – Need for roof garden – Limitations – Types of roof garden (Private or cooperative) – Planning – Suitability of the roof – Drainage and water proofing – Making of flower beds, pots and containers.
 |
| 1. Gardening – Concept – Soil Media – Planting – Planting materials Examples – Flowering annuals – Herbaceous perennials – Shrubs – Trees – Creepers – Bulbs – water plants – Maintenance of plants.
 |
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| **PRACTICALS** |
| **1.** | Study of various features of an ornamental garden with suitable plants and identification of plants for each feature |
| **2.** | Study of formal gardens (Mughal, Persian, Italian and French gardens) with their different features |
| **3.** | Study of special type of gardens (Terrace garden and Rock garden) |
| **4.** | Study of landscaping Highways, Railway stations, Bus terminus and Airports |
| **5.** | Study of landscaping factories, places of historic importance, places of worship |
| **6.** | Study of landscaping cities, towns, country side, canals and along the bank of rivers |
| **7.** | Visit to nearby places of worship, places of historic importance, Airport and highways for study of landscape design |
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| **SUGGESTED READINGS AND TEXT BOOKS** |
| **1.** | Randhawa, G. S. 1973. Ornamental Horticulture in India. Today and Tomorrow’s Printers and Publishers, New Delhi |
| **2.** | Bose, T. K and Mukherjee, D. 1977. Gardening in India. Oxford & IBH Publishing Co. Pvt. Ltd., Calcutta |
| **3.** | Walker, D. T. 1983. Planting Designs. PDA, Publishers Corporation, USA. |
| **4.**  | Iyengar, G. S. 1990. Complete Gardening In India. IBH, Banglore. |
| **5.** | Nambisan, K. M. P. 1992. Design Elements of Land Scape Gardening Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi. |
| **6.** | Bose, T. K. Malti, R. G. Dhua, R. S and Das, P. 2004. Floriculture and Landscaping. Nayaprakash, Calcutta. |
| **7.** | Aora, J.S. 2006. Introductory Ornamental Horticulture. Kalyani Publishres, Ludhiana.  |
| **8.** | Randhawa, G. S and Amitabha Mukhopadhyay. 2004. Floriculture in India. Allied Publishers Pvt. Ltd., New Delhi. |

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| **Semester-III** |
| **Paper Code: 302: Ornamental Gardening** |
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| **THEROY** |
| 1. Ornamental and shady Trees – Definition – Classification based on purpose with suitable examples – Specimen trees – Shady trees – Flowering trees – Avenue or road side trees – Screening trees – Fragrant flowering trees – Pollution controlling trees
 |
| 1. Selection of trees based on – Climatic – Soil – availability and Cost factor s- Methods of planting – Time of planting – Manuring – Care and Maintenance – Planting Schemes for avenue planting – One kind of flowering tree on both sides – two kinds of lowering trees blooming at one time on both sides of road – Two kinds of flowering trees blooming at different time on both sides of road – shady trees only on both sides of road.
 |
| 1. Shrubs – Definition – Utility (aesthetic values) – Classificaiton with suitable examples – based on Purpose of growing – Flowering – Foliage – Flowering and foliage – Fragrant shrubs – based on sunlight requirement – shrubs requiring full sunlight – Planting of Shrubs in garden -Growing of shrubs – Soil – Climate – Preparation of soil – Planting – Propagation – seeds – Cuttings – layering – After care – Irrigation – weeding – Pruning. Herbaceous perennials – Definition – Introduction – Classification with suitable examples – Herbaceous perennials for plains and for hills – Planting – Manuring – Propagation.
 |
| 1. Climbers – Definition – Climbers – twiners – ramblers – creepers – Utility (aesthetic values) – Classification with suitable examples – Sunny situation – Partial shade – shade loving climbers – Showy flowering climbers – Climbers with scented flowers – Climbers with attractive foliage – Climbers for pots – Annual climbers – Climbers for hedge making –Soil – Digging of pits – Planting of climbers – After care – Manuring – Maintenance.
 |
| 1. Palms – Definition – Introduction – Utility (aesthetic values) – Classification with examples – Feather leaved Palm – Fan leaved Palm – Propagation – Pot culture – Potting – Re-potting - Potting media – Manuring – Aftercare. Ferns – Introduction – Utility (aesthetic values) – Propagation – Spore – Division of Clumps – Suckers – bulbils – Site of growing – Soil media – Pot culture – re-potting – Irrigation – Indoor culture – Important Examples.
 |
| 1. Cacti – Introduction – Characteristics of Cactaceae – Site of growing – Natural habitat – Domestication (Housing of cacti) – Propagation – Seeds – Offsets – Grafting – Soil – Climate – Containers – Time and method of planting – Potting – Re-potting – Irrigation – Staking. Succulents – Characteristics – Difference between cacti and succulents – Utility (aesthetic values) – Climate – Soil – Housing – Propagation – Seeds – Cuttings – Watering – Re-potting – Summer protection.
 |
| 1. Floral Ornaments – Garlands – Floral crowns – Hair decoration – Rangoli – Floral Bouquets – Button holes – Floral arrangement – Western style – Principles of Design viz., – Emphasis – Balance – Proportion – Rhythm – Harmony – Unity – Elements of Design viz., – Line – Form – Texture – Colour. Selection of flowers and foliage – Line flowers – Form flowers – Mass flowers – Filler flower – Materials required – Design rules – Types of floral arrangement – Circular – Triangular – Radiating – Crescent – Horizontal Hogarthian curve – Conditioning – Reconditioning of flowers.
 |
| 1. Bonsai – Definition – Criteria for selecting plants – Examples – Classification of Bonsai – Upright (formal and informal) – Winding – Winding – Oblique – Gnarled – Semi-cascade-cascade – Clasped to stone – Containers (pots) and Media – Potting and Re-potting – Training – Pruning and Pinching (Shoot, leaf and root) – Watering – manuring – Defoliation – Mame Bonsai.
 |
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| **PRACTICALS** |
| **1.** | Identification and description of annuals. |
| **2.** | Identification of Herbaceous perennials. |
| **3.** | Identification of climbers, creepers, foliage and flowering shrubs.  |
| **4.** | Identification of avenue trees, palms and ferns.  |
| **5.** | Identification of ornamental grasses cacti and succulents.  |
| **6.** | Study of water garden, terrace garden and Japanese gardens, recreational and children’s corner.  |
| **7.** | Flower arrangement, Bonsai practicing and training.  |
| **8.** | Visit to nearby gardens |
| **9.** | Visit to nearby recreational and children’s corner.  |
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| **SUGGESTED READINGS AND TEXT BOOKS** |
| **1.** | Randhwa, M.S. 1950. Beautiful Gardens |
| **2.** | Randhawa, G S. Ornamental Horticulture in India |
| **3.** | Davidson Peterson and Marklenbug. Nursery Management |
| **4.** | Randhawa, G. S. Amitabha Mukhopadhyay. 2004. Floriculture in India. Allied Publishers Pvt. Ltd., New Delhi. |
| **5.** | Bose, T. K and Mukherjee, D. 2004. Gardening in India. Oxford & IBH Publishers. |
| **6.** | Chandra, K. L and Choudhary, B. 1986. Ornamental Horticulture in India. Publication and Information division ICAR, New Delhi. |

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| **Semester-III** |
| **Paper Code: 303: Landscape Management and Lawn Management** |
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| **THEROY** |
| 1. Bio-aesthetic Planning – Definition – Aim and Concept – Need for Bio-aesthetic planning – Air pollution – Human welfare. **Land scaping** – Educational Institutions (Schools and Colleges) – Importance – Need – Planting materials for different areas of institution – Land scaping – Country side and Village home – Land scaping – Railway stations and railway lines. **Land scaping** – cities and towns – Road side plantation – Planting trees in colonies – Land scaping City parks – Large – medium – small parks – pleasure grounds – Examples of ornamental shade and flowering trees for town roads.
 |
| 1. **Landscape Garden components or features –** Garden walls – Retaining wall – Fences and Gates – Steps – Garden Drives (Gravel and Asphalt) and Paths (Gravel, Brick, Grass, Stone, Crazy pavings) – Arches and Pergolas – Screens – Bridges – Outdoor garden rooms (Gazebos, garden pavilions, band stand, bower and thatched huts) – Garden components or features – Hedges and Edges – Flower bed – Borders – Carpet Bedding.
 |
| 1. **Land scape Garden adornments via.,** – Garden Seats – Ornamental tubs, urns and Vases – Bird baths – Sun dials – Floral Clocks – Japanese Lanterns – Ornamental Stones – Fountains – statues – Towers – Wells – Plants Containers – Plant Strands.
 |
| 1. **Types of garden –** Formal – Informal – Wild Garden – Styles of garden in the world – Mughal Garden – Site and design – Walls and gates – Terrace – Running water – Baradari – Trees and Flowers.
 |
| 1. **Features of English – Italian – French – Persian Gardens – Japanese Garden –** Types of Japanese Garden – Hill – Flat – Tea – Passage – Sand Gardens – Features of Japanese Garden – Ponds – Streams – Waterfalls – Fountains – Islands – Bridges – Water Basins – Stone Lanterns – Stones – Pagodas – Fences and Gates – Vegetation (Ever green, Deciduous and Flowering plants)
 |
| 1. **Lawn** – Selection of Grass – Bermuda grass – Korean grass – Poa grass – Fescue grass – Kentucky blue grass - Grasses for shady areas –
 |
| 1. **Site Selection** – Soil – Preparation of soil – drainage – digging – manuring and grading – Methods of planting – Sowing of Seeds – Dibbling – Turfing – turf plastering – Bricking – Planting on Polythene.
 |
| 1. **Maintenance of lawn** – Mowling – Rolling – Sweeping – Scraping – Raking – Weeding – Irrigation – Top dressing with compost and fertilizers – Diseases and other problems – Fairy ring – Pale Yellow Lawns.
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| **PRACTICALS** |
| **1.** | Visit to nearby landscape garden layout.  |
| **2.** | Study of planning, designing of gardens and layout.  |
| **3.** | Study of components of a garden and functional uses of plants in the landscape.  |
| **4.** | Study of planning and designing of house garden, roadside planting and avenues for new colonies, traffic islands.  |
| **5.** | Preparation of land for lawn and planting.  |
| **6.** | Identifying the different tools used for lawn maintenance |
| **7.** | Study of the design of garden structures and layout of rockery.  |
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| **SUGGESTED READINGS AND TEXT BOOKS** |
| **1.** | Michel Lorry. Landscape Design |
| **2.** | Eckbo, G. 1956. The Art of Home Landscaping |
| **3.** | Randhwa, M. S. 1950. Beautiful Gardens |
| **4.** | Randhwa, M. S. 1983. Flowering Trees  |
| **5.** | Neol Kings bury, 1997. The ultimate planting guide |
| **6.** | Bose, T. K., Malti, R.G., Dhua, R. S and Das, P. 2004. Floriculture and Landscaping. Nayaprakash, Calcutta.  |
| **7.** | Aora, J. S. 2006. Introductory Ornamental Horticulture. Kalyani Publishres, Ludhiana. |
| **8.** | Randhawa, G. S.and Amitabha Mukhopadhyay. 2004. Floriculture in India. Allied Publishers Pvt. Ltd., New Delhi. |

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| **Semester-III** |
| **Paper Code: 304: Plant Growth Regulators in Horticulture** |
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| **THEROY** |
| 1. Plant growth regulators nomenclature-classification, mode of action, movement-mechanism of action and translocations
 |
| 1. Auxins: in growth development of crops in rooting-flowering-fruiting and yield in different horticultural crops.
 |
| 1. Gibberellins in growth and development in seed germination, flowering fruiting, fruit development and yield in different horticultural crops
 |
| 1. Cytokinins in growth and development in seed germination, flowering fruiting, fruit development and yield in different horticultural crops.
 |
| 1. Ethylene in growth and development in flowering, fruit development and ripening in horticultural crops.
 |
| 1. Growth regulators in fruit set including parthenocarpy, fruit thinning (grapes), fruit drop (mango and citrus) fruit ripening (Climacteric and Non-climacteric fruits). Tuber and bulb formation nature of the stimulus, tuber growth development by different hormones.
 |
| 1. Sex expression and pollination, fruiting by different hormones in Vegetables. Role growth regulators in flower crops like Rose, Gerbera and Gladiolus
 |
| 1. Role of Growth retardants in canopy management in fruit and plantation crops.
 |
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| **PRACTICALS** |
| **1.** | Identifying different growth regulators formulations  |
| **2.** | Calculations of growth regulator requirements for different concentrations  |
| **3.** | Application of auxins to stem cuttings and observation on rooting studies |
| **4.** | Study on Delaying of fruit ripening by applications of gibberellins in fruit crops |
| **5.** | Study on applications of gibberellins in flower crops |
| **6.** | Study on the sex expression studies on vegetables by application of gibberellins.  |
| **7.** | Study on fruit ripening by applications of Ethephon in fruit crops |
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| **SUGGESTED READINGS AND TEXT BOOKS** |
| **1.** | Wareing, P. F and Phillips, I. D. J. 1970. The Control of Growth and Differentiation in Plants. Pergamon Press Oxford, UK.  |
| **2.** | Weaver, R. J. 1972. Plant Growth Substances in Agriculture. W H Freeman and Co., USA.  |
| **3.** | Purohith, S. S. 1993. Hormonal Regulation of Plant Growth and Development. Agrobotanical Publishers, Bikaner.  |
| **4.** | Leopold, A. C and Kriedemann, P. E. 1975. Plant Growth and Development Tata McGraw Hill publishing, Co. Ltd., New Delhi.  |
| **5.** | Delving, R. M and Witham, F. S. 1986. Plant Physiology. CBS Publishers and Distributers, Delhi.  |
| **6.** | Noggle, G. R and Fritz, T. G. 1944. Introductory Plant Physiology. Prentice Hall India Pvt. Ltd., New Delhi. |
| **7.** | Lincoln Taiz and Eduards Zeiger 2006. Plant Physiology. (4th Edition) Sinauer Associates, Inc. |

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| **Semester-IV** |
| **Paper Code: 401: Integrated Pest and Disease Management**  |
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| **THEROY** |
| 1. Identification-control measures of important Pests and Diseases in Mango. Identification-control measures of important Pests and Diseases in Banana
 |
| 1. Identification-control measures of important Pests and Diseases in Citrus. Identification-control measures of important Pests and Diseases in papaya.
 |
| 1. Identification-control measures of important Pests and Diseases in tropical Vegetable crops (Bhenid, Brinjal, Tomato and cucurbits)
 |
| 1. Identification-control measures of important Pests and Diseases in winter Vegetable crops (cabbage, cauliflower, carrot, etc)
 |
| 1. Identification-control measures of important Pests and Diseases in plantation and spice crops (Coconut, Cashew, Oilpalm, Chillies, turmeric and ginger).
 |
| 1. Identification-control measures of important Pests and Diseases in medicinal and aromatic crops (Rauvulfia, Cinchona, Citronella and Lemon grass)
 |
| 1. Identification-control measures of important Pests and Diseases in flower crops and ornamental crops (Roses, Chrysanthemum, gladiolus, gerbera)
 |
| 1. Integrated Pest Disease Management – Concepts-application in horticultural crops
 |
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| **PRACTICALS** |
| **1.** | Collection and herbarium of different disease specimens of fruit crops  |
| **2.** | Collection and herbarium of different disease specimens of tropical vegetable crops  |
| **3.** | Collection and herbarium of different disease specimens of winter vegetable crops  |
| **4.** | Collection and herbarium of different disease specimens of plantation crops  |
| **5.** | Collection and herbarium of different disease specimens of spice crops  |
| **6.** | Collection and herbarium of different disease specimens of medicinal crops  |
| **7.** | Collection and herbarium of different disease specimens of aromatic crops  |
| **8.** | Collection and herbarium of different disease specimens of flower and ornamental crops  |
| **9.** | Identification and labelling of different commercial fungicides and pesticide formulation  |
|  |  |
| **SUGGESTED READINGS AND TEXT BOOKS** |
| **1.** | Ramakrishna Ayyer, T. V. 1963. Hand book of Economic Entomology for South India. Govt. Press. Madras. |
| **2.** | Nair, M. R. G. K. 1975. Insects and Mites of Crops in India. ICAR, New Delhi. |
| **3.** | David, B. V. and Kumaraswamy, T. 1978. Elements of Economicf Entomology. Popular Book Depot. Madras. |
| **4.** | Butani, D. K. 1984. Insects and Fruits. Periodical Expert Book Agency, New Delhi. |
| **5.** | Mehrotra, R. S. Plant Pathology. Tata McGraw-Hill Publishing Company, New Delhi. |
| **6.** | Rangaswamy, G and Bagyaraj, G. J. Agricultural Microbiology. Prentice – Hall of India, Pvt. Ltd. New Delhi. |
| **7.** | David, B. V and Kumaraswamy, T. 1978. Elements of Economic Entomology. Popular book Depot, Madras. |
| **8.** | Anderson, J. V. Diseases of fruit Crops. Publishing House, Jodhpur. |

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| **Semester-IV** |
| **Paper Code: 402: Post Harvest Technology of Horticultural Crops** |
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| **THEROY** |
| 1. Importance of Post harvest technology of horticultural crops-post harvest losses in the country-Loss of revenue in the country. Physiological and Biochemical changes: Physiological – Softening, Physiological loss in weight (PLW), texture, respiration and transpiration, Bio-chemical changes – Change in carbohydrates, organic acids, pigments, phenolic compounds, flavouring compounds, enzyme activity.
 |
| 1. Study of Maturity – definition of maturity, different methods of judge maturity in horticultural crops like Mango, Banana, Citrus, Papaya, Brinjal, Tomato, Bhendi, coconut, oil palm.
 |
| 1. Physico-chemical changes during development, ripening, storage of fruits and vegetables. Methods of storage and transportation of horticultural crops
 |
| 1. Study of Harvesting, grading, packaging and storage of Fruit crops like Mango, Banana, Citrus, Papaya.
 |
| 1. Study of Harvesting, grading, packaging and storage of vegetable crops like Brinjal, Tomato, Bhendi, Onion, melons and pumpkin.
 |
| 1. Study of Harvesting, grading, packaging and storage of plantation crops like coconut, cashew, coffee, oil palm.
 |
| 1. Study of Harvesting, grading, packaging and storage of medicinal crops like Rauvulfia, Cinchona, Senna.
 |
| 1. Study of Harvesting, grading, packaging and storage of flower crops like Roses, gladiolus, gerbera, chrysanthemum.
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| **PRACTICALS** |
| **1.** | Practice in judging the maturity of various horticultural produce |
| **2.** | Determination of physiological loss in weight and quality |
| **3.** | Grading of horticultural produce |
| **4.** | Packing studies in fruits, vegetables by using different packing material |
| **5.** | Packing studies in plantation crops and cut flowers by using different packing material |
| **6.** | Methods of storage |
| **7.** | Methods of transportation |
| **8.** | Identification of storage pests and diseases |
| **9.** | Visit to markets, packing houses and cold storages |
| **10.** | Packing studies in plantation crops and cut flowers by using different packing material |
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| **SUGGESTED READINGS AND TEXT BOOKS** |
| **1.** | Hulme, B. C. 1970. The Biochemistry of Fruits and their Production. Academic Press, London.  |
| **2.** | Hard, N. F and Salunkhe, D. K. 1980. Post harvest Biology and Handling of Fruits and Vegetables. AVI Publishing Co., West Port, USA. |
| **3.** | Wills, R. H. H., Lee, T. H., Graham. D., Mc Glasson, M. B and Hall E. C. 1981. An Introduction to the Physiology and Handling of Fruits and Vegetables. Granada Publishing Co., London.  |
| **4.** | Venkatarathnam, L. 1988. Packaging of Fruits and Vegetables in India Agri-Horticultural Society, Hyderabad. |
| **5.** | Salunkhe, D. K., Bhatt, N. R and Desai, B. B. 1990. Post harvest Biotechnology of Flowers and Ornamental Plants. Nayaprakash, Calcutta. |
| **6.** | Pandey, P. H. 1998. Principles and Practice of Post Harvest Technology. Kalyani Publishers, Ludhiana. |
| **7.** | Prof. Peter, K.V., Kumar, K.P and Indira, V. Post Harvest Technology of Horticulture Crops. New publishing Agency. |

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| **Semester-IV** |
| **Paper Code: 403: Principles of Fruit and Vegetables Preservation** |
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| **THEROY** |
| 1. Importance of fruit and vegetable preservation-Definition of preservation- Classify the different Methods of preservation.
 |
| 1. Principle of preservation-prevention of microbial decomposition-prevention of self decomposition by enzymes-prevention of damage by insects, rodents, animals etc. Principles and method of preservation. Preservation by Asepsis, High Temperature, low temperature, chemicals-Drying, filtration, carbonation, sugar salt, fermentation, acids, oil and spices, antibiotics, irradiation
 |
| 1. Unfermented fruit beverages: Preparation and preservation of unfermented fruit beverages juices, RTS, Nectar, cordial, squash, syrup, crush.
 |
| 1. Jams, jellies and Marmalades – Procedure for preparation. Jams: Problems of Jam production. Jelly: Important considerations in jelly making and problems of jelly preparations
 |
| 1. Preservation by salt: Pickles Procedure for preparation. Preservation by vinegar: Problems of pickle making.
 |
| 1. Sauces/ketchups Procedure for preparation. Tomato processing: Problems in the preparation of sauces and ketchups.
 |
| 1. Preservation by sugar: Candies, Crystallised fruits, Preserves procedure for preparation Important considerations and problems in preparations. Dried products like mango lather, onion powder, tomato slices.
 |
| 1. Food laws: Fruit Product order-Food Standardization and Regulatory agencies in India
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| **PRACTICALS** |
| **1.** | Preparation of syrups and brines |
| **2.** | Preparation of Jams |
| **3.** | Preparation of Jellies and marmalades |
| **4.** | Preparation of RTS/ Squash/syrup |
| **5.** | Preparation of Candies and preserves |
| **6.** | Dehydration of Fruits and vegetables |
| **7.** | Preparation of Pickles (Hot and sweet) |
| **8.** | Preparation of Sauces |
| **9.** | Preparation of Ketchups |
| **10.** | Visit to Processing units |
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| **SUGGESTED READINGS AND TEXT BOOKS** |
| **1.** | Cruess, W. V. 1948. Commercial Fruits and Vegetable Products. McGraw Hill Book Co., London. |
| **2.** | Desrosier, N. W. 1959. The Technology of Food Preservation AVI Publishing Co., Inc., Connecticut, USA.  |
| **3.** | Hulme, A. C. 1970. The Biochemistry of Fruits and their Products. Academic Press, London.  |
| **4.** | Lal, G., Siddappa, G. S and Tadon, N. G. L. 1986. Preservation of Fruits and Vegetables ICAR, New Delhi. |
| **5.** | Moris, T.N. Principles of Fruit Preservation. Agrobios (India).  |
| **6.** | Girdhari Lal, G. S., Siddappa and Tandon, G.L. Preservation of Fruits and Vegetables. ICAR, New Delhi, Kalyani Publications. |

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| **Semester-IV** |
| **Paper Code: 404: Recent Advances in Horticulture** |
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| **THEROY** |
| 1. Watershed management objectives, approaches, steps in watershed development. Importance and principles of organic farming in horticultural crops, sources and importance of organic matter.
 |
| 1. Organic mulches weed control in organic farming, organic pest control. Composting, principles of composting, vermin-culture, vermin-composting & vermin-wash, coir pith manure.
 |
| 1. Cultivation of high value crops in Protected Cultivation-poly house culture of vegetable crops, flower crops etc.
 |
| 1. Irrigation systems-Drip, Sprinkler and Micro irrigation systems
 |
| 1. Flower arrangement – Ikabana & western trend, Principles of flower arrangement, tools & equipment, dehydrated flowers, dehydration methods, maintenance of flower shape, procedure for embedding, pot –pourri.
 |
| 1. Bonsai – Suitable plants for Bonsai; Aesthetics with plant parks, classification of Bonsai, requirements of Bonsai pot, Training and pruning, potting & repotting, general care-Terrarium culture.
 |
| 1. Apiculture, bee-keeping flora in India, bee-keeping technology, equipment, Honey extraction.
 |
| 1. Mushroom production nutritional aspects, recipes. Home scale industry prospects
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| **PRACTICALS** |
| **1.** | Flower arrangement in different styles. |
| **2.** | Preparation of bouquets. |
| **3.** | Visit to the local florist. |
| **4.** | Visit to Protected Cultivated areas of horticultural farms. |
| **5.** | Visit to Drip-Micro irrigation project areas of horticultural farms |
| **6.** | Visit to local vermin-compost unit. |
| **7.** | Visit to watershed management centre. |
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| **SUGGESTED READINGS AND TEXT BOOKS** |
| **1.** | Michel Lorry. Landscape Design. |
| **2.** | Eckbo, G. 1956. The Art of Home Landscaping. |
| **3.** | Randhwa, M. S. 1950. Beautiful Gardens. |
| **4.** | Randhwa, M. S. 1983. Flowering Trees.  |
| **5.** | Neol Kings bury, 1997. The ultimate planting guide. |
| **6.** | Chada, K. L and Grewal, J. S. Advances in Horticulture Volume 2,3,4,6 and 12. ICAR, Malhotra Publishing House, New Delhi. |
| **7.** | Sharma, V. K. Advances in Horticulture. Deep & Deep Publication Pvt. Limited, New Delhi, India. |