

New

HOR506*	Breeding of Ornamental Plants	2+1
HOR507	Protected Cultivation of Flower Crops	2+1
HOR508	Conservation agriculture	1+1
HOR509	Information technology in agriculture	1+1
HOR 510	Basic concepts in laboratory techniques	0+1
HOR511*	Commercial Production of Cut Flowers	2+1
HOR512	Seed Production in Flower Crops	1+1
HOR513	Dry land farming and water shed management	2+1
HOR514	Technical writing and communication skills	0+1
HOR515	Agricultural research, Research ethics and rural development programs	1+0
HOR516*	Commercial Production of Loose Flowers	2+1
HOR517	Library and information services	1+0
HOR518	Seminar	0+1
HOR519	Thesis Research	0+30

\*Compulsory among major courses

## M.Sc.(Hort.) Floriculture and Landscaping

### First Semester

- **Course Title** : Systematics of Ornamental Plants
- **Course Code** : HOR501
- **Credit Hours** : (2+1)
- **Need of the course?**

Systematics of ornamental plants will give an in depth knowledge on nomenclature, description of genera, floral biology and use of molecular techniques in systematics of flower crops and ornamental crops.

- **Objective of the course**

To familiarize students about the taxonomy, classification, nomenclature and descriptors of different ornamental crops. The course is organized as follows

No Blocks

Units

- Nomenclature

Unit 1: History, origin, hotspots, classification and nomenclature systems  
Unit 2: International Code, Identification features, descriptors.  
Unit 3: Red Book, Registration with NBPG R, PPVFRA

- Families

Unit 1: Rosaceae, Asteraceae, Caryophyllaceae, Orchidaceae, Araceae, Liliaceae,  
Unit 2: Acanthaceae, Palmaceae, Asparagaceae, Malvaceae, Musaceae, Oleaceae, Iridaceae.

- Molecular techniques

Unit: Molecular techniques in modern systematics.

- **Theory**

**Block I: Nomenclature**

**Unit I:** Nomenclature: History, origin, hotspots, and nomenclature systems. classification

**Unit II:** International systems: International Code, Treaties, International and National Organisations, Biodiversity Act, Identification features, descriptors.

**Unit III:** Red Book, Registration (NBPGR, PPVFRA, NBA).

**Block 2: Families**

**Unit**

**I:** Families: Description and families and important genera Rosaceae, Asteraceae, Caryophyllaceae, Orchidaceae, Aracaceae, Liliaceae.

**Unit II:**

Acanthaceae, Palmaceae, Asparagaceae, Malvaceae, Musaceae, Oleaceae, Iridaceae.

**Block 3: Molecular techniques**

**Unit I:** Molecular techniques in modern systematics.

- **Practical**

- Different nomenclature systems of plants (2);
- Floral biology and taxonomic description of rose, chrysanthemum, orchids, carnation, gerbera, anthurium, marigold, tuberose, Jasmine, China aster, lily, gypsophila (6);
- Cryopreservation and tissue culture repository (4);
- Molecular techniques (4).

- **Teaching Methods/Activities**

- Lectures
- Group discussions
- Flip classes
- Assignment and student presentation
- Hands-on training of different procedures

- **Learning outcome**

- After successful completion of this course,
- The students will have an in-depth knowledge of nomenclature, description of important genera and use of molecular techniques in systematics of flower crop

- **Suggested Reading**

- Bhattacharya Band Johri BM. 2004. *Flowering Plants: Taxonomy and Phylogeny*. Narosa Publ. House, New Delhi, India. pp. 753.
- Dutta AC. 1986. *A Class Book of Botany*. Oxford Univ. Press, Kolkata, India. Pandey BP. 2013. *Taxonomy of Angiosperms*. S. Chand & Co. pp. 608.
- Rajput CBS and Haribabu RS. 2014. *Citriculture*, Kalyani Publishers, New Delhi, India. Spencer RR, Cross Rand Lumley P. 2007. *Plant Names. 3rd Ed. A Guide to Botanical Nomenclature*. CSIRO Publ., Australia., 176p.
- Vasistha BB. 1998. *Taxonomy of Angiosperms*. Kalyani Publishers, New Delhi, India.

- **Course Title : Ornamental Gardening And Landscaping**

- **CourseCode** :HOR 502
- **CreditHours** :(2+1)
- **Need of thecourse?**  
Ornamentalgardeningandlandscapingisanimportantcoursewhichgivesathorough understanding of different types of gardens and their components. Thestudents need to imbibe the principles of landscaping and should develop skills forplanningunderdifferentsituations.
- **Objectofthecourse**  
Familiarizationwithprinciplesandpracticesoflandscaping

Thecourseisorganizedasfollows

No	Blocks	Units
1	Gardensandcomponents	I. Stylesandtypesofgardens • Gardencomponents • Specializedgardens
2	Landscapeplanning	I. Principlesandelementsoflandscaping II.Landscapingfordifferentsituations

- **Theory**

**Block1: Gardensandcomponents**

**Unit I:** Stylesandtypesofgardens: Historicalbackgroundofgardening, Importanceandscope ofornamentalgardening, stylesandtypesofgardens, formal and informal style gardens. English, Mughal, Japanese, Persian, Spanish, Italian, French, HinduandBuddhistgardens.

**Unit II:** Gardencomponents: Gardencomponents(livingandnon-living): arboretum, shrubbery, fernery, palmatum, arches and pergolas, edgesandhedges, climbersandcreepers, cactiandsucculents, herbs, annuals, flower borders and beds, ground covers, carpet beds, colour wheels, clock garden, bamboo groves, bonsai; Non -living components like-path, garden gate, fencing, paving and garden features like fountains, gardenseating, swings, lanterns, basins, birdbaths, sculptures, waterfalls, bridge, steps, ramps, Lawn-generaandspecies, establishmentandmaintenance.

**Unit III:** Specialized gardens: Specialised gardens such as vertical garden, roofgarden, terracedgarden, watergarden, sunkengarden, rockgarden, shade garden, temple garden, sacred gardens (with emphasis on nativeplants), Zengarden.

**Block2: Landscapeplanning**

**Unit I:** Principles and elements of landscaping: Basic drawing skills, use of drawing instruments garden symbols, steps in preparation of gardendesign, programmesphase, design, phase, etc.

Elements and principles of landscape design. Organization of spaces, visual aspects of plan arrangement- view, vista and axis. Principles of circulation, siteanalysisandlandscape, waterrequirement, useofrecycledwater.

**Unit II:** Landscaping for different situations: Urban landscaping, Landscapingfor specific situations such as residential, farm houses, institutions, corporate sector, industries, hospitals, roadsides, traffic islands, Children parks, public parks, xeriscaping, airports, railway station and tracks, river banks and dam sites and IT/ SEZ parks. Bio-aestheticplanning, eco-tourism, themeparks, indoorgardening, therapeuticgardening.

## VII. Practical

- Graphical language and symbols in landscaping, study of drawing instruments, viz., "T" square, set square, drawing board, etc. (1);
- Identification of various types of ornamental plants for different gardens and occasions (1);
- Preparation of land, planning, layout and planting, deviations from landscape principles (1);
- Case study (1);
- Site analysis, interpretation of map of different sites, use of GIS for selection (1);
- Enlargement from blue print. Landscape design layout and drafting on paper as per the scale (2);
- Preparation of garden models for home gardens, farmhouses, industrial gardens, institutional gardens, corporate, avenue planting, practices in planning and planting of special types of gardens. (3);
- Burlapping, lawn making, planting of edges, hedges, topiary, herbaceous and shrubby borders (2);
- Project preparation on landscaping for different situations, creation of formal and informal gardens (2);
- Visit to parks and botanical gardens (2).
- **Teaching Methods/Activities**
  - Lectures
  - Group discussions
  - Flip classes
  - Assignment and group seminars
  - Hands on training on different models of landscaping
  - Exposure visits
- **Learning outcome**

After successful completion of this course, the students are expected to be

  - The students will be apprised of different types of gardens and have a thorough understanding of principles of landscape gardening
  - Develop skills for landscaping under different situations and layout of garden components.
- **Suggested Reading**

Bose TK, Chowdhury B and Sharma SP. 2011. *Tropical Garden Plants in Colour*. Hort. and Allied Publ.

Bose TK, Maiti RG, Dhua RS and Das P. 1999. *Floriculture and Landscaping*. Naya Prokash, Kolkata, India.

Grewal HS and Singh P. 2014. *Landscape Designing and Ornamental Plants*. Kalyani Publishers, New Delhi.

Lauria A and Victor HR. 2001. *Floriculture - Fundamentals and Practices*. Agrobios Publ., Jodhpur.

Misra RL and Misra S. 2012. *Landscape Gardening*. Westville Publ. House, New Delhi, India.

Nambisan K MP. 1992. *Design Elements of Landscape Gardening*. Oxford & IBH Publ. Co., New Delhi, India.

Randhawa GS and Mukhopadhyay A. 1986. *Floriculture in India*. Allied Publ.

Sabina GT and Peter KV. 2008. *Ornamental Plants for Gardens*. New India Publ. Agency, New Delhi, India.

Singh A and Dhaduk BK. 2015. *A Colour Handbook: Landscape Gardening*. New India Publ. Agency, New Delhi, India.

Valsalakumari PK, Rajeevan PK, Sudhadevi PK and Geetha CK. 2008. *Flowering Trees*. New India Publ. Agency, New Delhi, India.

Woodrow MG. 1999. *Gardening in India*. Biotech Books, New Delhi, India.

- **Course Title** : Principles and Practices of Organic Farming
- **Course Code** : HOR503
- **Credit Hours** : 2+1
- **Objective of the course**



To study the principles and practices of organic farming for sustainable crop production.

- **Theory**

- **Unit I**

- Organic farming - concept and definition, its relevance to India and global agriculture and future prospects; principles of organic agriculture; organic and farming standards; organic farming and sustainable agriculture; selection and conversion of land, soil and water management - land use, conservation tillage; shelter zones, hedges, pasture management, agro-forestry.

- **Unit II**

- Organic farming and water use efficiency; soil fertility, nutrient recycling, organic residues, organic manures, composting, soil biota and decomposition of organic residues, earthworms and vermicompost, green manures, bio-fertilizers and biogas technology.

- **Unit III**

- Farming systems, selection of crops and crop rotations, multiple and relay cropping systems, intercropping in relation to maintenance of soil productivity.

- **Unit IV**

- Control of weeds, diseases and insect pest management, biological agents and pheromones, bio-pesticides.

- **Unit V**

- Socio-economic impacts; marketing and export potential: inspection, certification, labeling and accreditation procedures; organic farming and national economy.

- **Practical**

- Method of making compost by aerobic method
  - Method of making compost by anaerobic method
  - Method of making vermicompost
  - Identification and nursery raising of important agro-forestry trees and shrubs for shelter belts
  - Efficient use of biofertilizers, technique of treating legume seeds with *Rhizobium* cultures, use of *Azotobacter*, *Azospirillum*, and PSB cultures in field
  - Visit to a biogas plant
  - Visit to an organic farm
  - Quality standards, inspection, certification and labeling and accreditation procedures for farm produce from organic farms

- **Teaching methods/activities**

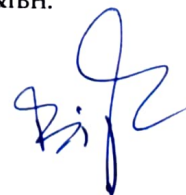
- Classroom teaching with AV aids, group discussion, assignment, exposure visit

- **Learning outcome**

- Basic knowledge on organic farming for sustainable agriculture and development

- **Suggested Reading**

- Ananthakrishnan TN. (Ed.). 1992. *Emerging Trends in Biological Control of Phytophagous Insects*. Oxford & IBH.
  - Gaur AC. 1982. *A Manual of Rural Composting*, FAO/UNDP Regional Project Document, FAO.
  - Joshi M. 2016. *New Vistas of Organic Farming*. Scientific Publishers
  - Lampin N. 1990. *Organic Farming*. Press Books, Ipswich, UK.
  - Palaniappan SP and Anandurai K. 1999. *Organic Farming - Theory and Practice*. Scientific Publ.
  - Rao BV Venkata. 1995. *Small Farmer Focused Integrated Rural Development: Socio-economic Environment and Legal Perspective*: Publ. 3, Parisaraprajna Parishatana, Bangalore.
  - Reddy MV. (Ed.). 1995. *Soil Organisms and Litter Decomposition in the Tropics*. Oxford & IBH.
  - Sharma A. 2002. *Hand Book of Organic Farming*. Agrobios.
  - Singh SP. (Ed.). 1994. *Technology for Production of Natural Enemies*. PDDB, Bangalore.
  - Subba Rao NS. 2002. *Soil Microbiology*. Oxford & IBH.
  - Trivedi RN. 1993. *A Text Book of Environmental Sciences*, Anmol Publ.



- Veeresh GK, Shivashankar Kand Suiglachar MA. 1997. *Organic Farming and Sustainable Agriculture*. Association for Promotion of Organic Farming, Bangalore.
- WHO. 1990. *Public Health Impact of Pesticides Used in Agriculture*. WHO.
- Woolmer P and Swift M.J. 1994. *The Biological Management of Tropical Soil Fertility*. TSBF & Wiley.

**Course Title** : **Intellectual property and management In agriculture**  
**Course Code** : **HOR504**  
**Credit Hours** : **1+0**

### Objective of Course

The main objective of this course is to equip students and stakeholders with knowledge of Intellectual Property Rights (IPR) related protection systems, their significance and use of IPR as a tool for wealth and value creation in a knowledge-based economy.

### Theory

Historical perspectives and need for the introduction of Intellectual Property Right regime; TRIPS and various provisions in TRIPS Agreement; Intellectual Property and Intellectual Property Rights (IPR), benefits of securing IPRs; Indian Legislations for the protection of various types of Intellectual Properties; Fundamentals of patents, copyrights, geographical indications, designs and layout, trade secrets and traditional knowledge, trademarks, protection of plant varieties and farmers' rights and biodiversity protection; Protectable subject matters, protection in biotechnology, protection of other biological materials, ownership and period of protection; National

Biodiversity protection initiatives; Convention on Biological Diversity; International Treaty on Plant Genetic Resources for Food and Agriculture; Licensing of technologies, Material transfer agreements, Research collaboration Agreement, License Agreement.

### Suggested Readings

- Erbisch FH and Mareida K. 1998. *Intellectual Property Rights in Agricultural Biotechnology*. CABI.
- Ganguli P. 2001. *Intellectual Property Rights: Unleashing Knowledge Economy*. McGraw-Hill.
- *Intellectual Property Rights: Key to New Wealth Generation*. 2001. NRDC and Aesthetic Technologies.
- Ministry of Agriculture, Government of India. 2004. *State of Indian Farmer*. Vol. V. Technology Generation and IPR Issues. Academic Foundation.
- Rothschild M and Scott N. (Ed.). 2003. *Intellectual Property Rights in Animal Breeding and Genetics*. CABI.
- Saha R. (Ed.). 2006. *Intellectual Property Rights in NAM and Other Developing Countries: A Compendium on Law and Policies*. Daya Publ. House.

The Indian Acts - Patents Act, 1970 and amendments; Design Act, 2000; Trademarks Act, 1999; The Copyright Act, 1957 and amendments; Layout Design Act, 2000; PPV and FR Act 2001, and Rules 2003; The Biological Diversity Act, 2002.

### I. Course Title : Experimental Designs

### II. Course Code : HOR505

### III. Credit Hours : 2+1

### IV. Need of the course

This course is meant for students of agricultural and animal sciences other than Agricultural Statistics. Designing an experiment is an integrated component of research in almost all sciences. The students would be exposed to concepts of Design of Experiments so as to enable them to understand the concepts involved in planning, designing their experiments and analysis of experimental data.

### V. Theory

#### Unit I

Need for designing of experiments, characteristics of a good design. Basic principles of designs- randomization, replication and local control.

#### Unit II

Uniformity trials, size and shape of plots and blocks, Analysis of variance, Completely randomized design, randomized block design and Latin square design.

#### Unit III

Factorial experiments, (symmetrical as well as asymmetrical). orthogonality and partitioning of degrees of freedom. Concept of confounding.

#### Unit IV

Split plot and strip plot designs, analysis of covariance and missing plot techniques in randomized block and Latin square designs; Transformations, Balanced Incomplete Block Design, resolvable designs and their applications, Lattice design, alpha design - concepts, randomization procedure, analysis and interpretation of results. Response surfaces. Combined analysis.

#### VI. Practical

- Uniformity trial data analysis, formation of plots and blocks, Fairfield Smith Law, Analysis of data obtained from CRD, RBD, LSD, Analysis of factorial experiments,
- Analysis with missing data,
- Split plot and strip plot designs.

#### VII. Suggested Reading

- Cochran WG and Cox GM. 1957. *Experimental Designs*. 2nd Ed. John Wiley.
- Dean AM and Voss D. 1999. *Design and Analysis of Experiments*. Springer.
- Montgomery DC. 2012. *Design and Analysis of Experiments*, 8th Ed. John Wiley.
- Federer WT. 1985. *Experimental Designs*. MacMillan.
- Fisher RA. 1953. *Design and Analysis of Experiments*. Oliver & Boyd.
- Nigam AK and Gupta VK. 1979. *Handbook on Analysis of Agricultural Experiments*. IASRI Publ.
- Pearce SC. 1983. *The Agricultural Field Experiment: A Statistical Examination of Theory and Practice*. John Wiley.

## Second Semester

- **Course Title** :BreedingofOrnamentalCrops
- **Course Code** :HOR506
- **Credit Hours** :(2+1)

- **Need of the course?**

Breeding novel and desired varieties is very important for growth of floriculture Industry. Students should have a thorough understanding of principles of plant breeding, genetic mechanisms and breeding methods in ornamental crops for making improvement in these crops.

- **Object of the course**

To impart comprehensive knowledge about the principles and practices of breeding of ornamental plants.

The course is organized as follows

- | No Blocks                      | Units  |
|--------------------------------|--|
| 1 Principles of Plant Breeding | I. Principles of plant breeding <ul style="list-style-type: none"><li>• Intellectual Property and Plant Breeders Rights</li><li>• Genetic mechanisms and inheritance</li></ul> |
| • Breeding methods             | I. Breeding methods<br>II. Role of biotechnology   |
- **Theory**

### **Block1: Principles of Plant Breeding**

**Unit I:** Principles of plant breeding: Principles of plant breeding; Origin, evolution, distribution, introduction, domestication and conservation of ornamental crops.

**Unit II:** Intellectual Property and Plant Breeders Rights: Introduction and initiatives in IP and PBR for ornamental crops.

**Unit III:** Genetic mechanisms and inheritance: Breeding objectives, reproductive barriers (Male sterility, incompatibility) in major ornamental crops. Inheritance of important traits, Genetic mechanisms associated with flower colour, size, form, doubleness, fragrance, plant architecture, post-harvest life, abiotic and biotic stress tolerance/resistance.

### **Block2: Breeding methods**

**Unit I:** Breeding methods: Breeding methods suitable for sexually, asexually propagated flower crops, self and cross pollinated crops- pedigree selection, backcross, clonal selection, polyploidy and mutation breeding, heterosis and F<sub>1</sub> hybrids.

**Unit II:** Role of biotechnology: Role of biotechnology in improvement of flower crops including soma clonal variation, *in-vitro* mutagenesis, *in-vitro* selection, genetic engineering, molecular markers, etc.

### **Crops**

Rose, chrysanthemum, carnation, gerbera, gladiolus, orchids, anthurium, lily, marigold, jasmine, tuberose, dahlia, gaillardia, crossandra, aster, etc.; Flowering annuals: petunia, zinnia, snapdragon, stock, pansy, calendula, balsam, dianthus, etc. Important ornamental crops like aglaonema, diffenbachia, hibiscus, bougainvillea, kalanchoe, etc.

### **Practical**

- Floral biology of important ornamental crops (2);
- Cytology and cytogenetics (2);
- Selfing and crossing procedures for important ornamental crops (2);
- Evaluation of hybrid progenies (2);
- Induction of mutants through physical and chemical mutagens (2);
- *In-vitro* selection, genetic engineering (2);
- Induction of polyploidy (2);
- DU Testing (2).

### **VIII. Teaching Methods/Activities**

- Lectures
- Group discussions
- Flip classes
- Assignment and student presentation
- Hands on training of different procedures
- **Learning outcome**  
After successful completion of course, the students are expected to have
  - Thorough understanding of principles of plant breeding and genetic mechanisms in different ornamental plants and flowers.
  - Application of different breeding methods for improvement of ornamental crops
  - Develop the required skills in conventional and advanced breeding

### **X Suggested Reading**

- Bhattacharjee SK. 2018. *Advances in Ornamental Horticulture*. Pointer Publ., Reprint, 6 vols, pp. 2065.
- Bose TK and Yadav LP. 1989. *Commercial flowers*. Naya Prokash, Kolkata, India.
- Callaway DJ and Callaway MB. 2009. *Breeding Ornamental Plants*. Timber Press. Revised edition, pp. 359.
- Chadha KL and Bhattacharjee SK. 1995. *Advances in Horticulture: Ornamental Plants*. Vol. XII, Parts 1 & 2. pp. 533, pp. 574. Malhotra Publ. House, New Delhi, India.
- Chadha KL and Choudhury B. 1992. *Ornamental Horticulture in India*. ICAR, New Delhi, India.



- Chaudhary RC. 1993. *Introduction to Plant Breeding*. Oxford & IBH Publ.
- Misra R Land Misra S. 2017. *Commercial Ornamental Crops: Cut Flowers*. Kruger Brentt Publisher UK Ltd. pp. 584.
- Misra R Land Misra S. 2017. *Commercial Ornamental Crops: Traditional and Loose Flowers*. Kruger Brentt Publisher UK Ltd.
- Singh BD. 2016. *Plant Breeding Principles and Methods*. Kalyani Publishers, New Delhi-Ludhiana, India.
- Vainstein A. (Ed). 2002. *Breeding for ornamental crops: Classical and Molecular Approaches*. Springer-Science-Business Media, B.V. Edition 1. pp. 392.
- Watts L. 1980. *Flower and Vegetable Plant Breeding*. Unilever Research, Sharnbrook, Bedford, UK. pp 182. Grower Books, London, UK.

- **Course Title** : **Protected Cultivation of Flower Crops**
- **Course Code** : **HOR507**
- **Credit Hours** : **(2+1)**
- **Why this course?**  
Protected cultivation is more rewarding in production of high value cut flowers. With appropriate structures and plant environment control measures, the constraints of environment prevalent in the region can be overcome allowing almost year-round cultivation. The students need a thorough understanding of principles, types, designs, crops for different environments and management of environment in protected cultivation.
- **Aim of the course**  
Understanding the principles, theoretical aspects and developing skills in protected cultivation of flower crops. The course is organized as follows

No Blocks	Units
• Principles and types	I Prospects and types of protected structures II Principles and designs
• Growing Environment	I Control of environment II Crop management and crop regulation III Automation and standards

- **Theory**

- **Block 1: Principles and types**

**Unit I:** Prospects and types of protected structures: Prospects of protected floriculture in India; Types of protected structures – Glasshouse/polyhouse, shade net houses, mist chambers, lath houses, orchidarium, fernery, rain shelters, etc.

**Unit II:** Principles and design: Principles of designing and erection of protected structures; Low cost/Medium cost/High cost structures; Locationspecific designs; Structural components; Suitable flower and foliage plants for protected cultivation.

- **Block 2: Growing environment**

**Unit I:** Control of environment: Microclimate management and manipulation of temperature, light, humidity, air and CO<sub>2</sub>; Heating and cooling systems, ventilation, naturally ventilated greenhouses, fan and pad cooled greenhouses, light regulation, water harvesting.

**Unit II:** Intercultural operations and crop regulation: Containers and substrates, media, soil decontamination, layout of drip and fertigation system, water and nutrient management, IPM and IDM, Crop regulation by chemical methods and special horticultural practices (pinching, disbudding, deshooting, debl ossoming, etc.); Staking and netting, Photoperiod regulation.

**Unit III:** Automation and standards: Automation in greenhouses, sensors, solar greenhouses and retractable greenhouses, GAP/Flower labels, Export

standards, EXIM policy, APEDA regulations for barriers.

export,

Non-tariff

Rose, Chrysanthemum, Carnation, Gerbera, Orchids, Anthuriums, Liliium, Limonium, Lisianthus, heliconia, Calalily, Alstromeria, etc.

- **Practical**

- Study of various protected structures (1);
- Design, layout and erection of different types of structures (2);
- Practices in preparatory operations, growing media, soil decontamination techniques (2);
- Microclimate management (2);
- Practices in drip and fertigation techniques, special horticultural practices (2);
- Determination of harvest indices and harvesting methods (1);
- Postharvest handling, packing methods (1);
- Economics of cultivation, Project preparation (2);
- Project Financing guidelines (1);
- Visit to commercial greenhouses (2).

- **Teaching Methods/Activities**

- Lectures
- Group discussions
- Flip classes
- Assignment and group seminars
- Hands on training of different techniques
- Exposure visits

- **Learning outcome**

After successful completion of this course, the students are expected to be acquire

- Knowledge on types, design and principles of protected structures
- Thorough understanding of principles of microclimate management and crop management.
- Develop the required skills for designing a greenhouse
- Acquire skills on microclimate management, production management

- **Suggested Reading**

Bhattacharjee SK. 2018. *Advances in Ornamental Horticulture*. Vols. I-VI. Pointer Publ. Reprint, pp. 2065.

Bose TK, Maiti RG, Dhua R Sand Das P. 1999. *Floriculture and Landscaping*. Naya Prokash, Kolkata, India.

Bose TK and Yadav LP. 1989. *Commercial Flowers*. Naya Prokash, Kolkata, India.

Chadha K L and Bhattacharjee SK. 1995. *Advances in Horticulture: Ornamental Plants*. Vol. XII, Parts 1 & 2. pp. 533 and pp. 574. Malhotra Publ. House, New Delhi, India.

Lauria A and Victor HR. 2001. *Floriculture - Fundamentals and Practices*. Agrobios Publ., Jodhpur.

Nelson PV. 2011. *Green House Operation and Management*. Pearson Publ. 7<sup>th</sup> edition, pp. 624.

Prasad Sand Kumar U. 2003. *Commercial Floriculture*. Agrobios Publ., Jodhpur. Randhawa G

Sand Mukhopadhyay A. 1986. *Floriculture in India*. Allied Publ.

Reddy S, Janakiram T, Balaji T, Kulkarni S and Misra RL. 2007. *Hi- Tech Floriculture*. Indian Society of Ornamental Horticulture, New Delhi, India

- **Course Title** : **Conservation Agriculture**

- **CourseCode** :HOR508
- **CreditHours** :1+1

- **Need of the course**

To impart knowledge of conservation of agriculture for economic development.

- **Theory**

**Unit I**

Conventional and conservation agriculture systems, sustainability concerns, conservation agriculture: Historical background and present concept, global experiences, present status in India.

**Unit II**

Nutrient management in CA, water management, weed management, energy use, insect-pest and disease management, farm machinery, crop residue management, cover crop management.

**Unit III**

Climate change mitigation and CA, C-sequestration, soil health management, soil microbes and CA.

CA in agroforestry systems, rainfed/dryland regions

**Unit V**

Economic considerations in CA, adoption and constraints, CA: The future of agriculture

- **Practicals**
  - Study of long-term experiments on CA,
  - Evaluation of soil health parameters,
  - Estimation of C-sequestration,
  - Machinery calibration for sowing different crops, weed seed bank estimation under CA, energy requirements, economic analysis of CA.
- **Teaching methods/activities**  
Classroom teaching with AV aids, group discussion, oral presentation by students.
- **Learning outcome**  
Experience on the knowledge of various types of conservation of agriculture.
- **Suggested Reading**
  - Arakeri HR and Roy D. 1984. *Principles of Soil Conservation and Water Management*. Oxford & IBH.
  - Bisht JK, Meena VS, Mishra PK and Pattanayak A. 2016. Conservation Agriculture-An approach to combat climate change in Indian Himalaya. Publisher: Springer Nature. Doi:10.1007/978-981-10-2558-7.
  - Dhruvanarayana VV. 1993. *Soil and Water Conservation Research in India*. ICAR.
  - FAO. 2004. *Soil and Water Conservation in Semi-Arid Areas*. Soils Bull., Paper 57.
  - Gracia-Torres L, Benites J, Martinez-Vilela A and Holgado-Cabera A. 2003. Conservation Agriculture-Environment Farmer experiences, innovations Socio-economic policy.
  - Muhammad F and Kamdambot HMS. 2014. *Conservation Agriculture*. Publisher: Springer Cham Heidelberg, New York Dordrecht London. Doi:10.1007/978-3-319-11620-4.
  - Yellamanda Reddy T and Sankara Reddy GH. 1992. *Principles of Agronomy* Kalyani

- **Course Title** :Basic concepts in laboratory techniques
- **Course Code** :HOR509
- **Credit Hours** :0+1

**Objective**

To acquaint the students about the basics of commonly used techniques in laboratory.

**Practical**

- Safety measures while in Lab;

- Handling of chemical substances;
- Use of burettes, pipettes, measuring cylinders, flasks, separatory funnel, condensers, micro pipettes and vials;
- Washing, drying and sterilization of glassware;
- Drying of solvents/chemicals;
- Weighing and preparation of solutions of different strengths and their dilution;
- Handling techniques of solutions;
- Preparation of different agro-chemical doses in field and pot applications;
- Preparation of solutions of acids;
- Neutralisation of acid and bases;
- Preparation of buffers of different strengths and pH values;
- Use and handling of microscope, laminar flow, vacuum pumps, viscometer, thermometer, magnetic stirrer, micro-ovens, incubators, sand bath, water bath, oil bath;
- Electric wiring and earthing;
- Preparation of media and methods of sterilization;
- Seed viability testing, testing of pollen viability;
- Tissue culture of crop plants;
- Description of flowering plants in botanical terms in relation to taxonomy.

#### **Suggested Readings**

- Furr AK. 2000. *CRCHandBookofLaboratorySafety*. CRC Press
- Gabb MH and Latchem WE. 1968. *A Handbook of Laboratory Solutions*. Chemical Publ. Co

#### **I. Course Title : Information Technology in Agriculture**

#### **II. Course Code : HOR510**

#### **III. Credit Hours : 1+1**

#### **IV. Need of the course**

This is a course on Introduction to Networking and Internet Applications that aims at exposing the students to understand analogy of computer, basic knowledge of MS Office. Also to understand Internet and WWW, use of IT application and different IT tools in Agriculture

#### **V. Theory**

##### **Unit I**

Introduction to Computers, Anatomy of computer, Operating Systems, definition and types, Applications of MS Office for document creation & Editing, Data presentation, interpretation and graph creation, statistical analysis, mathematical expressions,

##### **Unit II**

Database, concepts and types, uses of DBMS in Agriculture, World Wide Web Statistical Sciences: Computer Application

##### **765**

(WWW): Concepts and components, Introduction to computer programming languages, concepts and standard input/output operations. e-Agriculture, concepts and applications,

##### **Unit III**

Use of ICT in Agriculture, Computer Models for understanding plant processes. IT application for computation of water and nutrient requirement of crops, Computer controlled devices (automated systems) for Agri-input management, Smartphone Apps in Agriculture for farm advises, market price, postharvest management etc.,

##### **Unit IV**

Geospatial technology for generating valuable agri-information. Decision support systems, concepts, components and applications in Agriculture, Agriculture Expert System, Soil Information Systems etc. for supporting Farm decisions, Preparation of contingent crop-planning using IT tools.

#### **VI. Suggested Reading**

- Vanitha G. 2011. *Agro-informatics*

- <http://www.agrimoon.com>
- <http://www.agriinfo.in>
- <http://www.cagri.org>
- <http://www.agriglance.com>
- <http://agritech.tnau.ac.in>

## Third Semester

- **Course Title** : Commercial Production of Cut Flowers
  - **Course Code** : HOR511
  - **Credit Hours** : (2+1)
  - **Need of the course?**  
Cut flowers are grown in a wide variety of environments and agro climatic regions. The students of floriculture need to have an understanding of production and postharvest management of important cut flower crop on a commercial scale.
  - **Objective of the course**  
To impart basic knowledge about the importance and production dynamics of cut flowers grown in India.  
The course is organized as follows
- | No | Blocks                               | Units  |
|----|--------------------------------------|--|
| 1  | Production management                | I. Scope and scenario<br>• Growing environment   |
| No | Blocks                               | Units  |
| 2  | Postharvest management and marketing | • Crop Management<br>• Flower regulation<br>I. Postharvest management<br>II. Marketing |
- **Theory**
    - Block I: Production management**
    - Unit I:** Scope and scenario: National and International scenario, importance and scope of cut flower trade, constraints for cut flower production in India.
    - Unit II:** Growing environment: Soil analysis, soil health card, Growing environment, open cultivation, protected cultivation, soil/mediarequirements, land preparation, planting methods, influence of light, temperature, moisture, humidity and microclimate management on growth and flowering.
    - Unit III:** Crop management: Commercial Flower production – Commercial varieties, water and nutrient management, fertigation, weed management, crop specific practices, ratooning, training and

pruning, pinching, deshooting, bending, desuckering, disbudding. Use of growth regulators, physiological disorders and remedies, IPM and IDM.

**Unit IV:** Flower regulation: Flower forcing and year round/ offseason flower production through physiological interventions, chemical regulation, environmental manipulation.

**Block2: Post-harvest management and marketing**

**Unit I:** Post harvest management: Cut flower standards and grades, harvest indices, harvesting techniques, post-harvest handling, Methods of delaying flower opening, Pre-cooling, pulsing, packing, storage and transportation.

**Unit II:** Marketing: Marketing, export potential, institutional support, Agri Export Zones, 100% Export Oriented units, Crop Insurance.

**Crops**

Rose, chrysanthemum, gladiolus, tuberose, carnation, gerbera, orchids, lily, anthurium, chrysanthemum, alstroemeria, bird of paradise, heliconia, alpinia, ornamental ginger, dahlia, gypsophila, solidago, limonium, stock, cut greens and fillers.

**Practical**

- Identification of varieties (1);
- Propagation (2);
- Microclimate management (2);
- Training and pruning techniques (1);
- Pinching, deshooting, disbudding, desuckering (1);
- Practices in manuring, drip and fertigation, foliar nutrition, growth regulator application (2);

- Harvesting techniques, post-harvest handling, cold chain (2);
- Economics, Project preparation for regionally important cut flowers, crop specific guidelines for project financing (NHG guidelines) (2);
- Visit to commercial cut flower units (2);
- Case studies (1).

**Teaching Methods/Activities**

- Lectures
- Group discussions
- Flip classes
- Assignment and student presentation
- Hands on training of different procedures
- Exposure visits

**Learning outcome**

After successful completion of this course, the students are expected to –

- Understand the scope and scenario of floriculture
- A thorough understanding of production and post harvest management of flower crops.
- Acquire the required skills to prepare project reports on different crops for financing.

**Suggested Reading**

Arora JS. 2010. *Introductory Ornamental Horticulture*. Kalyani Publishers. 6th edition, pp. 230.

Bhattacharjee SK. 2018. *Advances in Ornamental Horticulture*. Vols. I-VI. Pointer Publ. Reprint, pp. 2065.

Bose TK, Maiti, RG, Dhuarsand Das P. 1999. *Floriculture and Landscaping*. Prokash, Kolkata, India.

Bose TK and Yadav LP. 1989. *Commercial Flowers*. Naya Prokash, Kolkata, India.

Chadha KL and Bhattacharjee SK. 1995. *Advances in Horticulture: Ornamental Plants*. Vol.

XII, Parts 1 & 2. pp. 533, pp. 574. Malhotra Publ. House, New Delhi, India.

Chadha KL and Chaudhury B. 1992. *Ornamental Horticulture in India*. ICAR, New Delhi, India.

- Dole JM and Wilkins HF. 2004. *Floriculture-Principles and Species*. Prentice Hall. 2<sup>nd</sup> edition, pp. 1048.
- Larson RA. 1980. *Introduction to Floriculture*. New York Academic Press. pp. 628.
- Laurie A and Rees VH. 2001. *Floriculture-Fundamentals and Practices*. Agrobios Publications, Jodhpur. pp. 534.
- Prasad S and Kumar U. 2003. *Commercial Floriculture*. Agrobios Publications, Jodhpur. pp. 660.
- Reddy S, Janakiram T, Balaji Kulkarni S and Misra RL. 2007. *Hi-Tech Floriculture*. Indian Society of Ornamental Horticulture, New Delhi, India.
- Singh AK. 2006. *Flower Crops: Cultivation and Management*. New India Publ. Agency, New Delhi, India. pp. 475.

- **Course Title** : **Seed Production in Flower Crops**
- **Course Code** : **HOR:512**
- **Credit Hours** : **(1+1)**

- **Need of the course?**

Seed production of flowers is a highly remunerative enterprise. The students need to have knowledge of seed industry, seed production methods and seed certification. This course provides hands on training on seed production of important flower crops.

- **Objective of the course**

To impart basic knowledge about the importance of seed production in important flower crops. The course is organized as follows

No Blocks	Units
• Seed Industry	I Scenario of Seed industry
• Hybrid Seed Production	I Seed Production methods II Population improvement III F1 Hybrid production
• Regulations	I Seed certification and standards

- **Theory**

**Block1: Seed Industry**

**Unit I:** Scenario of Seed Industry: Scope, scenario and importance of seed production in flower crops. Constraints in flower seed production. Marketing and economics of flower seeds.

**Block2: Hybrid Seed Production**

**Unit I:** Seed production-Methods: Methods of seed production, agrotechniques for production of nucleus, breeder and certified seeds. Harvesting, seed processing, seed priming, seed chain, packaging and storage.

**Unit II:** Population improvement: Mass selection, progeny selection. Use of in compatibility and male sterility, maintenance of variety and seed production in flower crops.

**Unit III:** F1 hybrids: F1 hybrid seed production advantages, steps involved in hybrid seed production, pollination behaviour and isolation, pollination management methods in production of F1/ hybrids in different flower crops.

**Block3: Regulations**

**Unit I:** Seed certification and standards: Seed certification, Seed standards, seed act, plant breeders rights and farmers' rights, Bio safety, handling of transgenic seed crops, importing of seeds and OGL, trade barriers in seed business, sanitary and phytosanitary issues, custom clearance and quarantine.

## Crops

Marigold, petunia, antirrhinum, zinnia, pansy, lupin, calendula, phlox, vinca, dianthus, sunflower, annual chrysanthemum, poppy, cornflower, riceflower.

### Practical

- Seed production of open pollinated varieties (2);
- Seed production of cross pollinated varieties (2);
- Steps involved in hybrid seed production (2);
- Hybrid seed production in different flower crops like marigold, petunia, antirrhinum, zinnia, pansy, lupin, calendula, phlox, vinca, dianthus, sunflower, annual chrysanthemum, etc. (6);
- Visit to seed industry (3);
- Visit to quarantine facility (1).

### Teaching Methods/Activities

- Lectures
- Group discussions
- Flip classes
- Assignment and group seminars
- Hands on training of different techniques
- Exposure visits

### Learning outcome

After successful completion of this course,

- The students will get a thorough knowledge on seed industry, principles and methods of seed production in flower crops.
- Students will get aware on seed standards, certification and law in flower crops.

### Suggested Reading

Bhattacharjee SK. 2018. *Advances in Ornamental Horticulture*. Vols. I-VI. Pointer Publ. Reprint, pp. 2065.

Bose TK, Yadav LP, Pal P, Parthasarathy VA and Das, P. 2003. *Commercial Flowers*. Vol. I & II. Naya Udyog, Kolkata, India.

Davies, Fred T Jr., Geneve RL, Wilson SB, Hartmann HT, Kester DL. 2018. *Hartmann and Kester's Plant Propagation: Principles and Practices*. Pearson Publ. 9<sup>th</sup> Edition.

Larson RA and Armitage AM. 1992. *Introduction of Floriculture*. International Book Distributing Co., Lucknow, India.

• **Course Title : Dryland Farming and Watershed Management**

• **Course Code : HOR513**

• **Credit Hours : 2+1**

### Objective of the course

To teach the basic concepts and practices of dryland farming and soil moisture conservation.

### Theory

#### Unit I

Definition, concept and characteristics of dryland farming; dryland versus rainfed farming; significance and dimensions of dryland farming in Indian agriculture.

#### Unit II

Soil and climatic parameters with special emphasis on rainfall characteristics; constraints limiting crop production in dryland areas; types of drought, characterization of environment for water availability; crop planning for erratic and aberrant weather conditions.

#### Unit III

Stress physiology and resistance to drought, adaptation of crop plants to drought,



drought management strategies; preparation of appropriate crop plans for dry land areas; mid-contingent plan for aberrant weather conditions.

#### **Unit IV**

Tillage, tillage, frequency and depth of cultivation, compaction in soil tillage; concept of conservation tillage; tillage in relation to weed control and moisture conservation; techniques and practices of soil moisture conservation (use of mulches, kinds, effectiveness and economics); antitranspirants; soil and crop management techniques, seeding and efficient fertilizer use.

#### **Unit V**

Concept of watershed resource management, problems, approach and components.

#### **Practical**

- Method of Seed Priming
- Determination of moisture content of germination of important dryland crops
- Determination of Relative Water Content and Saturation Deficit of Leaf
- Moisture stress effects and recovery behaviour of important crops
- Estimation of Potential ET by Thornthwaite method
- Estimation of Reference ET by Penman Monteith Method
- Classification of climate by Thornthwaite method (based on moisture index, humidity index and aridity index)
- Classification of climate by Koppen Method
- Estimation of water balance by Thornthwaite method
- Estimation of water balance by FAO method
- Assessment of drought
- Estimation of length of growing period
- Estimation of probability of rain and crop planning for different drought condition
- Spray of anti-transpirants and their effect on crops
- Water use efficiency
- Visit to dryland research stations and watershed projects

#### **Teaching methods/activities**

Classroom teaching with AV aids, group discussion, assignment.

#### **Learning outcome**

Basic knowledge on dryland farming and soil moisture conservation.

#### **Suggested Reading**

- Reddy TY. 2018. *Dryland Agriculture Principles and Practices*. Kalyani publishers
- Das NR. 2007. *Tillage and Crop Production*. Scientific Publ.
- Dhopte AM. 2002. *Agrotechnology for Dryland Farming*. Scientific Publ.
- Dhruv Narayan VV. 2002. *Soil and Water Conservation Research in India*. ICAR.
- Gupta US. (Ed.). 1995. *Production and Improvements of Crops for Drylands*. Oxford & IBH.
- Katyaj JC and Farrington J. 1995. *Research for Rainfed Farming*. CRIDA.
- Rao SC and Ryan J. 2007. *Challenges and Strategies of Dryland Agriculture*. Scientific Publ.
- Singh Pand Maliwal PL. 2005. *Technologies for Food Security and Sustainable Agriculture*. Agrotech Publ. Company.
- Singh RP. 1988. *Improved Agronomic Practices for Dryland Crops*. CRIDA.
- Singh RP. 2005. *Sustainable Development of Dryland Agriculture in India*. Scientific Publ.
- Singh SD. 1998. *Arid Land Irrigation and Ecological Management*. Scientific Publ.
- Venkateshwarlu J. 2004. *Rainfed Agriculture in India. Research and Development Scenario*. ICAR.

**Course Title** : Technical writing and communications skills  
**Course Code** : HOR514  
**Credit Hours** : 0+1



## Objective

To equip the students/ scholars with skills to write dissertations, research papers, etc. To equip the students/ scholars with skills to communicate and articulate in English (verbal as well as writing).

### Practical (Technical Writing)

- Various forms of scientific writings- theses, technical papers, reviews, manuals, etc.;
- Various parts of the thesis and research communications (title page, authorship contents page, preface, introduction, review of literature, material and methods, experimental results and discussion);
- Writing of abstracts, summaries, précis, citations, etc.;
  
- Commonly used abbreviations in the theses and research communications;
- Illustrations, photographs and drawings with suitable captions; pagination, numbering of tables and illustrations;
- Writing of numbers and dates in scientific write-ups;
- Editing and proof-reading;
- Writing of a review article;
- Communication Skills - Grammar (Tenses, parts of speech, clauses, punctuation marks);
- Error analysis (Common errors), Concord, Collocation, Phonetics symbols and transcription;
- Accentual pattern: Weak forms in connected speech;
- Participating in group discussion;
- Facing an interview;
- Presentation of scientific papers.

### Suggested Readings

- Barnes and Noble. Robert C. (Ed.). 2005. *Spoken English: Flourish Your Language*.
- *Chicago Manual of Style*. 14th Ed. 1996. Prentice Hall of India.
- *Collins' Cobuild English Dictionary*. 1995.
- Harper Collins. Gordon HM and Walter JA. 1970. *Technical Writing*. 3rd Ed.
- Holt, Rinehart and Winston. Hornby AS. 2000. *Comp. Oxford Advanced Learner's Dictionary of Current English*. 6th Ed. Oxford University Press.
- James HS. 1994. *Handbook for Technical Writing*. NTC Business Books.
- Joseph G. 2000. *MLA Handbook for Writers of Research Papers*. 5th Ed. Affiliated East-West Press.
- Mohan K. 2005. *Speaking English Effectively*. MacMillan India.
- Richard WS. 1969. *Technical Writing*.
- Sethi J and Dhamija PV. 2004. *Course in Phonetics and Spoken English*. 2nd Ed. Prentice Hall of India.
- Wren PC and Martin H. 2006. *High School English Grammar and Composition*. S. Chand & Co.

**Course Title** : Agricultural research, research ethics and rural development programmes  
**Course Code** : HOR515  
**Credit Hours** : 1+0

## Objective

To enlighten the students about the organization and functioning of agricultural research systems at national and international levels, research ethics, and rural development programmes and policies of Government.



## Theory

**UNIT I** History of agriculture in brief; Global agricultural research system: need, scope, opportunities; Role in promoting food security, reducing poverty and protecting the environment; National Agricultural Research Systems (NARS) and Regional Agricultural Research Institutions; Consultative Group on International Agricultural Research (CGIAR); International Agricultural Research Centres (IARC), partnership with NARS, role as a partner in the global agricultural research system, strengthening capacities at national and regional levels; International fellowships for scientific mobility.

**UNIT II** Research ethics: research integrity, research safety in laboratories, welfare of animals used in research, computer ethics, standards and problems in research ethics.

**UNIT III** Concept and connotations of rural development, rural development policies and strategies. Rural development programmes: Community Development Programme, Intensive Agricultural District Programme, Special group – Area Specific Programme, Integrated Rural Development Programme (IRDP) Panchayati Raj Institutions, Co-operatives, Voluntary Agencies / Non-Governmental Organisations. Critical evaluation of rural development policies and programmes. Constraints in implementation of rural policies and programmes.

### Suggested Readings

- Bhalla GS and Singh G. 2001. *Indian Agriculture- Four Decades of Development*. Sage Publ.
- Punia MS. *Manual on International Research and Research Ethics*. CCS Haryana Agricultural University, Hisar.
- Rao BSV. 2007. *Rural Development Strategies and Role of Institutions- Issues, Innovations and Initiatives*. Mittal Publ.
- Singh K. 1998. *Rural Development- Principles, Policies and Management*. Sage Publ.

## Fourth Semester

- **Course Title** : Commercial Production of Loose Flowers
- **Course Code** : HOR 516
- **Credit Hours** : (2+1)
- **Need of the course?**

Loose flowers are grown in a wide range of agroclimatic regions. The students of floriculture need to have an understanding of production and postharvest management of important loose flower crops.

- **Objective of the course**

To impart basic knowledge about the importance and management of loose flowers grown in India.

The course is organized as follows

No	Blocks	Units
1	Production management	I. Scope and scenario <ul style="list-style-type: none"><li>• Growing environment</li><li>• Crop management</li><li>• Flower regulation</li></ul>
2	Postharvest management and marketing	I. Postharvest management II. Marketing



- **Theory**

- **Block1: Production management**

- **Unit I:** Scope and scenario: Scope, scenario and importance of loose flowers, constraints and opportunities in loose flower production.

- **Unit II:** Growing environment: Nursery management, pro-tray nursery under shade nets, soil and climate requirement, Field preparation, systems of planting.

- **Unit III:** Crop management: Soil analysis, soil health card, water and nutrient management, weed management, training and pruning, special horticultural practices such as pinching and disbudding, use of growth regulators, physiological disorders and remedies, INM, IPM and IDM.

- **Unit IV:**

- **Crop regulation:** Flower forcing and year round flowering, production for special occasions through physiological interventions, chemical regulation.

- **Block2: Postharvest management and marketing**

- **Unit I:** Postharvest management: Harvest indices, harvesting techniques, post-harvest handling and grading, pre-cooling, packaging and storage.

- **Unit II:** Marketing: Important local markets, Export potential, transportation and marketing, APMC and online trading, institutional support, Crop Insurance.

- **Crops**

- Rose, jasmine, chrysanthemum, marigold, tuberose, china aster, crossandra, gaillardia, spider lily, hibiscus, nerium, barleria, celosia, gomphrena, Madar (*Calotropis gigantea*), nyctanthes (Harsingar), tabernaemontana (Chandni), lotus, water lily, michelia (Champa), gardenia, ixora and balsam.

- **Practical**

- Identification of species and varieties (1);
- Propagation and nursery management (1);
- Training and pruning techniques (1);
- Fertigation, foliar nutrition, growth regulator application (2);
- Crop protection (2);
- Pinching, disbudding, staking, harvesting techniques (1);
- Post-harvest handling, storage and cold chain (2);
- Project preparation for regionally important commercial loose flowers. crop specific guidelines for project financing (NHBG guidelines) (2);
- Cost Economics (2);
- Exposure Visits to fields (2).

- **Teaching Methods/Activities**

- Lectures
- Group discussions
- Flip classes
- Assignment and group seminars
- Hands on training of different techniques
- Exposure visits

- **Learning outcome**

- After successful completion of this course, the students would have

- A thorough understanding of production and postharvest management of loose flowers.
- Develop the required skills on commercial production management

- **Suggested Reading**



Arora JS.

2010. *Introductory Ornamental Horticulture*. Kalyani Publ. 6<sup>th</sup> Edition, pp.230. Bhattacharjee SK. 2018. *Advances in Ornamental Horticulture*. Vols. I-VI. Pointer Publ.

Reprint, pp.2065.

Bose TK, Maiti RG, Dhua RS and Das P. 1999. *Floriculture and landscaping*. Naya Prokash, Kolkata, India. Bose TK and Yadav LP. 1989. *Commercial Flowers*. Naya Prokash, Kolkata, India.

Chadha K L and Bhattacharjee SK. 1995. *Advances in Horticulture: Ornamental Plants*. Vol. XII, Parts 1 & 2. pp.533, pp.574. Malhotra Publ. House, New Delhi, India.

Chadha K L and Chaudhury B. 1992. *Ornamental Horticulture in India*. ICAR, New Delhi, India. Laurie A and Rees V H. 2001. *Floriculture - Fundamentals and Practices*. Agrobios Publ., Jodhpur.

pp.534.

Prasad S and Kumar U. 2003. *Commercial Floriculture*. Agrobios Publ., Jodhpur. Randhawa G S and Mukhopadhyay A. 2001.

*Floriculture in India*. Allied Publ. pp.660.

Sheela V L. 2008. *Flowers for Trade*. Horticulture Science Series, vol.10, pp.392. New India Publ. Agency, New Delhi, India.

- I. **Course Title : Library and information services**
- II. **Course Code : HOR 517**
- III. **Credit Hours : (0+1)**

### **Objective**

To equip the library users with skill to trace information from libraries efficiently, to apprise the user of information and knowledge resources, to carry out literature survey, to formulate information search strategies, and to use modern tools (Internet, OPAC, search engines, etc.) of information search.

### **Practical**

Introduction to library and its services; Role of libraries in education, research and technology transfer; Classification systems and organization of library; Sources of information-

Primary Sources, Secondary Sources and Tertiary Sources; Intricacies of abstracting and indexing services (Science Citation Index, Biological Abstracts, Chemical Abstracts, CABI Abstracts, etc.); Tracing information from reference sources; Literature survey; Citation techniques/Preparation of bibliography; Use of CD-ROM Databases, Online Public Access Catalogue and other computerized library services; Use of Internet including search engines and its resources; e-resources access methods.

**Seminar 0+1**

**Thesis Research 30**

