

## M. Sc. Ag. (Hort.) Floriculture and Landscaping Course Structure

<b>I<sup>ST</sup> YEAR / I<sup>ST</sup> SEM</b>						
<b>Course code</b>	<b>Type</b>	<b>Course title</b>	<b>Min credits</b>	<b>CIA</b>	<b>ESE</b>	<b>Max. Marks</b>
FLS 501	Core	Systematics of Ornamental Plants	2+1	50	50	100
FLS 502	Core	Breeding of Ornamental Plants	2+1	50	50	100
FSC 502	Minor	Sub-Tropical and Temperate Fruit Production	2+1	50	50	100
SAC 502	Supporting	Soil Fertility and Fertilizer Use	2+1	50	50	100
PGS 501	Compulsory Non-Credit	Library and Information Services (MOOC)	0+1	50	50	100
PGS 502	Compulsory Non-Credit	Technical Writing and Communication Skills (MOOC)	0+1	50	50	100
<b>TOTAL</b>			<b>14</b>			<b>600</b>
<b>I<sup>ST</sup> YEAR / II<sup>ND</sup> SEM</b>						
FLS 503	Core	Commercial Production of Cut Flowers	2+1	50	50	100
FLS 504	Core	Commercial Production of Loose Flowers	2+1	50	50	100
PPTH 507	Minor	Principles of Plant Disease Management	2+1	50	50	100
STAT 511	Supporting	Experimental Designs	2+1	50	50	100
PGS 503	Compulsory Non-Credit	Intellectual Property and Its Management in Agriculture (MOOC)	1+0	50	50	100
PGS 504	Compulsory Non-Credit	Basic Concepts in Laboratory Techniques (MOOC)	0+1	50	50	100
<b>TOTAL</b>			<b>14</b>			<b>600</b>
<b>II<sup>ND</sup> YEAR / III<sup>RD</sup> SEM</b>						
FLS 505	Core	Ornamental Gardening and Landscaping	1+1	50	50	100
FSC 510	Core	Protected Cultivation of Flower Crops	2+1	50	50	100
FSC 512	Core	Seed Production in Flower Crops	2+1	50	50	100
VSC 507	Minor	Protected cultivation of Vegetable Crops	1+1	50	50	100
PGS 505	Supporting	Agricultural Research, Research Ethics and Rural Development Programmes	1+0	50	50	100
FST 560	Research	Master's Research (Thesis/Dissertation)	10	-	-	S
<b>TOTAL</b>			<b>21</b>			<b>500</b>
<b>II<sup>ND</sup> YEAR / IV<sup>TH</sup> SEM</b>						
FSC 550	Seminar	Master's Course Seminar	0+1	-	-	100
FST 560	Research	Master's Research (Thesis/Dissertation) Thesis Report Viva-Voce Examination	20+0			
<b>TOTAL</b>			<b>21</b>			<b>S</b>
<b>GRAND TOTAL</b>			<b>70</b>			<b>1800</b>





## **First Semester**

### **M. Sc. Ag. (Hort.) Floriculture and Landscaping Course Structure**

#### **FLS 501: SYSTEMATICS OF ORNAMENTAL PLANTS (1+1)**

**Objective:** To familiarize students about the taxonomy, classification, nomenclature and descriptors of different ornamental crops.

##### **THEORY**

Block I: Nomenclature

UNIT I: Nomenclature: History, origin, hotspots, classification and nomenclature systems 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

##### **PRACTICALS**

1. Different nomenclature systems of plants
2. Floral biology and taxonomic description of rose, chrysanthemum, orchids, carnation, gerbera, anthurium, marigold, tuberose, Jasmine, China aster, liliium, gypsophila.
3. Cyropreservation and tissue culture repository
4. Molecular techniques

#### **FLS 502: BREEDING OF ORNAMENTAL CROPS (2+1)**

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

##### **Theory**

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 IPR and PBR of 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.

Block 2: 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 F1 hybrids.

UNIT II: Role of biotechnology: Role of biotechnology in improvement of flower crops including somaclonal 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.

## **PRACTICALS**

1. Floral biology of important ornamental crops
2. Cytology and cytogenetics
3. Selfing and crossing procedures for important ornamental crops
4. Evaluation of hybrid progenies
5. Induction of mutants through physical and chemical mutagens
6. In vitro selection, genetic engineering
7. Induction of polyploidy
8. DUS testing

## **FSC 502: SUBTROPICAL AND TEMPERATE FRUIT PRODUCTION**

**3(2+1)**

### **THEORY**

**Block 1: Introduction:** Importance and Background: Origin, distribution and importance, major species, rootstocks and commercial varieties of regional, national and international importance, eco-physiological requirements.

**Block 2: Agro-Techniques:** Propagation, Planting and Orchard Floor Management: Propagation, planting systems and densities, training and pruning, rejuvenation and replanting, intercropping,

nutrient management, water management, fertigation, use of bio-fertilizers, role of bio-regulators, abiotic factors limiting fruit production.

**Block 3: Crop Management:** Flowering, Fruit-Set and Harvesting: Physiology of flowering, pollination management, fruit set and development, physiological disorders- causes and remedies, crop regulation, quality improvement by management practices; maturity indices, harvesting, grading, packing, storage and ripening techniques; insect and disease management.

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

### **PRACTICALS**

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

### **SAC 502: SOIL FERTILITY AND FERTILIZER USE**

**(3+1)**

#### **THEORY**

**UNIT I:** Soil fertility and soil productivity; fertility status of major soils group of India; nutrient sources-fertilizers and manures; Criteria of essentiality, classification, law of minimum and maximum, essential plant nutrients - functions and deficiency symptoms, Nutrient uptake, nutrient interactions in soils and plants; long-term effect of manures and fertilizers on soil fertility and crop productivity;

**UNIT II:** Soil and fertilizer nitrogen-sources, forms, immobilization and mineralization, nitrification, denitrification; biological nitrogen fixation -types, mechanism, microorganisms and factors affecting; nitrogenous fertilizers and their fate in soils; management of fertilizer nitrogen in lowland and upland conditions for high fertilizer use efficiency.

**UNIT III:** Soil and fertilizer phosphorus-forms, immobilization, mineralization, reactions in acid and alkali soils; factors affecting phosphorus availability in soils; phosphatic fertilizers - behaviour in soils and management under field conditions. Potassium - forms, equilibrium in soils and its agricultural



significance; mechanism of potassium fixation; management of potassium fertilizers under field conditions.

**UNIT V:** Sulphur - source, forms, fertilizers and their behaviour in soils; role in crops and human health; calcium and magnesium— factors affecting their availability in soils; management of sulphur, calcium and magnesium fertilizers.

**UNIT VI:** Micronutrients: critical limits in soils and plants; factors affecting their availability and correction of their deficiencies in plants; role of chelates in nutrient availability.

**UNIT VII:** Common soil test methods for fertilizer recommendations; quantity–intensity relationships; soil test crop response correlations and response functions.

**UNIT VIII:** Fertilizer use efficiency; site-specific nutrient management; plant need based nutrient management; integrated nutrient management; speciality fertilizers concept, need and category. Current status of specialty fertilizers uses in soils and crops of India.

**UNIT IX:** Soil fertility evaluation - biological methods, soil, plant and tissue tests; soil quality in relation to sustainable agriculture, Determination of critical limit, DRIS.

**UNIT X:** Definition and concepts of soil health and soil quality; Long term effects of fertilizers and soil quality.

## **PRACTICALS**

1. Soil and plant sampling and processing for chemical analysis
2. Determination of soil pH, total and organic carbon in soil
3. Chemical analysis of soil for total and available nutrients (major and micro)
4. Analysis of plants for essential elements (major and micro)

## **PGS 501 LIBRARY AND INFORMATION SERVICES**

**1(0+1)**

### **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.

**PRACTICAL**

**Technical Writing**-Various forms of scientific writings- theses, technical papers, reviews, manuals, etc; Various parts of 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; Phonetic symbols and transcription; Accentual pattern: Weak forms in connected speech: Participation in group discussion: Facing an interview; presentation of scientific papers.

**Second Semester****FLS 503: COMMERCIAL PRODUCTION OF CUT FLOWERS (2+1)****THEORY****Block 1: 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/media requirements, 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.

**Block 2: 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, China aster, alstroemeria, bird of paradise, heliconia, alpinia, ornamental ginger, dahlia, gypsophila, solidago, limonium, stock, cut greens and fillers.

### **PRACTICALS**

1. Identification of varieties
2. Propagation
3. Microclimate management
4. Training and pruning techniques
5. Pinching, deshooking, disbudding, desuckering
6. Practices in manuring, drip and fertigation, foliar nutrition, growth regulator application
7. Harvesting techniques, post-harvest handling, cold chain
8. Economics, Project preparation for regionally important cut flowers, crop specific guidelines for project financing (NHB guidelines)
9. Visit to commercial cut flower units
10. Case studies

### **FLS 504: COMMERCIAL PRODUCTION OF LOOSE FLOWERS (2+1)**

#### **THEORY**

Block 1: 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.

## **Block 2: Post harvest management and marketing**

**UNIT I:** Post harvest 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), *Ervatamia* (Chandni), ixora, lotus, water lily, *Michelia* (Champa), gardenia, Ixora and balsam.

## **PRACTICALS**

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

## **PL PATH 507 PRINCIPLES OF PLANT DISEASE MANAGEMENT (2+1)**

### **THEORY**

**UNIT I:** Principles of plant disease management by cultural, physical, biological, chemical, organic amendments and botanicals methods of plant disease control, integrated control measures of plant diseases. Disease resistance and molecular approach for disease management.

**UNIT II:** History of fungicides, bactericides, antibiotics, concepts of pathogen, immobilization, chemical protection and chemotherapy, nature, properties and mode of action of antifungal, antibacterial and antiviral chemicals. Label claim of fungicides.



**UNIT III:** Application of chemicals on foliage, seed and soil, role of stickers, spreaders and other adjuvants, health *vis-a-vis* environmental hazards, residual effects and safety measures

### **PRACTICAL**

Phytopathometry. Methods of *in-vitro* evaluation of chemicals, antibiotics, bio agents against plant pathogens. Field evaluation of chemicals, antibiotics, bio agents against plant pathogens. Soil solarisation, methods of soil fumigation under protected cultivation. Methods of application of chemicals and bio control agents. ED and MIC values, study of structural details of sprayers and dusters. Artificial epiphytotic and screening of resistance.

## **STAT511 EXPERIMENTAL DESIGNS**

**3(2+1)**

### **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.

### **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.

## **PGS 503 INTELLECTUAL PROPERTY AND ITS MANAGEMENT IN AGRICULTURE**

**1(1+0)**

### **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.

### **PGS 504 BASIC CONCEPTS IN LABORATORY TECHNIQUES**

**1(0+1)**

#### **PRACTICAL**

Safety measures while in Lab; Handling of chemical substances; Use of burettes, pipettes, measuring cylinders, flasks, separatory funnel, condensers, micropipettes and vascupets; 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, sandbath, waterbath, oilbath; 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

## **Third Semester**

**FLS 505: ORNAMENTAL GARDENING AND LANDSCAPING (2+1) WHY THIS THEORY**

**Block 1: Gardens and components**

**UNIT I: Styles and types of gardens: Historical background of gardening, Importance**



and scope of ornamental gardening, styles and types of gardens, formal and informal style gardens. English, Mughal, Japanese, Persian, Spanish, Italian, French, Hindu and Buddhist gardens.

UNIT II: Garden components: Garden components (living and non-living): arboretum, shrubbery, fernery, palmatum, arches and pergolas, edges and hedges, climbers and creepers, cacti and succulents, 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, garden seating, swings, lanterns, basins, bird baths, sculptures, waterfalls, bridge, steps, ramps, Lawn -genera and species, establishment and maintenance.

UNIT III: Specialized gardens: Specialised gardens such as vertical garden, roof garden, terrace garden, water garden, sunken garden, rock garden, shade garden, temple garden, sacred gardens (with emphasis on native plants), Zen garden.

#### Block 2: Landscape planning

UNIT I: Principles and elements of landscaping: Basic drawing skills, use of drawing instruments garden symbols, steps in preparation of garden design, programmes phase, design, phase, etc.

Elements and principles of landscape design. Organization of spaces, visual aspects of plan arrangement- view, vista and axis. Principles of circulation, site analysis and landscape, water requirement, use of recycled water

UNIT II: Landscaping for different situations: Urban landscaping, Landscaping for 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-aesthetic planning, eco-tourism, theme parks, indoor gardening, therapeutic gardening,

#### PRACTICALS (16)

1. Graphic language and symbols in landscaping, study of drawing instruments viz., 'T' square, setsquare, drawing board, etc.
2. Identification of various types of ornamental plants for different gardens and occasions
3. Preparation of land, planning, layout and planting, deviations from landscape principles

4. Case study
5. Site analysis, interpretation of map of different sites, use of GIS for selection
6. Enlargement from blue print. Landscape design layout and drafting on paper as per the scale
7. Preparation of garden models for home gardens, farm houses, industrial gardens, institutional gardens, corporate, avenue planting, practices in planning and planting of special types of gardens.
8. Burlapping, lawn making, planting of edges, hedges, topiary, herbaceous and shrubby borders
9. Project preparation on landscaping for different situations, creation of formal and informal gardens
10. Visit to parks and botanical gardens

#### FLS 510: PROTECTED CULTIVATION OF FLOWER CROPS (2+1)

##### 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; Location specific 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, deblossoming, 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 export, Non-tariff barriers.

Crops: Rose, Chrysanthemum, Carnation, Gerbera, Orchids, Anthuriums, Lilium, Limonium, Lisianthus, heliconia, Cala lily, Alstromeria, etc.,

## PRACTICALS

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

FLS: 512-SEED PRODUCTION IN FLOWER CROPS (1+1)

## THEORY

### Block 1

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.

### Block 2

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 incompatibility 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

### Block 3: 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, corn flower, rice flower,

## PRACTICALS

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

## **VSC 507: PROTECTED CULTIVATION OF VEGETABLE CROPS** **(2+1)**

### **Theory**

UNIT I: Scope and importance- Concept, scope and importance of protected cultivation of vegetable crops; Principles, design, orientation of structure, low and high cost polyhouses/greenhouse structures

UNIT II: Types of protected structure-Classification and types of protected structures- greenhouse/polyhouses, plastic-non plastic low tunnels, plastic walk in tunnels, high roof tunnels with ventilation, insect proof net houses, shed net houses, rain shelters, NVP, climate control greenhouses, hydroponics and aeroponics; Soil and soilless media for bed preparation; Design and installation of drip irrigation and fertigation system

UNIT III: Abiotic factors- Effect of environmental factors and manipulation of temperature,

light, carbon dioxide, humidity, etc. on growth and yield of different vegetables.

UNIT IV: Nursery raising- High tech vegetable nursery raising in protected structures using plugs and portrays, different media for growing nursery under protected cultivation;



Nursery problems and management technologies including fertigation

UNIT V: Cultivation of crops- Regulation of flowering and fruiting in vegetable crops; Technology for raising tomato, sweet pepper, cucumber and other vegetables in protected structures, including varieties and hybrids, training, pruning and staking in growing vegetables under protected structures

UNIT VI: Solutions to problems- Problems of growing vegetables in protected structures and

their remedies, physiological disorders, insect and disease management in protected structures; Use of protected structures for seed production; Economics of greenhouse crop production.

### **PRACTICAL**

1. Study of various types of protected structure
2. Study of different methods to control temperature, carbon dioxide and light
3. Study of different types of growing media, training and pruning systems in greenhouse crops
4. Study of fertigation and nutrient management under protected structures
5. Study of insect pests and diseases in greenhouse and its control
6. Use of protected structures in hybrid seed production of vegetables
7. Economics of protected cultivation (Any one crop)
8. Visit to established green/polyhouses/shade net houses in the region

### **PGS:505 AGRICULTURAL RESEARCH, RESEARCH ETHICS AND RURAL DEVELOPMENT PROGRAMMES**

**1(1+0)**

### **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.

<b>FST 560</b>	<b>Master's Research (Thesis/Dissertation)</b>	<b>Credits 10.0</b>
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### **Fourth Semester**

<b>FST 560</b>	<b>Master's Course Seminar</b>	<b>0+1</b>
<b>FST 560</b>	<b>Master's Research (Thesis/Dissertation)</b>	<b>20+0</b>
	<b>Thesis Report</b>	
	<b>Viva-Voce Examination</b>	