

## Department of Floriculture & Landscaping

### **M.Sc. Programme**

Course No	Course title	Credits
<b>1<sup>st</sup> semester</b>		
FLA 501	Nursery Management and Plant Propagation Techniques	2+1
FLA 502	Environmental Control of growth and Development in Floriculture Crop	2 + 1
FLA 503	Greenhouse Management	1+1
FLA 504	Nutritional Requirements of Ornamental Plants	1+1
FLA 505	Plant Growth Substances and Their Uses in Ornamentals	1+1
FLA 506	Water Management for Ornamental Plants	1+1
<b>2<sup>nd</sup> Semester</b>		
FLA 551	Breeding of Flower Crops and Ornamental Plants	1+1
FLA 552	Production Technology of Cut Flowers	2+1
FLA 553	Landscaping and Ornamental Gardening	2+2
FLA-554	CAD for Outdoor and Indoor Scaping	1+1
<b>3<sup>rd</sup> Semester</b>		
FLA 601	Turfing and Turf Management	2+1
FLA 602	Production Technology for Loose Flowers	2+1
FLA 649	Seminar I	1+0
<b>4<sup>th</sup> Semester</b>		
FLA 651	Value Addition in Flowers	1+2
FLA 699	Seminar II	1+0
FLA 700	Master's Research	0+20

## **FLA 501 Nursery Management and Plant Propagation Techniques**

**2+1**

UNIT 1: Scope and importance of nursery. Constraints' in nursery business. Classification of nursery. Site selection and layout nursery. Workers protection standards. Propagation structures in a nursery--mist unit, fog unit, cold frames, hot beds, low polytunnel, greenhouse, lath house etc. site selection and installation.

.UNIT II: Management practices of field nursery--regulations, site selection, layout, water & nutrient management etc. Management practices for container nursery-site selection, layout, standing ground, types of containers, media, potting systems, water and nutrient management etc. Pro-tray nursery. Mother plant block management, annual propagation programme, propagation techniques of ornamental plants. Pest & disease management -IPM & plant health care (PHC). Weed management. Lifting, grading, packing and storage of field grown ornamental crops. Accessioning, Labeling & record keeping. Marketing of nursery produce.

UNIT III: Seed collection, processing & storage of ornamental trees & shrubs. Seed security. Seed testing. Concept of seed quality and factor affecting it.

**Practical:** Layout of nursery. Identifying types of nurseries. Selection of mother plant for propagation of ornamentals. Propagation techniques. Seed sowing & seedling raising. Lifting, labelling wrapping of balled plants. Lifting & packing of seedlings & rooted cuttings. Storage of bare rooted plants, balled & burlapped plants. Seed collection and storage. Purity & viability test of seeds.

## **FLA 502 Environment Control of Growth and Development in Ornamentals**

**2+1**

UNIT I: Concept of growth & development of ornamental plants.

UNIT II: Brief idea on plant environment and its factors. Micro & macro climate. Seed germination and seedling growth in relation to light and temperature. Plant growth & flowering in relation to light----- Quality, Intensity and Duration. Importance of supplementary lighting, night breaks, Use of filters in greenhouse flower production. Importance of Dark period, ripeness to respond, Phytochrome, its mechanism in flowering of ornamental plants. Photoperiodism. Growth and flowering of ornamentals in relation to effect of spatial variation to temperature. Vernalization & devernialization; perceptive organs and maturity factors. Injurious effect low & high temperature. Interactional factors in light and temperature on flowering of ornamentals. Air components & their functions. Influence of harmful gases on flowers. Soil climate & its influence on plant growth.

**Practical:** Seed germination under different quality of light. Measurement of leaf area; working principle of leaf area meter. Estimation of pigment factors in leaf & flowers. Working principles of spectrophotometer. Measurement of light intensity under different growing structures.

### **FLA 503            Greenhouse Management**

**2 + 1**

UNIT I: Prospects of protected floriculture in India; Types of protected structures – Greenhouses, polyhouses, shade houses, rain shelters etc.,

UNIT II: Environment control – management and manipulation of temperature, light, humidity, air and CO<sub>2</sub>; Heating systems -summer & winter cooling; ventilation---naturally ventilated greenhouses.

UNIT III: Beds & benches, Containers and substrates, media decontamination, watering systems and fertigation system.

**Practical:** Study of various protected structures, practices in design, layout and erection of different types of structures, practices in preparatory operations, soil decontamination techniques, practices in environmental control systems, practices in drip and fertigation techniques greenhouses. Cost economics of greenhouse construction. Visit to greenhouses.

### **FLA 504    Nutritional Requirements of Ornamental Plants            1+1**

UNIT I: Essential plant nutrient, sources of these nutrients their role in growth and development of flowering plants. Principles of selection and application of fertilizers (in solid and liquid form). Organic floriculture---use of organic matter, biofertilizers, biostimulant etc.

UNIT II: Brief outline on mode of uptake, translocation, & transformation of major elements inside the plant. Critical nutrients level in some important flowering plants.

**Practical:** Methods of nutrient analysis in leaf and soil. Preparation of starter solution & liquid nutrient solution and methods of application.

### **FLA 505   Plant Growth Substances and Their Uses in Ornamentals    1+1**

UNIT I: Different kinds of phytohormones. Brief outline of their history & synthesis. Role of auxin, GA<sub>3</sub> kinetin, inhibitors and retardants in ornamentals -- in propagation, vegetative growth, flowering, seed setting, bud & seed dormancy.

UNIT II: Factors affecting production of hormones in ornamental plants.

**Practical :** Preparation of stock solution of growth substances. Preparation of powder and paste formulation. Methods of application of plant growth substances in propagation, flowering and dwarfing.

**FLA 506 Water Management for Ornamental Plants 1+1**

UNIT I: Soil, plant and water relationship. Water movement in soil, concept and theories of water relation in soil. Measurement of soil moisture stress & growth of ornamental plants.

UNIT II: Irrigation techniques, time of irrigation in crops grown under different growing situations (field & container under different growing media). Drainage-principles & methods. Effect of excess water on growth of plants. Drainage requirement in relation to irrigation. Soil moisture stress & growth of ornamentals.

**Practical:** Estimation of soil moisture stress. Demonstration of different irrigation methods. Interpretation of soil and water analysis data. Study of drainage systems. Measurement of irrigation water.

**FLA 551 Breeding of Flower Crops and Ornamental Plants 1+1**

UNIT I: Principles -- evolution of varieties, origin, distribution, genetic resources genetic divergence- Patents and plant variety protection in India.

UNIT II: Genetic inheritance -- of flower colour, doubleness, flower size, fragrance, post harvest life.

UNIT III: Breeding methods suitable for sexually and asexually propagated flower crops and ornamental plants-- introduction, selection, domestication, polyploid and mutation breeding for varietal development, Role of heterosis, Production of hybrids, Male sterility, incompatibility problems, and seed production of flower crops in relation to marigold, tuberose, carnation, gladiolus, and chrysanthemum.

UNIT IV: Breeding constraints and achievements made in commercial flowers rose, jasmine, marigold, chrysanthemum, tuberose and ornamental plants – petunia, hibiscus, bougainvillea, Flowering annuals (zinnia, dianthus, snap dragon) and few ornamental foliage plants.

**Practical:** Description of botanical features– Cataloguing of cultivars, varieties and species in flowers, floral biology, selfing and crossing, evaluation of hybrid progenies, seed production- Induction of mutants through physical and chemical mutagens, induction of polyploidy, screening of plants for biotic, abiotic stresses and environmental pollution, *in vitro* breeding in flower crops and ornamental plants.

**FLA 552 Production Technology of Cut Flowers 2+1**

UNIT I: Scope of cut flowers in global trade, Global Scenario of cut flower production, Varietal wealth and diversity, area under cut flowers and production problems in India. Patent rights.

UNIT II: Growing conditions- open cultivation & protected cultivation. Crop specific requirements --Growing media, propagation and planting methods, influence of environmental parameters-light, temperature, moisture, humidity and CO<sub>2</sub> on growth and flowering.

UNIT III: Flower production – water and nutrient management, weed management, rationing, training and pruning, disbudding, special horticultural practices, use of growth regulators, physiological disorders and remedies, plant protection measures, production for exhibition purposes.

UNIT IV: Flower forcing and year round flowering through physiological interventions, chemical regulation, environmental manipulation.

UNIT V: Harvest indices, harvesting techniques, cut flower standards and grades. Post-harvest handling- methods of delaying flower opening, pre-cooling, pulsing, packing. Storage & transportation, marketing, export potential, institutional support, Agri Export Zones.

**Crops:** Cut rose, cut chrysanthemum, carnation, gerbera, gladioli, tuberose, orchids, anthurium, aster, liliun, altoemeria, bird of paradise, heliconia, alpinia, ornamental ginger, bromeliads, dahlia, gypsophilla, limonium, statice, stock, cut foliage and fillers.

**Practical:** Botanical description of varieties, propagation techniques, mist chamber operation, training and pruning techniques, practices in manuring, drip and fertigation, foliar nutrition, growth regulator application, pinching, disbudding, staking, harvesting techniques, post-harvest handling, cold chain, project preparation for regionally important cut flowers, visit to commercial cut flower units and case study.

## **FLA 553            Landscaping and Ornamental Gardening            2+2**

UNIT I: Prospect of landscaping, history of landscape gardening. Principles of landscaping Landscape designs, types of gardens, English, Mughal, Japanese, Persian, Spanish, Italian, Vanams, Buddha garden; Styles of garden, formal, informal and free style gardens. Colour wheel.

UNIT II: Urban landscaping, Landscaping for specific situations, institutions, industries, residents, hospitals, roadsides, traffic islands, damsites, IT parks, corporates.

UNIT III: Garden plant components- lawn, arches and pergolas, edges and hedges, arboretum, shrubbery, fernery, palmatum, , climbers and creepers, cacti and succulents, herbs, annuals, flower borders and beds, ground covers, carpetbeds, bamboo groves. Non-plant components.

UNIT IV: Special types of gardens-vertical garden, roof garden, bog garden, sunken garden, rock garden, clock garden, temple garden, sacred groves.

UNIT V: Bio-aesthetic planning, eco-tourism, theme parks, indoor gardening, therapeutic gardening, water scaping, xeriscaping, hardscaping.

**Practical:** Selection of ornamental plants, practices in preparing designs for home gardens, industrial gardens, institutional gardens, corporates, avenue planting, practices in planning and planting of special types of gardens, burlapping, lawn making, planting herbaceous and shrubbery borders, project preparation on landscaping for different situations, visit to parks and botanical gardens, case study on commercial landscape gardens.

### **FLA 554            Crop for Outdoor and Indoor Scaping            1+1**

UNIT I: Exposure to CAD (Computer Aided Designing) – Applications of CAD in landscape garden designing, 2D drawing by AUTOCAD, 3D drawing by ARCHICAD, 3D drawing by 3D MAX software, Creating legends for plant and non-plant components, Basics of Photoshop software in garden designing.

UNIT II: 2D drawing methods, AUTOCAD Basics, Coordinate systems in AUTOCAD LT 2007, Point picking methods, Toolbars and Icons, File handling functions, Modifying tools, Modifying comments, Isometric drawings, Drafting objects.

UNIT III: Using patterns in AUTOCAD drawing, Dimension concepts, Hyperlinking, Script making, Using productivity tools, e-transmit file, making sample drawing for outdoor and indoor garden by AUTOCAD 2D Drawing techniques, Drawing web format design, Making layout.

UNIT IV: 3D drawing methods, ARCHICAD file system, Tools and Infobox, modification tools, structural elements, GDL objects (Grid Dimensional Linking), Creation of garden components through ARCHICAD.

UNIT V: ARCHICAD organization tools, Dimensioning and detailing of designs, Attribute settings of components, Visualization tools for landscape preview, Data management, plotting and accessories for designing, Inserting picture using photoshop, Making sample drawing for outdoor and indoor gardens.

**Practical:** Practices in point picking methods, Using tool bars and icons, Using modifying tools and modifying comments, Isometric drawings, Using productivity tools, Drawing designs by AUTOCAD for home garden, institutional garden and special types of garden, Using tools and info-box for 3D drawing, Creation of garden components with ARCHICAD, Organization, dimensioning, detailing and visualization tools with ARCHICAD, Using Photoshop package for 3D picture insertion, Drawing designs with ARCHICAD for home garden, interior garden designing, ITparks, Corporates, Theme parks and Ecotourism spots.

**FLA 601                      Turfing and Turf Mangement                      1+1**

UNIT I: Site selection, basic requirements, site evaluation, concepts of physical, chemical and biological properties of soil pertaining to turf grass establishment.

UNIT II: Turf grasses - Types, species, varieties, hybrids; Selection of grasses for different locations; Grouping according to climatic requirement- Adaptation; Turfing for roof gardens.

UNIT III: Preparatory operations; Growing media used for turf grasses – Turf establishment methods, seeding, sprigging/dibbling, plugging, sodding/turfing, turf plastering, hydro-seeding, astro-turfing.

UNIT IV: Turf management – Irrigation, nutrition, special practices, aerating, rolling, soil top dressing, use of turf growth regulators (TGRs) and micronutrients, Turf mowing -- mowing equipments, techniques to minimize wear and compaction, weed control, biotic and abiotic stress management in turfs.

UNIT V: Establishment and maintenance of turfs for playgrounds, viz. golf, football, hockey, cricket, tennis, etc.

**Practical:** Identification of turf grasses, Preparatory operations in turf making, Practices in turf establishment, Layout of macro and micro irrigation systems, Water and nutrient management; Special practices – mowing, raking, rolling, soil top dressing, weed management; Biotic and abiotic stress management; Project preparation for turf establishment, visit to IT parks, model cricket and golf grounds, airports, corporates, Govt. organizations; Renovation of lawns; Turf economics.

**FLA 602                      Production Technology for Loose Flowers                      2+1**

UNIT I: Scope of loose flower trade, Significance in the domestic market/export, Varietal wealth and diversity.

UNIT II: Soil and climate requirements, field preparation, propagation, systems of planting, precision farming techniques.

UNIT III: Cultural practices-Water and nutrient management, weed management, rationing, training and pruning, pinching and disbudding, special horticultural practices, use of growth regulators, physiological disorders and remedies, plant protection.

UNIT IV: Flower forcing production for special occasions through physiological interventions, chemical regulation.

UNIT V: Harvest indices, harvesting techniques, post-harvest handling and grading, pre-cooling, packing and storage, transportation and marketing, export potential, institutional support, Agri Export Zones.

**Crops:** Jasmine, scented rose, chrysanthemum, marigold, tuberose, crossandra, nerium, hibiscus, barleria, celosia, gomphrena, non-traditional flowers (Nyctanthes, Tabernaemontana, lotus, lilies, champaka, pandanus).

**Practical:** Botanical description of species and varieties, propagation techniques, mist chamber operation, training and pruning techniques, practices in manuring, drip and fertigation, foliar nutrition, growth regulator application, pinching, disbudding, staking, harvesting techniques, post-harvest handling, storage and cold chain, project preparation for regionally important commercial loose flowers, visits to fields, essential oil extraction units and markets.

**FLA 651                                  Value Addition in Flowers                                  2+1**

UNIT I: Prospects of value addition, National and global scenario, production and exports, Women empowerment through value added products making, supply chain management.

UNIT II: Types of value added products. Value addition in loose flowers, garlands, veni, floats, floral decorations, value addition in cut flowers, flower arrangement, styles, Ikebana, morebana, free style, bouquets, button-holes, flower baskets, corsages, floral wreaths, garlands, etc.; Selection of containers and accessories for floral products and decorations.

UNIT III: Dry flowers– Identification and selection of flowers and plant parts; Raw material procurement, preservation and storage; Techniques in dry flower making – Drying, bleaching, dyeing, embedding, pressing; Accessories;

Designing and arrangement – dry flower baskets, bouquets, pot-pourri, wall hangings, button holes, greeting cards, wreaths; Packing and storage.

UNIT IV: Floral oil industry, recent advances. Extraction methods, Concrete and essential oils; Selection of species and varieties (including non-conventional species), extraction methods, Packing and storage, Selection of species and varieties, Types of pigments, carotenoids, anthocyanin, chlorophyll, betalains; Significance of natural pigments, Extraction methods; Applications.

**Practical:** Practices in preparation of bouquets, button-holes, flower baskets, corsages, floral wreaths, garlands with fresh flowers; Techniques in flower arrangement; Techniques in floral decoration; Identification of plants for dry flower making; Practices in dry flower making; Preparation of dry flower baskets, bouquets, pot-pourri, wall hangings, button holes, greeting cards, wreaths, etc.; Visit to dry flower units, concrete and essential oil extraction units.