Department of Horticulture
Mahatma Phule Krishi Vidyapeeth
Rahuri-413 722, Dist. Ahmednagar (MS)

Master's Programme in Floriculture and Landscaping

Course Layout

Minimum Credit Requirements

Sr. No.	Subject	Minimum credit(s)
1.	Major	21
2.	Minor	09
3.	Supporting	06
4.	Seminar	01
5.	Research	20
	Total Credits	**57**
6.	Compulsory Non Credit Courses	04

Sr. No.	Course Number	Course Title	Credits
A)	**Major Subjects (Min. 21 credits)**		
1	FLA- 501*	Breeding of Flower Crops and Ornamental	2+1=3
2	FLA- 502*	Production Technology of Cut-flowers	2+1=3
3	FLA- 503*	Production Technology of Loose-flowers	2+1=3
4	FLA- 504*	Landscaping & Ornamental Gardening	2+1=3
5	FLA- 505	Protected Floriculture	2+1=3
6	FLA- 506	Value Addition in Flowers	2+1=3
7	FLA- 507*	Turfing and Turf Management	2+1=3
B)	**Minor Subjects (Min. 09 credits)**		
1	AGRO- 505	Agro-Meteorology and Crop Weather Forecasting	2+1=3
2	GP- 503	Principles of Plant Breeding	2+1=3

3	GP- 510	Breeding for Abiotic Stress	2+1=3
C)	**Supporting Subjects (Min. 06 credits)**		
1	STAT- 511	Statistical Methods for Applied Science	2+1=3
2	STAT- 512	Experimental Designs	2+1=3
D)	**Seminar (01 credit)**		
1	FLA- 591	Seminar	0+1=1
E)	**Master's Research (20 credits)**		
1		Master's Research	0+20=20
F)	**Non Credit Compulsory Courses**		
1	PGS- 501	Library and Information Services	0+1=1
2	PGS- 504	Basic concepts in Laboratory Techniques	0+1=1
3	PGS- 505	Agricultural Research Ethics and Rural Development Programme	1+0=1
4	PGS- 506	Disaster Management	1+0=1

Course Contents

Major Subjects

Course No. : FLA 501
Course title : BREEDING OF FLOWER CROPS AND ORNAMENTAL PLANTS
Credits : 2+1=3

Theory:

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, polyploidy and mutation breeding for varietal development, Role of heterosis, Production of hybrids, Male sterility, incompatibility problems.
Unit-IV	**:**	Breeding constraints and achievements made in commercial flowers
Unit-V	**:**	Breeding constraints and achievements made in *Ornamental plants* – Petunia, Hibiscus, Bougainvillea
Main crops		Rose, Chrysanthemum, Marigold, Tuberose, Gerbera, Gladiolus, Aster
Minor crops		Crossandra, Dahlia, Anthurium, Nerium
Flowering annuals		Zinnia, Cosmos, Dianthus, Snap dragon
Ornamental foliages		Introduction and selection of plants for waterscaping and xeriscaping.

Practical:

Description of botanical features– Cataloguing of cultivars. Varieties and species in flowers. Floral biology (any four) Selfing and crossing technique. Evaluation of hybrid progenies and seed production (any one crop). Induction of mutants through physical and chemical mutagens. Induction of polyploidy (any one crop). Screening of plants for biotic, abiotic stresses and environmental pollution. *In vitro* breeding in flower crops and ornamental plants.

Practical No.	Topic

1-3	Description of botanical features– Cataloguing of cultivars. Varieties and species in flowers.
4-6	Floral biology (any four)
7-8	Selfing and crossing technique
9-10	Evaluation of hybrid progenies and seed production (any one crop)
11	Induction of mutants through physical and chemical mutagens
12	Induction of polyploidy (any one crop)
13-14	Screening of plants for biotic, abiotic stresses and environmental pollution
15-16	*In vitro* breeding in flower crops and ornamental plants

Reference Books:

Bhattacharjee SK. 2006. Advances in Ornamental Horticulture. Vols. I-VI. Pointer Publ.

Bose TK & Yadav LP. 1989. Commercial Flowers. Naya Prokash.

Chadha KL & Choudhury B.1992. Ornamental Horticulture in India. ICAR.

Chadha KL. 1995. Advances in Horticulture. Vol. XII. Malhotra Publ. House.

Chaudhary RC. 1993. Introduction to Plant Breeding. Oxford & IBH.

Singh BD. 1990. Plant Breeding. Kalyani.

Course No. : FLA 502
Course title : PRODUCTION TECHNOLOGY OF CUT FLOWERS
Credits : 2+1=3

Theory:

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 - nursery management, media for nursery, special nursery.
Unit-II	**:**	**:** Growing environment, open cultivation, soil requirements, planting methods, influence of environ-mental parameters, light, temperature, moisture and humidity
Unit-III	**:**	Flower production–water and nutrient management, fertigation, weed management, training and pruning, disbudding, special horticultural practices, use of growth regulators, physiological disorders and remedies, IPM and IDM, production for exhibition purposes. **Open field:** Rose, Chrysanthemum, Gladiolus, Tuberose, Aster, Dahlia,

		Bird of paradise, Heliconia, Ornamental ginger, Limonus (statice), and fillters
Unit-IV	**:**	Flower forcing and year round flowering through physiological interventions, chemical regulation, environmental manipulation.
Unit-V	**:**	Cut flower standards and grades, harvest indices, harvesting techniques, 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, liliums, bird of paradise, heliconia, gypsophilla, limonium, statice, stock, cut foliages 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 two cut flowers. Visit to commercial cut flower units and case study.

Practical No.	Topic
1	Botanical description of varieties
2	Propagation techniques
3	Mist chamber operation
4	Training and pruning techniques
5	Practices in manuring
6	Drip and fertigation
7	Foliar nutrition
8	Growth regulator application
9	Pinching, disbudding, staking
10-11	Harvesting techniques
12-13	Post-harvest handling, cold chain
14-15	Project preparation for regionally important two cut flowers
16	Visit to commercial cut flower units and case study

Reference Books:

Arora JS. 2006. Introductory Ornamental horticulture. Kalyani.

Bhattacharjee SK. 2006. Advances in Ornamental Horticulture. Vols. I-VI. Pointer Publ.

Bose TK & Yadav LP. 1989. Commercial Flowers. Naya Prokash.

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

Chadha KL & Chaudhury B. 1992. Ornamental Horticulture in India. ICAR.

Chadha KL. 1995. Advances in Horticulture. Vol. XII. Malhotra Publ. House.

Lauria A & Ries VH. 2001. Floriculture – Fundamentals and Practices. Agrobios.

Prasad S & Kumar U. 2003. Commercial Floriculture. Agrobios.

Randhawa GS & Mukhopadhyay A. 1986. Floriculture in India. Allied Publ.

Reddy S, Janakiram B, Balaji T, Kulkarni S & Misra RL. 2007. Hightech Floriculture. Indian Society of Ornamental Horticulture, New Delhi.

Course No. : FLA 503
Course title : PRODUCTION TECHNOLOGY OF LOOSE FLOWERS
Credits : 2+1=3

Theory:

Unit-I	**:**	Scope of loose flower trade, Significance in the domestic market/export. Varietal wealth and diversity.
Unit-II	**:**	Propagation, sexual and asexual propagation methods, nursery management, pro-tray nursery. Soil and climate requirements, field preparation, systems of planting, precision farming techniques.
Unit-III	**:**	Water and nutrient management, weed management, training and pruning, pinching and disbudding, special horticultural practices, use of growth regulators, physiological disorders and remedies, IPM and IDM.
Unit-IV	**:**	Flower forcing and year round flowering, production for special occasions through physiological interventions, chemical regulation.
Unit-V	**:**	Agri Export Zones**,** Harvest indices, harvesting techniques, post-harvest handling and grading, pre-cooling, packing and storage, concrete and essential oil extraction, transportation and marketing, export potential, institutional support, Agri-export zones. ***Traditional flowers*** **Main :** Jasmine, Scented rose, Chrysanthemum, Marigold, Tuberose **Minor :** Crossandra, Aster and Gallardia ***Non-traditional flowers*** Helicrissom, Pandanus, Golden daisy, Lotus, Lillies, Champaka, Ixora, Lotus

Practical:

Botanical description of species and varieties. Propagation techniques. 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 (any two) loose flowers. Visits to fields, essential oil extraction units and markets.

Practical No.	Topic
1	Botanical description of species and varieties
2-3	Propagation techniques
4	Training and pruning techniques
5	Practices in manuring
6	Drip and fertigation
7	Foliar nutrition
8	Growth regulator application
9	Pinching, disbudding, staking
10-11	Harvesting techniques, Post-harvest handling
12	Storage and cold chain
13-14	Project preparation for regionally important commercial (any two) loose flowers
15-16	Visits to fields, essential oil extraction units and markets

Reference Books:

Arora JS. 2006. Introductory Ornamental Horticulture. Kalyani.

Bhattacharjee SK. 2006. Advances in Ornamental Horticulture. Vols. I-VI. Pointer Publ.

Bose TK & Yadav LP. 1989. Commercial Flowers. Naya Prokash.

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

Chadha KL & Chaudhury B.1992. Ornamental Horticulture in India. ICAR.

Chadha KL. 1995. Advances in Horticulture. Vol. XII. Malhotra Publ. House.

Lauria A & Ries VH. 2001. Floriculture – Fundamentals and Practices. Agrobios.

Prasad S & Kumar U. 2003. Commercial Floriculture. Agrobios.

Randhawa GS & Mukhopadhyay A. 1986. Floriculture in India. Allied Publ.

Sheela VL. 2007. Flowers in Trade. New India Publ. Agency.

Valsalakumari PK, Rajeevan PK, Sudhadevi PK & Geetha CK. 2008. Flowering Trees. New India Publ. Agency.

Course No. : FLA 504
Course title : LANDSCAPING AND ORNAMENTAL GARDENING
Credits : 2+1=3

Theory:

Unit-I	**:**	Landscape designs. Types of gardens - English, Mughal, Japanese, Persian, Spanish, Italian, Vanams, Buddha garden. Styles of garden, formal, informal and free style gardens.
Unit-II	**:**	Urban landscaping, Landscaping for specific situations, institutions,industries, residents, hospitals, roadsides, traffic islands, damsites, IT parks, corporates.
Unit-III	**:**	Garden plant components, 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, bamboo groves; Production technology for selected ornamental plants.
Unit-IV	**:**	Lawns, Establishment and maintenance, special types of gardens, vertical garden, roof garden, bog garden, sunken garden, rock garden, clock garden, colour wheels, temple garden, sacred groves.
Unit-V	**;**	Bio-aesthetic planning, eco-tourism, theme parks, indoor gardening, therapeutic gardening, non-plant components, 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.

Practical No.	Topic
1-2	Selection of ornamental plants
3-4	Practices in preparing designs for home gardens
5	Industrial gardens, institutional gardens
6	Corporates, avenue planting
7-8	Practices in planning and planting of special types of gardens
9-10	Burlapping, lawn making
11-12	Planting herbaceous and shrubbery borders
13-14	Project preparation on landscaping for different situations
15	Visit to parks and botanical gardens
16	Case study on commercial landscape gardens

Reference Books:

Bose TK, Maiti RG, Dhua RS & Das P. 1999. Floriculture and Landscaping. Naya

Prokash.
Lauria A & Victor HR. 2001. Floriculture – Fundamentals and Practices Agrobios.
Nambisan KMP.1992. Design Elements of Landscape Gardening. Oxford & IBH.
Randhawa GS & Mukhopadhyay A. 1986. Floriculture in India. Allied Publ.
Sabina GT & Peter KV. 2008. Ornamental Plants for Gardens. New India Publ. Agency.
Valsalakumari et al. 2008. Flowering Trees. New India Publ. Agency.
Woodrow MG.1999. Gardening in India. Biotech Books.

Course No. : FLA 505
Course title : PROTECTED FLORICULTURE
Credits : 2+1=3

Theory:

Unit-I	**:**	Prospects of protected floriculture in India; Types of protected structures – Greenhouses, polyhouses, shade houses, rain shelters etc. Designing and erection of protected structures; Low cost/Medium cost/High cost structures. Economics of cultivation for rose, carnation, gerbera, Anturium, orchids, lilium, Gypsophilla, Chrysanthemum Location specific designs; Structural components; Suitable flower crops for protected cultivation.
Unit-II	**:**	Environment control – management and manipulation of temperature, light, humidity, air and CO_2; Heating and cooling systems, ventilation, naturally ventilated greenhouses, fan and pad cooled greenhouses, light regulation.
Unit-III	**:**	Containers and substrates, soil decontamination, layout of drip and fertigation system, water and nutrient management, weed management, physiological disorders, IPM and IDM.
Unit-IV	**:**	Crop regulation by chemical methods and special horticultural practices (pinching, disbudding, deshooting, deblossoming, etc.); Staking and netting, Photoperiod regulation.
Unit-V	**:**	Harvest indices, harvesting techniques, post-harvest handling techniques, Pre-cooling, sorting, grading, packing, storage, quality standards.

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. Special horticultural practices. Determination of harvest indices and harvesting methods. Postharvest handling. Packing methods. Project preparation. Visit to commercial greenhouses.

Practical No.	Topic
1-2	Study of various protected structures
3-4	Practices in design, layout and erection of different types of structures
5	Practices in preparatory operations
6	Soil decontamination techniques
7	Practices in environmental control systems
8	Practices in drip and fertigation techniques
9	Special horticultural practices
10	Determination of harvest indices and harvesting methods
11	Postharvest handling
12	Packing methods
13-14	Project preparation
15-16	Visit to commercial greenhouses

Reference Books:

Bhattacharjee SK. 2006. Advances in Ornamental Horticulture. Vols. I-VI. Pointer Publ.

Bose TK & Yadav LP. 1989. Commercial Flowers. Naya Prokash.

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

Chadha KL. 1995. Advances in Horticulture. Vol. XII. Malhotra Publ. House.

Lauria A & Victor HR. 2001. Floriculture – Fundamentals and Practices Agrobios.

Nelson PV. 1978. Green House Operation and Management. Reston Publ. Co.

Prasad S & Kumar U. 2003. Commercial Floriculture. Agrobios

Randhawa GS & Mukhopadhyay A. 1986. Floriculture in India. Allied Publ.

Reddy S, Janakiram B, Balaji T, Kulkarni S & Misra RL. 2007. High-tech Floriculture. Indian Society of Ornamental Horticulture, New Delhi.

Course No. : FLA 506
Course title : VALUE ADDITION IN FLOWERS
Credits : 2+1=3

Theory:

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	:	Concrete and essential oils; Selection of species and varieties (including non-conventional species), extraction methods. Packing and storage, Selection of species and varieties. 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.

Practical No.	Topic
1-2	Practices in preparation of bouquets, button-holes, flower baskets, corsages, floral wreaths, garlands with fresh flowers.
3-4	Techniques in flower arrangement
5-6	Techniques in floral decoration
7-8	Identification of plants for dry flower making
9-10	Practices in dry flower making

11-14	Preparation of dry flower baskets, bouquets, pot-pourri, wall hangings, button
	holes, greeting cards, wreaths, etc.
15-16	Visit to dry flower units, concrete and essential oil extraction units

Reference Books:

Bhattacharjee SK. 2006. Advances in Ornamental Horticulture. Vols. I-VI. Pointer Publ.
Chadha KL.1995. Advances in Horticulture. Vol.XII. Malhotra Publ. House.
Lauria A & Victor HR. 2001. Floriculture – Fundamentals and Practices Agrobios.
Prasad S & Kumar U. 2003. Commercial Floriculture. Agrobios.
Reddy S, Janakiram B, Balaji T, Kulkarni S & Misra RL. 2007.Hightech Floriculture. Indian Society of Ornamental Horticulture, New Delhi.

Course No. : FLA 507
Course title : TURFING AND TURF MANAGEMENT
Credits : 2+1=3

Theory:

Unit-I	**:**	Prospects of landscape industry; History of landscape gardening. 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, rugby, 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. Cricket ground/Foot ball Visit to IT parks. Model cricket and golf grounds, airports, corporate, Govt. organizations.	
Practical No.	**Topic**
1	Identification of turf grasses
2	Preparatory operations in turf making
3	Practices in turf establishment
4	Layout of macro and micro irrigation systems
5	Water and nutrient management
6-7	Special practices – mowing, raking, rolling, soil top dressing
8	Weed management
9	Biotic and abiotic stress management
10-11	Project preparation for turf establishment, Cricket ground/Foot ball
12	Visit to IT parks
13-14	Model cricket and golf grounds, airports, corporates, Govt. organizations
15	Renovation of lawns
16	Turf economics

Reference Books:

Nick-Christians 2004
www.amazon.com
Fundamentals of Turf grass Management

Course No. : FLA 508
Course title : CAD FOR OUTDOOR AND INDOORSCAPING
Credits : 2+1=3

Theory:

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, IT parks. Corporates. Theme parks and Ecotourism spots.

Practical No.	**Topic**
1	Practices in point picking methods
2	Using tool bars and icons
3	Using modifying tools and modifying comments
4	Isometric drawings
5	Using productivity tools
6	Drawing designs by AUTOCAD for home garden
7	Institutional garden and special types of garden
8	Using tools and info-box for 3D drawing.
9	Creation of garden components with ARCHICAD

10-11	Organization, dimensioning, detailing and visualization tools with ARCHICAD
12	Using Photoshop package for 3D picture insertion
13	Drawing designs with ARCHICAD for home garden, interior garden designing,
14	IT parks
15	Corporates
16	Theme parks and Ecotourism spots

Reference Books:

Christine Wein-Ping Yu 1987. Computer-aided Design: Application to Conceptual Thinking in Landscape Architecture. amazon.com

Seminar (01 credit)		
FLA- 591	Seminar	0+1=1
Master's Research (20 credits)		
Master's Research		0+20=20