आईएफटीएम विश्वविद्यालय, मुरादाबाद, उत्तर प्रदेश

IFTM University, Moradabad, Uttar Pradesh

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SCHOOL OF AGRICULTURAL SCIENCES & ENGINEERING

DEPARTMENT OF AGRICULTURAL SCIENCES

MASTER OF SCIENCE AG. HORTICULTURE (FLORICULTURE & LANDSCAPING)

[*w.e.f.* ACADEMIC SESSION 2021 – 22]

IFTM UNIVERSITY

N.H.-24, Lodhipur Rajput, Delhi Road, Moradabad, Uttar Pradesh-244102

Website: www.iftmuniversity.ac.in

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SCHOOL OF AGRICULTURAL SCIENCES & ENGINEERING

DEPARTMENT OF AGRICULTURAL SCIENCES

CBCS Based Course Structure and Syllabi

of

Master of Science Ag. Horticulture (Floriculture & Landscaping)

[*w.e.f.* Academic Session 2021 – 22]

Summary

Programme	:	**Master of Science Ag. Horticulture (Floriculture & Landscaping)**
Programme Level	:	**Degree (Post Graduation)**
Duration	:	**Two Years (Four semesters) Full time**
Medium of Instruction	:	**English**
Minimum Required Attendance	:	**75%**
Maximum Credits	:	**56**

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Programme: **M.Sc. Ag. Horticulture (Floriculture and Landscaping)**

Programme Outcomes (POs):
Students completing this course will be able to:

1. Research based subjects such as scientific writing and ethics help students to build research aptitude for local, national, international and global needs.
2. The curriculum of this course lays strong emphasis on in-depth knowledge of theoretical and practical aspects for managing emerging issues in commercial flower production by highlighting the usage in protected cultivation and good agriculture practices in floricultural crops for local and national levels.
3. Seminar based course develop presentation and technical skills in students for national and international platforms.
4. A candidate who possesses a M.Sc. Ag. degree in horticulture with specialization in Floriculture and Landscaping can be benefitted with an enormous number of job profiles under public and private sectors at local, national and international levels.
5. A growing export industry, increasing product demands and advances in horticultural technology is making this an extremely lucrative career for local, national and international prospects.
6. Students can work in a wide range of areas in botanical gardens, agribusiness, crop management of flowers, seed production of flowers. Landscaping of public and private areas, floral arrangements, nursery industry, etc. at local and national levels.
7. Students can also render their services as a scientist in the field of floriculture and landscaping at national and international levels.
8. The training institutes welcome such candidates for the posts of training organizers at nationally and internationally.
9. Students can go for higher degree programs for further research work at national and international.
10. Jobs are being created in sectors, both private and public, in fields such as research and journalism and also within and outside the borders.

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11. Students may develop as an entrepreneur by producing and processing of flowers and ornamental plants at local and national needs.

Program Specific Outcomes:

After completion of this course Students would be able to:

PSO-1: Acquire theoretical knowledge, research capability (dissertation work), communication and management skills which, in turn, allow the students to become efficient researchers to start their career in research through Ph.D. & other R & D programmes.

PSO-2: To understand the basic of practical knowledge of flower and ornamental crop production as a tool of agricultural diversification.

PSO-3: Understand principles and practices of improvement of flower crops through different conventional and modern breeding techniques.

PSO-4: Have firm understanding in the principles and application of the post harvest management of flowers through processing and value addition.

PSO-5: Have firm understanding of the basics of the seed production and other propagation techniques of flower and ornamental crops.

PSO-6: To design and execute the landscaping of any piece of land in a well scientific manner.

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M.Sc. Ag. Horticulture (Floriculture and Landscaping)			
Basic Structure: Distribution of Courses			
S. No.	**Type of Course**	**No. of Courses**	**Credits**
1	Major Course	06	23
2	Minor Course	01	04
3	Supporting Course	01	04
4	Elective Course	01	03
5	Research and Seminar		22

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Major Courses			
Theory			
1.	MAHF 102	Production Technology of Cut Flowers	3
2.	MAHF 103	Landscaping and Ornamental Gardening	3
3.	MAHF 201	Production Technology of Loose Flowers	3
4.	MAHF 202	Protected Floriculture	3
5.	MAHF 301	Value Addition in Flowers	3
6.	MAHF 302	Turfing and Turf Management	3
Practical's			
1.	MAHF 152	Production Technology of Cut Flowers Lab	1
2.	MAHF 153	Landscaping and Ornamental Gardening Lab	1
3.	MAHF 251	Production Technology of Loose Flowers Lab	1
4.	MAHF 252	Protected Floriculture Lab	1
5.	MAHF 351	Value Addition in Flowers Lab	1
Minor Courses			
1.	MAHF 101	Breeding of Flower Crops and Ornamental Plants	3
Practical's			
1.	MAHF 151	Breeding of Flower Crops and Ornamental Plants Lab	1
Supporting Courses			
1.	MMAG 204	Agricultural Statistics and Experimental Designs	3
Practical's			
1.	MMAG 254	Agricultural Statistics and Experimental Designs Lab	1
Elective Courses			
1.	MAHF 303	Elective I	3
Research & Seminar			
1	MAHF 352	Seminar	1
2	MAHF 354	Pre- Dissertation	1
3	MAHF 451	Dissertation Work	20

Elective I

S.N.	CODE	Name of Elective
1.	**MAHF 303** **(A/B/C/D/E/F/G)**	Production Technology of Medicinal and Aromatic Crops
2.		Planting Material and Seed Production Technology in Flower crops
3.		CAD for Outdoor and Indoorscaping
4.		Systematic of Ornamental Plants
5.		Indoor Plants and Interior Scaping
6.		Nursery Management in Ornamental Plants
7.		Post-harvest Management in Floricultural Crop

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STUDY & EVALUATION SCHEME
M. Sc. Ag. Horticulture (Floriculture and Landscaping)
YEAR - I, SEMESTER – I

S.N.	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
						Mid Term Exam			External Exam		
			L	T	P	CT	AS +AT	Total			
Theory											
1.	MAHF 101	Breeding of Flower Crops and Ornamental Plants	3	0	0	20	10	30	70	100	3
2.	MAHF 102	Production Technology of Cut Flowers	3	0	0	20	10	30	70	100	3
3.	MAHF 103	Landscaping and Ornamental Gardening	3	0	0	20	10	30	70	100	3
Practical's / Project											
						IA	**AT**				
5.	MAHF 151	Breeding of Flower Crops and Ornamental Plants Lab	0	0	2	20	10	30	70	100	1
6.	MAHF 152	Production Technology of Cut Flowers Lab	0	0	2	20	10	30	70	100	1
	MAHF 153	Landscaping and Ornamental Gardening Lab	0	0	2	20	10	30	70	100	1
		Total	**9**	**0**	**6**	**-**	**-**	**-**	**-**	**600**	**12**

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STUDY & EVALUATION SCHEME
M. Sc. Ag. Horticulture (Floriculture and Landscaping)
YEAR – I, SEMESTER – II

S.N.	Course Code	Course Name	Periods			Evaluation Scheme				Course Total	Credits
						Mid Term Exam			External Exam		
			L	T	P	CT	AS +AT	Total			
Theory											
1.	MAHF 201	Production Technology of Loose Flowers	3	0	0	20	10	30	70	100	3
2.	MAHF 202	Protected Floriculture	3	0	0	20	10	30	70	100	3
4.	MMAG 204	Agricultural Statistics and Experimental Designs	3	0	0	20	10	30	70	100	3
Practical's / Project											
						IA	**AT**				
5.	MAHF 251	Production Technology of Loose Flowers Lab	0	0	2	20	10	30	70	100	1
	MAHF 252	Protected Floriculture Lab	0	0	2	20	10	30	70	100	1
6.	MMAG 254	Agricultural Statistics and Experimental Designs Lab	0	0	2	20	10	30	70	100	1
		Total	**9**	**0**	**6**	-	-	-	-	**600**	**12**

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STUDY & EVALUATION SCHEME
M. Sc. Ag. Horticulture (Floriculture and Landscaping)
YEAR – II, SEMESTER – III

S.N.	Course Code	Course Name	Periods			Evaluation Scheme				Course Total	Credits
						Mid Term Exam			External Exam		
			L	T	P	CT	AS +AT	Total			
Theory											
1.	MAHF 301	Value Addition in Flowers	3		0	20	10	30	70	100	3
2.	MAHF 302	Turfing and Turf Management	3		0	20	10	30	70	100	3
3.	MAHF 303 (A/B/C)	Elective I	3		0	20	10	30	70	100	3
Practical's / Project											
						IA	**TA**				
4.	MAHF 351	Value Addition in Flowers Lab	0	0	2	20	10	30	70	100	1
5.	MAHF 352	Seminar	0	0	2	-	-	100	-	100	1
6.	MAHF 354	Pre- Dissertation	0	0	2	-	-	30	70	100	1
		Total	**9**	**0**	**6**	**-**	**-**	**-**	**-**	**600**	**12**

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STUDY & EVALUATION SCHEME
M. Sc. Ag. Horticulture (Floriculture and Landscaping)
YEAR - II, SEMESTER – IV

S.N.	Course Code	Course Name	Periods			Evaluation Scheme				Course Total	Credits
						Mid Term Exam			External Exam		
			L	T	P	CT	AS +AT	Total			
Theory											
-	-	-	-	-	-	-	-	-	-	-	-
Practical's / Project											
1.	MAHF 451	Dissertation Work	0	0	40	-	-	300	300	600	20
		Total	-	-	**40**	-	-	-	-	**600**	**20**

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STUDY & EVALUATION SCHEME

M. Sc. Ag. Horticulture (Floriculture and Landscaping)

List of Electives

Elective I		
MAHF 303 **(A/B/C/D/E/F/G)**	A	Production Technology of Medicinal and Aromatic Crops
	B	Planting Material and Seed Production Technology in Flower crops
	C	CAD for Outdoor and Indoorscaping
	D	Systematic of Ornamental Plants
	E	Indoor Plants and Interior Scaping
	F	Nursery Management in Ornamental Plants
	G	Post-harvest Management in Floricultural Crop

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MAHF101 Breeding of Flower Crops and Ornamental Plants L:T:P 3:0:0

Objective: To impart comprehensive knowledge about the principles and practices of breeding of flower crops and ornamental plants **to improve the skill, employability and entrepreneurship.**

UNIT I

Principles - Evolution of varieties, origin, distribution, genetic resources, genetic divergence- Patents and Plant Variety Protection in India **for skill development**.

UNIT II

Genetic inheritance - of flower colour, doubleness, flower size, fragrance, post-harvest life **knowledge for better employability in industry**.

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 **for better skilling of employability and Entrepreneurship.**

UNIT IV

Breeding constraints and achievements made in commercial flowers - rose, jasmine, chrysanthemum, marigold, tuberose, crossandra, carnation, dahlia, gerbera, gladioli, orchids, anthurium, aster, heliconia, liliums, nerium **for better skilling of employability**.

UNIT V

Breeding constraints and achievements made in ornamental plants – petunia, hibiscus, bougainvillea, Flowering annuals (zinnia, cosmos, dianthus, snap dragon, pansy) and ornamental foliages– Introduction and selection of plants for waterscaping and xeriscaping **for better skilling of employability**.

Course outcomes:

CO1. Plant breeding methods will help to understand crop improvement **for better skilling of employability**.

CO2. Students learn the genetic diversity and inheritance pattern of characters in flowering plants and its utilization in development of variety/hybrid **for skill development and better employability in industry**.

CO3. Learn breeding methods of sexually and asexually propagated flower crops **for better skilling of employability and Entrepreneurship**.

CO4. Constraints and achievements of breeding flowering plants give rise to scope of commercial floriculture **for better skilling of employability**.

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CO5. Constraints and achievements of breeding ornamental plants and seasonal flowers give views to design and decorate the gardens **for better skilling of employability**.

PO-CO Mapping (Please write 3,2,1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3
CO3	1	3	2	3	3	3	3	3	3	3	3
CO4	2	3	1	3	3	3	3	3	3	3	3
CO5	1	3	2	3	3	3	3	3	3	3	3

CO-Curriculum Enrichment Mapping(Please write 3,2,1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO1	3	3	1
CO2	3	3	1
CO3	3	3	3
CO4	3	3	1
CO5	3	3	1

References:

1. Bhattacharjee SK. 2006. *Advances in Ornamental Horticulture*. Vols. I-VI. Pointer Publ.
2. Bose TK &Yadav LP. 1989. *Commercial Flowers.* NayaProkash.Chadha KL &Choudhury B.1992. *Ornamental Horticulture in India.*
3. ICAR. Chadha KL. 1995. *Advances in Horticulture.* Vol. XII. Malhotra Publ.
4. House.Chaudhary RC. 1993. *Introduction to Plant Breeding.* Oxford & IBH. Singh BD. 1990. *Plant Breeding*. Kalyani.

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- http://www.asrb.org.in/images/asrb/pdfs/2017/11-20_19-1-2018_new.pdf
- https://www.researchgate.net/publication/322096393_Strategies_for_the_development_of_unique_flower_forms_in_ornamental_crops_A_review
- http://www.rvskvv.net/images/Breeding--Seed-Prodution-of-Ornamental-Plants_20.04.2020.pdf
- https://issuu.com/kisanadmin/docs/breeding_and_genetics_of_commercial.

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MAHF151 Breeding of Flower Crops and Ornamental Plants LabL:T:P 0:0:1

1. Description of botanical features– Cataloguing of cultivars, varieties and species in flowers
2. Study of floral biology
3. Study of selfing and crossing,
4. Evaluation of hybrid progenies
5. Induction of mutants through physical and chemical mutagens
6. Induction of polyploidy
7. Screening of plants for biotic, abiotic stresses and environmental pollution
8. *In vitro* breeding in flower crops and ornamental plants.

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MAHF 102 Production Technology of Cut Flowers L:T:P 3:0:0

Objective: To impart basic knowledge about the importance and production technology of cut flowers grown in India **for better skilling of Entrepreneurship**.

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, nursery management, media for nursery, special nursery practices **for skill development**.

UNIT II

Growing environment, open cultivation, protected cultivation, soil requirements, artificial growing media, soil decontamination techniques, planting methods, influence of environmental parameters, light, temperature, moisture, humidity and CO_2 on growth and flowering **for better employability in industry and Entrepreneurship Development.**

UNIT III

Flower production – water and nutrient management, fertigation, weed management, rationing, training and poruning, disbudding, special horticultural practices, use of growth regulators, physiological disorders and remedies, IPM and IDM, production for exhibition purposes **for better skilling of employability**.

UNIT IV

Flower forcing and year round flowering through physiological interventions, chemical regulation, environmental manipulation **for skilling of Entrepreneurship Development**.

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, aster, liliums, bird of paradise, heliconia, alstroemeria, alpinia, ornamental ginger, bromeliads, dahlia, gypsophilla, limonium, statice, stock, cut foliages and fillers **for skilling of better employability and Entrepreneurship Development**.

Course outcome:

After completion of this course students will be able to

CO1. Aware about the importance, scope, national and international scanerio of the cut flower production **for skill development**.

CO2. Know the scientific cultivation practices of cut flower under open and protected

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conditions **for better employability in industry and Entrepreneurship Development.**

CO3. Understand important for the commercial cultivation of flowers for exhibition purpose **for Entrepreneurship Development.**

CO4. Learn flower forcing and other physiological interventions for commercial production cultivation of flowers **for skilling ofEntrepreneurship Development**

CO5. Understand important practices of post-harvest management **for skilling of better employability and Entrepreneurship Development.**

PO-CO Mapping (Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	3	3	2	1	2	3	3	1	2
CO2	2	3	1	2	3	2	3	3	1	2	3
CO3	3	1	3	3	2	3	1	2	3	3	1
CO4	3	3	2	1	3	3	2	3	3	3	3
CO5	1	2	2	1	2	2	1	1	2	1	2

CO-Curriculum Enrichment Mapping(Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	2
CO2	2	3	3
CO3	2	1	3
CO4	3	1	3
CO5	3	3	3

References:

1. Arora JS. 2006. *Introductory Ornamental horticulture*. Kalyani. Bhattacharjee SK. 2006. *Advances in Ornamental Horticulture*. Vols. I-VI.
2. Pointer Publ.Bose TK &Yadav LP. 1989. *Commercial Flowers.* NayaProkash. Bose TK, Maiti RG, Dhua RS & Das P. 1999. *Floriculture and*
3. *Landscaping.* NayaProkash.Chadha KL &Chaudhury B. 1992. *Ornamental Horticulture in India.*
4. ICAR.Chadha KL. 1995. *Advances in Horticulture.* Vol. XII. Malhotra Publ. House.
5. Lauria A &Ries VH. 2001. *Floriculture – Fundamentals and Practices.* Agrobios.
6. Prasad S & Kumar U. 2003.*Commercial Floriculture.* Agrobios. Randhawa GS &Mukhopadhyay A. 1986.*Floriculture in India.* Allied

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

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- https://icar.org.in/files/EnglishUnit/Horticulture/PRODUCTION%20TECHNOLOGY%20OF%20CUT%20FLOWERS.html
- http://www.fao.org/3/ac452e/ac452e04.htm
- https://extension.psu.edu/cut-flower-production
- https://agritech.tnau.ac.in/horticulture/horti_flower%20crops_cut%20rose.html
- https://www.hortcourses.com/download/samples/CutFlowerProductionLesson4.pdf

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MAHF 152 **Production Technology of Cut Flowers Lab** **L:T:P 0:0:1**

1. Botanical description of varieties,
2. Study of different propagation techniques of cut flowers
3. Study of Training and pruning techniques
4. Practices in manuring
5. Drip and fertigation practices in cut flower crops
6. Application of foliar nutrition
7. Growth regulator application
8. Pinching, disbudding, staking
9. Harvesting techniques
10. Post-harvest handling of cut flowers
11. Visit to commercial cut flower units and case study.

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MAHF103 Landscaping and Ornamental Gardening L:T:P 3:0:0

Objective: Familiarization with principles and practices of landscaping and ornamental gardening **for better skilling of employability**.

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 **for skilling and employability and Entrepreneurship Development**.

UNIT II

Urban landscaping, Landscaping for specific situations, institutions, industries, residents, hospitals, roadsides, traffic islands, damsites, IT parks, corporates **for better employability in industry and Entrepreneurship Development**.

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 **for skilling of Entrepreneurship Development**.

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 **for better employability in industry.**

UNIT V

Bio-aesthetic planning, eco-tourism, theme parks, indoor gardening, therapeutic gardening, non-plant components, water scaping, xeriscaping, hardscaping **for skill Development**.

Course outcomes:

On completion of the course students should be able to:

CO1. Understand the styles of gardens **for skill Development.**

CO2. Explain the procedure of preparation of the gardenfor different situation and purpose **for better employability in industry and Entrepreneurship Development**.

CO3. Understand different components of landscaping **for skill Development.**

CO4. Learn lawn establishment and maintenance techniques **for employment.**

CO5. Understand about eco tourism, bio-aesthetic planning xeriscaping etc **for skill Development**.

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PO-CO Mapping (Please write 3,2,1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	1	2	3	2	3	3	1	3
CO2	1	3	3	2	3	3	2	3	1	3	2
CO3	3	1	2	3	3	2	3	1	3	3	2
CO4	3	3	3	2	1	3	3	2	1	3	3
CO5	2	2	3	3	3	1	1	3	3	2	1

CO-Curriculum Enrichment Mapping(Please write 3,2,1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	2	3	3
CO3	3	1	2
CO4	1	3	2
CO5	3	2	1

References:

1. Bose TK, Maiti RG, Dhua RS & Das P. 1999. *Floriculture and Landscaping.* NayaProkash.
2. Lauria A & Victor HR. 2001.*Floriculture – Fundamentals and Practices* Agrobios.
3. Nambisan KMP.1992. *Design Elements of Landscape Gardening*. Oxford & IBH.
4. Randhawa GS &Mukhopadhyay A. 1986.*Floriculture in India*. Allied Publ.
5. Sabina GT & Peter KV. 2008. *Ornamental Plants for Gardens*. New India Publ. Agency.
6. Valsalakumari et al. 2008.*Flowering Trees*. New India Publ. Agency. Woodrow MG.1999. *Gardening in India.* Biotech Books.

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MAHF 153 Landscaping and Ornamental Gardening Lab **L:T:P 0:0:1**

1. Identification of ornamental plants,
2. Practices in preparing designs for home gardens, industrial gardens, institutional gardens, corporates, avenue planting, etc.
3. Practices in planning and planting of special types of gardens.
4. Planning and planting of lawn making,
5. Planting herbaceous and shrubbery borders,
6. Project preparation on landscaping for different situations,
7. Visit to parks and botanical gardens,
8. Case study on commercial landscape gardens.

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MAHF201 **Production Technology of Loose Flowers** **L:T:P 3:0:0**

Objective: To impart basic knowledge about the importance and management of loose flowers grown in India **for improving skills of entrepreneurship development**.

UNIT I

Scope of loose flower trade, Significance in the domestic market/export, Varietal wealth and diversity, propagation, sexual and asexual propagation methods, propagation in mist chambers, nursery management, pro-tray nursery under shadenets, transplanting techniques **for skill development and entrepreneurship.**

UNIT II

Soil and climate requirements, field preparation, systems of planting, precision farming techniques **for skill development**.

UNIT III

Water and nutrient management, weed management, rationing, training and pruning, pinching and disbudding, special horticultural practices, use of growth regulators, physiological disorders and remedies, IPM and IDM **for better skilling of employability**.

UNIT IV

Flower forcing and year round flowering, production for special occasions through physiological interventions, chemical regulation **for skill development and entrepreneurship**.

UNIT V

Harvest indices, harvesting techniques, post-harvest handling and grading, pre-cooling, packing and storage, value addition, concrete and essential oil extraction, trasportation 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, ixora, lotus, lilies, tecoma, champaka, pandanus) **for better employability in industry and Entrepreneurship Development**.

Course outcome:

After completion of this course students will be able to

CO1. Aware about the importance, scope, national and international scenario of the loose flower production **for skill development**.

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CO2. Know the scientific cultivation practices of cut flowers for commercial exploitation **for improving skillsofentrepreneurship development.**

CO3. Understand important management techniques of loose flowers **for skill development.**

CO4. Learn flower forcing and round the year production of loose flower crops **for entrepreneurship development.**

CO5. Familiar about the Post-harvestmanagement of loose flowers **for better employability in industry and Entrepreneurship Development**.

PO-CO Mapping (Please write 3,2,1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	3	3	2	1	3	2	1	3	3
CO2	3	2	3	3	3	2	3	3	1	2	1
CO3	2	3	3	1	1	3	3	1	3	3	2
CO4	3	1	2	2	3	3	1	3	3	1	3
CO5	1	3	1	2	3	1	3	3	2	2	3

CO-Curriculum Enrichment Mapping(Please write 3,2,1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	2
CO2	3	1	3
CO3	3	1	2
CO4	2	1	3
CO5	2	3	3

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MAHF 251 **Production Technology of Loose Flowers Lab** **L:T:P 0:0:1**

1. Botanical description of species and varieties of different loose flowers
2. Propagation techniques of loose flowers
3. Study of training and pruning techniques in loose flower crops
4. Practices in manuring in cut flower crops
5. Application of irrigation in loose flower crops
6. Application of foliar nutrition,
7. Application of growth regulator application,
8. Pinching, disbudding, staking,
9. Study of harvesting techniques for different loose flower crops
10. Post-harvest handling,
11. Study of storage of different loose flowers
12. Visits to fields, essential oil extraction units and markets.

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MAHF 202 **Protected Floriculture** **L:T:P 3:0:0**

Objective: Understanding the principles, theoretical aspects and developing skills in protected cultivation **for improving skills of entrepreneurship development.**

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; Location specific designs; Structural components; Suitable flower crops for protected cultivation **for better skilling of employability**.

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 **for skill development and employability**.

UNIT III

Containers and substrates, soil decontamination, layout of drip and fertigation system, water and nutrient management, weed management, physiological disorders, IPM and IDM **to provide employability and entrepreneurship**.

UNIT IV

Crop regulation by chemical methods and special horticultural practices (pinching, disbudding, deshooting, deblossoming, etc.); Staking and netting, Photoperiod regulation **to provideknowledge for better employability in industry and entrepreneurship development**.

UNIT V

Harvest indices, harvesting techniques, post-harvest handling techniques, Precooling, sorting, grading, packing, storage, quality standards **for employability and entrepreneurship**.

Course outcomes:

At the end of the course the student should be able to

CO1. Summarize the scope and importance of greenhouse technology in improving crop production **for skill development**.

CO2. Compare various types of greenhouses, its advantages and cost benefits **for employability and entrepreneurship**.

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CO3. Students are able to successfully growing the different floricultural crops in protected conditions **for entrepreneurship development**.

CO4. Understand the flower crop regulation techniques **for skill development.**

CO5. Familiar with the post-harvest management of flowers **for better skilling of employability and entrepreneurship.**

PO-CO Mapping (Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	1	2	1	2	2	3	3	2	3	1
CO2	3	2	3	3	3	1	2	1	3	3	3
CO3	1	3	1	3	1	3	3	2	1	3	2
CO4	3	3	3	2	3	3	1	3	3	1	3
CO5	2	3	3	3	3	3	3	1	2	2	3

CO-Curriculum Enrichment Mapping(Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	2
CO2	2	3	3
CO3	2	1	3
CO4	3	1	2
CO5	3	3	3

References:

1. Bhattacharjee SK. 2006. *Advances in Ornamental Horticulture*. Vols. I-VI. Pointer Publ.
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MAHF 252 **Protected Floriculture Lab** **L:T:P 0:0:1**

1. Study of various protected structures,
2. Practices in design, layout and erection of different types of structures
3. Practices in preparatory operations, soil decontamination techniques
4. Practices in environmental control systems
5. Practices in drip and fertigation techniques
6. Determination of harvest indices and harvesting methods.
7. Postharvest handling, packing methods
8. Project preparation visit to commercial greenhouses.

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MMAG 204 Agricultural Statistics and Experimental Design L:T:P : 3:0:0

Objective: The main aims of this course are to provide comprehensive knowledge of the basic information of agriculture statistics and experimental design **for skilling of employability and entrepreneurship.**

Unit I

Presentation of Data: Frequency distributions; graphical presentation of data by histogram, frequency polygon, frequency curve and cumulative frequency curves Measures of Locations and Dispersion: Mean, median, mode and their simple properties (with-out derivation) and calculations of median by graphs; range, mean deviation, standard deviation, standard error, coefficient of variation **for employability and entrepreneurship**.

Unit II

Probability and Distributions: Random distributions; events exhaustive, mutually exclusive and equally likely; definition of probability (with simple exercises); definitions of binomial, Poisson's and normal distributions; and simple properties of the above distributions (without derivation) **for better skilling of employability.**

Unit III

Correlation and Regression: Bivariate data-simple correlation and regression coefficients and their relation; Spearman rank correlation; limits of correlation coefficient; effect of change of origin and scale on correlation coefficient; linear regression and equations of line of regression; association and independence of attributes **for better skilling of employability and entrepreneurship**.

Unit IV

Sampling: Concept of population and sample; random samples; methods of taking a simple random sample. Tests of significance: sampling distribution of mean and standard error; z and t-test (equality of means; paired and unpaired t-test); t-test for comparison of means when variances of two populations differ; Chi- square test for goodness of fit; independence of attributes, and homogeneity of samples; interrelation between t-test and F-Test **for employability in industry**.

Unit V

Experimental Designs: Principles of experimental designs; completely randomized, randomized complete block design (missing plot value in RBD); latin square designs;

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augmented block design; simple factorial experiments including split and strip plot design (mathematical derivations not required); analysis of variance (ANOVA) and its use including estimation of LSD (CD) **for better skilling of employability and entrepreneurship.**

Course Outcomes:

The student is able to

CO1. Understand basic theoretical and applied principles of agricultural statistics needed to enter in agriculture **for skill development.**
CO2. Demonstrate an understanding of the basic concepts of probability and random variables **for better skilling of employability.**
CO3. Understand and interpret the concepts of descriptive statistics from the obtained data **for skill development.**
CO4. Utilize and apply regression and other statistical methods to analyze commodity markets and economic data **for better skilling of employability and entrepreneurship.**
CO5. Gain proficiency in using statistical software for data analysis **for employment and entrepreneurship.**

PO-CO Mapping (Please write 3,2,1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	1	1	3	3	3	2	1	3
CO2	2	3	3	1	3	3	2	1	3	3	3
CO3	3	3	3	3	3	2	3	3	3	1	2
CO4	1	2	2	3	3	1	3	2	3	3	1
CO5	3	1	3	3	2	3	1	3	1	2	3

CO-Curriculum Enrichment Mapping(Please write 3,2,1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	3	3	1
CO3	3	2	1
CO4	3	3	3
CO5	2	3	3

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1. J, Medhi: Statistical Methods, New age International (P) Ltd.
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MMAG 254 **Agricultural Statistics and Experimental Design Lab** **L:T:P 0:0:1**

List of Experiments:

1. Measurement of central tendency and dispersion
2. Standard deviation and standard error
3. Principle uses of χ_2, F and T- test.
4. Correlation Coefficient, Regression coefficient and Regression equation.
5. Analysis of data generated from completely randomized design, randomized block design.
6. Analysis of data generated from Latin square design, factorial experiments in 2^2, 2^3 Split plot designs
7. Missing plot techniques.
8. Analysis of covariance.
9. Sampling in field experiments.
10. Analysis of variance (ANOVA).

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MAHF 301 **Value Addition in Flowers** **L:T:P 3:0:0**

Objective: To develop understanding of the scope and ways of value addition in flowers **for entrepreneurship development**.

UNIT I

Prospects of value addition, National and global scenario, production and exports, Women empowerment through value added products making, supply chain management **for skill development.**

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 **to provide the skill for entrepreneurship**.

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 **for better skilling of employability and entrepreneurship**.

UNIT IV

Concrete and essential oils; Selection of species and varieties (including non-conventional species), extraction methods, Packing and storage **for employability in industry**.

UNIT V

Selection of species and varieties, Types of pigments, carotenoids, anthocyanin, chlorophyll, betalains; Significance of natural pigments, Extraction methods; Applications **for skill development**.

Course outcome: After completion of this course student will be able to

CO1. Develop as an entrepreneur by acquiring the knowledge of value addition in flowers**for entrepreneurship development**.

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CO2. Be aware about the importance, scope and Scenario of value addition of commercial flowers **for skill development**.

CO3. .Know different scientific packages and practices of value addition of flowers**for employability in industry.**

CO4. Understand the different aspect of oil extraction **for better skilling of employability and entrepreneurship.**

CO5. Selection of varieties and methodology of oil extraction**for skill development**.

PO-CO Mapping (Please write 3,2,1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	1	2	3	3	2	1	3	3
CO2	2	1	3	3	3	1	3	3	2	1	3
CO3	3	3	1	3	1	2	3	3	3	3	2
CO4	1	3	3	3	3	3	2	1	3	3	1
CO5	3	2	3	2	2	1	3	3	1	3	3

CO-Curriculum Enrichment Mapping(Please write 3,2,1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO1	2	1	3
CO2	3	2	2
CO3	1	3	2
CO4	3	3	3
CO5	3	1	1

References

1. Bhattacharjee SK. 2006. *Advances in Ornamental Horticulture*. Vols. I-VI. Pointer Publ.
2. Chadha KL.1995. *Advances in Horticulture*.Vol.XII. Malhotra Publ. House.
3. Lauria A & Victor HR. 2001.*Floriculture – Fundamentals and Practices* Agrobios.
4. 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.

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- https://www.slideshare.net/mobile/JindalManisha/prospect-of-value-addition-and-its-senerio
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MAHF 351 **Value Addition in Flowers Lab** **L:T:P 0:0:1**

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

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MAHF 302 **Turfing and Turf Management** **L:T:P 3:0:0**

Objective: To develop understanding of the principles and management of turfing**for skilling and employability and entrepreneurship**.

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 **for skill development**.

UNIT II

Turf grasses - Types, species, varieties, hybrids; Selection of grasses for different locations; Grouping according to climatic requirement- Adaptation; Turfing for roof gardens **for provide employability and entrepreneurship**.

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**for skilling of entrepreneurship development**.

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 **knowledge for better employability in industry**.

UNIT V

Establishment and maintenance of turfs for playgrounds, viz. golf, football, hockey, cricket, tennis, rugby, etc **for employment and entrepreneurship**.

Course outcome:

After completion of this course students will be able to

CO1. Understand the importance of landscape industry in urban India **for skill development**.

CO2. Know the scientific techniques for establishment and maintenance of turf **for employment and entrepreneurship**.

CO3. Understand the technologies involved in turfgrass management**for skilling and employability.**

CO4. Understand the different operation for turfgrass management **for skill development**.

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CO5. Know the establishment of the turf grass for the specific purpose **for skill development.**

PO-CO Mapping (Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	1	2	1	3	3	3	1	2	3	1
CO2	3	3	3	1	3	1	1	3	3	1	3
CO3	3	1	1	3	3	3	3	3	1	3	2
CO4	2	3	3	3	2	2	3	3	3	2	3
CO5	1	2	3	2	3	3	2	3	2	1	3

CO-Curriculum Enrichment Mapping(Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO1	3	2	1
CO2	1	3	3
CO3	3	3	2
CO4	3	2	1
CO5	3	1	2

Suggested Readings

1. Nick-Christians 2004. *Fundamentals of Turfgrass Management*.www.amazon.com

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- http://www.annamalaiuniversity.ac.in/studport/download/agri/hort/resources/fla-624_%20turfing%20and%20turf%20management.pdf

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MAHF 303A Production Technology of Medicinal and Aromatic Crops L:T:P 3:0:0

Objective : To facilitate understanding on the importance, conservation and cultivation of medicinal and aromatic crops **to improve the skill, employability and entrepreneurship.**

UNIT I

Definition, introduction, history, scope, opportunities and constraints, in the cultivation of medicinal and aromatic plants in India. important medicinal and aromatic plants grown in India **for skill development**.

UNIT II

Importance, origin, distribution, area, production, climatic and soil requirements, propagation and nursery techniques, planting and after care, cultural practices, training and pruning, nutritional and water requirements. Plant protection and harvesting of commercial medicinal plants such as medicinal yam, fox-glove, opium, pyrethrum, sarpgandha, senna, isubgol, periwinkle, aswagandha **for skilling of entrepreneurship**.

UNIT III

Production technology of major aromatic crops viz. lemmon grass, citronella grass, palmarosa grass, vetiver, geranium, mints, ocimum **for employability and entrepreneurship.**

UNIT IV

Oil bearing rose, tuberose, lavender, jasmine and other species relevant to the local conditions **for entrepreneurship**.

UNIT V

Distillation of essential oil, Essential oil industry in India; Institutions involved in medicinal and aromatic plants promotion **for employability and entrepreneurship.**

Course outcomes:

CO1. Students would understand the importance and scope of growing medicinal and aromatic plants**for skill development**.

CO2. Students will be able to learn the medicinal values of plants for use in *Ayurveda* **for employability and entrepreneurship.**

CO3. Students will be aquatint with production technology of important medicinal and aromatic crops **for skill development**.

CO4. Students would understand about the production technology of oil bearing flowers crops **for entrepreneurship**

CO5. Students would understand the distillation process of extracting essential oil **for employability and entrepreneurship**.

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PO-CO Mapping (Please write 3,2,1 wherever required)
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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	1	3	3	2	1	2	3	1	2
CO2	2	3	3	1	2	3	3	1	1	3	3
CO3	3	1	2	3	3	3	2	3	3	3	1
CO4	3	3	3	3	1	1	3	3	2	2	3
CO5	1	2	3	2	3	3	3	3	3	3	3

CO-Curriculum Enrichment Mapping(Please write 3,2,1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	2
CO2	2	3	3
CO3	3	1	2
CO4	2	1	3
CO5	2	3	3

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MAHF 303B Planting material and Seed Production Technology in Flower Crops
L:T:P 3:0:0

Objective: To develop understanding of the principles and management of production of planting material and seed of commercial crops **for employability and entrepreneurship.**

UNIT I

Definition, Introduction, Area, Production, Scope and present status of seed production of flower crops, Different groups of seeds, seed production system in India **for skilling of employability.**

UNIT II

Causes of genetic deterioration, developmental variation, natural out-crossing, mechanical mixtures, use of seed in self pollinated crops Cross fertilization for hybrid vigour, use of seeds of vegetative propagated crops, cross fertilized crops, mutation **for skill development.**

UNIT III

Procedures for seed production. Various components like parental plant culture, maintenance of genetic purity, pollination, seed harvesting and seed extraction, seed cleaning, seed storage **for employability and entrepreneurship**.

UNIT IV

Seed certification, phases of certification, procedure for seed certification, field inspection. Seed Act and Seed Act enforcement. Duty and powers of seed inspector, offences and penalties. Seeds Control Order 1983**for skill up employability in Industry and entrepreneurship development.**

UNIT V

Seed production technology of self-pollinated (impatiens, sweet pea) often cross pollinated (antirrhinum, aster, dahlia, salvia) cross pollinated (calendula, marigold, ice plant, petunia) flower crops and development of planting material for rose, gladiolus, gerbera and carnation **for skill up employability.**

Course outcomes:

CO1. Students will aware of present status and future scope of developing planting materials and seed production of flower crops **for skill development**.

CO2. Students would understand the multiplication means of ornamental and flowering plants **for skilling of entrepreneurship**.

CO3. Students can be able to produce genetically pure seeds of seasonal and commercial flower crops **for skill up employability**.

CO4. Students will aware of the seed certification procedure, its importance and different acts related to it**for skill up employability in Industry and entrepreneurship development.**

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CO5. Students would understand Seed production technology of self-pollinated, often cross pollinated and cross pollinated flower crops and development of planting material **for skill up employability.**

PO-CO Mapping (Please write 3,2,1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	1	2	1	2	1	3	2	3	3
CO2	1	3	3	3	3	1	3	3	3	1	3
CO3	2	1	2	3	3	3	2	3	3	3	3
CO4	3	3	3	1	2	3	3	2	3	3	1
CO5	1	2	3	3	3	3	3	1	1	2	3

CO-Curriculum Enrichment Mapping(Please write 3,2,1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	2
CO2	3	2	3
CO3	3	3	2
CO4	3	3	3
CO5	3	3	2

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MAHF 303C **CAD for Outdoor and Indoor scaping** **L:T:P 3:0:0**

Objective:

- To develop understanding of the principles and management of production of planting material and seed of commercial crops **for skill development**.
- To impart basic knowledge about the operation of Computer Aided Designing (CAD) in landscape garden designing **for employability in Industry and entrepreneurship development.**

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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 **for skill development**.

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 **for employability and entrepreneurship.**

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 **for employability and entrepreneurship**.

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 **for skill employability and entrepreneurship development.**

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 **for skill development.**

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Course outcome:
After completion of this course students would be able to

CO1. Understand the inclusion of CAD in the land scape designing **for skill development.**
CO2. Know the use of basic tools, sofwares, processes for landscape designing **for skill employability in industry.**
CO3. Use patterns in AUTOCAD drawing, Dimension concepts and Drawing web format design **for employability and entrepreneurship**
CO4. Understand 3D drawing methods, ARCHICAD file system **for skill upemployability and entrepreneurship development.**
CO5. Familiar ARCHICAD organization tools, Dimensioning and detailing of designs, Attribute settings of components **for skill development.**

PO-CO Mapping (Please write 3,2,1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	1	3	3	3	3	2	1	3	3	3
CO2	2	3	3	1	2	3	3	3	3	2	1
CO3	3	3	1	3	3	2	1	3	2	1	3
CO4	3	3	2	2	3	1	3	2	2	3	2
CO5	3	2	3	3	1	3	3	3	1	3	3

CO-Curriculum Enrichment Mapping(Please write 3,2,1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	2
CO2	3	3	1
CO3	1	3	3
CO4	3	3	3
CO5	3	2	1

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MAHF-303 (D) **Systematic of Ornamental Plants L:T:P 3:0:0**

Objective: To teach morphological, cytological and molecular taxonomy of Ornamental Plants**for skill development, employability and entrepreneurship.**

UNIT-I

Principles of classification; different methods of classification; salient features of international code of nomenclature of ornamental plants.**for skill development.**

UNIT-II

Origin, history, evolution and distribution of ornamental plants, botanical description of families, genera and species covering various tropical, subtropical and temperate ornamental plants**to provide employability and entrepreneurship.**

UNIT-III

Cytological level of various ornamental plants; descriptive keys for important ornamental plants.**to impartknowledge for better employability in industry**.

UNIT-IV

Importance of molecular markers in evolution of ornamental plants; molecular markers as an aid in characterization and taxonomy of ornamental plants **for provide employability and entrepreneurship.**

UNIT-V

Taxonomy -importance, history, development, binomial nomenclature of important ornamental plants. Definitions of Biotype, Sub-species, Species of some ornamental trees, shrubs, herbs and grasses making lawns **for skill development**.

Course Outcomes:

Students completing this course will be able to:

CO1: Students will get basic idea about classification and nomenclature of ornamental plants**for skill development.**

CO2: Provide knowledge of botanical description of various tropical, subtropical and temperate ornamental plants **to provide employability and entrepreneurship**.

CO3: Understand the cytological studies of ornamental plants **knowledge for better employability in industry**.

CO4: Understand the about molecular markers and its role in characterization of ornamental plants **for provide employability and entrepreneurship**.

CO5: Understand biotype, sub-species, and Species of some ornamental trees, shrubs, herbs and grasses making lawns **for skill development**.

PO-CO Mapping (Please write 3,2,1 wherever required)

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	1	3	3	3	3	2	1	3	3	3
CO2	2	3	3	1	2	3	3	3	3	2	1
CO3	3	3	1	3	3	2	1	3	2	1	3
CO4	3	3	2	2	3	1	3	2	2	3	2
CO5	3	2	3	3	1	3	3	3	1	3	3

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

CO-Curriculum Enrichment Mapping(Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	1	3	3
CO3	1	3	1
CO4	2	3	3
CO5	3	1	2

References:

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MAHF-303 (E) **Indoor Plants and Interior Scaping** **L:T:P 3:0:0**

Objective: To update knowledge on the recent trends in the field of landscape designing and developing practical skills for decorating Indoors of housing **for skill development, employability and entrepreneurship.**

UNIT-I

Environmental factors in indoor gardening- light, humidity, points to remember in indoor plant selection, management, methods of indoor gardening, indoor plants for air purification, hanging baskets and window boxes and terrariums - miniature garden **for skill development.**

UNIT-II

Bonsai – Introduction, styles, plants and containers, characteristics of plants suitable for bonsai, pots or containers for bonsai, plants suitable for indoor bonsai **to provide employability and entrepreneurship.**

UNIT-III

Flower arrangement, styles, Ikebana, Morebana, free style. Selection of containers and accessories for making floral products and decorations, designs for special occasions, collection and preparation of flowers and foliage, vase solutions' preparation **to impart knowledge for better employability in industry**.

UNIT-IV

Significance of interior scaping, Materials of garden design, Design making by different garden styles and types. Design principles in ancient and modern landscape. Role of landscaping in environment improvement and ecology conservation (birds, butterflies, animals). Plant wealth for edges, hedges, herbaceous borders, trees, floral beds, water plants, cacti, ferns, palms, etc. **for provide employability and entrepreneurship.**

UNIT-V

Assessing site and plants adaptability for different locations, special techniques in garden landscaping (Burlapping, waterscaping,xeriscaping, hardscaping, lawn establishment, topiary styles specializing,bioaesthetic planning). Software's use for drawing of site plan, **for skill development**.

Course Outcomes:

Students completing this course will be able to:

CO6: Students will get basic idea about indoor plants and indoor gardening **for skill development.**

CO7: Provide knowledge of bonsai,styles, suitable plants and pots for making bonsai **to provide employability and entrepreneurship**.

CO8: Develop the knowledge of flower arrangement, containers and accessories for decorating indoors with plants.**for better employability in industry**.

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CO9: Understand the significance of interior scapingin improving environment and ecology conservation **to provide employability and entrepreneurship**.

CO10: Understand the special techniques used in garden landscaping and software's use for designing and planning of interior decoration of house. **for skill development**.

PO-CO Mapping (Please write 3,2,1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	1	3	3	3	3	2	1	3	3	3
CO2	2	3	3	1	2	3	3	3	3	2	1
CO3	3	3	1	3	3	2	1	3	2	1	3
CO4	3	3	2	2	3	1	3	2	2	3	2
CO5	3	2	3	3	1	3	3	3	1	3	3

CO-Curriculum Enrichment Mapping(Please write 3,2,1 wherever required)
Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	1	3	3
CO3	1	3	1
CO4	2	3	3
CO5	3	1	2

References:

1. Pribyl Berger. 2021. **Indoor Plants.** Harveys Books.
2. Rajaneesh&Bijendra Kumar Singh Singh. 2020. Introductory Ornamental Horticulture and Landscape Gardening. Bio-Green Books.
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MAHF303(F) Nursery Management in Ornamental Plants L:T:P 3:0:0

Objective: Familiarization with principles and practices of propagation and nursery management for Ornamental plants **and improve the skill, employability and entrepreneurship.**

UNIT I

Scenario of nursery industry and sexual propagation: Importance and present scenario and status of nursery industry in India and in the world, life cycles in plants, Propagation methods, Factors influencing seed germination of flower crops, dormancy, seed quality, packing, storage, certification, testing. Hormonal regulation of germination and seedling growth **for skill development.**

UNIT II

Asexual propagation: Methods of asexual propagation, rooting of soft and hard wood cutting under mist. Role of Plant growth regulators. Physiological, anatomical and biochemical aspects of root induction in cuttings. Layering – principles and methods, budding and grafting – selection of elite mother plants. Stock, scion and inter stock, relationship – Incompatibility **to provide employability and entrepreneurship.**

UNIT III

Growing structures: Growing structures like mist chambers, tunnels, lath house, net house, growing media types, soil less culture and containers. Automation in nursery management. Sanitary and phyto-sanitary issues: Nursery – types, components, planning and layout **knowledge for better employability in industry**.

UNIT IV

Nursery management practices for healthy propagule production. Nursery Act, PPV&FR act and Quarantine system in India. Important quarantine pests and diseases, sanitary and phyto-sanitary issues threats to nursery Industry **to provide employability and entrepreneurship.**

UNIT V

Standards: Nursery standards, Hi-tech nurseries, garden centers **for skill development.**

Course Outcomes:

Students completing this course will be able to:

CO1: Understand the basic concepts of field and crop management starting from field preparation, seed sowing, till harvesting and threshing of crop **for skill development.**

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CO2: Define the importance of water in agriculture and ways to improve water use efficiency **to provide employability and entrepreneurship.**

CO1: Understand the nutritional requirements of crops and also about sources available to fulfill the nutritional requirement **knowledge for better employability in industry.**

CO2: Understand the importance of weed management in agriculture and also about advantages and disadvantages of herbicide usage **for provide employability and entrepreneurship.**

CO3: Understand the concept of plant growth and development **for skill development.**

PO-CO Mapping (Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	1	3	3	3	3	2	1	3	3	3
CO2	2	3	3	1	2	3	3	3	3	2	1
CO3	3	3	1	3	3	2	1	3	2	1	3
CO4	3	3	2	2	3	1	3	2	2	3	2
CO5	3	2	3	3	1	3	3	3	1	3	3

CO-Curriculum Enrichment Mapping(Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	1	3	3
CO3	1	3	1
CO4	2	3	3
CO5	3	1	2

References:

1. Adriance GW and Brison FR. 2000. Propagation of Horticultural Plants. Biotech Books, New Delhi, India.

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MAHF303(G) Post-harvest Management in Floricultural Crop L:T:P 3:0:0

Objective: Understanding the principles, theoretical aspects and developing skills in protected harvesting of flower crops **and improve the skill, employability and entrepreneurship.**

UNIT I

Factors affecting post harvest quality and vase life of cut flowers and foliage. Stage method and time of harvest **to provide employability and entrepreneurship.**

UNIT II

Postharvest handling - pre-cooling, pulsing, grading, bunching, packing and storage of important cut flowers. Types of packaging materials – methods of packaging for short term and long term transport and transit **for skill development.**

UNIT III

Use of bud opening and holding solutions. Quality deterioration in the storage environment - sanitary procedures to be followed. Internal and global demand and consumption trends of cut flowers - standards – marketing systems in India and abroad – role of intermediaries – problems and prospects in production for export **knowledge for better employability in industry**.

UNIT IV

Postharvest handling of cut foliage. Value addition in flowers - garlands, bouquet, flower arrangements. Extraction of oil and pigment, use in aromatherapy **for skill development.**

UNIT V

Preparation of dry flowers, dry flower arrangements and marketing of dry flowers. Storage and care of dried products **to provide employability and entrepreneurship.**

Course Outcomes:

Students completing this course will be able to:

CO1: Understand the basic concepts of field and crop management starting from field preparation, seed sowing, till harvesting and threshing of crop **for skill development.**

CO2: Define the importance of water in agriculture and ways to improve water use efficiency **to provide employability and entrepreneurship**.

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CO3: Understand the nutritional requirements of crops and also about sources available to fulfill the nutritional requirement **knowledge for better employability in industry**.

CO4: Understand the importance of weed management in agriculture and also about advantages and disadvantages of herbicide usage **for provide employability and entrepreneurship**.

CO5: Understand the concept of plant growth and development **for skill development**.

PO-CO Mapping (Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	1	3	3	3	3	2	1	3	3	3
CO2	2	3	3	1	2	3	3	3	3	2	1
CO3	3	3	1	3	3	2	1	3	2	1	3
CO4	3	3	2	2	3	1	3	2	2	3	2
CO5	3	2	3	3	1	3	3	3	1	3	3

CO-Curriculum Enrichment Mapping(Please write 3,2,1 wherever required)

Note: 3= Highly correlated, 2= Moderately correlated, 1= Less correlated

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	1	3	3
CO3	1	3	1
CO4	2	3	3
CO5	3	1	2

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- https://iasri.icar.gov.in
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