



IFTM
UNIVERSITY
M O R A D A B A D

NAAC ACCREDITED

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(Effective from 2018-19)

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.
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.
3. Seminar based course develop presentation and technical skills in students.
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.
5. A growing export industry, increasing product demands and advances in horticultural technology is making this an extremely lucrative career.
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.
7. Students can also render their services as a scientist in the field of floriculture and landscaping.
8. The training institutes welcome such candidates for the posts of training organizers.
9. Students can go for higher degree programs for further research work.
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.
11. Students may develop as an entrepreneur by producing and processing of flowers and ornamental plants.

School of Agricultural Sciences & Engineering
IFTM UNIVERSITY, MORADABAD
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
			L	T	P	Mid Term Exam		External Exam			
						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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IFTM UNIVERSITY, MORADABAD
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
			L	T	P	Mid Term Exam			External Exam		
						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
			L	T	P	Mid Term Exam		External Exam			
						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	-	-	50	50	100	1
Total			9	0	6	-	-	-	-	600	12

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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	20	-	-	300	300	600	20
Total			-	-	20	-	-	-	-	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)	A	Production Technology of Medicinal and Aromatic Crops
	B	Planting Material and Seed Production Technology in Flower crops
	C	CAD for Outdoor and Indoorscaping

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.

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

UNIT IV

Breeding constraints and achievements made in commercial flowers - rose, jasmine, chrysanthemum, marigold, tuberose, crossandra, carnation, dahlia, gerbera, gladioli, orchids, anthurium, aster, heliconia, liliiums, nerium.

UNIT V

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

Course outcomes:

- Plant breeding methods will help to understand crop improvement.
- Students learn the genetic diversity and inheritance pattern of characters in flowering plants and its utilization in development of variety/hybrid.
- Constraints and achievements of breeding flowering plants give rise to scope of commercial floriculture.
- Constraints and achievements of breeding ornamental plants and seasonal flowers give views to design and decorate the gardens.

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.

Website sources:

- 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-Production-of-Ornamental-Plants_20.04.2020.pdf
- https://issuu.com/kisanadmin/docs/breeding_and_genetics_of_commercial.

MAHF151 Breeding of Flower Crops and Ornamental Plants Lab L: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.

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.

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.

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 CO₂ on growth and flowering.

UNIT III

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

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, aster, liliiums, bird of paradise, heliconia, alstroemeria, alpinia, ornamental ginger, bromeliads,

dahlia, gypsophilla, limonium, statice, stock, cut foliage and fillers.

Course outcome:

After completion of this course students will be able to

- Aware about the importance, scope, national and international scenario of the cut flower production.
- Know the scientific cultivation practices of cut flower under open and protected conditions.
- Understand important practices of post harvest management.

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*. 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*.
3. 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
7. Publ. Reddy S, Janakiram B, Balaji T, Kulkarni S & Misra RL. 2007. *Hightech Floriculture*. Indian Society of Ornamental Horticulture, New Delhi.
8. *Floriculture*. Indian Society of Ornamental Horticulture, New Delhi.

Website Sources:

- <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>

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.

MAHF103

Landscaping and Ornamental Gardening

L:T:P 3:0:0

Objective: Familiarization with principles and practices of landscaping and ornamental gardening.

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, dam sites, 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.

Course outcomes:

On completion of the course students should be able to:

- Differentiate the styles in garden architecture in the world
- Explain the procedure of preparation of the garden and different components of landscaping.

References:

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

Website Sources:

- <http://www.jnkvv.org/>
- <https://www.agrimoon.com/>
- <http://ecoursesonline.iasri.res.in/>
- <https://iasri.icar.gov.in/>
- <https://tnau.ac.in/>

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.

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.

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^[L]_[SEP]

UNIT II

Soil and climate requirements, field preparation, systems of planting, precision farming techniques.

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.

UNIT IV

Flower forcing and year round flowering, production for special occasions through physiological interventions, chemical regulation^[L]_[SEP]

UNIT V

Harvest indices, harvesting techniques, post-harvest handling and grading, pre-cooling, packing and storage, value addition, concrete and essential oil extraction, 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, ixora, lotus, lilies, tecoma, champaka, pandanus).

Course outcome:

After completion of this course students will be able to

- Aware about the importance, scope, national and international scenario of the loose flower production.
- Know the scientific cultivation practices of cut flowers for commercial exploitation
- Understand important practices of post harvest management of loose flowers

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.
3. Bose TK, Maiti RG, Dhua RS & Das P. 1999. *Floriculture and Landscaping*. NayaProkash.
4. Chadha KL & Chaudhury B. 1992. *Ornamental Horticulture in India*. ICAR.
5. Chadha KL. 1995. *Advances in Horticulture*. Vol. XII. Malhotra Publ. House.
6. Lauria A & Ries VH. 2001. *Floriculture – Fundamentals and Practices*. Agrobios.
7. Prasad S & Kumar U. 2003. *Commercial Floriculture*. Agrobios. Randhawa GS & Mukhopadhyay A. 1986. *Floriculture in India*. Allied
8. Publ. Sheela VL. 2007. *Flowers in Trade*. New India Publ. Agency. Valsalakumari PK, Rajeevan PK, Sudhadevi PK & Geetha CK. 2008.
9. *Flowering Trees*. New India Publ. Agency.

Website sources:

- <https://icar.org.in/files/English-Unit/Horticulture/PRODUCTION%20TECHNOLOGY%20FOR%20LOOSE%20FLOWERS.html>
- https://agritech.tnau.ac.in/horticulture/horti_flower%20crops.html
- <https://dfr.icar.gov.in/AtaGlance/Profiles>
- <https://ncert.nic.in/vocational/pdf/kegr101.pdf>
- <https://agricare.kisanhelp.in/content/production-technology-rose>

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.

Objective: Understanding the principles, theoretical aspects and developing skills in protected

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.

UNIT II

Environment control – management and manipulation of temperature, light, humidity, air and CO₂; 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, Precooling, sorting, grading, packing, storage, quality standards.

Course outcomes:

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

- Summarize the scope and importance of greenhouse technology in improving crop production.
- Compare various types of greenhouses, its advantages and cost benefits.
- Students are able to successfully growing the different floricultural crops in protected conditions.

References:

1. Bhattacharjee SK. 2006. *Advances in Ornamental Horticulture*. Vols. I-VI. Pointer Publ.
2. Bose TK & Yadav LP. 1989. *Commercial Flowers*. NayaProkash. Bose TK, Maiti RG, Dhua RS & Das P. 1999. *Floriculture and Landscaping*. NayaProkash. Chadha KL. 1995. *Advances in Horticulture*. Vol. XII. Malhotra Publ.
3. House. Lauria A & Victor HR. 2001. *Floriculture – Fundamentals and Practices*
4. Agrobios. Nelson PV. 1978. *Green House Operation and Management*. Reston Publ.
5. Co. Prasad S & Kumar U. 2003. *Commercial Floriculture*. AgrobiosRandhawa GS & Mukhopadhyay A. 1986. *Floriculture in India*. Allied
6. Publ. Reddy S, Janakiram B, Balaji T, Kulkarni S & Misra RL. 2007. *Hightech Floriculture*. Indian Society of Ornamental Horticulture, New Delhi.
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- 8.

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- <http://cohvka.kau.in/>
- <https://ncert.nic.in/>
- <http://www.hillagric.ac.in/>
- <https://iasri.icar.gov.in/>
- <https://tnau.ac.in/>
- <http://ecoursesonline.iasri.res.in/>

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.

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

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.

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)

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.

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.

Unit V

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

Course Outcomes:

The student is able to

- Understand basic theoretical and applied principles of agricultural statistics needed to enter in agriculture.
- Demonstrate an understanding of the basic concepts of probability and random variables.
- Understand and interpret the concepts of descriptive statistics from the obtained data.
- Utilize and apply regression and other statistical methods to analyze commodity markets and economic data.
- Gain proficiency in using statistical software for data analysis.

References:

1. J. Medhi: Statistical Methods, New age International (P) Ltd.
2. J.K. Goyal & J.N. Sharma, Mathematical Statistics.
3. J.K. Ghosh, Mathematical Statistics, John Wiley & Sons, New York.
4. S.C. Gupta & V.K. Kapoor .Advanced Statistics, S. Chand.
5. M. Ray, Mathematical Statistics, R.P & Sons, Agra.
6. Goulden, C.H. (1952). Methods of Statistical Analysis, 2/e, John Wiley, New York
7. Kempton RA and Fox PN (1997). Statistical Methods for Plant Variety Evaluation.
8. Chapman and Hall.
9. Panse, V.C. and Sukhatme, P.V. (1967). Statistical Methods for Agricultural Workers,
10. I.C.A.R., New Delhi.

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- www.pdfdrive.com
- www.dmi.gov.in
- www.yourarticlelibrary.com
- www.onlinecourses.nptel.ac.in
- www.en.wikipedia.org

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).

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.

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.

UNIT V

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

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

- Develop as an entrepreneur by acquiring the knowlwdge of value addition in flowers
- Be aware about the importance, scope and Scenrio of value addition of commercial flowers.
- Know different scientific packages and practices of value addition of flowers

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.

Website sources:

- <https://icar.org.in/files/English-Unit/Horticulture/VALUE%20ADDITION%20IN%20FLOWERS.html>
- <https://www.slideshare.net/mobile/JindalManisha/prospect-of-value-addition-and-its-senerio>
- <https://www.springerprofessional.de/en/value-addition-in-flowers/4657550>
- https://link.springer.com/chapter/10.1007/978-81-322-2262-0_5
- http://www.uaf.edu.pk/golden_jubilee/downloads/presentations/indonesia/Rana%20aslam.pdf

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.

Objective: To develop understanding of the principles and management of turfing.

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.

Course outcome:

After completion of this course students will be able to

- Understand the importance of landscape industry in urban India.
- Know the scientific techniques for establishment and maintenance of turf.
- Understand the technologies involved in turfgrass management

Suggested Readings

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

Website sources:

- <http://www.downloadmela.com/turfing-and-turf-management-4%3C%3EgvmfEAYbLJVVKX85HUItVA%3D%3D>
- [http://www.hillagric.ac.in/edu/coa/horticulture/lecture/Lawn%20Making%20\[Compatibility%20Mode\]%20pdf.pdf](http://www.hillagric.ac.in/edu/coa/horticulture/lecture/Lawn%20Making%20[Compatibility%20Mode]%20pdf.pdf)
- https://ag.umass.edu/sites/ag.umass.edu/files/pdf-doc-ppt/lawn_bmp_establishment_2016_final.pdf
- <http://www.downloadmela.com/120-turfing-and-turf-management-4%3C%3Ez62vaEf%2Bv%2BrOqIEdyeG92Q%3D%3D>
- http://www.annamalaiuniversity.ac.in/studport/download/agri/hort/resources/fla-624_%20turfing%20and%20turf%20management.pdf

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.

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.

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.

UNIT III

Production technology of major aromatic crops viz. lemmon grass, citronella grass, palmarosa grass, vetiver, geranium, mints, ocimum

UNIT IV

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

UNIT V

Distillation of essential oil, Essential oil industry in India; Institutions involved in medicinal and aromatic plants promotion,

Course outcomes:

- Students would understand the importance and scope of growing medicinal and aromatic plants.
- Students will be able to learn the medicinal values of plants for use in *Ayurveda*.
- Students will be aquatint with production technology of important medicinal and aromatic crops.
- Students would understand the distillation process of extracting essential oil.

References:

1. Kumar N. et al. 2004. Introduction to Spices, Plantation crops, Medicinal and Aromatic Plants. Oxford & IBH Publishing Co. OV. LTD. New Delhi
2. Atal CK & Kapur BM. 1982. *Cultivation and Utilization of Aromatic Plants*. RRL, CSIR, Jammu.
3. Atal CK & Kapur BM. 1982. *Cultivation and Utilization of Medicinal Plants*. RRL, CSIR, Jammu.

Website Sources:

- <https://www.agrimoon.com/wp-content/uploads/Medicinal-and-Aromatic-Crops.pdf>
- <https://link.springer.com/article/10.1007/s10668-019-00368-7>.
- <https://krishi.icar.gov.in/jspui/bitstream/123456789/12920/2/ICAR-CIWA-TB%2828%29%202017.pdf>.
- <https://vikaspedia.in/agriculture/crop-production/package-of-practices/medicinal-and-aromatic-plants/medicinal-aromatic-crops>.

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.

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

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 vegetatively propagated crops, cross fertilized crops, mutation

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.

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,

UNIT V

Seed production technology of self pollinated (impatiens, sweet pea) often cross pollinated (antirrhinum, aster, dahlia, salvia) cross pollinated (calendula, marigold, iceplant, petunia) flower crops and development of planting material for rose, gladiolus, gerbera and carnation

Course outcomes:

- Students will aware of present status and future scope of developing planting materials and seed production of flower crops.
- Students would understand the multiplication means of ornamental and flowering plants.
- Students can be able to produce genetically pure seeds of seasonal and commercial flower crops.

References:

1. Agarwal, R.L.2003. Seed technology. Oxford & IBH, Delhi.
2. Nema, NP. 1987. Principles of seed certification and testing.

Website Sources:

- <https://seednet.gov.in/material/IndianSeedSector.htm>
- <https://agritech.tnau.ac.in/seed/seedconcepts.html>
- <https://krishi.icar.gov.in/jspui/bitstream/123456789/11983/1/Mannual%20Volume%20II.pdf>
- http://agritech.tnau.ac.in/amis/pdf/Seed_act_1966.pdf

Objective:

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

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.

Course outcome:

After completion of this course students would be able to

- Understand the inclusion of CAD in the landscapedesigning

- Know the use of basic tools, softwares, processes for landscape designing

References:

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

Website Sources:

- <https://icar.org.in/files/English-Unit/Horticulture/CAD%20FOR%20OUTDOOR%20AND%20INDOORSCAPING.html>
- <https://www.aksuniversity.ac.in/Syllabus/M%20Sc%20Ag%20FLA.pdf>
- <https://www.acs.edu.au/info/computers/graphics/cad-for-landscaping.aspx>
- https://www.academia.edu/28451202/Computer_Aided_Designing_for_Landscape_Gardening
- <https://www.witpress.com/Secure/elibrary/papers/SC13/SC13033FU1.pdf>