

PG & RESEARCH DEPARTMENT OF BOTANY

DIPLOMA IN HORTICULTURE

Syllabus

(2020 – 2023 onwards)



JAMAL MOHAMED COLLEGE (Autonomous)

College with Potential for Excellence
Accredited (3rd Cycle) with 'A' Grade by NAAC
DBT Star College Scheme & DST-FIST Funded
(Affiliated to Bharathidasan University)
Tiruchirappalli – 620020, Tamil Nadu, India

PG and Research Department of Botany

Diploma in Horticulture

Programme outcomes

1. Realize the scope and opportunities of horticulture as a discipline.
2. Outline basic and fundamental knowledge on horticulture production.
3. Classify and evaluate the appropriate cultivable plants species in demand by applying suitable eco-friendly methods.
4. Exposure to get trained in field condition.
5. Designate good management practices and develop entrepreneurial skills.

Programme specific outcomes

1. Acquire recent advanced knowledge on the objectives, scope and purpose of horticulture.
2. Develop employability and entrepreneurship skills.
3. Explore possibilities of problem-solving ability in horticulture.
4. Develop and evaluate techniques to improve the productivity on horticulture.
5. Adapt transformation of education towards application relevant to society.

PG and Research Department of Botany

Diploma in Horticulture

(Programme Structure for Students Admitted from 2020 – 2023 Onwards)

SEMESTER	PART	COURSE	COURSE CODE	COURSE TITLE	TOTAL HOURS	CREDITS	MARKS		
							CIA	ESE	Total
I	I	General	20DHO1CC1	Fundamentals of horticulture	60	4	25	75	100
	I	General	20DHO1CC2	Plant propagation practices	60	4	25	75	100
	I	General	20DHO1CC3	Floriculture	60	4	25	75	100
	II	Skill	20DHO1CC4P	Fundamentals of horticulture – Practical	180	6	20	80	100
	II	Skill	20DHO1CC5P	Plant propagation practices – Practical	180	6	20	80	100
	II	Skill	20DHO1IN	Floriculture – Internship	180	6	--	--	100
	Total					720	30	115	385
Exit Qualification: Certificate NSQF Level: 4 Exit Qualification Pack: Florist AGR/ Q0703									
II	I	General	20DHO2CC6	Seed science and technology	60	4	25	75	100
	I	General	20DHO2CC7	Horticultural pre and post-harvest practices	60	4	25	75	100
	I	General	20DHO2CC8	Landscape gardening and greenhouse technology	60	4	25	75	100
	II	Skill	20DHO2CC9P	Seed science and technology – Practical	180	6	20	80	100
	II	Skill	20DHO2CC10P	Horticultural pre and post-harvest practices – Practical	180	6	20	80	100
	II	Skill	20DHO2IN	Landscape gardening and greenhouse technology – Internship	180	6	--	--	100
	Total					720	30	115	385
Grand Total					1440	60	230	770	1200
Exit Qualification: Diploma NSQF Level: 5 Exit Qualification Pack: Heritage Gardener AGR/Q0810 Horticulture supervisor AGR/Q0811									

Semester	Course	Course Code	Title of the course	Hours	Credits	Max. marks	Internal marks	External Marks
I	General	20DHO1CC1	Fundamentals of horticulture	60	4	100	25	75

Course outcomes:

At the end of the course, students will be able to

1. Realize the scope and significance of horticultural practices.
2. Plan and develop orchards and recall its managements.
3. Utilize the green manuring and organic fertilizers.
4. Identify and appraise appropriate plant growth stimulating and inhibiting hormones.
5. Solve economic implications of cultivation of tropical and subtropical fruits and vegetable crops.

Unit I: Fundamentals of horticulture

12 Hours

Definition, classification, scope and importance. #Horticultural zones in Tamil Nadu and India#. Soil – Kinds of soil, physical and chemical properties and soil fertility. Climate – Basic environmental components. Systems of irrigation – surface, underground and special irrigation methods.

Unit II: Establishment of orchards and cultivation

12 Hours

Location, site, planning, layout, planting seasons, systems, distance and transplanting methods of orchards. Methods of soil management practices – clean culture, cover culture, mulching, sod and sod mulching. Inter, mixed and multitier cropping. Training, pruning and #weed management in orchards#.

Unit III: Nutrients of horticultural crops

12 Hours

Organic manures – night soil, guana, bones, oil cakes, leaf mould, farmyard manure and vermi-compost. Inorganic fertilizers – nitrogen, phosphate, potash and mixed fertilizers. #Biofertilizers – Algal, fungi and Bacterial#. Application of fertilizers and manures.

Unit IV: Horticultural applications of growth regulators

12 Hours

History and types. Role of plant growth regulators in horticulture – Propagation of plant, control of flowering, fruit setting, fruit size and quality, pre-harvest fruit drop, #weed and dormancy#. induction of parthenocarpy, blossom thinning, fruit ripening and arresting plant growth.

Unit V: Pomology and olericulture

12 Hours

Classification and types of fruits, cultivation practices of Mango, Papaya, Jack fruit, Pomegranate and Citrus. Classification of vegetables, types of vegetable growing and #cultural aspects of vegetables#. Vegetables cultivation suitable for tropical climate – Brinjal, Lady's finger, Tomato and cucurbit varieties.

#-----# Self-study portion

Text Books:

1. Gupta SN, Instant Horticulture, 16th Edition, Jain Brothers Pvt Ltd, New Delhi, India, 2010.
2. Sheela VL, Horticulture, 1st Edition, MJP Pvt Ltd, Chennai, Tamil Nadu, India, 2011.
3. Kumar N, Introduction to Horticulture, 8th Edition, Medtech, Scientific International Pvt Ltd, New Delhi, India, 2017.

Books for Reference:

1. George A, Horticulture: Principles and Practices, 4th Edition, Prentice Hall India Learning Pvt Ltd, New Delhi, India, 2009.
2. Peter KV, Basics of Horticulture, 2nd Revised Edition, New India Publishing Agency Pvt Ltd, New Delhi, India, 2009.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Course Code	Title of the course					Hours	Credits			
I	20DHO1CC1	Fundamentals of horticulture					60	4			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓		✓			✓			✓		
CO2	✓	✓	✓			✓	✓	✓	✓	✓	
CO3	✓		✓			✓	✓	✓	✓		
CO4	✓		✓	✓		✓	✓		✓		
CO5	✓		✓	✓	✓	✓	✓	✓	✓		
Number of Matches = 33, Relationship: Moderate											

Prepared by:

Dr. N. Ahamed Sherif

Checked by:

Dr. A. Aslam

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very High

Semester	Course	Course Code	Title of the course	Hours	Credits	Max. marks	Internal marks	External Marks
I	General	20DHO1CC2	Plant propagation practices	60	4	100	25	75

Course outcomes:

At the end of the course, students will be able to

1. Recall the concept of natural propagation, growth and development system in plants.
2. Select suitable planting materials for cottage, layering, graftage and budding mediated plant propagation.
3. Conclude the advantages and disadvantages of various propagation system.
4. Analyse factors affecting artificial plant propagation.
5. Develop pathogen free clones *in vitro* and maintenance of true to true type of plant species.

Unit I: Asexual and Sexual propagation

12 Hours

Definition. Microsporogenesis and megasporogenesis. Apomixis – types and significance. Polyembryony. Advantages and disadvantages of asexual and sexual propagation. Genetic instability. #Propagation by specialized plants parts#.

Unit II: Plant propagation through cuttage

12 Hours

Types and methods of cuttage (leaf, leaf bud, stem and root). Regeneration of plants from cuttage. #Advantages and disadvantages#.

Unit III: Plant propagations through layering

12 Hours

Types and methods of layering (simple, serpentine trench, tip, stooling and air layering). Anatomical and physiological basis of rooting. #Advantages and disadvantages of layering#.

Unit IV: Plant propagations through grafting and budding

12 Hours

Grafting – Stock and scion concept, rootstocks, factors for successful graft union, formation of graft union, grafting types, methods and incompatibility. Budding – types, methods and limitations. #Advantages and disadvantages#.

Unit V: Micropropagation

12 Hours

Scope and requirements. Procedure for micropropagation. Various methods of culturing plant tissues and organs. Deflasking, hardening and acclimatization. Potting mixtures for micropropagated plants. #Advantages and bottlenecks in micropropagation#.

#-----# Self-study portion

Text Books:

1. Reddy M and Rao A, Plant propagation in Horticulture, 1st Edition, Pacific Book International Pvt Ltd, New Delhi, India, 2009.
2. Sheela VL, Horticulture, 1st Edition, MJP Pvt Ltd, Chennai, Tamil Nadu, India, 2011.
3. Kumar N, Introduction to Horticulture, 8th Edition, Medtech, Scientific International Pvt Ltd, New Delhi, India, 2017.

Books for Reference:

1. Michael Dirr A and Charles Heuser W, Reference manual of woody plant propagation: From seed to tissue culture, 2nd Edition, Timber Press Pvt Ltd, United States of America, 2006.
2. Hartmann HT, Kester DE, Fred T, Davies JR, Robert LG, Plant Propagation: Principle and Practices, 1st Edition, Pearson Education Pvt, Ltd, United States of America, 2017.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Course Code	Title of the course					Hours	Credits			
I	20DHO1CC2	Plant propagation practices					60	4			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓	✓			✓	✓		✓		✓	
CO2	✓	✓			✓	✓					
CO3	✓	✓	✓		✓	✓		✓		✓	
CO4	✓	✓		✓	✓	✓	✓		✓	✓	
CO5	✓	✓			✓	✓	✓	✓	✓	✓	
Number of Matches = 33, Relationship: Moderate											

Prepared by:

Dr. N. Ahamed Sherif

Checked by:

Dr. A. Aslam

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very High

Semester	Course	Course Code	Title of the course	Hours	Credits	Max. marks	Internal marks	External Marks
I	General	20DHO1CC3	Floriculture	60	4	100	25	75

Course outcomes:

At the end of the course, students will be able to

1. Recognize the fundamentals of floriculture.
2. Employ various cultivation practices for flowering plants in commercial scale.
3. Generate quality planting material of ornamentals and flowering plants.
4. Standardize and practice production, preparation, and packaging of the commercially important cut flowers and flower based decorative products.
5. Validate commercial floriculture as competent field to start their own enterprise and turn into job creators instead of becoming job seekers.

Unit 1: Diversification of floriculture

12 Hours

Scope and importance of floriculture. Classification of flowering plants. Traditional and protected cultivation of flowers (site, soil and layout). Flower seed production and flower beds. #Colour scheme and grouping#.

Unit 2: Cultivation methods

12 Hours

Cultivation methods of Rose, Marigold, Chrysanthemum, Jasmine, Dahlia, Orchid and Crossandra. Training and pruning of flowering plants. #Ornamental bulbous plant – Cacti, succulents, palms, cycads and ferns#.

Unit 3: Cut flower technology

12 Hours

Production, packaging, drying and preservation. Post-harvest technology of cut flowers. Cut flower production techniques for domestic and export market with special reference to rose, #Marigold, Chrysanthemum#, Anthurium, Gladiolus, Jasmine, Dahlia, Tuberose, Gerbera, Orchid and Crossandra.

Unit 4: A profitable floriculture industry

12 Hours

Vase life – prolonging the vase life of flowers. Flower arrangements – Practices and preparation of floral bouquets and decorations. #Preparation of floral rangoli, veni and ikebana#. Dry flowers – techniques of drying, preservation, bleaching, dyeing, painting, storage and products.

Unit 5: Entrepreneurship in Floriculture

12 Hours

Marketing of floriculture products – methods, publicity and marketing mix. Schemes and supporting agencies for entrepreneurship of floriculture – APEDA, DIC, SIDA, SISI, NSIC, SIDO. #Policies, programs and financing ideas#. Investment procurement – project formation, feasibility, legal formalities, shop act, estimation and costing, investment procedure, loan procurement, banking processes and export strategies.

#-----# Self-study portion

Text Books:

1. Sheela VL, Horticulture, 1st Edition, MJP Pvt Ltd, Chennai, Tamil Nadu, India, 2011.
2. Arora JS, Introductory Ornamental Horticulture, 2nd Edition, Kalyani Publishers Pvt Ltd, New Delhi, India, 2016.
3. Randhawa GS and Mukhopadyay AN, Floriculture in India, 1st Edition (Reprinted), Allied Publishers Pvt Ltd, Chennai, Tamil Nadu, India, 2015.

Books for Reference:

1. Brain M, Flowering Bulbs for the Garden (The Royal Botanical Gardens, KEW in association with COLLINGRIDE), 8th Edition, The Himalayan Publishing Group Pvt Ltd, Kew, London, 2013.
2. Chadha KL and Choudhury B, Ornamental Horticulture in India, 6th Edition, ICAR, New Delhi, India, 2014.

Web Source:

1. http://www.apeda.gov.in/apedawebsite/SubHead_Products/Floriculture.htm
2. https://agriexchange.apeda.gov.in/indexp/Product_description_32head.aspx?gcode=01013
3. <https://agriexchange.apeda.gov.in/FTP/ftp2015-20E>
4. www.Anilrana13014.webbly.com
5. <https://www.zauba.com/export-INDIAN+FRESH+FLOWERS-hs-code.html>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Course Code	Title of the course					Hours	Credits				
I	20DHO1CC3	Floriculture					60	4				
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	✓					✓						
CO2	✓	✓	✓	✓	✓	✓		✓	✓	✓		
CO3	✓		✓	✓	✓	✓	✓	✓	✓	✓		
CO4	✓		✓	✓	✓	✓		✓	✓	✓		
CO5	✓		✓	✓	✓	✓		✓	✓	✓		
Number of Matches = 36, Relationship: High												

Prepared by:

Dr. N. Ahamed Sherif

Checked by:

Dr. A. Aslam

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very High

Semester	Course	Course Code	Title of the course	Hours	Credits	Max. marks	Internal marks	External Marks
I	Skill	20DHO1CC4P	Fundamentals of Horticulture – Practical	180	6	100	20	80

Course outcomes:

At the end of the course, students will be able to

1. Classify the plants according to their nature and parts used.
2. Practice soil and soil less cultivation methods.
3. Demonstrate nursery bed preparation, utilizing hormones and methods of irrigation.
4. Find, identify orchard weeds & their control and know how to apply the organic & inorganic fertilizers.
5. Appraise special garden equipment's and machinery.

List of Practical's

1. Categorization of horticultural crops in Tamil Nadu based on use, plant type and usable plant part.
2. Soil less plant culture – Hydroponics.
3. Skill learning and practicing nursery bed preparation.
4. Practicing irrigation for irrigated crops.
5. Use of plant growth regulators – IAA/NAA/IBA, Kinetin, ABA and GA.
6. Identify horticultural orchard weed and earthing up.
7. Practicing application of organic, inorganic and green manures.
8. Spray volume calculation and foliar application of fertilizers.
9. Pruning practices in horticultural trees.
10. Practicing the use of special garden implements (Seed drill, rotary weeder, Mower and sprayers, litter blower).
11. Identification of major conditions responsible for spoilage of horticultural crops.
12. Field trips: Field visit to standing crop sites, nurseries, vegetable gardens and horticultural fields at agricultural institutes / universities or other suitable locations.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Course Code	Title of the course					Hours	Credits			
I	20DHO1CC4P	Fundamentals of Horticulture – Practical					180	6			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓	✓	✓			✓				✓	
CO2	✓	✓	✓			✓	✓				
CO3	✓	✓	✓			✓					
CO4	✓	✓	✓	✓	✓	✓		✓	✓	✓	
CO5	✓	✓	✓	✓	✓	✓		✓	✓	✓	
Number of Matches = 32, Relationship: Moderate											

Prepared by:

Dr. N. Ahamed Sherif

Checked by:

Dr. A. Aslam

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very High

Semester	Course	Course Code	Title of the course	Hours	Credits	Max. marks	Internal marks	External Marks
I	Skill	20DHO1CC5P	Plant propagation practices - Practical	180	6	100	20	80

Course outcomes:

At the end of the course, students will be able to

1. Outline propagation by using specialized plant parts.
2. Produce high yielding plant varieties using different propagation techniques.
3. Prepare suitable potting media for desirable planting materials.
4. Formulate plant tissue culture media and know how to transplant regenerated plants from in vitro to ex vitro condition.
5. Analyse factors affecting and problem-solving ways in artificial propagation in delicate and toughened plant species.

List of Practical's

Plant propagation techniques

1. Cuttage.
2. Layering
3. Grafting.
4. Budding.
5. Propagation by using specialized plant parts.
6. Preparation of pot mixture, potting and repotting.
7. Micropropagation.
 - a) Sterilization procedures.
 - b) Handling of weighing balance, laminar air flow chamber, pH meter and autoclave.
 - c) Preparation of stock solutions for medium preparation.
 - d) Preparation of solid and liquid medium.
 - e) *In vitro* culture methods using different types of explants.
 - f) Hardening and transplantation of regenerated plants.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Course Code	Title of the course					Hours	Credits			
I	20DHO1CC5P	Plant propagation practices - Practical					180	6			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓			✓	✓		✓	✓		✓	
CO2	✓	✓		✓	✓		✓	✓		✓	
CO3	✓		✓	✓	✓		✓	✓		✓	
CO4	✓		✓	✓	✓	✓	✓	✓		✓	
CO5	✓		✓	✓	✓		✓	✓	✓	✓	
Number of Matches = 36, Relationship: High											

Prepared by:

Dr. N. Ahamed Sherif

Checked by:

Dr. A. Aslam

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very High

Semester	Course	Course Code	Title of the course	Hours	Credits	Max. marks	Internal marks	External Marks
I	Skill	20DHO1IN	Floriculture – Internship	180	6	100	25	75

Course outcomes:

At the end of the course, students will be able to

1. Choose desirable flower seed materials for floral bed preparation.
2. Select suitable varieties for plantation in different geographical locations.
3. Classify flowers based on size, shape and colour during post-harvesting of commercial flowers.
4. Identify different types of boxes used for packing and export of commercial flowers.
5. Produce floral bouquets and decoration for flower shows to market their commercial flowers.

List of Practical's come Internship

1. Soil cultivation and area preparation.
2. Flower's seed production and bed preparation.
3. Seedling for plantation.
4. Irrigation and organic mulching.
5. Practicing on flower bud capping with net material.
6. Practicing on flower harvesting and separation based on size, colour, length etc.
7. Practicing on flower bunching, packing, marketing and export.
8. Practices and preparation of floral bouquets and decorations.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the course					Hours	Credits				
I	20DHO1IN	Floriculture – Internship					180	6				
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	✓	✓	✓	✓	✓	✓	✓	✓		✓		
CO2	✓		✓	✓	✓	✓	✓	✓				
CO3	✓		✓	✓	✓	✓	✓		✓	✓		
CO4	✓	✓	✓	✓	✓	✓	✓		✓			
CO5	✓		✓	✓	✓	✓	✓	✓	✓			
Number of Matches = 35, Relationship: High												

Prepared by:
Dr. N. Ahamed Sherif

Checked by:
Dr. A. Aslam

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very High

Semester	Course	Course Code	Title of the course	Hours	Credits	Max. marks	Internal marks	External Marks
II	General	20DHO2CC6	Seed Science and Technology	60	4	100	25	75

Course outcomes:

At the end of the course, students will be able to

1. Realize the hypothetical orientation of seed development.
2. Appreciate the principles of seed production technology & its use for flowering and vegetable crops.
3. Illustrate the concept of hybrid seed production.
4. Examine various methods of seed testing.
5. Distinguish seed processing, storage, certification and marketing.

Unit I: Introduction

12 Hours

Seed morphology, anatomy and its types. Seed dormancy – possible reasons and methods of breaking dormancy. Concept of seed technology, difference between seed and grains, seed quality, relationships to the other sciences, role and goals of seed technology. Seed industries in India. #Opportunities for seed technologists#.

Unit II: Seed production in vegetable crops

12 Hours

General principles and methods. Identification of areas, compact area approach and #factor affecting in seed production#. Climatic requirements, cultural practices, isolation distance, rouging, seed standards, extraction and processing. Seed production techniques in solanaceous vegetables, peas, beans, okra, cucurbits, onion, cole and root crops.

Unit III: Seed production in flower crops

12 Hours

Indian scenario in flower seeds production, different groups of seeds, formula mix, #pollination behavior#, isolation and pollination management. Hybrid seed production, harvesting and threshing. Seed yield in important annuals and maintenance of the variety.

Unit IV: Seed testing

12 Hours

Seed sampling, determination of density, purity and genuineness of varieties. Seed viability, moisture, vigour, health, age testing and #germination#.

Unit V: Seed processing, storage, certification and marketing

12 Hours

Seed processing, drying, cleaning, upgrading, treatment, packaging, handling and storage. Seed certification, minimum seed certification standards, field and seed inspection. Seed legislation, #law enforcement# and marketing.

#-----# Self-study portion

Text Books:

1. Agarwal PK, Principles of Seed Technology, 1st Edition, ICAR, New Delhi, India, 2010.
2. Basavaraju GV, Ravishankar P and Sarika G, 2nd Edition, A Text book of Seed Science and Technology, Kalyani Publishers Pvt Ltd, New Delhi, India, 2014.
3. Rattan Lal A, Seed Technology, 2nd Edition, Oxford & IBH Publishing Pvt Ltd, New Delhi, India, 2017.

Books for Reference:

1. Lawrence OC and Miller FM, Principles of Seed Science and Technology, 1st Edition, Springer, 2002.
2. Vanangamudi K, Seed Science and Technology, 2nd Edition, New India Publishing Agency Pvt Ltd, New Delhi, India, 2014.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Course Code	Title of the course					Hours	Credits			
II	20DHO2CC6	Seed Science and Technology					60	4			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓		✓		✓	✓	✓		✓		
CO2	✓	✓	✓		✓	✓	✓	✓	✓		
CO3	✓		✓	✓	✓	✓	✓		✓		
CO4	✓	✓	✓		✓	✓	✓		✓	✓	
CO5	✓		✓		✓	✓	✓		✓		
Number of Matches = 35, Relationship: High											

Prepared by:

Dr. N. Ahamed Sherif

Checked by:

Dr. A. Aslam

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very High

Semester	Course	Course Code	Title of the course	Hours	Credits	Max. marks	Internal marks	External Marks
II	General	20DHO2CC7	Horticultural pre and post-harvest practices	60	4	100	25	75

Course outcomes:

At the end of the course, students will be able to

1. Develop competent pre and post-harvest techniques in horticultural crops.
2. Visualize the post-harvest problems likely to be confronted.
3. Inculcate the concept of different types of practices for value addition.
4. Critically evaluate different post-harvest physiology, disease and protection techniques.
5. Know the tricks of the trade and how to increase the longevity of the produce.

Unit I: Pre-harvest practice and disease management

12 Hours

Pre-harvest factors affecting quality, factors responsible for deterioration of horticultural products, physiological and bio-chemical changes, hardening and delaying ripening process. Pre-harvest diseases –densifications of deficiency symptoms and nutritional management. IPM strategies (genetic, biological and chemical methods for pest control). #Crop sanitation and quarantine practices#.

Unit II: Post-harvest practices

12 Hours

Overview and importance of post -harvest handling. Principle and methods of preservation and processing. Methods of minimizing loses during storage and transportation; Harvesting and handling of fruits, #cut flowers#, vegetables, herbs, storage tissues and organs.

Unit III: Post-harvest processing

12 Hours

Food processing – canning, fruit juice beverages, pickles, jam, jellies, candies, food additives, labeling. Food irradiation and food safety. Importance and advantages of appropriate technologies. Evaluation of quality traits. Harvesting of produce and extent of post-harvest losses. Value addition – standardization and #improvement of quality#.

Unit IV: Protection of Post-harvest Produce

12 Hours

Concept of maturity and maturity indices. Pre-harvest quality modifiers, Trimming, cleaning and drying technologies. Post-harvest physiology – Physiological disorders, development, identification and Control. Post-harvest diseases - source of infection, types of diseases, losses by insects. Prevention techniques for post -harvest losses. Storage techniques, #biorational approaches#.

Unit V: Post-harvest strategies and transportation

12 Hours

Laws of food selling. Treatments prior to shipment –chlorination, waxing, chemicals, biocontrol agents and #natural plant products#. Methods of storage: ventilated, refrigerated, MAS, CA storage, Precooling, sorting, grading, packaging, transportation and marketing.

#-----# Self-study portion

Text Books:

1. Upadhyaya RC, Post-Harvest Technology of Horticulture crops, 1st Edition, Anmol Publication Pvt Ltd, New Delhi, India, 2008.
2. Sharon Pastor S and Straus MC, Post-Harvest Technology of Horticultural Crops, 1st Edition, Oxford & IBH Publishing Pvt Ltd, New Delhi, India, 2010.
3. Rathore NS, Mathur GK and Chasta SS, Post-Harvest management and processing of fruits and vegetables, 1st Edition, The Energy and Resources Institute, New Delhi, India, 2012.

Books for Reference:

1. Sudheer KP and Indira V, Post-harvest Technology of Horticultural Crops, 1st Edition, New India Publishing Agency Pvt Ltd, New Delhi, India, 2007.
2. Prakash K and Chandraprabha S, Post-harvest technology and Value Addition of Fruits and Vegetables, 1st Edition, LAP Lambert Academic Publishing, 2020.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Course Code	Title of the course					Hours	Credits				
II	20DHO2CC7	Horticultural pre and post-harvest practices					60	4				
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1		✓	✓		✓	✓	✓	✓		✓		
CO2		✓	✓		✓		✓	✓	✓	✓		
CO3	✓	✓	✓		✓		✓	✓		✓		
CO4		✓	✓		✓		✓	✓		✓		
CO5		✓	✓	✓	✓		✓	✓	✓	✓		
Number of Matches = 35, Relationship: High												

Prepared by

Dr. N. Ahamed Sherif

Checked by

Dr. A. Aslam

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very High

Semester	Course	Course Code	Title of the course	Hours	Credits	Max. marks	Internal marks	External Marks
II	General	20DHO2CC8	Landscape gardening and Greenhouse technology	60	4	100	25	75

Course outcomes:

1. Apply the principle and components of gardening.
2. Design various types of gardens according to the philosophy.
3. Conceptualize flower arrangement and bio-aesthetic planning.
4. Recognize the basic details of organization and functioning of greenhouse.
5. Familiarize with crop management in greenhouse condition.

Unit I: Origin, history and indoor gardening

12 Hours

Introduction, world history of garden, major gardening styles of the world. #Famous Indian gardens#. Indoor gardening – containers, environmental factors, selection of plants, potting media and other aspects.

Unit II: Special types of gardens

12 Hours

Formal and informal garden – garden components. Establishment, construction and management of rock, water, marsh, roof, vertical, terrace and temple garden. #Bonsai – origins, kinds and requirements for starting of bonsai#.

Unit III: Lawn establishment and its management

12 Hours

Introduction, site selection, land preparation, types of grasses, planting, detaching methods, irrigation, drainage, manures, fertilizers, disease and #pest management#.

Unit IV: Construction and components of greenhouse

12 Hours

An overview of different protective cultivation structures. #Construction and composition of a greenhouse#. Types of greenhouse based on covering material, environmental control and shape. Greenhouse cooling – ventilation, roof shading and evaporating cooling systems.

Unit V: Greenhouse management

12 Hours

Requirements for planting in green houses –choice of cultivar, bed preparation, medium, microirrigation, fertigation and carbon dioxide enrichment. Green house cultivation of some important ornamentals and vegetables. #Abiotic and biotic factors affecting greenhouse cultivation and their management#.

#-----# Self-study portion

Text Books:

1. Manohar KR, Greenhouse technology and management, 2nd Edition, B.S. Publishers Pvt Ltd, New Delhi, India, 2007.
2. Misra RL and Misra S, Landscape Gardening, 1st Edition, Westville Publishing House Pvt Ltd, New Delhi, India, 2012.
3. Patil NN, Greenhouse Technology – Management, operations and Maintenance, 1st Edition, Universal Prakashan Pvt Ltd, Pune, India, 2016.

Books for Reference:

1. Tiwari GN, Greenhouse for controlled environment, 1st Edition, Alpha Science International Pvt Ltd, United Kingdom, 2003.
2. Bhattacharjee SK, Landscape Gardening and Design with Plants, 1st Edition, Avishkar Publishers Pvt Ltd, New Delhi, India, 2012.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Course Code	Title of the course					Hours	Credits				
II	20DHO2CC8	Landscape gardening and greenhouse technology					60	4				
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	✓			✓	✓	✓	✓			✓		
CO2	✓		✓	✓	✓	✓	✓			✓		
CO3	✓			✓	✓	✓	✓	✓		✓		
CO4	✓	✓		✓	✓	✓	✓		✓	✓		
CO5	✓			✓	✓	✓	✓	✓		✓		
Number of Matches = 35, Relationship: High												

Prepared by:

Dr. N. Ahamed Sherif

Checked by:

Dr. A. Aslam

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very High

Semester	Course	Course Code	Title of the course	Hours	Credits	Max. marks	Internal marks	External Marks
II	General	20DHO2CC9P	Seed Science and Technology - Practical	180	6	100	20	80

Course outcomes:

At the end of the course, students will be able to

1. Build a collection and preserve traditionally important seed varieties for conservation and commercialization.
2. Demonstrate viability of seeds by short and long-term storage techniques.
3. Analyse the different dormancy types in seeds.
4. Rule on seed dormancy and its breaking by mechanical and chemical methods.
5. Recognize the importance of artificial seeds and their germination techniques.

List of Practical's

1. Germplasm collection of different types of seeds for conservation – Dicot and monocots.
2. Seed viability by using Tetrazolium Test.
3. Seed moisture analysis.
4. Seed constituent's analysis.
5. Seed priming for breaking seed dormancy.
6. Seed germination studies: Dicots and monocots.
7. Synthetic seed preparation by using sodium alginate method.
8. Short term and long-term storage of seed – Liquid Nitrogen.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Course Code	Title of the course					Hours	Credits				
II	20DHO2CC9P	Seed Science and Technology - Practical					180	6				
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	✓		✓	✓	✓	✓	✓			✓		
CO2	✓			✓	✓	✓	✓			✓		
CO3	✓			✓	✓	✓	✓	✓		✓		
CO4	✓	✓		✓	✓	✓	✓			✓		
CO5	✓			✓	✓	✓	✓		✓	✓		
Number of Matches = 34, Relationship: Moderate												

Prepared by:

Dr. N. Ahamed Sherif

Checked by:

Dr. A. Aslam

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very High

Semester	Course	Course Code	Title of the course	Hours	Credits	Max. marks	Internal marks	External Marks
II	General	20DHO2CC10P	Horticultural pre and post-harvest practices - Practical	180	6	100	20	80

Course outcomes:

At the end of the course, students will be able to

1. Classify the pre and post-harvest produce.
2. Identify major condition responsible for early decay of produce.
3. Select suitable storage methods for pre and post-harvest produces.
4. Know how to grade and packaging of produces.
5. Realize the importance of community cold storage facilities in our country.

List of Practical's

1. Field visit to some nearby cold-storage facility.
2. Handling of post-harvest equipment: Dryers, storage containers and vessels.
3. The production process of the marketable products.
4. Post-harvest processing – drying and grading.
5. Packaging and transport of produce, minimization of damage during packaging of dry fruits / nuts / herbs and herbal products.
6. Post-harvest processing for transportation.
7. Identification of major conditions responsible for early decay of produce.
8. Identification of pathogenic and non-pathogenic reasons of produce spoilage during storage.
9. Cold storage techniques for fruits and vegetables.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Course Code	Title of the course					Hours	Credits				
II	20DHO2CC10P	Horticultural pre and post-harvest practices - Practical					180	6				
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	✓	✓		✓		✓	✓			✓		
CO2	✓	✓		✓		✓	✓	✓		✓		
CO3	✓	✓		✓	✓	✓	✓			✓		
CO4	✓	✓	✓	✓		✓	✓			✓		
CO5	✓	✓		✓		✓	✓		✓	✓		
Number of Matches = 34, Relationship: Moderate												

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Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very High

Semester	Course	Course Code	Title of the course	Hours	Credits	Max. marks	Internal marks	External Marks
II	Skill	20DHO2IN	Landscape gardening and greenhouse technology - Internship	180	6	100	25	75

Course outcomes:

At the end of the course, students will be able to

1. Realize the characteristics of various plants suitable for indoor and outdoor plantation along with physical identification.
2. Design indoor and outdoor gardens and train lawn establishment and maintenance.
3. Know how to prepare bonsai plants, preserving, watering, pest management, packing and export strategies.
4. Plan, estimation and construction of poly, green and net houses and know the control process of regulating temperature, humidity and light.
5. Select and grow the commercial vegetable crops through protected cultivation method.

List of Practical's come Internship

1. Field visit to Botanical gardens, to identify the trees, shrubs and other herbaceous vegetation.
2. Principles of designing indoor and outdoor garden.
3. Propagate, raise and maintenance of indoor and outdoor plants.
4. Practicing on preparation and maintenance of bonsai trees.
5. Practices in lawn establishment and maintenance.
6. Identification of pathogenic and non-pathogenic diseases of garden plants and grasses.
7. Practicing on protected cultivation of plants in green, poly and net house.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Course Code	Title of the course	Hours	Credits						
II	20DHO2IN	Landscape gardening and greenhouse technology - Internship	180	6						
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓		✓	✓		✓		✓	✓
CO2		✓		✓	✓		✓		✓	✓
CO3		✓	✓	✓	✓		✓	✓	✓	✓
CO4		✓		✓	✓		✓		✓	✓
CO5		✓	✓	✓	✓	✓	✓		✓	✓
Number of Matches = 35, Relationship: High										

Prepared by:
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Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very High