

# GUJARAT UNIVERSITY

## M. Sc. Horticulture Science and Garden Management

Effective from July 2022

1. There will be Four Papers (Three Hour Duration) and Two Practicals (Six hour Duration) of One Hundred (70 External + 30 Internal) Marks each at Semester Examination.
2. Candidate shall be required to submit at the time of practical examination at the end of each semester.
  - The laboratory Journal and diary of field work (Tour report) duly signed by the teachers concerned from time to time.
  - Project report, assignments, seminars, Slides, Preparations or Materials illustrating the subject - matter as per syllabus for each semester.

### Distribution of Marks

#### INTERNAL MARKS

#### PRACTICAL:

M.Sc.	Seminar	Experiment	Total	Assignment/ Review article	Experiment	Total	Strategic Planning/ Project
Sem I		HSGM 405			HSGM 406		
Marks	10	40	50	10	40	50	---
Sem II		HSGM 411			HSGM 412		
Marks	10	40	50	10	40	50	---
Sem III		HSGM 505			HSGM 506		
Marks	10	40	50	10	40	50	---
Sem IV	30			30			120
* Note: Practical internal 50 marks to be converted in to 30 marks: Exam time 6 hrs.							

#### Theory:

Semester	Per Paper / Marks	Papers	Total
I	50	4	200
II	50	4	200
III	50	4	200
IV	--	--	--

\* Note: Theory internal 50 marks to be converted in to 30 marks: Exam time 1.5 hrs

Time for External 3 hrs.

Semester	Theory			Practical			Grand
	Internal	External	Total	Internal	External	Total	Total
I	30 X 4 = 120	70 X 4 = 280	400	30 X 2 = 60	70 X 2 = 140	200	600
II	30 X 4 = 120	70 X 4 = 280	400	30 X 2 = 60	70 X 2 = 140	200	600
III	30 X 4 = 120	70 X 4 = 280	400	30 X 2 = 60	70 X 2 = 140	200	600
IV	Seminar /Assignment 30 X 2=60	Seminar /Assignment 70 X 2=140	200	Project- 120	Project- 280	400	600
							<b>2400</b>

### Seminar:

- Topics will be allotted in the beginning of the each semester.
- On due date student has to present the seminar on allotted topic and submit compiled literature.
- Presentation would be evaluated.

### Assignment / Submission:

- Student must Prepare / Collect specific literature / Herbarium / Material pertaining to the topics in HSGM.
- Student may take up survey work in guidance of the department.
- Assignment / submission would be evaluated.

### Project:

- Based on the papers and topics studied, student must select a line of research; prepare a project proposal (comprising introduction, literature survey, problem, target, methodology, probable outcome and reference) and submit the dissertation.
- Project report would be evaluated.

## Question Paper Pattern (for External Examination)

### Theory:

Question	Unit	Marks
Q – 1		
Or	From Unit I	14
Q – 1		
Q – 2		
Or	From Unit II	14
Q – 2		
Q – 3		

Or Q – 3	From Unit III	14
Q – 4 Or Q – 4	From Unit IV	14
Q – 5*	From Unit I to IV	14

\*Objective type questions like Multiple choice / match A & B / fill in the blank / True or false / give one word / expand abbreviations etc.

### **Practical:**

Q – 1. Major experiment	20 Marks.
Q – 2. Minor experiment	14 Marks.
Q – 3. General experiment	10 Marks.
Q – 4. Comment	16 Marks.
Q – 5. Viva – voce and journal	10 Marks.

(Pattern may change slightly depending upon the practical topics.)

# HSGM

Department Name: Botany, School of Sciences			Semester – I				
Course		Name of Course	No. of Hours per Week				
No.	Type		Lectures	Others	Practical	Total	Credit
HSGM 401	CORE	HORTICULTURE SCIENCE	3	1	-	4	4
HSGM 402	CORE	GROWING PLANTS	3	1	-	4	4
HSGM 403	CORE	PRODUCTION TECHNOLOGY: FRUITS AND VEGETABLES	3	1	-	4	4
HSGM 404	CORE	PRODUCTION TECHNOLOGY: PLANTATION CROPS AND SPICES	3	1	-	4	4
HSGM 405	CORE	PRACTICAL – 1	-	1	3	4	4
HSGM 406	CORE	PRACTICAL - 2	-	1	3	4	4
TOTAL			12	06	06	24	24
			Semester – II				
Course		Name of Course	No. Of Hours per Week				
No.	Type		Lectures	Others	Practical	Total	Credit
HSGM 407	CORE	ORNAMENTAL HORTICULTURE	3	1	-	4	4
HSGM 408	CORE	GREEN HOUSE TECHNOLOGY	3	1	-	4	4
HSGM 409	CORE	FLORICULTURE	3	1	-	4	4
HSGM 410	CORE	PLANT PROTECTION	3	1	-	4	4
HSGM 411	CORE	PRACTICAL – 3	-	1	3	4	4
HSGM 412	CORE	PRACTICAL – 4	-	1	3	4	4
TOTAL			12	06	06	24	24
			Semester – III				
Course		Name of Course	No. Of Hours per Week				
No.	Type		Lectures	Others	Practical	Total	Credit
HSGM 501	CORE	POST HARVEST MANAGEMENT	3	1	-	4	4
HSGM 502	CORE	NURSERY MANAGEMENT	3	1	-	4	4
HSGM 503	CORE	HORTIMANAGEMENT	3	1	-	4	4
HSGM 504	CORE	ADVANCES IN HORTICULTURAL PRACTICES	3	1	-	4	4
HSGM 505	CORE	PRACTICAL – 5	-	1	3	4	4
HSGM 506	CORE	PRACTICAL – 6	-	1	3	4	4
TOTAL			12	06	06	24	24
			Semester – IV				
Course		Name of Course	No. Of Hours per Week				
No.	Type		Lectures	Others	Practical	Total	Credit
HSGM 507	ELECTIVE	PROJECT / STRATEGIC PLANNING (HSGMANICAL APPLICATION)	2	2	16	20	20
		ASSIGNMENT (DOCUMENTATION)	1	1	-	2	2
		REVIEW WRITING (RECENT DEVELOPMENT)	1	1	-	2	2
TOTAL			04	04	16	24	24

# M Sc HSGM: M Sc Horticulture Science and Garden Management

## Semester – I

### HSGM-401 Horticulture Science

#### Unit 1 Fundamentals in Horticulture

- Classification of Horticultural plants, Economic and industrial importance of horticulture, Horticulture on the internet
- Morphology of root, stem, leaves, flower, fruit, seed and inflorescences
- Modifications of root, stem, leaves,
- Variegated plant parts, Chimeras
- **Types of Horticulture**

#### Unit 2 Plant Growth Environment

- Above ground environment- air, temperature, relative humidity
- Below ground environment- soil : type, water holding capacity, moisture
- Soil –Types, nutrients, manures, sterilization
- Other potting media, liquid media, soil organisms
- **Soil Health and management**

#### Unit 3 Plant physiology and development

- Developmental stages of growth- juvenile stage, vegetative stage, reproductive stage, factors affecting, growth correlations.
- Plant growth processes: photosynthesis, respiration, transpiration, Translocation,
- Plant growth regulators, growth retardants, Pruning-objectives and significance
- Flowering- intrinsic and extrinsic factors.
- **Fruiting- intrinsic and extrinsic factors**

#### Unit 4 Plant breeding

- Objectives of plant breeding, introduction, exploration, quarantine
- Methods of plant breeding, hybridization, hybrid vigor
- NBPGR, markers in plant breeding,
- Biotechnology in plant breeding, role of tissue culture-brief overview/case study
- **Plant breeding research Institutes in Gujarat and India.**

### HSGM-402 Growing plants

#### Unit 1 Plant propagation using seeds

- Propagation using seeds-seed production and harvesting, storage and viability

- Seed Dormancy and germination, pretreatments, seeders, seed beds, scarification, stratification, flat seedling production, plug production,
- Watering systems-overhead systems, sub irrigation systems,
- Transplanting and care.
- Advantages and disadvantages of using seeds for propagation

## Unit 2 Vegetative propagation-Cuttings

- Principle and techniques of propagation using cuttings,
- Types of cuttings,
- Anatomical and Physiological aspects of development of adventitious root and buds,
- Factors affecting rooting of cuttings.
- Advantages and Disadvantages of propagation using cuttings

## Unit 3 Grafting and Budding

- Principle and techniques of propagation using Grafting,
- Types of grafting, Graft incompatibility
- Anatomical and Physiological aspects of successful grafting
- Budding, factors affecting grafting and budding
- Advantages and Disadvantages of propagation using grafting

## Unit 4 Layering and other methods

- Layering , Types, Anatomical and Physiological aspects
- Propagation using specialized stems and roots,
- Propagation of grasses for lawn- factors, care and maintenance
- Bonsai-types, techniques, care
- Advantages and Disadvantages of propagation using layering.

## HSGM-403 Production technology: Fruits and Vegetables

### Unit 1 Pomology

- Local significant economically important fruits, cultivars,
- Recent trends in propagation, agrotechniques.
- Nutrient management,
- Canopy classification and management, spacing and land utilization.
- Dry and Fresh fruits in Gujarat

### Unit 2 Fruit production

- Physiology of flowering, pollination,

- Fruit set, maturity, harvesting and storage.
- Packing, ripening , postharvest techniques and value addition, preservation
- Biodiversity and conservation of fruits, germplasm conservation, cryopreservation, seed storage.
- Case study-Production and market of Mango, papaya, banana, amla.

### **Unit 3 Olericulture**

- Local significant economically important Vegetables, cultivars,
- Recent trends in propagation, agrotechniques.
- Nutrient management,
- Nutritional and economic value,
- Exotic Vegetables-Lettuce, broccoli, cherry tomatoes and baby corn.

### **Unit 4 Vegetable production**

- Physiology of flowering, pollination,
- fruit set, maturity, harvesting and storage.
- Packing, ripening , postharvest techniques and value addition, preservation
- Biodiversity and conservation of vegetables, germplasm conservation, cryopreservation, seed storage.
- Case study-Production and market of lettuce, broccoli, cherry tomatoes and baby corn.

## **HSGM-404 Production technology: Plantation crops and spices**

### **Unit 1 Plantation crops**

- Local significant economically important crops, cultivars,
- Recent trends in propagation, agrotechniques.
- Nutrient management,
- Nutritional and economic value
- High value Plantation crops and their cultivation practices

### **Unit 2 Production technology**

- Physiology of flowering, pollination,
- Fruit set, maturity, harvesting and storage.
- Packing, ripening , postharvest techniques and value addition, preservation
- Biodiversity and conservation, germplasm conservation, cryopreservation, seed storage.
- Research institutes for plantation crops in Gujarat.

### **Unit 3 Medicinal plants and Spices**

- Local significant economically important spices, cultivars,

- Recent trends in propagation, agrotechniques.
- Nutrient management,
- Nutritional and economic value,
- Medicinal significance of spices

#### **Unit 4 Production of Spices**

- Physiology of flowering, pollination,
- fruit set, maturity, harvesting and storage.
- Packing, ripening , postharvest techniques and value addition, preservation
- Biodiversity and conservation, germplasm conservation, cryopreservation, seed storage.
- Research Institutes for medicinal plants in Gujarat

#### **HSGM-405: Practicals based on 401 & 402**

#### **HSGM-406: practicals based on 403 & 404**

## **SEMESTER II**

#### **HSGM-407 Ornamental Horticulture**

##### **Unit 1 Landscaping**

- Objectives, types, designs,
- outdoor landscaping-types, non-plant elements,
- indoor landscaping, advantages
- Xeriscaping
- Aquascaping, Ecoscaping and Naturoscaping

##### **Unit 2 Landscape installation**

- Hardscaping-types, materials used, lighting and water
- Designing a flower garden-site , plants, care, examples
- Ground cover-choice of plants, site preparation, care, examples
- Trees , shrubs, Lawn ,Topiary,
- Sustainable landscaping

##### **Unit 3 Gardening**

- Garden –features, types, styles, theme gardens, gardening tools
- Ecotourism and gardens, important gardens in India and Gujarat,



- Nursery production and maintenance
- Propagation of grasses for lawn- factors, care and maintenance
- Zero waste sustainable gardening practises

## Unit 4 Home Gardening

- Herbs for aesthetics-bottle gardens, vertical garden, terrarium
- Herbs for health- important medicinal herbs in a home garden
- Foliage for ever- climbers, herbs and shrubs for a home garden
- Flowers, climbers, cacti and succulents, dried flowers, Ikebana
- Terrace and rooftop gardening

## HSGM-408 Green house technology

### Unit 1 Green house

- Green house design, classification , advantages and applications
- Construction materials, care and maintenance,
- Light and water in a green house, medium for planting, fertilization,
- Automation in a green house-temperature and humidity control,
- Green houses in Ahmedabad and Gujarat

### Unit 2 Green house production system

- Ground culture, container culture advantages and applications
- Soilless culture-types, advantages and disadvantages,
- Aeroponics, Aquaponics, Bioponics, NFT,
- Foliage, cacti and succulents in a green house
- Propagation of flowers, exotic vegetables and fruits- factors, care and maintenance
- Environmental impact calculator for green house production systems

### Unit 3 Biotechnology and Tissue culture

- rDNA technology-significance and applications,
- GM cultivars-significance and applications
- Genetic markers-morphological markers and molecular markers
- Micropropagation-technique and applications
- Research Institutes employing Tissue culture in Horticultural crops

### Unit 4 Organic farming

- Principle, Soil fertility management,
- Composting-principle, types, maintenance, significance
- Mulching-types of mulches, advantages
- Integrated weed management and Integrated pest management

- Research institutes of organic farming in Gujarat

## **HSGM-409 Floriculture**

### **Unit 1 Growing commercially important flowers**

- Scope of cut flowers, loose flowers, Varietal wealth and diversity, area under cut and loose flowers
- Flower production-light, temperature, humidity, CO<sub>2</sub>, water, soil and nutrient requirement
- Weed management, Training and pruning, pinching and disbudding
- Flower forcing, and year round flowering through physiological interventions, chemical regulation, environmental manipulation.
- Case studies – Growing Roses, Gerberas, Orchid, Liliium, Jasmine, Marigold.

### **Unit 2 Value addition in flowers**

- Types of value added products, value added products with loose flowers, flower arrangements with cut flowers, bouquets, baskets, Fillers, foliage used in bouquets
- Dry Flowers, techniques, value added products using dry flowers,
- Essential oils, extraction, value addition, applications
- Pigments from Flowers, extraction, value addition, applications
- Local florists and suppliers.

### **Unit 3 Crop specific practices: Cut flowers**

- Varietal wealth of Rose & carnation
- Varietal wealth of Gerbera & Anthurium
- Varietal wealth of Orchid & Heliconia
- Varietal wealth of Gladioli and Liliium
- Market – demand and supply, challenges and opportunities

### **Unit 4 Crop specific practices: Loose flowers**

- Varietal wealth of Jasminum & Marigold
- Varietal wealth of Rose & Chrysanthemum
- Varietal wealth of Tuberose and Tabernaemontana
- Varietal wealth of Plumeria & Spider lily
- Market – demand and supply, challenges and opportunities

## **HSGM-410 Plant protection**

### **Unit 1 Plant disease**

- Causal agents, Disease triangle, Disease cycle
- Pathogen attack- mechanical and chemical weapons

- Host Defense- structural and biochemical
- Disease symptoms
- Major diseases of Horticultural crops in Gujarat and losses

## **Unit 2 Plant disease Management**

- Regulatory methods
- Physical methods
- Cultural methods
- Biological methods
- Disease forecasting and monitoring

## **Unit 3 Chemical methods**

- Plant pests, pesticides and their use
- Weeds, herbicides and their use
- Fungicides, bactericides and their use
- Plant parasites and their control
- Chemical residues in crops and their assessment methods

## **Unit 4 Gardening Tools**

- Tools for sowing and digging
- Tools for ploughing and watering
- Tools for cutting, pruning etc
- Tools for spraying , harvesting
- Accessories for the gardener while working in the garden.

### **HSGM-411 Practicals based on HSGM 407 & 408**

### **HSGM-412 Practicals based on HSGM 409 & 410**

## **SEMESTER III**

### **HSGM-501 Post harvest management**

#### **Unit 1 Harvesting**

- When to harvest-ripening,
- How to harvest-hand / machine
- Handling, sorting, grading , packing and transport
- Market, Demand and supply, supply chain management.
- Case study: Crop failure and losses due to disease, rain, flood, drought

#### **Unit 2 Post harvest technology: fruits**

- Economic importance and On farm processing, storage
- Causes of post harvest losses
- Post harvest physiology and changes
- Processing and extending post harvest shelf life, Total quality management (TQM)
- Case study of local fruits - Preharvest factors affecting post harvest quality of fruits

### **Unit 3 Post harvest technology: Vegetables**

- Economic importance and On farm processing, storage
- Causes of post harvest losses
- Post harvest physiology and changes
- Processing and extending post harvest shelf life, Total quality management (TQM)
- Case study of local Vegetables - Preharvest factors affecting post harvest quality of vegetables

### **Unit 4 Post harvest technology: flowers**

- Economic importance and On farm processing, storage
- Causes of post harvest losses
- Post harvest physiology and changes
- Processing and extending post harvest shelf life, Total quality management (TQM)
- Case study of local flowers - Preharvest factors affecting post harvest quality of flowers

## **HSGM-502 Nursery Management**

### **Unit 1 Ornamental trees and Shrubs**

- Growing practices and challenges while growing flowering & Shade giving trees
- Growing practices and challenges while growing Avenue & ornamental foliage trees
- Growing practices and challenges while growing flowering and foliage shrubs
- Growing practices and challenges while growing protective and other shrubs
- Forest nurseries in Gujarat, commercial Nurseries in Ahmedabad.

### **Unit 2 Ornamental climbers and other plants**

- Growing practices and challenges while growing climbers and annuals.
- Growing practices and challenges while growing Cacti and succulents.
- Growing practices and challenges while growing Bulbs and Palms.
- Growing practices and challenges while growing medicinal and aromatic plants.
- Ornamental & Medicinal - aromatic plants nursery in Ahmedabad.

### **Unit 3 Exhibiting and Marketing**

- Exhibiting for effective sale-do's and don'ts

- Marketing at the nursery-do's and don'ts
- Economics of a nursery-income, expenditure, resource management
- Management of a Flower show and other consumer awareness programmes
- Horticulture fair and trade shows in last five years in Gujarat

#### **Unit 4 Mass production**

- Rooting media, water management, Nutrient Management
- Starting material requirements, labour, transportation
- Demand and supply management, Government support
- Entrepreneurship, Risk and Profits
- Advertising and marketing

#### **HSGM-503 Hortimangement**

##### **Unit 1 Nutrient management**

- Nutrient deficiencies in important ornamental plants
- Chemical fertilizers , fortified fertilizers
- Manures and biofertilizers
- Methods of application and media preparation
- Companies in Gujarat that make biofertilizers and chemical fertilizers

##### **Unit 2 Financial Management**

- Capital Investment: land, building, road, fence, polyhouse, shade net, equipment and machinery, well / tube well, motor for water supply , etc
- Capital cost and financial assistance- loan etc, Government help, Breakeven point
- Working capital –Labour(Salary), stock purchases, raw material, transportation,
- Records –Purchase book, Sales book, Ledger, cash book, bank book, stock register.
- Process to get finance from Nationalised banks, agricultural banks etc

##### **Unit 3 Plant Library**

- Collection- live plants, herbarium, flash cards, photographs, photocopies
- Digital database with photographs, Bibliography
- Indoor plants-growing , care and digital listing of data
- Outdoor plants-growing, care and digital listing of data
- Videos for general information and outreach

##### **Unit 4 Hi tech horticulture**

- Vertical garden, green building, bottle garden
- Terrarium-container, terrace garden,
- Flower arrangement supplies, maintaining bouquets,

- Use of biodegradable materials , aquaculture, water plants
- Online sale and purchase of plants -opportunities and challenges

## **HSGM-504 Advances in Horticultural Practices**

### **Unit 1 Advances in landscaping**

- CAD(Computer Aided Design) in Landscaping and garden designing
- 2D Drawing by AUTOCAD
- 3D Drawing by ARCHICAD & 3DMAX software
- Photoshop software in garden designing

### **Unit 2 Sustainable Landscaping and Gardening**

- Water efficient Landscape and Garden
- Sustainable utilization of resources in a landscape and garden
- Energy efficient landscape and garden
- Climate resilience and vulnerability of plants in a landscape and garden

### **Unit 3 Processing of Horticultural Produce**

- Principles and methods of preservation by heat pasteurization, canning, bottling. Methods of preparation of juices, squashes, syrup and fermented beverages. Jam, jelly and marmalade.
- Preservation by sugar and chemicals, candies, crystallized fruits, preserves chemical preservatives,
- preservation with salt and vinegar, pickling, chutneys and sauces, tomato and mushrooms,
- Freezing , Dehydration & storage, Quality control

### **Unit 4 Government initiatives**

- APEDA
- NABARD
- NHB
- APMC

**HSGM 505: Practicals based on HSGM 501 and HSGM 502**

**HSGM 506: Practicals based on HSGM 503 and HSGM 504**

## **Semester IV**

**HSGM 507:Project / Strategic planning**

**Assignment- Documentation**

**Review Article-Recent Writing**

**SUGGESTED READINGS:**

**Fundamentals of Horticulture by Jitendra Singh**

**Instant Horticulture by S.N. Gupta**

**Horticultural Science by Jules Janick**

**Ornamental Horticulture by J. S. Arora**

**Vegetable crops in India by Dr. Sudhir Pradhan**

**Handbook of Horticulture by ICAR**

**Ornamental horticulture by S.S.Sindhu**

**Basics of Horticulture by K. V. Peter**

**Post Harvest Technology by K.V.Peter**

**Fundamentals of ornamentals horticulture landscaping and gardening by A.K.Tiwari**

**Propagation of Horticultural crops by K.V.Peter**

**Practical manual of horticultural crops by Anil Verma et al.**

**Biotechnology in horticulture by K.V.Peter**