

**SYLLABUS FOR
B.VOC. IN MODERN FARMING TECHNOLOGY AND NURSERY
MANAGEMENT (MFN)**

**Programme Template: B. Voc Course (CBCS) in MFN
Gauhati University**

Semester	Core course (12 papers, 72 credits)	Ability Enhancement Compulsory Course (AECC) (2 papers, 8 credits)	Skill Enhancement Course (SEC) (4 papers, 16 credits)	Discipline Specific Elective (DSE) (6 papers, 36 credits)
I	MFN-VC-1016	ENG-AE-1014		
	MFN -VC-1026			
	MFN-VC-1036			
II	MFN -VC-2016	ENV-AE-2014		
	MFN -VC-2026			
	MFN-VC-2036			
III	MFN -VC-3016		MFN-SE-3014	
	MFN -VC-3026			
	MFN -VC-3036			
IV	MFN -VC-4016		MFN-SE-4014	
	MFN-VC-4026			
	MFN -VC-4036			
V			MFN-SE-5014	MFN-VE-5016
				MFN-VE-5026
				MFN-VE-5036
VI			MFN-SE-6014	MFN-VE-6016
				MFN-VE-6026
				MFN -VE-6036

Course Structure for CBCS in B.Voc. in Modern Farming Technology and Nursery Management as per requirement of UGC

Semester	Course Type	Paper Code	Paper Name	Paper Type	Credit
I	Core Course	MFN-VC-1016	Fundamentals of Modern Farming Techniques	Theory + Practical	4+2
		MFN - VC-1026	Fundamentals of Nursery Management	Theory + Practical	4+2
		MFN-VC-1036	Floriculture	Theory + Practical	4+2
	Ability Enhancement Compulsory Course	ENG-AE-1014	English communications	Theory	4
II	Core Course	MFN - VC-2016	Fundamentals of Plant Taxonomy and Systematics	Theory + Practical	4+2
		MFN - VC-2026	Fundamentals of Microbiology	Theory + Practical	4+2
		MFN-VC-2036	Post disease Management of fruits and vegetables	Theory + Practical	4+2
	Ability Enhancement Compulsory Course	ENV-AE-2014	Environmental Science	Theory	4
III	Core Course	MFN - VC-3016	Fundamentals of Cytology and Genetics	Theory + Practical	4+2
		MFN - VC-3026	Agricultural Biotechnology	Theory + Practical	4+2
		MFN - VC-3036	Horticultural Practices	Theory + Practical	4+2
	Skill Enhancement Course	MFN-SE-3014	Post Harvesting Technology		4
IV	Core Course	MFN - VC-4016	Growing and Processing of Economically important, Aromatic and medicinal plants, Essential and	Theory + Practical	4+2

			Aromatic OilYielding plants		
		MFN-VC-4026	Biofertilizers	Theory + Practical	4+2
		MFN - VC-4036	Mushroom Culture Technology	Theory + Practical	4+2
	Skill Enhancement Course	MFN-SE-4014	Nursery and Gardening		4
V	Skill Enhancement Course	MFN-SE-5014	Plant propagation and Tissue Culture Technique		4
	Discipline Specific Elective	MFN-VE-5016	Cotton, Banana and Citrus cultivating Techniques	Theory + Practical	4+2
		MFN-VE-5026	Organic Urban Farming	Theory + Practical	4+2
		MFN-VE-5036	Extraction of Essential and Aromatic Oil	Theory + Practical	4+2
VI	Skill Enhancement Course	MFN-SE-6014	Intellectual Property Rights		4
	Discipline Specific Elective	MFN-VE-6016	Analytical Techniques	Theory + Practical	4+2
		MFN-VE-6026	Herbal Technology	Theory + Practical	4+2
		MFN - VE-6036	Internship		6

Total credits in B.Voc Modern Farming Technology and Nursery Management: 132 Credit

List of Papers

B.Voc in Modern Farming Technology and Nursery Management under CBCS

Core Papers

- | | | |
|-----|--------------|---|
| 1. | MFN-VC-1016 | Fundamentals of Modern Farming Techniques |
| 2. | MFN -VC-1026 | Fundamentals of Nursery Management |
| 3. | MFN-VC-1036 | Floriculture |
| 4. | MFN -VC-2016 | Fundamentals of Plant Taxonomy and Systematics |
| 5. | MFN -VC-2026 | Fundamentals of Microbiology |
| 6. | MFN-VC-2036 | Post disease Management of fruits and vegetables |
| 7. | MFN -VC-3016 | Fundamentals of Cytology and Genetics |
| 8. | MFN -VC-3026 | Agricultural Biotechnology |
| 9. | MFN -VC-3036 | Horticultural Practices |
| 10. | MFN -VC-4016 | Growing and Processing of Economically important, Aromatic and medicinal plants, Essential and Aromatic Oil Yielding plants |
| 11. | MFN-VC-4026 | Biofertilizers |
| 12. | MFN -VC-4036 | Mushroom Culture Technology |

Skill Enhancement Papers

- | | | |
|----|-------------|--|
| 1. | MFN-SE-3014 | Post Harvesting Technology |
| 2. | MFN-SE-4014 | Nursery and Gardening |
| 3. | MFN-SE-5014 | Plant propagation and Tissue Culture Technique |
| 4. | MFN-SE-6014 | Intellectual Property Rights |

Discipline Specific Elective Papers

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|----|--------------|--|
| 1. | MFN-VE-5016 | Cotton, Banana and Citrus cultivating Techniques |
| 2. | MFN-VE-5026 | Organic Urban Farming |
| 3. | MFN-VE-5036 | Extraction of Essential and Aromatic Oil |
| 4. | MFN-VE-6016 | Analytical Techniques |
| 5. | MFN-VE-6026 | Herbal Technology |
| 6. | MFN -VE-6036 | Internship |

Ability Enhancement Course Compulsory

- | | | |
|----|-------------|------------------------|
| 1. | ENG-AE-1014 | English communications |
| 2. | ENV-AE-2014 | Environmental Science |

Core Courses

Semester I

Paper: MFN -VC-1016- Fundamentals of Modern Farming Techniques

Total Lectures: 40; Credits: 6 (Theory – 4, Practical - 2); Total marks: 100

THEORY

Total marks: 60

Unit 1: Modern Farming Technology: Scope, branches and importance of modern farming technology, role in urban and rural economy and employment generation. **(7 lectures)**

Unit 2: Biofertilizers, Organic farming, Vermicomposting, tissue culture and micropropagation. **(7 lectures)**

Unit 3: GIS software and GPS Agriculture, Satellite imagery, Drone and other imagery, crop monitoring. **(7 lectures)**

Unit 4: Horticulture: Scope, branches and importance of horticulture, importance in food and nutritional security; urban horticulture and ecotourism. **(7 lectures)**

Unit 5: Mushroom culture: Introduction, history, nutritional and medicinal value of edible mushrooms; poisonous mushrooms. Types of edible mushrooms available in India–*Volvariella volvaceae*, *Pleurotus sp.*, *Agaricus bisporus*. **(7 lectures)**

Unit 6: Harvesting tools and instruments **(5 lectures)**

PRACTICAL

Total marks: 20

1. Study of different farming and harvesting tools.
2. Use of GIS and GPS

Internal Assessment

Total marks: 20

Paper: MFN -VC-1026- Fundamentals of Nursery Management

Total Lectures: 40; Credits: 6 (Theory – 4, Practical - 2); Total marks: 100

THEORY

Total marks: 60

Unit 1: Nursery: Definition, objectives and scope and building up of infrastructure for nursery. **(6 lectures)**

Unit 2: Nursery Management and routine garden operations: Propagation methods: asexual (grafting, cutting, layering, budding), sexual (seed propagation), Scope and limitations; seed sowing. **(7 lectures)**

Unit 3: Landscaping and garden design - Planning and Layout (parks and avenues); principle of garden designs. **(7 lectures)**

Unit 4: Green House technique, mist chamber, shed root, shade house and glass house.

(7 lectures)

Unit 5: Ornamental plants, diseases and pest of ornamental plants, commercial floriculture.

(7 lectures)

Unit 6: Seed: Structure and types, seed dormancy, diseases, seed storage, seed testing and certification. **(6 lectures)**

PRACTICAL

Total marks: 20

1. Study of propagation techniques.
2. Study of various gardening tools.
3. Visit to nursery

Internal Assessment

Total marks: 20

Paper: MFN-VC-1036- Floriculture

Total Lectures: 40; Credits: 6 (Theory – 4, Practical - 2); Total Marks: 100

THEORY

Total marks: 60

Unit 1: Introduction: History of gardening; Importance and scope of floriculture and landscape gardening. **(3 lectures)**

Unit 2: Nursery Management and routine garden operations; vegetative propagation; soil sterilization; seed sowing; pricking; planting and transplanting; shading; stopping or pinching; Defoliation; Wintering: Mulching: Topiary: Role of plant growth**(7 lectures)**

Unit 3; Ornamental plants; Flowering annuals: Herbaceous perennials: Divine vines: Shade and ornamental trees: Ornamental bulbous and foliage plants; Cacti and succulents; Palms and Cycads; Ferns and Selaginellas; Cultivation of plants in pots; Indoor gardening; Bonsai; hydroponics. **(7 lectures)**

Unit 4: Principles of Garden Designs; English, Italian, French, Persian, Mughal and Japanese gardens; Features of a garden (Garden wall, Fencing, Steps, Hedge, Edging, Lawn, Flower beds, Shubbery, Borders, Water burden. Some Famous gardens of India **(7 lectures)**

Unit 5: Landscaping Places of Public Importance: Landscaping highways and educational institutions. **(7 lectures)**

Unit 6: Commercial Floriculture: Factors affecting flower production: Production and packaging of cut flowers; Flower arrangements: Methods to prolong vase life. Cultivation of Important cut flowers (Carnation, Aster, Chrysanthemum, Dahlia, Gerbera, Gladiolous, Marigold, Rose, Lilium, Orchids) **(7 lectures)**

Unit 7: Diseases and Pests of Ornamental Plants **(2 lectures)**

PRACTICAL

Total marks: 20

1. Vegetative propagation of plants by using grafting and layering methods.
2. Bonsai technique
3. Cultivation of plants in pots.
4. Hydroponics of different plant species.

Internal Assessment

Total marks: 20

Semester II

Paper: MFN -VC-2016- Fundamentals of Plant Taxonomy and Systematics

Total Lectures: 40; Credits: 6 (Theory – 4, Practical - 2); Total marks: 100

THEORY

Total marks: 60

Unit 1: Basics of Plant Taxonomy and Systematics

Introduction to Taxonomy and Systematics, Plant identification, Classification, Nomenclature. (5 lectures)

Unit 2: Botanical nomenclature

Principles and rules (ICN); Ranks and names; Typification, author citation, names of hybrids, effective and valid publication, rejection of names, principle of priority, limitations; names of hybrids. (7 lectures)

Unit 3: Taxonomic Structure

Concept of taxa; Categories and taxonomic hierarchy (Species, Genus and Family)

(5 lectures)

Unit 4: Process of identification

Herbarium: Importance and techniques, e-flora, botanical gardens, Important herbarium, botanical gardens and museums in India and around the world. (7 lectures)

Unit 5: Systems of Classification

Artificial, natural and phylogenetic classification systems (Contribution of Theophrastus, Linnaeus, Bessey, Takhtajan, Conquist, Bentham and Hooker, Engler and Prantl) and APG Classification (7 lectures)

Unit 6: Taxonomic literature

World flora, Indian flora (Taxonomic journals, Icones, Checklist, Illustrations)(4 lectures)

Unit 7: Angiospermic Families

Magnoliaceae, Fabaceae, Asteraceae, Solanaceae, Acanthaceae, Lamiaceae, Euphorbiaceae, Orchidaceae, Musaceae, Zingiberaceae, Poaceae (5 lectures)

PRACTICAL

Total marks: 20

1. Study of vegetative and floral characters of locally available angiospermic plants belonging to the families: Fabaceae, Solanaceae, Acanthaceae, Lamicaeae, Euphorbiaceae, Musaceae.
2. Field visit to familiarize students with vegetation of an area and identification of plant species.
3. Mounting of properly dried and pressed specimen of wild plants.

Internal Assessment

Total marks: 20

Paper: MFN -VC-2026- Fundamentals of Microbiology

Total Lectures: 40 Credits: 6 (Theory – 4, Practical - 2); Total marks: 100

THEORY

Total marks: 60

Unit 1: Introduction to microbial world

Scope of microbes in industry and environment; microbial nutrition, growth and metabolism (anabolism and catabolism) **(6 lectures)**

Unit 2: Viruses

Discovery, physiochemical and biological characteristics, classification, structure and replication; viroids and prions, lytic and lysogenic cycle, RNA virus, economic importance of virus, plant diseases caused by virus. **(7 lectures)**

Unit 3: Bacteria

Discovery and general characteristics, Cell structure, Reproduction: vegetative, asexual and recombination (conjugation, transformation and transduction); Archea-bacteria and eubacteria; economic importance of bacteria **(7 lectures)**

Unit 4: Soil microbiology

Soil microbiology, soil environment, microbial diversity in soil, soil microbial communities and decomposition of organic matter, soil metagenomics, biosensors to monitor soil health and toxicity **(7 lectures)**

Unit 5: Agricultural microbiology

Agricultural microbiology, agriculturally important microbes, biological N₂ Fixation, rhizosphere, phyllosphere, mycorrhiza, crop disease caused by various microbes, biocontrol of plant disease. **(7 lectures)**

Unit 6: Food microbiology

Food microbiology, fermented foods (milk, wheat, vegetables, beer, wine, vinegar, SCP), food spoilage, good sterilization and preservation, food borne diseases. **(6 lectures)**

PRACTICAL

Total marks: 20

1. Electron micrographs/Models of viruses- T-Phage and TMV/ Photographs of Lytic and Lysogenic cycle.
2. Types of bacteria to be observed from temporary/permanent slides/ photographs.
3. Gram staining.

Internal Assessment

Total marks: 20

Paper: MFN-VC-2036- Post disease Management of fruits and vegetables

Total Lectures: 40; Credits: 6 (Theory – 4, Practical - 2); Total marks: 100

THEORY

Total marks: 60

Unit 1: Postharvest diseases of plant products

Identification of common diseases and pest of ornamental, fruits and vegetables; Quarantines practices
(8 lectures)

Unit 2: Postharvest decays of fresh fruits and vegetables

Diseases caused by *Aspergillus*, *Penicillium*, *Rhizopus*, *Mucor*, *Alternaria*, *Fusarium*, *Colletotrichum*
(9 lectures)

Unit 3: Postharvest decays of grain and legumes

Diseases caused by Ascomycetes and Dueteromycetes: *Alternaria*, *Cladosporium*, *Colletotrichum* and *Fusarium*.
(9 lectures)

Unit 4: Mycotoxins and Mycotoxicoses

Aflatoxins, *Fusarium* toxins, Ochratoxins
(7 lectures)

Unit 5: Disease control Management

Identification, of deficiency symptoms; remedial measures and nutritional management practices.
(7 lectures)

PRACTICAL

Total marks: 20

1. Study of some postharvest diseases of fruits.
2. Study of postharvest diseases of some vegetables
3. Study of some postharvest diseases of some grains and legumes.
4. Collection of diseased plant materials.

Internal Assessment

Total marks: 20

Semester III

MFN -VC-3016- Fundamentals of Cytology and Genetics

Total Lectures: 40; Credits: 6 (Theory – 4, Practical - 2); Total marks: 100

THEORY

Total marks: 60

Unit 1: The Cell

Cell as a unit of structure and function, Prokaryotic and Eukaryotic cells (6 lectures)

Unit 2: Cell wall and plasma membrane

Chemistry, structure and function of cell wall and cell membrane; membrane transport (7 lectures)

Unit 3: Cell organelles

Nucleus, Chloroplast, Mitochondria, Ribosomes, Endoplasmic reticulum and peroxisomes (7 lectures)

Unit 4: Cell division

Mitosis and meiosis (7 lectures)

Unit 5: Mendelian genetics and its extension

Principles of inheritance, chromosome theory of inheritance, autosomes and sex chromosomes, incomplete dominance and codominance; multiple alleles, lethal alleles (7 lectures)

Unit 6: Gene mutation

Types of mutation and mutagens (6 lectures)

PRACTICAL

Total marks: 20

1. Study of cell structure with the help of epidermal peel mount of onion/*Rhoeo/Crinum*
2. Study of different stages of mitosis and meiosis

Internal Assessment

Total marks: 20

Paper: MFN -VC-3026- Agricultural Biotechnology

Total Lectures: 40; Credits: 6 (Theory – 4, Practical - 2); Total marks: 100

THEORY

Total marks: 60

Unit 1: Recombinant DNA Technology

Restriction Endonucleases (History, biological role and application); Cloning vectors: Prokaryotic (pBR322, Ti plasmid, BAC); Lambda Phage, Cosmid; Eukaryotic vectors (YAC). (7

lectures)

Unit 2: Gene Cloning

Recombinant DNA, PCR, Gene construct, DNA markers.

(6 lectures)

Unit 3: Methods of gene transfer

Electroporation, Microinjection, Microprojectile bombardment.

(7 lectures)

Unit 4: Application of Biotechnology

Pest resistant (Bt-Cotton); herbicide resistant (Round Up Ready Soyabean); Transgenic crops and its role in human welfare.

(7 lectures)

Unit 5: Fungal Biotechnology

GM-Fungi, fungi as biocontrol agent, edible and poisonous fungi, industrially important fungi as a source of antibiotics, organic acids, enzymes and proteins, IPR.

(7 lectures)

Unit 6: Genetic Engineering Technology

Genetically Engineered Products; Genetic mapping; Biosafety concerns.

(6 lectures)

PRACTICAL

Total marks: 20

1. Study of methods of gene transfer through photographs: *Agrobacterium*-mediated, direct gene transfer by electroporation, microinjection, microprojectile bombardment.
2. Study of steps of genetic engineering for production of Bt-Cotton, golden rice, Flavr Savr tomato through photographs.
3. Isolation of plasmid DNA.
4. Restriction digestion and gel electrophoresis of plasmid DNA.

Internal Assessment

Total marks: 20

Paper: MFN -VC-3036- Horticultural Practices

Total Lectures: 40; Credits: 6 (Theory – 4, Practical - 2); Total marks: 100

THEORY

Total marks: 60

Unit 1: Introduction

Scope and importance, Branches of horticulture, role in rural economy and employment generation; importance in food and nutritional security; urban horticulture and ecotourism.
(6 lectures)

Unit 2: Horticultural techniques

Application of manure, fertilizers, nutrients and PGRs; weed control; Biofertilizers, Biopesticides; Irrigation method (drip irrigation, surface irrigation, furrow and border irrigations); Hydroponics; Propagation methods: asexual (grafting, cutting, layering, budding), sexual (seed propagation), Scope and limitations.
(7 lectures)

Unit 3: Landscaping and garden design

Planning and Layout (parks and avenues); gardening traditions – Ancient Indians, European, Mughal and Japanese Gardens; Urban forestry; policies and practices. **(6 lectures)**

Unit 4: Floriculture:

Cut flowers, bonsai, commerce (market demand and supply); Importance of flower shows and exhibitions.
(7 lectures)

Unit 5: Ornamental plants

Types, classification (annuals, perennials, climbers and trees); Identification and salient features of some ornamental plants [rose, marigold, carnations, orchids, poppies, sages, tuberose, cacti and succulents (opuntia and agaves)], ornamental flowering trees (Indian laburnum, gulmohar, Jacaranda, Lagerostomia, fishtail and areca palms, semul, coral tree).
(7 lectures)

Unit 6: Fruits and vegetables

Production, origin and distribution; Description of plants and their economic products; Management and marketing of vegetable and fruit crops; Identification of some fruits and vegetable varieties (citrus, banana, mango, chillies and cucurbits). **(7 lectures)**

PRACTICAL

Total marks: 20

1. Field visits to gardens, standing crop sites, nurseries, vegetable gardens and horticultural fields at suitable locations.

Internal Assessment

Total marks: 20

Semester IV

Paper: MFN -VC- 4016: Growing and Processing of Economically important, Aromatic and medicinal plants, Essential and Aromatic Oil Yielding plants

Total Lectures: 40; Credits: 6 (Theory – 4, Practical - 2); Total marks: 100

THEORY

Total marks: 60

Unit 1: Origin of Cultivated Plants

Centre of origin and their importance, Plant introduction, Plant domestication, evolution of new crops or varieties (4 lectures)

Unit 2: Cereals

Wheat and Rice (origin, processing and uses), Millets (brief account) (4 lectures)

Unit 3: Legumes

Chick Pea, Pigeon Pea and fodder legumes (4 lectures)

Unit 4: Spices

Importance spices, their used part, uses and cultivation. Economic importance of fennel, saffron, cardamom, clove and black pepper. (4 lectures)

Unit 5: Beverages

Tea, Coffee (morphology, processing and uses) (4 lectures)

Unit 6: Natural Rubber

Para-rubber (processing and uses) (4 lectures)

Unit 7: Drug yielding plants

Cinchona, *Papaver* and *Cannabis* (4 lectures)

Unit 8: Timber plants

Pine and teak (general account) (4 lectures)

Unit 9: Fibers

Cotton, Coir and Jute (morphology, processing and uses) (4 lectures)

Unit 10: Sources of oils and fats

Groundnut, Sunflower and Linseed (4 lectures)

PRACTICAL

Total marks: 20

1. **Cereals:** Study of useful part of Rice (habit sketch, study of paddy and grain)
2. **Legumes:** Bean (habit, fruit, seed structures)
3. **Beverages:** Tea (plant specimen, tea leaves), Coffee (plant specimens, beans)
4. **Rubber:** Specimen photographed/ model/ samples of rubber products

5. **Sources of oils and fats:** Coconut and Mustard (Processing and extraction)

Internal Assessment

Total marks: 20

Paper: MFN-VC-4026- Biofertilizers

Total Lectures: 40; Credits: 6 (Theory – 4, Practical - 2); Total marks: 100

THEORY

Total marks: 60

Unit 1: General account about microbes used as biofertilizers – *Rhizobium* – isolation, identification, mass multiplication, carrier multiplication, carrier-based inoculants, symbiosis. **(10 lectures)**

Unit 2: *Azospirillum*: isolation and mass multiplication – carrier-based inoculants, associative effect of different micro-organisms. *Azotobacter*: classification, characteristics – crop response to *Azotobacter* inoculum, maintenance and mass multiplication. **(10 lectures)**

Unit 3: Cyanobacteria (blue-green algae), *Azolla* and *Anabaena azollae* association, nitrogen fixation, factors affecting growth, blue green algae and *Azolla* in rice cultivation. **(10 lectures)**

Unit 4: Mycorrhizal association, types of mycorrhizal association, taxonomy, occurrence and distribution, phosphorus nutrition, growth and yield; VAM. **(10 lectures)**

PRACTICAL

Total marks: 20

1. Observation of *Azospirillum*, *Azolla* and *Anabaena* under microscope.
2. Observation of mycorrhiza using photographs.

Internal Assessment

Total marks: 20

Paper: MFN -VC- 4036- Mushroom Culture Technology

Total Lectures: 40; Credits: 6 (Theory – 4, Practical - 2); Total marks: 100

THEORY

Total marks: 60

Unit 1: Introduction

Introduction, history, nutritional and medicinal value of edible mushrooms; poisonous mushrooms. Types of edible mushrooms available in India – *Volvariella volvacea*, *Pleurotus sp.*, *Agaricus bisporus*. (10

lectures)

Unit 2: Cultivation

Cultivation technology, Low cost technology, composting technology in mushroom cultivation. (8 lectures)

Unit 3: Storage

Short-term storage (Refrigeration – upto 24 hours) Long term storage (canning, pickle, papads). (7

lectures)

Unit 4: Nutrition

Proteins - amino acids, Mineral elements nutrition - carbohydrates, Crude fiber content - Vitamins. (7 lectures)

Unit 5: Food preparation

Types of food from mushroom. Research centers: National level and Regional level. Marketing in India and Export value. (8

lectures)

PRACTICAL

Total marks: 20

1. Mushroom Cultivation using proper techniques.

Internal Assessment

Total marks: 20

Skill Enhancement Paper

Semester III

MFN-SE-3014- Post Harvesting Technology

Total Lectures: 40; Credits: 4

THEORY

Total marks: 60

Unit 1: Post Harvest Technology

Importance of post-harvest technology in horticulture crops; evaluation of quality traits; harvesting hand of fruits, vegetables and cut flowers. **(9 lectures)**

Unit 2: Preservation and Processing

Preservation and processing, methods of minimizing losses during storage and transportation; Food irradiation. **(9 lectures)**

Unit 3: Horticultural crops- conservation and management

Documentation and conservation of germplasm; role of micropropagation and tissue culture; IPR issues; national, international and professional societies and sources of information on horticulture. **(10 lectures)**

Unit 4: Disease control Management

Field and post-harvest diseases, Identification, of deficiency symptoms; remedial measures and nutritional management practices. **(9 lectures)**

Unit 5: Field trips

Field visits to gardens, standing crops sites, nurseries, vegetable gardens and horticultural fields at suitable locations. **(5 lectures)**

Semester IV

MFN-SE-4014- Nursery and Gardening

Total Lectures: 40; Credits: 4

THEORY

Total marks: 60

Unit 1: Nursery: definition, objectives and scope and building up of infrastructure for nursery, planning and seasoning activities. **(9 lectures)**

Unit 2: Seed: Structure and types – Seed dormancy; causes and methods of breaking dormancy; seed storage; seed banks; seed technology and certification. **(9 lectures)**

Unit 3: Vegetative propagation: Air layering, cutting, selection of cutting, collection season; treatment of cutting; green-house techniques. **(8 lectures)**

Unit 4: Gardening: definition, objectives and scope; landscaping and home gardening. **(5 lectures)**

Unit 5: Sowing or raising of seeds and seedlings; transplanting of seedlings; cultivation of crop plants; storage and marketing procedures. **(9 lectures)**

Semester V

MFN-SE-5014- Plant propagation and Tissue Culture Technique

Total Lectures: 40; Credits: 4

THEORY

Total marks: 60

Unit 1: Plant tissue culture: historical perspective; composition of media; Nutrients and hormone requirements (role of vitamins and hormones). **(9 lectures)**

Unit 2: Micropropagation; brief account of embryo and endosperm culture with their applications. **(9 lectures)**

Unit 3: Totipotency; Organogenesis; Embryogenesis. **(8 lectures)**

Unit 4: Cryopreservation, germplasm conservation, secondary metabolite production, haploid, triploid and hybrids. **(9 lectures)**

Unit 5: Medicinal Plant micro propagation of Basil and neem. **(5 lectures)**

Semester VI

Paper: MFN-SE-6014- Intellectual Property Rights

Total Lectures: 40; Credits: 4

THEORY

Total marks: 60

Unit 1: Introduction to Intellectual Property Rights (IPR)

Concept and kinds. Economic importance. IPR in India and world. IPR and WTO.

(6 lectures)

Unit 2: Patents

Objectives, Rights, Patent Acts 1970 and its amendments. Procedure of obtaining patents, working of patent, Infringement.

(7 lectures)

Unit 3: Copyrights

Introduction, works protected under copyright law, Rights, Transfer of Copyrights, Infringement.

(6 lectures)

Unit 4: Trademarks

Objectives, Types, Rights, Protection of goodwill, Infringement, Passing off, Defenses, Domain name.

(7 lectures)

Unit 5: Protection of traditional knowledge

Objectives, Concept of traditional knowledge, Holders, Issues concerning, Bio-Prospecting and Bio-Piracy, Alternative ways, Protectability, Traditional Knowledge Digital Library.

(7 lectures)

Unit 6: Protection of Plant Varieties

Objectives, Justification, International Position, Plant varieties protection in India. Rights of farmers, breeders and researchers. National gene bank. Protection of Plant Varieties and Farmers' Rights Act, 2001

(7 lectures)

Discipline Specific Elective paper

Semester V

Paper: MFN-VE-5016- Cotton, Banana and Citrus cultivating Techniques

Total Lectures: 40; Credits: 6 (Theory – 4, Practical - 2); Total marks: 100

THEORY

Total marks: 60

Unit 1: Cotton growing techniques

(6 lectures)

Unit 2: Identification of diseases of cotton and their control and managements; use of Bt-Cotton.

(7 lectures)

Unit 3: Banana growing techniques.

(6 lectures)

Unit 4: Identification of diseases and postharvest diseases of banana and their control and management.

(7 lectures)

Unit 5: Citrus growing techniques.

(7 lectures)

Unit 6: Identification of diseases and postharvest diseases of citrus fruits and their control and managements.

(7 lectures)

PRACTICAL

Total marks: 20

1. Growing techniques of Cotton.
2. Growing techniques of Banana.
3. Growing techniques of Citrus fruits (*Citrus limon*, *Citrus aurantifolia* and *Citrus reticulata*).

Internal Assessment

Total marks: 20

Paper: MFN-VE-5026- Organic Urban Farming

Total Lectures: 40; Credits: 6 (Theory – 4, Practical - 2); Total marks: 100

THEORY

Total marks: 60

Unit 1: Organic farming: Green manuring with Leguminous crops in crop rotation; organic fertilizers, city compost; liquid manure. **(8 lectures)**

Unit 2: Recycling of biodegradable municipal, agricultural and industrial waste: bio-compost waste methods; Types and methods of vermicomposting. **(9 lectures)**

Unit 3: Recycling of organic matter in organic agriculture; Transformation of organic substances in soil. **(7 lectures)**

Unit 4: Preparation of compost: Different methods, Enrichment of compost; Nutrient composition. **(7 lectures)**

Unit 5: Sustainable Agriculture: Economics and Environment; Cost- benefit and cost effectiveness; social and cultural benefits; Health nutrition and food accessibility benefits. **(9 lectures)**

PRACTICAL

Total marks: 20

1. Preparation of green manure.
2. Different compost methods.
3. Growing of Leguminous plants (Chick pea / Pigeon Pea)

Internal Assessment

Total marks: 20

Paper: MFN-VE-5036: Extraction of Essential and Aromatic Oil

Total Lectures: 40; Credits: 6 (Theory – 4, Practical - 2); Total marks: 100

THEORY

Total marks: 60

Unit 1: Essential and aromatic oils: Introduction, active principle and methods of their testing. **(8 lectures)**

Unit 2: Different methods of extraction: Steam distillation, Soxhlet Extraction, Cold pressing method, Solvent extraction, CO₂ Extraction, Maceration technique, Enfleurage, water distillation. **(9 lectures)**

Unit 3: Use of essential oils in cosmetics and perfumes, pharmaceuticals and confectionary food products. **(7 lectures)**

Unit 4: Processing and marketing of Essential and Aromatic oils in India and around the world. **(7 lectures)**

Unit 5: Study of some essential and aromatic oil yielding plants: Lemon, Linseed, Groundnut, *Clove*, *Citronella*. **(9 lectures)**

PRACTICAL

Total marks: 20

1. Demonstration of Soxhlet Extraction
2. Extraction of oil from different plant (Lemon, Linseed, Groundnut, *Clove*, *Citronella*).
3. Biochemical test for the presence of lipids and oils in extract.

Internal Assessment

Total marks: 20

Semester VI

Paper: MFN-VE-6016- Analytical Instruments

Total Lectures: 40; Credits: 6 (Theory – 4, Practical - 2); Total marks: 100

THEORY

Total marks: 60

Unit 1: Cell fractioning

Centrifugation: Differential and density gradient centrifugation, sucrose density gradient, analytical centrifugation, ultracentrifugation, marker enzymes. **(7 lectures)**

Unit 2: Chromatography

Paper chromatography, column chromatography, TLC, HPLC, GLC, Ion-Exchange chromatography, Molecular sieve chromatography, affinity chromatography. **(7 lectures)**

Unit 3: Spectroscopy

Principles and applications. Mass spectroscopy; GCMS; LCMS. **(6 lectures)**

Unit 4: Imaging and other techniques

Principles of microscopy; Light microscopy; Fluorescence microscopy; Confocal microscopy; TEM; SEM; Electrophoresis; AGE, PAGE, SDS-PGE; X-ray crystallography; X-ray diffraction. **(7 lectures)**

Unit 5: Radioisotopes

Use in biological research, auto-radiography, pulse chase experiment. **(6 lectures)**

Unit 6: Biostatistics

Statistics, data, population, samples, parameters; Representation of data; Tabular, Graphical; Measures of central tendency; Mean, Median, Mode, Mean deviation, standard deviation, variation, Chi-square test. **(7 lectures)**

PRACTICAL

Total marks: 20

1. To separate sugars by thin layer chromatography.
2. Isolation of chloroplasts by column chromatography
3. Demonstration of ELISA.
4. To separate proteins using PAGE.

Internal Assessment

Total marks: 20

Paper: MFN-VE-6026- Herbal Technology

Total Lectures: 40; Credits: 6 (Theory – 4, Practical - 2); Total marks: 100

THEORY

Total marks: 60

Unit 1: Herbal medicines: history and scope- definition of medical terms- role of medicinal plants in India; cultivation- harvesting- processing- storage- marketing and utilization of medicinal plants. **(9 lectures)**

Unit 2: Pharmacognosy- systematic position, medicinal uses of Basil, Ginger, Fenugreek, Indian Gooseberry and Ashoka. **(7 lectures)**

Unit 3: Phytochemistry- active principles and methods of their testing- identification and utilization of medicinal herbs. **(8 lectures)**

Unit 4: Analytical pharmacognosy: Drug adulteration- types, methods of drug evaluation; phytochemical screening test for secondary metabolites (alkaloids, flavonoids, steroids, terpenoids, phenolic compounds). **(9 lectures)**

Unit 5: Medicinal plant micropropagation of *Withania somnifera*, Neem and Tulsi. **(7 lectures)**

PRACTICAL

Total marks: 20

1. Test for alkaloids (Mayer's test and Dragendorff's test)
2. Test for flavonoids
3. Test for phenol
4. Micropropagation of *Withania somnifera*(Aswagandha), *Azadirachta indica* (Neem) and *Ocimum tenuiflorum* (Tulsi).

Internal Assessment

Total marks: 20

Paper: MFN-VE-6036- Internship

Total Credit: 6; Total marks: 100

Conduct in workplace: Student will undergo either project supervised by any teacher or industrial in the field of their specialization during the semester of academic year. Evaluation will be done by the department based on the outcome of the project or on feedback received from the concerned management on the student's performance during the tenure.

Report making and verbal presentation: After completion of the project, the students will prepare a report on her work and experience. Evaluation will be based on the quality of the report and presentation.

Project report + Presentation + Viva voce

Total marks: 100