

## Revised Syllabus B.Sc. (Hort.)

## Semester - IV

Sr. No	Course No	Course Title	Credits
1	H/FS - 242	Breeding of fruit and plantation crops	2+1=3
2	H/FS - 243	Arid fruit crops	1+1=2
3	H/VS - 242	Temperate Vegetables	1+1=2
4	H/FL - 243	Commercial Floriculture	2+1=3
5	H/AGRO - 243	Organic Farming	1+1=2
6	H/PATH - 243	Diseases of fruit, Plantation, Medicinal and Aromatic Crops	2+1=3
7	H/AROMED - 241	Aromatic and Medicinal plants	1+1=2
8	H/SSAC - 244	Soil Irrigation water and plant analysis	0+1=1
9	H/ECON - 242	Horti - Business Management	2+0=2
			12+8=20

Course No. : H/FS - 242  
 Course title : Breeding of Fruit and Plantation Crops

Credits : 3(2+1)  
 Semester : IV

**Theory :**

Fruit breeding – History, Centers of origin, importance of centre of origin and scope of fruits breeding, objectives of fruit and plantation breeding, modes of reproduction apomixes and its types, agencies of pollination, type of incompatibility, sterility distribution, domestication and adaptation of commercially important fruits, variability for economic traits, breeding methods in production, selection - clonal selection, mutation, polyploidy and hybridization in crop improvement – policy manipulations, *in vitro* breeding tools (important fruit mango, banana, papaya, citrus, grape, guava, sapota, pomegranate, areca nut, cashew, coconut, coffee, cocoa, oil palm, rubber, tea, annona, ber, onla, kokum.)

**Practical :**

Exercises on floral biology, pollen viability, emasculation and pollination procedures, hybrid seed production, raising and evaluation of segregation populations, use of mutagens to induce mutations and polyploidy.

**Books recommended :**

1. Nijjar, S. (1977) Fruit Breeding in India.
2. Shukla A. K. and B. B. Vashishtha – Fruit Breeding Approaches and Achievement
3. Advances in Fruit Breeding : Janick and Moore
4. Fruit Breeding : Janick and Moore
5. Choudhary R. C. (1984) Introduction to Plant Breeding.
6. Aalard R. W. (1960) Principles of Plant Breeding : John Wiley and Sons, New York.
7. Kuma, N. (2006) : Breeding of Horticultural Crops : Principles and practices, New India publishing agency, New Delhi.
8. Ray, A. K. (2006) : Breeding Tropical and Sub-tropical Fruits. Narosa publishing House, New Delhi.

Course No. : H/FS - 242  
 Course title : Breeding of Fruit and Plantation Crops

Credits : 3(2+1)  
 Semester : IV

Lesson plan - Theory :

Lecture	Topic	Weightage
1,2	Fruit breeding – History, Center of origin, importance and scope of fruits breeding, distribution, domestication and adaptation of commercially important fruits. Objectives of breeding in fruit and plantation crops.	10
	Fruit breeding including modes of reproduction pomixes and its types, agencies of pollination, type of incompatibility, sterility distribution, domestication and adaptation, variability of economic traits, clonal selection and breeding methods in following crops.	10
3 – 5	Mango	10
6 – 8	Banana	10
9 – 10	Citrus	10
11 – 12	Grape	5
13	Papaya	5
14 – 15	Sapota and Guava	5
16	Annona	2
17 – 18	Ber and Aonla	5
19 – 20	Pomegranate	5
21 – 22	Oil palm and Rubber	2
23	Cashew nut	3
24 – 25	Coffee, Tea and Cocoa	3
26	Arecanut and Date Palm	2
27 – 28	Coconut	5
29 – 31	Mutagenesis and its application in crop improvement – policy manipulations – in vitro breeding tools for following important fruit and plantation crops Mango, Banana, Citrus, Grape, Papaya, Ber, Annona and Aonla, Coffee, Tea, Coconut and Arecanut.	5
32	Recommendations of JOINT AGRESCO for last five years.	3

Practical :

Practical	Topic
1	Study of Breeding kit
2	Methods of emasculation and pollination procedures
	<b>Floral biology of :</b>
3	Mango
4	Banana
5	Citrus
6	Grape
7	Papaya
8	Ber and Aonla
9	Pomegranate and Fig
10	Aonla and Tamarind
11	Arecanut and Coconut
12	Cashew nut
13	Pollen viability
14	Hybrid seed germination
15	Raising of Segregating populations
16	Evaluation of segregation population. Use of mutagens to induce. Mutagens and polyploidy.

Course No. : H/FS - 243  
Course title : Arid Fruit Crops

Credits : 2(1+1)  
Semester : IV

**Theory :**

Definition, importance and scope, present status of Arid fruit crops, classification of Arid regions in the country, Problems and constraints in fruit production in arid regions. Soil and agro-climatic condition of the arid regions, Detailed cultivation of Aonla, Tamarind, Annona, Ber, Karonda, Woodapple, Jamun and Phalsa with respect to origin, botany, soil, climate, propagation, layout and planting, spacing, nutrition and irrigation management, interculture, horticultural practices, varieties, harvesting, yield, grading, and storage, important pest and diseases, and their management, Brief information about cultivation on above aspects of Jamun, Woodapple, Charoli, Marking nut, Passionfruit, Loquat, Litchi, Phalsa, Jackfruit. Special horticultural practices for Arid and minor fruit crops such as training, pruning, use of plant growth regulators and chemicals, mulching, terracing, intercropping. Handling and storage.

**Practical :**

Studies on different varieties of Arid and minor fruit crops, propagation and nursery management of Arid and minor fruit crops, layout of orchards, planting, agrotechnique like irrigation and nutrition management, training, pruning, use of plant growth regulators and chemicals, mulching, techniques of minimizing soil erosion and water, harvesting grading and storage. Visit to commercial garden. Diagnosis of pest and diseases and their control.

**Book recommended :**

1. Fruit Culture in India : Shyam Singh, S. Krishnamurthy and S. L. Katyal
2. Arid Fruit culture : Chundawat
3. Fruits of India : Tropical and subtropical : T. K. Bose.
4. Production technology of fruit crops : K. G. Shanmugavellu.

Course No. : H/FS - 243

Credits : 2(1+1)

Course title : Arid Fruit Crops

Semester : IV

## Lesson plan - Theory :

Periods	Lesson	Marks
1	Definition, importance, scope and presents tatus of Arid fruit crops	5
2	Classification of Arid zones of India	2.5
3	Problems and constraints in fruit production in arid region	5
4	Soil and agro climatic condition of arid region	2.5
	Detail cultivation in respect of origin, botany, soil, climate, propagation, varieties, layout and planting, spacing, nutrition, irrigation, intercultural, horticultural practices, yield, grading and storage, Important pest and diseases and their management of the following crops.	
5	Acnla	20
6	Tamarind	
7	Annona spp.	
8	Ber	
9	Karonda	
10	Woodapple	
11	Jamun	
12	Phalsa	
	Brief information about cultivation on above aspect for following crops	
13	Passion fruit, Loquat, Litchi, Charoli, Marking nut, Jackfruit	5
14	Training and pruning in Arid fruit crops	5
15	Mulching, terracing, intercropping	5
16	Handling and storage of Arid fruits, Recommendations of JOINT AGRESCO for last five year	

Note : Weightage reduced by 50%

## Lesson plan - Practical :

Periods	Topics
1, 2	Description of Commercially grown varieties of Arid fruit crops.
3, 4	Nursery management and propagation technique
5	Layout of orchards and planting
6	Nutrition and irrigation management
7	Training and pruning
8	Preparation and use of plant growth regulators
9	Use of mulching and anti-transparent
10	Techniques of minimizing soil erosion and water (Soil moisture conservation)
11	Harvesting, grading and storage
12,13,14	Visit o commercial orchards of arid fruit crops.
15,16	Diagnosis of pests and diseases and their control measures.

Course No. : H/VS - 242  
Course title : Temperate Vegetables

Credits : 2(1+1)  
Semester : IV

**Theory :**

Importance and scope of cool season vegetable crops in nutrition and national economy. Area, production, export potential, description of varieties and hybrids, origin, climate and soil, production technologies. Marketing of Cabbage, Cauliflower, Knolkhol, Sprouting broccoli, Brussels sprout, Lettuce, Palak, Chinese cabbage, Spinach, Garlic, Onion, Leek, Radish, Carrot, Turnip, Beet root, Peas, Broad beans, Rhubarb, Asparagus, Globe artichoke and Potato.

**Practical :**

Identification and description of temperate vegetable crops and their varieties; propagation methods, nursery management; preparation of field, sowing / transplanting; method of application of manures and fertilizers, methods of irrigation, inter-cultural operation, use of growth regulators. Identification of physiological and nutritional disorders and their correction, Harvesting, grading, packing and storage and handling; Cost of cultivation and field visits to commercial farms..

**Book recommended :**

1. Thamburaj, S. (2005), Vegetables, Tubers and Spices ICAR, Publication, New Delhi.
2. Niraj, N. P. (2006) : Basic Concepts of vegetable science IBDC, Lucknow.
3. Singh, S. P. (2005) : Production Technology of Vegetable crops. ARCC, Hisar.
4. Bose, T. K. and M. G. Som (2005) Vegetable Crops in India Naya Prokash, Kolkatta.

Course No. : H/VS - 242  
 Course title : Temperate Vegetables

Credits : 2(1+1)  
 Semester : IV

**Lesson plan - Theory :**

Periods	Lesson	Marks
1	Importance and scope of temperate vegetables in nutrition and national economy.	5
2	Area, production, export potential of temperate vegetables.	5
3	Production technology of Cole crops : Cabbage	10
4	Cauliflower	5
5	Sprouting broccoli	5
6	Chineses cabbage	5
7	Knol – khol	5
8	Brussel's sprout, Lettuce.	5
9	Root vegetables : Radish, Carrot,	10
10	Turnip, Beet root	5
11	Pears and beans : Broad beans and Peas	10
12	Greens : Palak Spinach and shubarb	5
13	Bulk vegetables : Onion, Garlic	10
14	Leek, Globe artichoke, asparagus	5
15	Potato	5
16	Recommendations of Joint Agresco	5

**Lesson plan - Practical :**

Periods	Topics
1-2	Identification and description of temperate vegetables
3-4	Identification and description of commercially important varieties of temperate vegetables.
5-6	Propagation methods and nurse management for temperate vegetables.
7	Field preparation and sowing of temperate vegetables.
8	Field preparation and transplanting of temperate vegetables.
9	Identification of physiological disorders in temperate vegetables and remedies.
10-11	Methods of irrigation and manures and fertilizer - application.
12	Identification of nutritional deficiencies in temperate vegetables and their control measures.
13	Maturity indices and harvesting of temperate vegetables. Packaging and storage of temperate vegetables
14	Estimation of cost of cultivation of tem arate vegetables.
15	Field visit to vegetable farms
16	Visit to vegetable market

Course No. : H/FL-243 Credits : 3(2+1)

Course title : Commercial Floriculture

Semester : IV

**Theory :**

Scope and importance of commercial floriculture in India and Maharashtra. Production techniques of floricultural plants like Rose, Chrysanthemum, Carnation, Gerbera, Gladiolus, Marigold, Gaillardia, Tuberose, Jasmine, China Aster, Dehlia and Lily\*. Production of above crops for domestic and export market with special reference to maturity, packaging and transport needs. Production techniques of above floricultural crop under poly house and net house conditions. Post harvest management of cut flowers. Dehydrated flower trade in India its scope and present status. Post harvest technology for loose flowers. Flower arrangement and value addition in Floriculture

\* - Additional crop

**Practical :**

Identification of above floricultural crops. Propagation techniques in gladiolus, carnation, gerbera, chrysanthemum, tuberose. Sowing of seed and raising of seedling of annual floricultural crops. Propagation by cutting, layering, budding and grafting. Training and pruning of roses. Drying and preservation of flowers. Bonsai preparation. Use of chemicals and plant growth regulators in prolonging the vase life of cut flowers. Flower arrangement, preparation of bouquets, garlands, venis and gajras.

**Books recommended :**

1	Commercial Floriculture - Prasad & Kumar.
2	Commercial Flowers Vol -II- Bose.T.K.
3	Commercial Flowers Vol-I - Bose.T.K.
4	Complete Gardening in India - Gopalswami Iyengar
5	Floriculture in India - Randhawa & Mukhopadhyay
6	Indoor Gardening - Trivedi.
7	Ornamental Horticulture - Vishnu Swarup
8	Progressive floriculture - LS.Yadav and M.L.Choudhary
9	The Complete Book of Gardening - J.Coutts, A.Osborn and A.Edwards
10	Landscape Principles and Practices - Jack E..Ingels
11	Floriculture and Landscaping - Bose.T.K



Course No. : H/FL-243  
Course title : Commercial Floriculture

Credits : 3(2+1)  
Semester : IV

Lesson plan - Theory

Lecture No.	Topic	Weightage
1-2	Scope and importance of commercial floriculture in India,	5
	Production techniques of ornamental plants for domestic and export Market for following flower crops	
3	Rose	5
4	Marigold	5
5	Chrysanthemum	5
6	Gaillardia	5
7	Carnation	5
8	Gladiolus	5
9	Jasmine	5
10	Dahlia	5
11	Tuberose	5
12	Bird of paradise	5
13	China aster	5
14	Gerbera	5
15	Lily *	5
16-17	Domestic and export marketing of flowers	5
18-21	Growing of flowers under protected environments such as glass house, plastic house, net house etc.,	5
22-26	Post harvest technology of cut and loose flowers in respect of commercial flower crops	5
27-28	Dehydration technique for drying of flowers scope, importance and status.	5
29-32	Production techniques for bulbous crops.	10

\* - Additional crop

Lesson plan - Practical

Practical No.	Topics
1	Identification of commercially important floricultural crops.
2-3	Propagation technique in gladiolus, carnation, chrysanthemum and tuberose.
4	Sowing of seeds and raising of seedlings of annuals.
5-6	Propagation of ornamental plants with particular reference to cuttage layerage and budding.
7-8	Training and pruning of roses.
9-10	Drying and preservation of flowers.
11	Bonsai preparation.
12	Use of chemicals and other compounds for prolonging the vase life of cut flowers.
13-14	Flower arrangement practices
15-16	Preparation of garland, veni and gajara

Course No. : H/AGRO 243  
 Course title : Organic Farming

Credits : 2(1+1)  
 Semester : IV

### Theory :

Introduction, concept, relevance in present context; Organic production requirements; Biological intensive nutrient management-organic manures, vermicomposting, green manuring, recycling of organic residues, biofertilizers; Soil improvement and amendments; Integrated diseases and pest management - use of biocontrol agents, biopesticides pheromones, trap crops, bird perches; Weed management; Quality considerations, certification, labeling and accreditation process; marketing and export.

### Practical:

Raising of vegetable crops organically through nutrient, diseases and pest management; vermicomposting; vegetable and ornamental nursery raising; macro quality analysis, grading, packaging, post harvest management.

### Lesson plan - Practical

Lecture NO.	Topic to be covered	Weightage (%)
1 and 2	Introduction, concept, advantages and disadvantages, relevance in present context, organic matter production requirements.	11
3	Biological intensive nutrient management	13
4, 5, 6	Organic manures: FYM, Compost, vermicomposting, green manuring.	16
7, 8	Recycling of organic residue and biofertilizers	13
9, 10	Soil improvement and amendments, integrated weed, disease and pest management.	14
11, 12, 13	Use of bio-control agents, bio-pesticides, pheromones, trap crops, bird perches.	17
14, 15, 16, 17	Quality consideration, certification, labeling and accreditation process, marketing and export.	16

### Reference books :

1. Trends in organic farming in India, 2006, Agrobios Publication
2. Organic farming for sustainable agriculture, 2005, A.K. Dahama Agrobios Publication, Jodhpur.
3. Handbook of Organic Farming, A.K. Sharma.
4. Organic Farming in India, Problems and Prospects, Thapa U. and Tripathi P. 2006.
5. Organic Farming - theory and practice, Palanippan S.P. and Anandurai K. 1999. Scientific Publishers, Jodhpur.
6. Organic Farming - Standards, Accreditation, Certification and Inspection - 2005, Deshyent Gehlot.

### Practical :

Ex. No.	Title of the Exercise
1	Preparation of FYM, compost and green manuring
2	Preparation of vermicompost
3	Raising of agronomic/vegetable crops organically
4	Calculation of nutrient requirement for organically raised crops using different sources.
5	Preparation of phospho-compost by using minerals.
6	Use of phospho-compost to organically grown, fruits and vegetable crops
7	Study of parameters and their characteristics and favourable conditions required for production of quality compost
8	Study of relative suitability of different organic materials for composting according to ease of decomposition
9	Use of concentrated organic manures (oil cakes, slaughter house waste, fish meal and poultry manures etc.) in organically grown different horticultural crops
10	Use of biostimulants in organically grown horticultural crops
11	Preparation of vermin-wash for vegetable seedlings
12	Pest management in organically raised crops
13	Disease management in organically grown vegetable crops
14	Use of biofertilizer for seed treatment of vegetable crops
15	Nutritional management in organically grown orchards, pest management in organically grown floriculture
16	Nutritional management in organically grown vegetable crops
17	Grading, packaging, post harvest management and marketing of organically raised produce
18	Visit to bio-control lab, biofertilizer unit and vermicompost unit

Course No. : Path 243  
 Course title : Diseases of fruits, plantation,  
 medicinal and aromatic crops

Credits : 3(2+1)  
 Semester : IV

#### Theory :

Symptoms, etiology, modes of spread, epidemiology and integrated management of the diseases of fruits, plantation, medicinal and aromatic crops viz . mango, banana, grape, citrus, guava, sapota, papaya, jackfruit, pineapple, pomegranate, ber, apple, pear, peach, plum, almond, walnut, strawberry, areca nut, coconut, custard apple, fig, pineapple, jamun, aonla, oil palm, coffee, tea, cocoa, cashew, rubber, betel vine, senna, neem, hemp, belladonna, pyrethrum, camphor, costus, crotalaria, datura, dioscorea, mint; opium, *Solanum khasianum* and tephrosia. Important post-harvest diseases of fruit, plantation, medicinal and aromatic crops and their management.

#### Practical:

Observations of disease symptoms, identification of casual organisms and host parasite relationship of important diseases. Examination by scrapings and cultures of important pathogens of fruits, plantation, medicinal and aromatic crops.

#### Books recommended :

1. Diseases of Fruit Crops Pathak, V.N: 1980. Oxford & IBH. New Delhi
2. Plant Pathology Agrios, G. N. 1997. Acad. Press., New York.
3. Diseases of Fruit Crops. Vy Singh, R.S. 2000. Oxford and IBH., New Delhi. (Special Indian Edition)
4. Diseases of Crop Plants in India. 4th Edn. By Rangaswamy G. and Mahadevan. Prentice Hall of India. , New Delhi. 4<sup>th</sup> Edn.
5. Plant Pathology Mehrotra, R.S. 1980 Tata McGraw Hill., New Delhi.
6. Diseases of Major Medicinal Crops Janardhanan. 2002. Daya Publ., Lucknow.

Course No. : Path 243  
 Course title : Diseases of fruits, plantation,  
 medicinal and aromatic crops

Credits : 3(2+1)  
 Semester : IV

Lesson plan - Theory

Lecture No.	Topic	Weightage
	Etiology, symptoms, mode of spread, epidemiology and integrated management of the diseases of	
	<b>Fruit Crops viz.</b>	
1, 2	Mango	8 - 10
3, 4	Banana	8 - 10
5, 6	Grape	8 - 10
7, 8	Citrus	8 - 10
9, 10	Gauva, Sapota, fig	4 - 5
11	Papaya	4 - 5
12, 13	Pomegranate	4 - 5
14	Ber, Custard apple, Aonla, Jamun	4 - 5
15	Jackfruit, pineapple	4 - 5
16, 17	Strawberry, Almond, Cashew, Walnut	4 - 5
18, 19	Apple, Pear, Peach, Plum	4 - 5
	<b>Plantation Crops viz.,</b>	
20, 21	Betelvine, Arecanut, coconut, Oil palm	4 - 5
22, 23	Coffee, Tea, Cocoa, Rubber	4 - 5
	<b>Medicinal and Aromatic Crops viz.</b>	
24, 25	Senna, Neem, Hemp, Belladonna, Pyrethrum	4 - 5
26, 27	Camphor, Costus, Croton, Datura, Discorea, Mint, Opium, Solanum khasianum and Tephrosia	4 - 5
28, 29, 30	Important post-harvest diseases of fruit, plantation, medicinal and aromatic plants and their management	4 - 5

\* - Additional crop

## Lesson plan - Practical

Practical No.	Topics
	Symptoms, Etiology, mode of spread, epidemiology and integrated management of the diseases of
	<b>Fruit Crops viz.</b>
1, 2	Mango : Malformation, Anthracnose, Powdery mildew, Bacterial blight, Stone graft mortality, Red Rust Giant Mistletoe (Loranthus)
3, 4	Banana : Wilt, Sigatoka, Anthracnose, Erwinia rot, Bunchy top, Heart Rot Infectious chlorosis, Cigar end rot
5, 6	Grape: Downey mildew, Powdery mildew, Anthracnose, Bacterial Blight, Grape Fan Leaf Virus
7, 8	Citrus: Gummosis, Leaf fall and Fruit Rot, Anthracnose, Diplodia, Ganoderma root rot, Powdery mildew, Die-back, Canker, Mottling Greening, Tristeza, Psorosis, Citrus. Exocortis Quick and Slow Decline, Khaira Disease (Zink Deficiency)
9	Papaya : Pythium soft rot, Powdery midew, Anthracnose, Fruit rot, Viruses : Ring spot, leaf curl and mosaic
10	a) Guava : Wilt, Canker, Pestilential leaf spat, Anthracnose b) Sapota : Root rot, Leaf spot, Fruit rots c) Fig : Fig rust
11	Pomegranate : <i>Alternaria</i> , <i>Helminthosporium</i> and <i>Colletotrichum</i> Cercospora leaf and fruit spots, Wilt, Bacterial Blight
12	a) Ber: Powdery mildew b) Custard Apple: Pythium Seedling Mortality and Fruit Rots c) Aonla: Emblica Rust ( <i>Ravenalia</i> sp) d) Jamun: Fruit rot and foliage diseases
13	a) Jackfruit : Die Back, Fruit Rot b) Pineapple : Heart rot, Base rot and Wilt
14	a) Strawberry : Leaf spots, wilt and root rots b) Almond : Leaf spots c) Cashew : Leaf spots d) Walnut : Leaf spots
15	a) Apple: Fire blight , Root and Collar rot, Cankers. Powdery mildew, Scab, Fruit Rots, Crown Gall, Mosaic b) Pear : Rust , Leaf spots and Blight, fire blight, Scab, Mosaic c) Peach: Rust, Blight, Scab and Leaf Curl d) Plum : Bacterial Canker, Wilt, Mosaic and Leaf Curl e) Stone Fruit : Crown gall
	<b>Plantation Crops viz.,</b>
16	a) Betelvine : Phytophthora wilt, Sclerotium foot rot, Powdery mildew, bacterial leafs spot b) Arecanut : Koleroga
17	c) Coconut : Wilt, Stem bleeding, Stem rot, Bud rot, Cadang cadang disease, Lethal yellow d) Oil Palm : Major foliage diseases

18	e) Coffee: Rust f) Tea: Rust g) Cocoa: Anthracnose, leaf spots, seedling die-back, white thread blight, witches broom
19	h) Rubber : Abnormal leaf fall and stem rot, powdery mildew, anthracnose and leaf spots
Medicinal and Aromatic Crops viz.	
20, 21	a) Senna: Leaf spots, blight; Neem: Bacterial blight, anthracnose, gummosis; Hemp: Black dot, root rot, anthracnose, damping off, powdery mildew, bacterial blight, crown rot; Belladonna, Pyrethrum: Major Diseases
22, 23	b) Camphor, Cactus, Croton : Major Diseases
24, 25	c) Datura, Discaria, Mint, Opium : Major Diseases
26, 27	d) Solanum khasianum and Tephrosia: Major Diseases
28, 29, 30	Important Post Harvest Diseases of above Fruit, Plantation, Medicinal and Aromatic Plants and Their Management

Course No. : H/AROMED-241

Course title : Aromatic and Medicinal Plants

Credit: 3 (2+1)

Semester : IV

**Theory :**

History, scope and constraints in the cultivation and maintenance of medicinal and aromatic plants in India. Importance, origin and distribution, area, production, climatic and soil requirements, propagation and nursery techniques, planting and after care, cultural practices, training and pruning, nutritional and water requirement. Plant protection, harvesting and processing of under mentioned important medicinal and aromatic plants, extraction, use and economics of drugs and essential oils in medicinal and aromatic plants. Therapeutic and pharmaceutical uses of important species. **Medicinal plants** : Betelvine, periwinkle, rauwolfia, dioscorea, isabgol, belladonna, cinchona, ashwagandha, safed musali, stevia, aloe vera, adulsa, panpimpli, asparagus, wild brinjal and other species relevant to local conditions. **Aromatic plants** : Citronella grass, palma rosa grass, lemon grass, Khas grass, lavender, geranium, patchauli, mentha and other species relevant to the local conditions.

**Practical :**

Collection of medicinal and aromatic plants from their natural habitat and study their morphological description, nursery techniques, harvesting, curing, and processing techniques and extraction of essential oils.

**Books recommended:**

1. Cultivation and Industries of Medicinal and Aromatic plants (1989). Vol. I & II : Atal E.K. and Kaput, B.M. CRRL CSIR, Jammu & Kashmir.
2. Advances in Horticulture (1995). Vol. H Medicinal and Aromatic plants: KL. Chadha and Rajendra Gupta.
3. Medicinal plants: S.K Jain.
4. Indian Medicinal Plants (1975). Vol. I to IV: K.R. Kirtikar et al.
5. Introduction to Spices, Plantation crops, Medicinal and Aromatic crops: Kumar N



Course No. : H/AROMED-241  
 Course title : Aromatic and Medicinal Plants

Credits : 3 (2+1)  
 Semester : IV

Lesson plan - Theory :

Lecture	Topic	Weightage
No. 2	History importance scope and constraints in the cultivation and maintenance of medicinal and aromatic plants.	10
16	Importance, origin and distribution, area, production, climatic and soil requirements, propagation and nursery techniques, planting and after care, cultural practices, training and pruning, nutritional and water requirement. Plant protection, harvesting and processing of Medicinal plants : Betelvine, periwinkle, rauwolfia, dioscorea, isabgol, belladonna, cinchona, ashwagandha, safed musali, stevia, aloe vera, adulsa, panpimpli, asparagus, wild brinjal and other species relevant to local conditions.	40
10	Importance, origin and distribution, area, production, climatic and soil requirements, propagation and nursery techniques, planting and after care, cultural practices, training and pruning, nutritional and water requirement. Plant protection, harvesting and processing of Aromatic plants : Citronella grass, palma rosa grass, lemon grass, Khas grass, lavender, geranium, patchauli, mentha and other species relevant to the local conditions.	30
2	Study of chemical composition of few important medicinal and aromatic plants, extraction use and economics of drugs and essential oils in medicinal and aromatic plants.	10
2	Therapeutic and pharmaceutical uses of important species	10

Course No : SSAC-244, Credits: (0+1)=1

Course Title : Soil, Irrigation Water and Plant Analysis

Semester : IV

Sr.No	Title
1	Collection and processing of soil samples
1(a)	Determination of moisture content in soil by gravimetric method
2	Determination of maximum water holding capacity (mwhc) of soil using kr boxes
3	Determination of hydraulic conductivity of soil by constant heat method
4	Determination of pH and electrical conductivity of soil
5	Determination of sodium adsorption ratio and exchangeable sodium percentage of soil
6	Determination of exchangeable calcium and magnesium
7	Determination of available nitrogen in soil (Alkaline permanganate method)
8	Determination of available phosphorus in soil
9	Determination of available potassium in soil (neutral N ammonium method)
10	Collection and processing of plant sample for analysis of determination of moisture content in plant sample
11	Determination of total nitrogen from plant sample
12	Digestion of sample and determination of total phosphorus from plant sample
13	Determination of potassium from plant sample
14 & 15	Determination of DTPA extractable micronutrients from soil
16	Collection of irrigation water sample and determination of pH and EC and anions from irrigation water
17	Determination of cations estimation of soluble cations from irrigation water
18.	Enumeration of soil microbes
18(a)	Estimation of soil microflora by conn's direct microscopic method

Course No. : H/ECON-242  
 Course title : Horti - Business Management

Credits : 2 (2+0)  
 Semester : IV

**Theory :**

Farm management – definition, nature, characteristics and scope. Farm management principles and decision making, production function, technical relationships, cost concept, curves and functions – factors, product, relationship – factors relationship, product relationship, optimum conditions, principles of opportunity cost-equi-marginal returns and comparative advantages, time value of money, economic of scale, returns to scale, cost of cultivation and production, break even analysis, decision making under risk and uncertainty. Farming systems and types Planning meaning, steps and methods of planning, types of plan, characteristics of effective plans. Organizations - forms of business organizations, organizational principles, division of labour. Unity of command, scalar pattern, job design, span of control responsibility, power authority and accountability. Direction - guiding, leading, motivating, Supervising, Coordination - meaning, types and methods of controlling - evaluation. Control system and devices. Budgeting as a tool for planning and control. Record keeping as a tool of control. Functional areas of management operations management - physical facilities, implementing the plan, scheduling the work, controlling production in terms of quantity and quality. Materials management - types of inventories, inventory costs, managing the inventories, economic order quantity (EOQ), Personnel management—recruitment, selection training, job specialization. Marketing management—definition, planning the marketing programmes, marketing mix and four P's. Financial management - financial statements and ratios, capital budgeting. Project management - project preparation evaluation measures.

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**Lesson plan - Theory :**

Lecture No.	Details of lecture	Weightage
1&2	Farm Management Definition, Characteristics of Farm Management, Nature, Farm Management Process, Scope, i.e. Farm Management Research, Training and Extension	02
3,4 & 5	Decision Making/ Factor - Product Relationship Farm Management Decisions, Production Function, Factor Product relationship, Meaning/ Forms of Production Function (Graphic / Algebraic/Tabular Form), Types of Production Function (Constant Marginal rate of return / Decreasing Marginal rate of return / Increasing Marginal rate of return)	05
6	Technical Relationship Relationship between Total, Average and Marginal Product, Three regions/ Stages of production function	03

Course No : SSAC-244, Credits: (0+1)=1

Course Title : Soil, Irrigation Water and Plant Analysis

Semester : IV

Sr.No	Title
1	Collection and processing of soil samples
1(a)	Determination of moisture content in soil by gravimetric method
2	Determination of maximum water holding capacity (mwhc) of soil using kr boxes
3	Determination of hydraulic conductivity of soil by constant heat method
4	Determination of pH and electrical conductivity of soil
5	Determination of sodium adsorption ratio and exchangeable sodium percentage of soil
6	Determination of exchangeable calcium and magneisum
7	Determination of available nitrogen in soil (Alkaline permanganate method)
8	Determination of available phosphorus in soil
9	Determination of available potassium in soil (neutral N ammonium method)
10	Collection and processing of plant sample for analysis of determination of moisture content in plant sample
11	Determination of total nitrogen from plant sample
12	Digestion of sample and determination of total phsophorus from plant sample
13	Determination of potassium from plant sample
14 & 15	Determination of DTPA extractable micronutrients from soil
16	Collection of irrigation waters ample and determination of pH and EC and anions from irrigation water
17	Determiantion of cations estimation of soluble cations from irrigation water
18.	Enumeration of soil microbes.
18(a)	Estimation of soil microflora by conn's direct microscopic method

7	Cost Concept Curves and Functions Cost, Meaning, Categories Of Cost (Fixed Cost/ Variable Cost/ Total Cost), Relationship Between Total Fixed Cost, Total Variable Cost And Total Cost, Relationship Between Average Fixed Cost, Average Variable Cost, Average Total Cost	05
8, 9, 10 & 11	Factor-Factor Relationship Meaning, Iso-Quant Curve, Types Of Factor-Factor Relationship (Fix Proportion Combination / Constant Rate of Substitution / Varying Rate of Substitution), Iso-Cost Line, Least Cost Combination, ( Arithmetic/ Graphic/ Algebraic) Expansion Path, Ridge Line	06
12 & 13	Product-Product Relationship Basic Relationship, Joint Product, Complementary Product, Supplementary Product, Competitive Product.	04
14 & 15	Principals of Farm Management 1) Laws of Return or Principal of Variable Proportion. 2) Cost Principal 3) Principal of Substitution Between Input 4) Equi Marginal Principal or Opportunity Cost Principal 5) Principal of Substitution Between Product 6) Principal Underlying Decision Involving Time and Uncertainty, Economics of scale, Return to Scale.	07
16	Time Value of Money Compounding, Discounting	5
17	Cost of Cultivation Meaning, Components, Standard Cost, Concept- Cost A, B, C.	5
18	Cost of Production Meaning, Components, Cost of Production/ quintal Break Even Analysis Meaning and Measurement	5
19	Decision Making Under Risk and Uncertainty Meaning and Types	3
20 & 21	Farming System and Types Specialized Farming, Diversified Farming, Mixed Farming, Dry Farming, Ranching.	5
22 & 23	Planning Meaning, Necessity of Planning, Characteristics, Steps, Methods, Types of Plan: 1) Simple Farm Plan 2) Complete Farm Plan Steps: 1) Statement of Objectives 2) Diagnosis of Existing Organization 3) Assessment of Resource Endowment on the Farm 4) Identification of Enterprises to be included 5) Preparation of Enterprise budget 6) Identification of Risk 7) Preparation of Plan	5

24 & 25	<p>Organization Forms of Business Organization:</p> <ol style="list-style-type: none"> <li>1) Peasant Farming</li> <li>2) Co-operative Farming</li> <li>3) Capitalistic Farming</li> <li>4) Collective Farming</li> <li>5) State Farming</li> </ol>	3
26	<p>Division of Labour Unity of Command Scalar pattern, Job Design, Span of Control, Responsibility, Power Authority and Accountability</p>	3
27	<p>Direction Guiding, Leading, Motivating, Supervising Coordination Meaning, Types, Methods of Controlling Evaluation Control Systems and Devices</p>	4
28	<p>Budgeting Types of Farm Budgeting: Partial, Enterprises, Total or Complete Budget.</p>	3
29 & 30	<p>Record Keeping Advantage Of Record Keeping:</p> <ol style="list-style-type: none"> <li>1) Means Of Higher Income</li> <li>2) Basis For Diagnosis And Planning</li> <li>3) Way To Improve Managerial Ability Of Farmer</li> <li>4) Basis For Credit Acquisition And Management</li> <li>5) Guide To Better Home Management</li> <li>6) Basis Of Conducting Research In Agril Economics And Product Economics</li> <li>7) Basis For Government Policies</li> </ol> <p>Types Of Farm Records:</p> <ol style="list-style-type: none"> <li>1) Physical Farm Record, Production Record, Labour Record, Store Register, Feed Record.</li> <li>2) Financial Record- Farm Inventory Farm Financial Accounts</li> <li>3) Supplementary Financial Record</li> </ol>	10
31	<p>Functional Area Of Management Operation Management Physical Facilities, Implementing the Plan, Scheduling the Work, Controlling Production in Term of Quantity and Quality</p>	2
32	<p>Material Management Types of Inventories, Inventory Cost, Managing the Inventory, Economics Order Quantity[EOQ]</p>	3
33	<p>Personnel Management Recruitment, Selection, Training, Job Specification</p>	2
34	<p>Marketing Management Definition, Planning the Marketing Programme, Marketing Mix, Four Ps (Product/ Price/ Promotion/ Place)</p>	3

35	Financial Management Financial Statement, Rations, Capital Budgeting	2
36	Project Management Project, Definition, Aspects, Project Cycle, Discounted and Under Discounted, Measures of Project Evaluation	5

## Text Book:

1. Farm Management: S. P. Dhondyal
2. Fundamentals of Farm business management by S. S. Johl and T. R. Kapur
3. Elements of Farm management Economics by J. J. Singh
4. Economics of Farm management in India by A. S. Kahlon and Karam Singh