

HORTICULTURE (VOCATIONAL STREAM)

SCHEME OF STUDIES

CLASS XI

Sl. No	Papers	Theory	Practical
1	Horticulture Paper I	100	100
2	Horticulture Paper II	100	100
3	Horticulture Paper III	100	100
4	English (General Course as prescribed for Arts/ Science/ Commerce)	100	
5	Environmental Education (General Course as prescribed for Arts/ Science/Commerce)	Grading	
6	On-the-Job Training		100
	Total:	400	400
	Grand Total:	800	

CLASS - XII

Sl. No	Papers	Theory	Practical
1	Horticulture Paper IV	100	100
2	Horticulture Paper V	100	100
3	Horticulture Paper VI	100	100
4	English (General Course as prescribed for Arts/ Science/ Commerce)	100	
5	Environmental Education (General Course as prescribed for Arts/ Science/Commerce)	Grading	
6	On-the-Job Training		100
	Total:	400	400
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**HORTICULTURE
(SYLLABUS)
CLASS - XI**

PAPER - I

**FUNDAMENTALS OF HORTICULTURE
THEORY**

TIME: 80 HRS

- Definition, importance and scope of horticulture.
- Branches of horticulture, classification, distribution of horticultural crops and horticultural zones of India.
- Climatic factors, plant growth and development including effects of adverse climatic conditions and their management.
- Soil as a media of plant growth including effects of soil conditions.
- Propagation - types and methods of propagation, propagation structures, tools and equipment, media and containers.
- Propagation through seed, apomixis, polyembryony, dormancy, viability, and factors affecting viability.
- Principles of seed production, pollination requirements, bees and their role in pollination and honey production. Isolation techniques of pure and hybrid seed production and storage.
- Nursery raising, preparation of bed, seed sowing; protection, hardening, lifting and packing of seedlings.
- Asexual propagation and its importance; propagation by cutting, layering, grafting, budding and their types.
- Propagation of plants by specialized structures-bulbs, corms, tubers, rhizomes, runners, slips, stolans, suckers and their types.
- Handling of nursery plants, display, marketing and economics of nursery business.
- Selection of site, land development including fencing and windbreaks and planting.
- Nutrition of horticultural crops
- Irrigation in horticultural crops.
- Growth and development and use of plant growth substances.
- Training and pruning of horticultural crops.
- Plant and protection in horticultural crops.
- Maturity indices for various horticultural crops.
- Methods of communication and transfer of technology.
- Management of horticultural enterprises.

PAPER - I

**FUNDAMENTALS OF HORTICULTURE
PRACTICAL**

TIME: 120 HRS

- Survey of site and study of feasibility criteria for horticultural crops.
- Study and classification of horticultural plants.
- Study of garden tools and implements.
- Collection and analysis of soil and water samples.

- Study of material and plants required for fencing.
- Visit to nursery and selection of healthy, true to the type planting material.
- Preparation of nursery beds, sowing of papaya seeds and care.
- Practicing the lifting and transplanting of plants.
- Preparation of potting mixture, potting and repotting.
- Study of different types of fertilizers, manures and bio fertilizers.
- Study of symptoms of deficiency of nutrients and various physiological disorders in horticultural crops.
- Methods of irrigation including drip and sprinkler in an orchard.
- Use of different kinds of mulches in horticultural crops.
- Study of common weeds and their control.
- Study of common diseases and pests and their control.
- Training and pruning in horticultural crops.
- Preparation of plant growth regulator solutions for different purposes.
- Study of maturity stages and harvesting of banana, grapes and mango.
- Study of propagation structures in a commercial nursery.
- Study of different pots/containers and preparation of media, potting and repotting.
- Study of seeds and seed germination including presowing treatments.
- Study of specialized propagules in propagation like, runners, suckers, offshoots, tubers, bulbs and their planting.
- Propagation through cuttings and layering, leaf shoot, root cuttings, *gootee*, ground layering using different plant species.
- Practice of different methods of grafting in mango and budding in roses.
- Packaging of different types of plants, grafts and scion material.
- Study of apiaries and their management.

PAPER - II

**FRUIT PRODUCTION
THEORY**

TIME: 120 HRS

- Importance and present status and future scope of fruit industry in India. Nutritive value of fruits. Fruit production as an economic proposition.
- Classification of fruit crops based on climatic requirements and fruit growing zones in India.
- Selection of site for fruit crops.
- Layout and planting systems for fruit crops.
- Commercial cultivation of major fruit crops with special reference to their origin, climate, soil, varieties, propagation, planting, training, pruning nutrition, interculture, irrigation, weed control, plant protection, use of growth regulators, special problems, maturity, standards, harvesting, grading, storage and marketing of -

TROPICAL AND SUBTROPICAL FRUITS: Mango, banana, papaya, pineapple, sapota, citrus fruits, guava, grape, litchi, *ber*, aonla and pomegranate.

TEMPERATURE FRUITS: Apple, pear, peach, plum and apricot.

MINOR FRUITS: *Phalsa, jamun*, custard apple and jack fruit.

PAPER - II

**FRUIT PRODUCTION
PRACTICAL**

TIME: 120 HRS

- Visit to an orchard, study of features and identification of fruits crops.
- Visit to an orchards for identification of varieties of fruit crops.
- Lay out of orchards for square system of planting.
- Lay out for qincux/hexagonal system of planting.
- Digging of pits, refilling the pits for planting of important fruit crops.
- Propagation methods for important fruit crops.
- Raising of seedlings of fruit crops.
- Planting of fruit trees.
- Study of bearing habit in important fruit crops.
- Interculture operation in fruit trees.
- Mulching in fruit plants.
- Study of fruit set and fruit drop through spray of growth regulators.
- Methods of training in grapes.
- Methods of pruning in grapes/*ber*.
- Study of methods of irrigation.
- Application of manures and fertilizers for mango/citrus/apple.
- Identification and control of insect pests-mango/guava/citrus/apple/pear/peach.
- Identification and control of diseases in important fruit crops.
- Study of special problems like malformation in mango/citrus decline.
- Selection of mango, citrus, apple and *ber* scion wood.
- Grading and packaging of mango/apple.
- Organoleptic evaluation of cultivators of fruit crops.
- Economics of cultivation of fruit crops.

PAPER - III

**VEGETABLE PRODUCTION
THEORY**

TIME: 80 HRS

- Importance of vegetables and their role in human diet.
- Present status and future scope of vegetable production.
- Classification of vegetables.
- Types and system of vegetable growing including protected cultivation and cropping sequence.
- Nursery raising for vegetables crops.
- Use of growth regulators in vegetables.
- Commercial cultivation of the following in respect to origin, climate, soil, varieties, planting, nutrition, inter culture, irrigation, weed control, plant protection, special problem, maturity, harvesting and grading: Tomato, brinjal, chilli, pepper, okra, cowpea, cluster bean, watermelon, muskmelon, cucumber, gourds, sweet potato, potato, onion, garlic, pea,

cauliflower, cabbage, radish, carrot, beet, spinach, lettuce, fenugreek, tapioca and other vegetables of local importance.

- Seed production in important vegetable crops like tomato, cauliflower, chilli, peas, onion, radish, watermelon and hybrid seed production.
- Economics of vegetable crop production.

PAPER - III

**VEGETABLE PRODUCTION
PRACTICAL**

TIME: 120 HRS

- Visit to vegetable farms and study of system of cultivation.
- Lay out of vegetable fields and preparation of cropping scheme.
- Identification of various vegetable seeds.
- Determining the germination percentage of different types of seeds.
- Pre-sowing seed treatment in vegetable crops.
- Lay out and soil sterilization for vegetable nurseries.
- Preparation of a land and beds for important vegetable crops.
- Use of manure and fertilizers as basal application for important vegetable crops.
- Hardening of nursery seedlings and preparation and use of starter solution.
- Top dressing in vegetable crops with nitrogenous fertilizers.
- Study of nutrient deficiency symptoms in important vegetable crops.
- Interculture operations like hoeing, earthing and staking in tomato, sweet potato, etc.
- Chemical weed control in vegetable crops.
- Identification of important pests of vegetables.
- Control of fruit fly and red pumpkin beetle in cucurbits.
- Identification of important diseases of vegetables.
- Control of major diseases in vegetable crops.
- Visit to a vegetable seed production farm and seed processing unit.
- Harvesting of vegetable crops.
- Grading and packaging of vegetable crops.
- Economics of cultivation of important vegetable crops.

CLASS - XII

PAPER - IV

**FLORICULTURE AND LANDSCAPING
THEORY**

TIME: 80 HRS

- Importance, definition, status and scope of floriculture, landscaping and interior scaping.
- History and styles of gardens.
- Elements and principles of landscape design.
- Design and layout of gardens for home, school, college, public buildings, parks, villages.
- Important components and features of gardens - gate, lawn, shrubbery, flower beds, borders, paths, hedges, edges, steps, statues, fountains, bird baths, streams, pools, waterfalls, planters, terraces, rockeries, pergolas, arches.
- Indoor gardening, principles of interior scaping.

- Ornamental trees, shrubs, climbers and groundcovers, their selection based in landscape value and use, their planting and maintenance.
- Avenue trees.
- Colour schemes with plant materials.
- Establishment and maintenance of lawns.
- Cultivation of bedding plants, bulbs and pot plants.
- Commercial cultivation of the following cut flower crops with respect to soil, climate, varieties, propagation, nutrition, irrigation, weeding, pest control, flower regulation, harvesting, grading, packing and marketing: Rose, chrysanthemum, gladiolus, marigold, carnation, tuberose, jasmine, orchids, crossandra, gerbera, snapdragon, aster and lilies.
- Flower arrangements, use of preservatives for prolonging vase life. Principles of making Bonsai.
- Protected cultivation.
- Seed production of important flower crops.
- Participation in flower shows and exhibitions.
- Economics of cultivation of some commercial flowers.

PAPER - IV

**FLORICULTURE AND LANDSCAPING
PRACTICAL**

TIME: 120 HRS

- Identification of annuals, bulbs and pot plants.
- Preparation of nursery beds and sowing of seeds.
- Preparation of land for lawn.
- Planting and maintenance of lawn.
- Identification of landscape trees, shrubs/climbers and ground covers.
- Propagation of rose, chrysanthemum, succulents.
- Planting of woody plants, bulbs and bedding plants.
- Planting shrubbery, hedges and edges.
- Potting and repotting.
- Garden operations - staking, training, pruning, desukering, pinching, disbudding, topiary.
- Application of fertilizers, pesticides and weedicides.
- Pollination in snapdragon, aster, pansy.
- Harvesting, cleaning, packaging of cut flowers.
- Preparation of garlands, bouquets, *venies*, wreaths and baskets.
- Flower arrangements in different styles using seasonal, cut flowers and cut greens.
- Arranging pots and materials for special decorations.
- Practice in making bonsai.
- Visits to flower growers fields, gardens and flower shows and markets.

PAPER - V

**COMMERCIAL CROPS
THEORY**

TIME: 80 HRS

- Introduction, present status and future prospects of plantation, spice, medicinal and aromatic crops in India.

- Commercial cultivation of the following with respect to origin, distribution, area and production, soil, climate, improved varieties, propagation and nursery techniques, lay out and planting, cultural practices related to nutrition, water management, intercultivation, weed control, plant protection, harvesting, processing, products, storage and marketing of the following:

PLANTATION CROPS: Coconut, arecanut, oil palm, cashewnut, coffee, cacao, rubber, tea and betelvine.

SPICE CROPS: Cardamom, pepper, cinnamon, clove, ginger, turmeric, fennel, cumin and coriander.

MEDICINAL CROPS: Dioscorea, periwinkle, *sarpagandha*, *ashwagandha*, steroid bearing solanum, *isabgol*, senna and liquorice.

AROMATIC CROPS: Lemon grass, citronella, palmarosa, vetiver (*khus*), geranium, patchaouli, davana, mints and rosemary.

MUSHROOMS: Their types, environmental requirements, containers, media and its preparation, disinfection, seeding, look after and care, harvesting, dehydration and packing. Preparation and maintenance of culture.

PAPER - V

**COMMERCIAL CROPS
PRACTICAL**

TIME: 120 HRS

Plantation Crops

- Study of important plantation crops and their varieties.
- Study of nursery practices in coconut.
- Propagation of cashew nut through softwood grafting technique.
- Lay out and planting of coconut and cashew.
- Manuring and application of fertilizers in coffee.
- Study of flowering, fruitset and fruit drop in coconut, arecanut, cashew nut, coffee and oil palm.
- Pollination studies in oil palm.
- Visit to a cashewnut processing factories.
- Visit to coffee, tea and rubber plantation and their processing factories.

Spice Crops

- Raising of cardamom seedlings.
- Study of propagation techniques in pepper, cinnamon, nutmeg and vanilla.
- Processing and curing of ginger and turmeric.

Medicinal and Aromatic Crops

- Study of important spice, medicinal and aromatic crops.
- Extraction of essential oils in plants.
- Preparation of plants of geranium and patchouli through cuttings.
- Study of propagation in aromatic grasses.
- Study of dioscorea species and their propagation.
- Study of flowering and fruitset in dioscorea and vanilla.

Mushrooms

- Study of common cultivated mushrooms and their food value.
- Compost preparation for button mushroom.
- Filling of trays/shelves/bags with compost for button mushroom.
- Spawning in button mushroom.
- Casing in button mushroom.
- Cropping and harvesting of button mushroom.
- Substrate preparation for oyster mushroom.
- Filling and spawning in oyster mushroom.
- Cropping and harvesting of oyster mushroom.
- Substrate preparation for paddy straw mushroom.
- Bed preparation and spawning in paddy straw mushroom.
- Cropping in paddy straw mushroom.
- Post harvest management.
- Management of insect-pests and diseases.

PAPER - VI

POST HARVEST TECHNOLOGY THEORY

TIME: 80 HRS

- Importance and scope of post harvest technology.
- Post harvest changes in different horticultural produce and causes of spoilage/deterioration including role of bacteria and enzymes.
- Post harvest handling procedures: Cleaning, sorting, grading, treatments, packing, storage and transportation.
- Storage of fruits, vegetables and flowers: Methods, condition, preparation for storage like pulsing, pre-cooling, dip-treatment, waxing, packing.
- Principles and methods of preservation and processing: Refrigeration and freezing; Carbonation, heat processing, sundrying and dehydration; use of chemical additives and preservatives and fermentation.
- Establishment of small scale processing unit: Site, finance, buildings, water and power supply, sanitation and drainage, labour, machinery and equipment, lay out plan, economics.

- Canning of important fruits and vegetables: Canning equipment, machinery and containers; selection of fruits and vegetables, sorting and grading, washing, preparation, blanching, filling, syruping or brining, lidding or crunching, exhausting, sealing, sterilization, cooling, inspection of defects, labeling, storage and marketing.
- Preparation and preservation of fruit and vegetable juices and beverages: Equipment machinery and containers, types of fruit beverages and methods of their preservation.
- Preparation and preservation by sugar: Jam, jelly, marmalade preserve, candy and crystalised fruits.
- Preparation and preservation of tomato juice, puree and ketchup.
- Preparation and preservation of *chutney*, sauce spreads.
- Preparation and preservation of pickles.
- Drying and dehydration of important fruits and vegetables: Equipment, pre-treatment, drying, packaging and storage.
- Evaluation of quality of preserved/processed products.
- Processed products specifications and regulations.
- Fruit Products Order (FPO) and Prevention of Food Adulteration Act (PFA).

PAPER - VI

**POST HARVEST TECHNOLOGY
PRACTICAL**

TIME: 120 HRS

- Study of maturity indices for certain fruits.
- Harvesting, assorting and grading of certain fruits.
- Study of curing of onion.
- Visit to small scale preservation unit.
- Preparation and preservation of fruit juice.
- Preparation and preservation of rose syrup.
- Preparation of squash.
- Preparation of lime cordial.
- Preparation of papaya nectar.
- Drying and dehydration of horticultural crops.
- Study of fruit and vegetable preservation equipment and containers.
- Canning of fruits or vegetables.
- Preparation of jam
- Preparation of jelly.
- Preparation of marmalade.
- Preparation and preservation of candy.
- Preparation of mango preserve and leather.
- Preparation of fruit toffee.
- Preparation of tomato ketchup.
- Preparation and preservation of tomato puree.
- Preparation of raisins.
- Preparation of mixed pickles.
- Evaluation of quality of preserved and processed products.
- Cutout test for canned and bottled products and their sensory evaluation.

- Visit to fruit and vegetable market and fruit ripening centres.

ON-THE-JOB TRAINING SITES, SYLLABUS AND EVALUATION (Classes XI & XII)

NAME OF THE SITE: NURSERIES

SYLLABUS: The student will learn about the layout and important components of a nursery, maintenance and propagation structures, hands-on practice of different propagation methods and propagation of various horticultural crops; identification and familiarity with all the ornamental plants, varieties of fruit plants, care and maintenance of mother plants, preparation of potting mixtures, potting and repotting, hardening of plants, packaging of plants for transport, display of nursery plants and assistance in sales.

NAME OF THE SITE: ORCHARDS

SYLLABUS: Study of location and lay out of orchard, crops grown, area, distribution, management practices, farm labour and skilled jobs. Participation in harvesting, grading at farm level and selling. Study of farm records, analysis of economics of fruit production based on records available.

NAME OF THE SITE: DEPARTMENTAL FARMS AND NURSERIES

SYLLABUS: Study of mandate, staff component, budgetary provision, component of farms, area, distribution, buildings and their type, listing of plant species and varieties, farm record and expenditure and income analysis.

Study the area allotted to nursery, propagation structures, type of containers, species multiplied, methods of multiplication, method of package, price list, economic analysis, type of records and participation in preparing nursery bed, pot filling; undertaking cutting, budding, grafting and operations like packing of plants for sale and record writing.

NAME OF THE SITE: PROCESSING UNIT

SYLLABUS: Study of location of unit, building component, tools and machinery and its arrangement, types of products, man power, laboratory, participation in sorting, cleaning, preparation of material, processing, packing, labeling and storage and understanding marketing arrangements and procedure, economic analysis.

NAME OF THE SITE: GROWERS FIELDS/GARDENS/FLOLISTS/HOTELS

SYLLABUS: Identification of ornamental plants, operations for flower production, maintenance of landscape plants and lawns, post harvest handling of cut flowers, preparation of bouquets, garlands, venies, flower arrangement. Arrangement of pots and material for special occasions. Styles of gardens, garden operations.

NAME OF THE SITE: VEGETABLE GARDEN

SYLLABUS: Identification of crops, lay out of fields, important components of crop growing viz., nursery raising, sowing, transplanting, interculture operations, pest management, harvesting, yields, grading, packing and disposal. Acquaintance with the maintenance of records and economics of production.

NAME OF THE SITE: FRUIT AND VEGETABLE MARKETS

SYLLABUS: Nature and variety of fruits and vegetables in market. Channel of markets i.e. from local farms or distant farms, direct from grower or middleman. Means of transport. Quality of fruits/vegetables. Observation for stage of harvest, grade etc. Use and type of storage. Spoilage during storage. Type of containers used, Disposal (through private dealer or co-operative society), commission, octroi, cash sale or credit sale.

EVALUATION OF ON-THE-JOB TRAINING (OJT)

Evaluation of various components of OJT is required to be done by adopting the following techniques.

1) Observation

Since the major emphasis of the OJT programme is on the development of performance skills, work habits and attitudes, observation technique is to be adopted for assessment of the students. The supervisor in consultation with the vocational teacher develops a rating sheet records his observation on various criteria.

2) Interview and viva

Occasionally either the supervisor or the vocational teacher conducts one session with the students to assess his ability to communicate, his maturity, self confidence, comprehension and his overall disposition.

3) Report

The student should prepare a report to be examined by the supervisor and teacher for the jobs assigned to him by the supervisor and submit before the termination of the training.

SUGGESTED LIST OF REFERENCE BOOKS

Sl. No.	Name of Book	Authors	Publishers
1.	Fruit Physiology and Production.	Amar Singh	Kitabistan, Allahabad, India.
2.	Fruits of India - Tropical and Subtropical	Bose, T. K. and Mitra, S. K.	Naya Prakash, Calcutta
3.	Fruits	Rangjit Singh	National Book Trust of India, New Delhi.
4.	Fruit Culture in India	Singh, S, Krishnamurthy, S and Katyal S. L.	ICAR, New Delhi.
5.	Arid Fruits	Chundawat, B. S.	Oxford and IBH New Delhi
6.	Vegetables	Choudhary, B	National Book Trust of India, New Delhi.
7.	Vegetable Production	Chauhan, D. V. S.	Ram Prasad and Sons, Agra.
8.	Vegetable Crops	Bose T. K. and Sons	Naya Prakash, Calcutta
9.	Vegatable Crops in India	Yawalkar, K. S.	Agri Horti Publishing House, Allahabad.
10.	Vegetable Growing for Tropical Region	Prem Nath	ICAR, New Delhi
11.	Seed Production of Vegetable Crops	Panda D. S. and Jarnail Singh	P. A. U., Ludhiana
12.	Mineral Nutrition of Vegetable Crops	Kirti Singh	ICAR, New Delhi
13.	Gardening in India	Bose, TK and Mukherjee	Oxford and IBH, New Delhi
14.	Floriculture in India	Randhava G. S. and Mukhopadhyay A. K.	Allied Publishers, New Delhi
15.	Planning and Planting Design for Home Garden	Desai, B. L.	ICAR, New Delhi
16.	Major Essential Oil Crops of India	Akhtar Hussain et. al.	CIMAP, Lucknow
17.	Beautiful Climbers of India	Pal, B. P.	ICAR, New Delhi.
18.	Flowering Trees	Randhawa, M. S.	N. B. T. India, New Delhi
19.	Garden Flowers	Swarup, V	N. B. T. India, New Delhi
20.	Commercial Flowers	Bose and Yadav	Naya Prakash, Calcutta
21.	Preservation of Fruits and Vegetables	Gardharilal, Siddappa and Tandon	ICAR, New Delhi
22.	A Homescale Preservation		CFTRI, Mysore
23.	Production Technology of Fruit Crops	Shanmugavelu, K. G.	SBA Publication, Calcutta
24.	Production Technology of Vegetable Crops	Shanmugavelu, K. G.	Oxford and IBH, New Delhi
25.	Post Harvest Biotech of Flowers	Salunke, D. K., et. al	
26.	Famous Garden of India	Randhawa, Chadha and	Malhotra Publishing

		Daljit Singh	House, New Delhi
27.	Spices and Plantation Crops	Shanmugavelu, K. G. and Madhav Rao V. N.	Popular Book House, Madras
28.	Medicinal Plants	Jain, S. K.	N. B. T. of India, N. Delhi
29.	Cultivation Practices for Medicinal and Aromatic Plants	Farooqi, A. A. and Khan, M. M.	UAS, Bangalore
30.	Medicinal Plants	Edf Atal C. K. and Kapur B.M.	Regional Research Laboratory, Jammu.
31.	Aromatic Plants	Atal, C. K. and Kapur B.M.	- do -
32.	Fundamentals of Fruit Production-Instructional-cum-Practical Manual (1989)	Dhote, A. K.	NCERT, New Delhi
33.	Fruit Culture-Instructional-cum-Practical Manual (1988)	Dhote, A. K.	NCERT, New Delhi
34.	Plant Propagation - Instructional-cum-Practical Manual (1989)	Dhote, A. K.	NCERT, New Delhi
35.	Vegetable Crops - Instructional-cum-Practical Manual (1988)	Dhote, A. K.	NCERT, New Delhi
36.	Floriculture-Instructional-cum-Practical Manual (1988)	Dhote, A. K.	NCERT, New Delhi
37.	Plant Protection - Instructional-cum-Practical Manual (1988)	Dhote, A. K.	NCERT, New Delhi

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TRAVEL AND TOURISM TECHNIQUES (VOCATIONAL STREAM)

SCHEME OF STUDIES

CLASS XI

Sl. No.	Papers	Theory	Practical
1.	Travel & Tourism Techniques Paper I	100	100
2.	Travel & Tourism Techniques Paper II	100	100
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