Syllabus for the post of PGT Horticulture in DoE

Syllabus for XI and XII:

Present scenario of production of Vegetable, Fruits , Flowers, spices, and aromatic Crops, and Scope in Global Market.

- Protected Cultivation of fruits, Vegetable and flowers and their importance, limitations etc.
- Types of protected structures and components.

- Preparation of Media and Containers for commercial cultivation in Green House.
- Irrigation and fertigation system

- Green House Operations.
- Employee avenues/Opportunities of Horticulture Sector.
- Outdoor Room concept – public area , private area and service area
- Concept of CAD (Computer Aided Design) for landscape designs
- Lawns and their management – Methods of establishments, protection from insects / pests , Nutrition and other relevant aspect in the management of Lawn.
- Flower arrangement- types and styles.
- Methods of Dry flowers making, preparation of value Added products from flowers/ Fruits/ Vegetables.
- Post harvesting of Handling of commercial crops of flowers, vegetables and Fruits etc. including packing and Transportation.
- Protected Cultivations of commercial Vegetables, Fruits, and flower Crops.

Graduation Level: Horticulture syllabus

- Fundamentals of Horticulture
- Plant propagation
- Growth and Development of Horticulture crops.
- Tropical and Development of Vegetable , Fruits
- Temperate fruits, vegetables
- Plant parasitic nematodes
- Fundamental of food Technology
- Principles of Genetics
- Introductory microbiology
- Ornamental Horticulture
- Bio - Chemistry
- Fundamentals of Entomology
- Principles of plant – breeding
- Orchard management
- Breeding of fruits
- Mushroom culture
- Organic farming
- Introductory agroforestry
- Apiculture
- Principles of plant—Biotechnology
- Breeding and seed production

- Medicinal and Aromatic plants
- Processing of horticulture crops

HORTICULTURE

Production Technology of Cool Season Vegetable Crops

Introduction, climatic and soil requirement, commercial varieties/hybrids, sowing/planting times and methods, seed rate and seed treatment, nutritional and irrigation requirements, intercultural operations, weed control, mulching, physiological disorders, harvesting, post-harvest management, plant protection measures and seed production of: potato, cole crops: cabbage, cauliflower, knol khol, sprouting broccoli, Brussels sprout, root crops: carrot, radish, turnip, and beetroot, bulb crops: onion and garlic, Peas and beans, leafy vegetables: palak, methi and coriander cool season vegetables.

Production Technology of Warm Season Vegetable Crop

Introduction, climatic and soil requirements, commercial varieties/hybrids, sowing/planting times and methods, seed rate and seed treatment, nutritional and irrigation requirements, intercultural operations, weed control, mulching, physiological disorders, harvesting, post-harvest management, plant protection measures, economics of crop production and seed production of: Tomato, eggplant, hot and sweet pepper, Okra, cowpea and cluster bean, Cucurbitaceous crops, and sweet potato, amaranths.

Breeding of Vegetable Crops

Origin, botany, taxonomy, cytogenetics, genetics, breeding objectives, breeding methods (introduction, selection, hybridization, mutation), varieties and varietal characterization, resistance breeding for biotic and abiotic stress,

quality improvement, biotechnology and their use in breeding in vegetable crops - molecular marker, genomics,
marker assisted selection and QTLs. Potato and tomato, Eggplant, hot pepper, sweet pepper and okra, Peas and
beans, lettuce, gourds, melons, pumpkins and squashes, cabbage, cauliflower, carrot and radish.

Growth and Development

Cellular structures and their functions; definition of growth and development, growth analysis and its importance
in vegetable production; Physiology of dormancy and germination of vegetable seeds, tubers and bulbs; Role of
auxins, gibberellilns, cyktokinins and abscisic acid; Application of synthetic hormones, plant growth retardants
and inhibitors for various purposes in vegetable crops; Role and mode of action of antitranspirants, anti-auxin,
ripening retardant and plant stimulants in vegetable crop production; Role of light, temperature and photoperiod
on growth, development of underground parts, flowering and sex expression in vegetable crops; apical
dominance; Physiology of fruit set, fruit development, fruit growth, flower and fruit drop; parthenocarpy in
vegetable crops; phototropism, ethylene inhibitors, senescence and abscission; fruit ripening and physiological
changes associated with ripening; Plant growth regulators in relation to vegetable production; morphogenesis and
tissue culture techniques in vegetable crops. sex expression in cucurbits and checking flower and fruit drops and
improving fruit set in Solanaceous vegetables.

Systematics of Vegetable Crops

Principles of classification; different methods of classification; salient features of international code of nomenclature of vegetable crops; Origin, history, evolution and distribution of vegetable crops, botanical description of families, genera and species covering various tropical, subtropical and temperate vegetables; Cytological level of various vegetable crops; descriptive keys for important vegetables; Importance of molecular markers in evolution of vegetable crops; molecular markers as an aid in characterization and taxonomy of vegetable crops.

Post-Harvest Technology of Vegetable Crops

Importance and scope of post-harvest management of vegetables; Maturity indices and standards for different vegetables; methods of maturity determinations; biochemistry of maturity and ripening, enzymatic and textural changes, ethylene evolution and ethylene management, respiration, transpiration, regulation methods; Harvesting tools, harvesting practices for specific market requirements; post-harvest physiological and biochemical changes, disorders-chilling injury in vegetables, influence of pre-harvest practices and other factors affecting post-harvest losses, packaging house operations, commodity pretreatments-chemicals, wax coating, prepackaging and irradiation; packaging of vegetables, post-harvest, diseases and prevention from infestation, principles of transport; Methods and practices of storage-ventilated, refrigerated, MA, CA storage, hypobaric storage, pre-cooling and cold storage, zero energy cool chamber; storage disorders.

Organic Vegetable Production Technology

Importance, principles, prospective, concept and component of organic production of vegetable crops, managing

soil fertility, pest, disease and weed problem in organic farming system, crop rotation in organic vegetable
production. Method of enhancing soil fertility, mulching, raising green manure crops, indigenous methods of
compost, panchgavya, biodynamics preparation, ITKs organic farming. Role of botanicals and bio-control agents.
GAP and GMP, opportunity and challenges in organic production of vegetables.

Hi-tech Production Technology of Vegetable Crops (Protected Cultivation)

Importance and scope of protected cultivation of vegetable crops, principles used in protected cultivation and
greenhouse technology, effect of temperature, carbon dioxide, humidity; energy management, low cost structures,
training methods, engineering effects, Use of plastics, structures including low cost poly-house/green houses and
other structures in vegetable production. Drip and sprinkler irrigation, fertigation, shading, hydroponics and other
production technologies for enhancing productivity and off-season of high value vegetable crops like tomato,
capsicum and cucumber.

Fruit Science/ Pomology

Subtropical and Temperate Fruit Production

Commercial varieties of regional, national and international importance, ecophysiological requirements, recent

trends in propagation, rootstock influence, planting systems, cropping systems, root zone and canopy

management, nutrient management, water management, fertigation, role of bioregulators, abiotic factors limiting

fruit production, physiology of flowering, pollination, fruit set and development, honeybees in cross pollination,

physiological disorders – causes and remedies, quality improvement by management practices; maturity indices,

harvesting, grading, packing, storage and ripening techniques; industrial and export potential, Agri. Export Zones

(AEZ) and industrial supports.

Crops: Apple, pear, quince, grapes, plums, peach, apricot, cherries, litchi, loquat, persimmon, kiwifruit, strawberry,

walnut, almond, pistachio, hazelnut, mangosteen, carambola, bael, wood apple, fig, jamun, rambutan and

pomegranate.

Biodiversity and Conservation

Biodiversity and conservation; issues and goals, centres of origin of cultivated fruits; primary and secondary

centres of genetic diversity; present status of gene centres; exploration and collection of germplasm; conservation

of genetic resources – conservation in situ and ex situ. Germplasm conservation – problem of recalcitrancy – cold

storage of scions, tissue culture, cryopreservation, pollen and seed storage; inventory of germplasm, introduction

of germplasm, plant quarantine; intellectual property rights, regulatory horticulture. Detection of genetic

constitution of germplasm and maintenance of core group; GIS and documentation of local biodiversity,

geographical indication.

Crops: Mango, sapota, citrus, guava, banana, papaya, grapes, jackfruit, custard apple, ber, aonla, Malus &Prunus sp.,

litchi and nuts.

Canopy Management in Fruit Crops

Canopy management – importance and advantages; factors affecting canopy development; Canopy types and

structures with special emphasis on geometry of planting, canopy manipulation for optimum utilization of light.

Light interception and distribution in different types of tree canopies; Spacing and utilization of land area –

canopy classification; Canopy management through rootstock and scion; Canopy management through plant

growth inhibitors, training and pruning and management practices; Canopy development and management in

relation to growth, flowering, fruiting and fruit quality in temperate fruits, grapes, mango, sapota, guava, citrus

and ber.

Breeding of Fruit Crops

Origin and distribution, taxonomical status – species and cultivars, cytogenetics, genetic resources, blossom

biology, breeding systems, breeding objectives, ideotypes, approaches for crop improvement – introduction,

selection, hybridization, mutation breeding, polyploid breeding, rootstock breeding, improvement of quality traits,

resistance breeding for biotic and abiotic stresses, biotechnological interventions, achievements and future thrust

in the following selected fruit crops.

Crops: Mango, banana, pineapple, citrus, grapes, guava, sapota, jackfruit, papaya, custard apple, aonla, avocado,

ber, litchi, jamun, phalsa, mulberry, raspberry, apple, pear, plums, peach, apricot, cherries and strawberry.

Post-Harvest Technology

Maturity indices, harvesting practices and grading for specific market requirements, influence of pre-harvest

practices, enzymatic and textural changes, respiration, transpiration; Physiology and biochemistry of fruit

ripening, ethylene evolution and ethylene management, factors leading to post-harvest loss, pre-cooling;

Treatment prior to shipment, viz., chlorination, waxing, chemicals, bio-control agents and natural plant products,

fungicides, hot water, vapour heat treatment, sulphur fumigation and irradiation. Methods of storage – ventilated,

refrigerated, MAS, CA storage, physical injuries and disorders; Packing methods and transport, quality evaluation,

principles and methods of preservation, food processing, canning, fruit juices, beverages, pickles, jam, jellies,

candies; Dried and dehydrated products, nutritionally enriched products, fermented fruit beverages, packaging

technology, processing waste management, food safety standards.

Growth and Development

Definition, parameters of growth and development, growth dynamics, morphogenesis; Annual, semi-perennial and

perennial horticultural crops, environmental impact on growth and development, effect of light, photosynthesis

and photoperiodism, vernalisation, effect of temperature, heat units, thermoperiodism; Assimilate partitioning

during growth and development, influence of water and mineral nutrition during growth and development,

biosynthesis of auxins, gibberellins, cytokinins, abscisic acid, ethylene, brassinosteroids, growth inhibitors,

morphactins, role of plant growth promoters and inhibitors, developmental physiology and biochemistry during

dormancy, bud break, juvenility, vegetative to reproductive interphase, flowering, pollination, fertilization and

fruit set, fruit drop, fruit growth, ripening and seed development; Growth and developmental process during

stress – manipulation of growth and development, impact of pruning and training, chemical manipulations in

horticultural crops, molecular and genetic approaches in plant growth development.

Biotechnology of Fruit Crops

Harnessing bio-technology in horticultural crops, influence of plant materials, physical, chemical factors and

growth regulators on growth and development of plant cell, tissue and organ culture; Callus culture – types, cell

division, differentiation, morphogenesis, organogenesis, embryogenesis; Use of bioreactors and in vitro methods

for production of secondary metabolites, suspension culture, nutrition of tissues and cells, regeneration of tissues,

ex vitro, establishment of tissue cultured plants; Physiology of hardening – hardening and field transfer, organ

culture – meristem, embryo, anther, ovule culture, embryo rescue, somaclonal variation, protoplast culture and

fusion; Construction and identification of somatic hybrids and cybrids, wide hybridization, in vitro pollination and

fertilization, haploids, in vitro mutation, artificial seeds, cryopreservation, rapid clonal propagation, genetic

engineering and transformation in horticulture crops, use of molecular markers. In vitro selection for biotic and

abiotic stress, achievements of biotechnology in horticultural crops.

Principles and Practices of Plant Propagation

Selection of elite mother plants.

Establishment of bud wood bank. Stock, scion and interstock relationship and incompatibility. Physiology of

dwarfing rootstocks. Rejuvenation, progeny orchard and scion bank. Micropropagation ---- in vitro clonal

propagation, direct organogenesis, embryogenesis, micrografting and meristem culture. Hardening, packing and

transport of micro-propagules.

FLORICULTURE & LANDSCAPING/FLORICULTURE & LANDSCAPE ARCHITECTURE

Breeding

Principles – Evolution of varieties, origin, distribution, genetic resources, genetic divergence. Patents and Plant

Variety Protection in India; Genetic inheritance of flower colour, doubleness, flower size, fragrance, post-harvest

life; Breeding methods suitable for sexually and asexually propagated flower crops and ornamental plants –

introduction, selection, domestication, polyploidy and mutation breeding for varietal development, Role of

heterosis, Production of hybrids, Male sterility, incompatibility problems, seed production of flower crops;

Breeding constrains and achievements made in commercial flowers – rose, jasmine, chrysanthemum, marigold,

tuberose, crossandra, carnation, dahlia, gerbera, gladioli, orchids, anthurium, aster, heliconia, liliums, Breeding

constrains and achievements made in ornamental plants – petunia, hibiscus, bougainvillea, Flowering annuals

(zinnia, cosmos, dianthus, snap dragon, pansy) and ornamental foliages – Introduction and selection of plants for

waterscaping and xeriscaping.

Production Technology of Cut Flowers

Scope of cut flowers in global trade, Global Scenario of cut flower production, Varietal wealth and diversity, area

under cut flowers and production problems in India – Patent rights, nursery management, media for nursery,

special nursery practices; Growing environment, open cultivation, protected cultivation, soil requirements,

artificial growing media, soil decontamination techniques, planting methods, influence of environmental

parameters, light, temperature, moisture, humidity and CO_2 on growth and flowering; Flower production – water

and nutrient management, fustigation, weed management, rationing, training and pruning, disbudding, special

horticultural practices, use of growth regulators, physiological disorders and remedies, IPM and IDM, production

for exhibition purposes; Flower forcing and year round flowering through physiological interventions, chemical

regulation, environmental manipulation; Cut flower standards and grades, harvest indices, harvesting techniques,

post-harvest handling, Pre-cooling, pulsing, packing, Storage and transportation, marketing, export potential,

institutional support, Agril. Export Zones; Crops: Cut rose, cut chrysanthemum, carnation, gerbera, gladioli,

tuberose, orchids, anthurium, aster, lilies, bird of paradise, heliconia, alstroemeria, alpinia, ornamental ginger,

bromediads, dahlia, gypsophilla, limonium, statice, stock, cut foliage.

Production Technology for Loose Flowers

Rose, Jasmine, Marigold, Hibiscus, Chrysanthimum, lotus, lilies, tecoma, pandanus

Landscaping

Landscape designs, Styles of garden, formal, informal and free style gardens, types of gardens, English, Mughal,

Japanese, Persian, Spanish, Italian, Vanas, Buddha garden; Urban landscaping, Landscaping for specific situations,

Institutions, industries, residents, hospitals, roadsides, traffic islands, damsites,. IT parks, corporates; Garden plant

components, arboretum, shrubbery, fernery, palmatum, arches and pergolas, edges and hedges, climbers and

creepers, cacti and succulents, herbs, annuals, flower borders and beds, ground covers, carpet beds, bamboo

groves; Production technology for selected ornamental plants; Lawns, Establishment and maintenance, special

types of gardens, vertical garden, roof garden, bog garden, sunken garden, rock garden, clock garden, colour

wheels, temple garden, sacred groves; Bio-aesthetic planning, eco-tourism, theme parks, indoor gardening,

therapeutic gardening, non-plant components, water scaping, xeriscaping, hardscaping.

Value Addition

Prospects of value addition, National and global scenario, production and exports, Women empowerment through

value added products making, supply chain management; Types of value added products, value addition in loose

flowers, garlands, veni, floats, floral decorations, value addition in cut flowers, flower arrangement, styles,

ikebana, morebana, free style, bouquets, button-holes, flower baskets, corsages, floral wreaths, garlands, etc.;

Selection of containers and accessories for floral products and decorations; Dry flowers – Identification and

selection of flowers and plant parts; Raw material procurement, preservation and storage; Techniques in dry

flower making – Drying, bleaching, dyeing, embedding, pressing; Accessories; Designing and arrangement – dry

flower baskets, bouquets, pot-pourri, wall hangings, button holes, greeting cards, wreaths; Packing and storage;

Concrete and essential oils; Selection of species and varieties (including non-conventional species), extraction

methods, Packing and storage, Selection of species and varieties, Types of pigments, carotenoids, anthocyanin,

Turfing and Turf Management

Prospects of landscape industry, History of landscape gardening, site selection, basic requirements, site

evaluation, concepts of physical, chemical and biological properties of soil pertaining to turf grass establishment;

Turf grasses – Types, species, varieties, hybrids; Selection of grasses for different locations; Grouping according to

climatic r3equirement – Adaptation; Turfing for roof gardens; Preparatory operations; Growing media used for

turf grasses – Turf establishment methods, seeding, sprigging/dibbling, plugging, sodding/turfing, turf plastering,

hydro-seeding, astro-turfing; Turf management – Irrigation, nutrition, special practices, aerating, rolling, soil top

dressing, use of turf growth regulators (TGRs) and micronutrients, Turf mowing – mowing equipments,

techniques to minimize wear and compaction, weed control, biotic and abiotic stress management in turfs;

Establishment and maintenance of turfs for playgrounds, viz. golf, football, hockey, cricket, tennis, rugby, etc.

Computer Aided Designing (CAD) for Outdoor and Indoorscaping

Exposure to CAD (Computer Aided Designing) – Applications of CAD in landscape garden designing, 2D drawing

by AUTOCAD, 3D drawing by ARCHICAD, Creating legends for plant and non-plant components, Basics of

Photoshop software in garden designing; 2D drawing methods, AUTOCAD Basics, Coordinate systems in

AUTOCAD LOT 2007, Point picking methods, Toolbars and Icons, File handling functions, Modifying tools,

Modifying comments, Isometric drawings, Drafting objects; Using patterns in AUTOCAD drawing, Dimension

concepts, Hyperlinking, Script making, Using productivity tools, e-transmit file, making sample drawing for

outdoor and indoor garden by AUTOCAD 2D Drawing techniques, Drawing web format design, Making layout; 3D

drawing methods, ARCHICAD file system, Tools and Infobox, modification tools, structural elements, GDL objects

(Grid Dimensional Linking), Creation of garden components through ARCHICAD; ARCHICAD organization tools,

Dimensioning and detailing of designs, Attribute settings of components, Visualization tools for landscape

preview, data management, plotting and accessories for designing, inserting picture using Photoshop, Making

sample drawing for outdoor and indoor gardens.

SPICES, PLANTATION, MEDICINAL & AROMATIC PLANTS

Production of Plantation Crops

Coffee and tea, Cashew and cocoa, Rubber,

palmyrah and oil palm, Coconut and arecanut, Wattle and betel vine. Role of commodity boards and

developmental institutions in plantation crops.

Production Technology of Spice Crops

Turmeric, ginger and garlic, Coriander, cumin

Production Technology of Medicinal and Aromatic Crops

Aswagandha, Sarpagandha, Aloe vera, Satavari, , lemongrass, Mentha, lavender.

Processing of Plantation Crops, Spices, Medicinal and Aromatic Plants

Commercial uses of spices and plantation crops. Processing of major spices - cardamom, black pepper, ginger,

turmeric, chilli and paprika, vanilla, cinnamon, clove, nutmeg, allspice, coriander, fenugreek, curry leaf. Extraction

of oleoresin and essential oils; Processing of produce from plantation crops, viz. coconut, arecanut, cashewnut, oil

palm, palmyrah, date palm, cocoa, tea, coffee, rubber etc; Processing of medicinal plants– dioscorea, gloriosa,

stevia, coleus, ashwagandha, tulsi, isabgol, safed musli, senna, aloe, catharanthus, etc. Different methods of drying

and storage. Microbial contamination of stored product. Influence of temperature and time combination on active

principles; Extraction and analysis of active principles using TLC/HPLC/GC. Distillation, solvent extraction from

aromatic plants– davana, mint, rosemary, rose, citronella, lavender, jasmine, etc. Study of aroma compounds and

value addition. Nano-processing technology in medicinal and aromatic plants.

Organic Spice and Plantation Crop Production Technology

Importance, principles, perspective, concept and component of organic production of spice and plantation crops;

organic production of spice crops and plantation crops, viz. Pepper, cardamom, turmeric, ginger, cumin, vanilla,

coconut, coffee, cocoa, tea, arecanut; managing soil fertility, pests and diseases and weed problems in organic

farming system; crop rotation in organic horticulture; processing and quality control for organic foods; methods

for enhancing soil fertility, mulching, raising green manure crops. Indigenous methods of compost, panchagavya,

biodynamics, preparation etc.; pest and disease management in organic farming; ITK's in organic farming. Role of

botanicals and bio-control agents; GAP and GMP- certification of organic products: organic production and export -opportunity and challenges.

Annexure-B

Topics of syllabus-Teaching Education and Methodology:-

1. Learning & Teaching
2. Language across the curriculum
3. Understanding discipline and subject
4. Gender school and Society
5. Pedagogy of a school subject
6. Knowledge and curriculum
7. Assessment for learning
8. Creating an inclusive school
9. Childhood and growing up
10. Drama and Art in Education