B.Sc. Horticulture

Programme Code: 105

Programme Summary:

Duration 4 years; 8 semesters

Eligibility

10+2 with minimum 45% marks in aggregate with PCB/PCM.

Program outcomes:

- To study vegetable farming systems, orchard planting systems, water and weed management in fruit, vegetable and flower crops.
- To know the physiology of the plants and application of growth regulators or bioregulators in the horticultural crops
- To study the production, propagation, breeding and seed production, aspects of tropical, sub-tropical and temperate fruits, vegetables, flowers, spices, condiments and medicinal and aromatic crops.
- To know the genetic diversity among the various horticultural crops.
- To enhance the communication skills and command on spoken english.
- To learn the different aspects of statistics and its application in the horticultural plants through the calculation as well as computation of data received from the field.
- To study the basics of the agronomical crops and fundamentals of soil science.
- To know about the plants and animals and their classification as well as characterization.
- To study the introduction of various types of microbes, insects, pathogens, nematodes etc. and their genetic make up, with aim of identification and control in horticultural crops.
- To know the importance, application (biofertilzers, bio-agents, vermicompost and soil amendments) and certification procedure for organic farming.
- To understand and calculate the economics or cost of cultivation of the horticultural crops to the growers or farmers.

Course Outcomes:

S.No.	Course code	Course name	Credits	Course outcomes
				1st Semester
1	SOA/HC 101 T	Fundamentals of Geology and Soil Science	2+1	To study composition of earth's crust, soil as a natural body major components by volume pedology rockstypes Igneous sedimentary and metamorphic classification soil forming minerals. To study the definition classification - silicates, oxides, carbonates, sulphides, phosphates occurrence. To know the weathering of rocksand minerals, weathering factors: physical, chemical, biological agents involved, weathering indices,factors of soil formation, land forms parent, material climate organism, relief time soil forming processes eluviations and illuviation formation of various soils. To understand the problem soils: salted soils, permeable, flooded, sandy soils properties. Physical parameters texture definition methods of textural analysis textural classes, absolute specific gravity definition apparent specific gravity/bulk density factorsinfluencing field bulk density. To study the relation between BD.PD Practical Problem. Pore space definition, factors affecting capillary and noncapillary porosity, soil colour definition, its significance, colour variable hue, value, chroma, Munsell colour chart, factors influencing parent material soil moisture organic matter, soil structure, types of structure, factors influencing genesis of soil structure. To study about Soil air , air composition, amount of air space, soil air renewal, soil temperature sources and distribution of heat, chemical properties humus inorganic secondary silicate clay hydrous oxides. To know the soil organic matter decomposition, pH nutrient availability, soil buffering capacity, soil water forms, hygroscopic, capillary and gravitational, soil moisture constants, hygroscopic coefficient, wilting point, field capacity, moisture equivalent, maximum water holding capacity, energy concepts, pF scale measurement-gravimetric, electric and tensiometer methods. Soil water movement, saturated and unsaturated infiltration and percolation. Soils of different eco-systems and their properties.
2	SOA/HC 102 T	Elementary Plant Biochemistry and Biotechnology	2+1	Understand the significance of Biochemistry Describe the chemistry of carbohydrates, lipids, proteins and amino acids Describe the classification and structural organization of proteins Describe the mechanism of enzyme action and identify the classes of enzymes and

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				factors affecting action Describe the catabolic reactions of carbohydrates, lipids and amino acids Understand Concepts, principles and processes in plant biotechnology. Identify the class and functions of secondary metabolites
3	HC103T	Principles of Plant Physiology	2+1	To know about the metabolic activity and life, cycle of the plant from germination through growth and development. Know importance and scope of plant physiology. Understand the plants and plant cells in relation to water-osmosis, imbibition , diffusion and water potential and the movement of sap and absorption of water in plant body, structure and function of stomata, opening and closing of stomata, different types of stresses- water, cold, heat, plant nutrition and essentiality and mechanism of absorption. Understand the process of photosynthesis particular light and dark reaction, respiration particular emphasis on aerobic and anaerobic respiration, photo-hormones.
4	SOA/HC 104T	Statistics and Computer application	2+1	To know the basic concepts of Variable statistics, types and sources of data, classification and tabulation of data, construction of frequency distribution, tables, graphic representation of data, simple, multiple component and percentage, bar diagram, pie diagram, histogram, frequency polygon and frequency curve. To calculate average and measures of location, mean, mode, median, geometric mean, harmonic mean, percentiles and quadrilles, for raw and grouped data. To know the concept of dispersion: Range, standard deviation, variance, coefficient of variation for raw and grouped data. To understand the probability: Basic concept, additive and multiplicative laws. Theoretical distributions, binominal, poison and normal distributions. Correlation: Scatter diagram, correlation co- efficient and its properties, regression, fitting of simple linear regression. To know the test of significance: Basic concepts, Test of equality of one mean, Chi-square test for application of attributes and test for goodness of fit The outcome was mixture of practical and theoretical explanation of topics concerning computational and statistical approaches. Basics of computer, its input output devices, operating system and programming languages elaborated. Databases to handle data with reference to Horticulture were also discussed.
5	SOA/HAECC 101 T	Structural Grammar and	1+1	To study about the introduction to word classes; structure of the verb in English. To study the uses of tenses.

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		spoken English		To understand the study of voice. To study the uses of conjunctions and prepositions. To learn about sentence patterns in English. To learn the conversations of different situations in everyday life. To learn the concept of stress, stress shift in words and sentences. To study the words with silent letters and their pronunciations. To learn about the basic intonation patterns.
6	SOA/HE 101 T	Introductory Economics	2+0	The students will be able to understand Nature and scope of economics. The students will be able to state the concepts and divisions of economics, and also define economics. The students will be able to state the various theories related to consumer behavior such as equi-marginal utility, indifference curve, diminishing marginal utility. The students will be able to classify goods. The students will be able to state the characteristics of wants. The students will be able to define law of demand and understand the concept of price, income and cross elasticity's. The students will be able to explain consumer's surplus, Theory of firm and factors of production i.e. land, labour, capital and enterprise. The students will be able to describe theories of population. The students will be able to understand Cost concepts. The students will be able to state the Law of supply. The students will be able to explain the theories of rent, wage, interest and profit. The students will be able to understand the concepts of Price determination and forecasting under various market structures.
7	SOA/HE 103 T	Introductory Biology	1+1	To Introduction to the living world and classification of plant kingdom. To study about the binomial Nomenclature; characteristics of algae, fungi, bryophyte, pteridophyta; angiosperms and zymnosperm- structure and functions. To study about Morphology and important modification of root, stem and leaf, inflorescence, flower and fruit, seed structure and germination. To understand about cytology and histology (plant cell and tissues, internal structure of dicot and monocot plants). Introduction to the living world and classification of plant kingdom, binomial Nomenclature; characteristics of algae, fungi, bryophyte, pteridophyta; angiosperms and zymnosperms- structure and functions. Morphology and important modification of root, stem and leaf, inflorescence, flower

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				and fruit, seed structure and germination; cytology and histology (plant cell and tissues, internal structure of dicot and monocot plants). To study the general classification of animal kingdom; characteristics of major groups of Non-chordata and chordate. To know the cell structure and function- cell as unit of life, prokaryotes, eukaryotes, cell organelles. To study the cell division- mitosis, meiosis; origin of life and an elementary knowledge of animal evolution; histology of gut, liver, kidney, ovary, testies and skeletal system of rabbit; physiology of digestion, respiration, circulation, excretion, coordination, endocrine and reproductive system. To understand the economic importance of animals in Forestry/Agriculture.
8	SOA/HE 104 T	Sericulture	1+1	Importance and history of sericulture, future scope. To study Mulberry cultivation geographical distribution, species and varieties, classification, climate, nursery and propagation, field preparation, planting methods, irrigation, manuring, pruning and training, insect pests and diseases and their management. Types of silk worms, morphology and life cycle. Rearing appliances and methods, maintenance of ericulture units, egg production techniques and post cocoon technology. Pests and diseases of silk moth, properties of silk, uses. Economics of sericulture. Recent trends in sericulture. Biology and behaviour of lac insect, host plants. The lac cultivation, manufacturing of shellac and its uses.
2nd Semester				
1	SOA/HC 105 T	Introductory Microbiology	1+1	To understand about history and Scope of Microbiology: To study about the discovery of micro-organism, spontaneous generation conflict, germ theory of diseases, microbial effect on organic and inorganic matter. To learn the Development of microbiology in India and composition of microbial world. To examine about Specimen Preparation and Microscopy: To study about The bright field microscope, fixation, dyes and simple staining, differential staining. Difference between prokaryotic and eucaryotic cells. To learn about the Prokaryotic cell structure and functions. To study about Types of culture media and pre-culture techniques. To study about Microbial growth in models of bacterial, yeast and mycelial growth

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				curve and measurement of bacterial growth. To learn General properties of viruses and brief description of bacterophages. To study about general principle of bacterial genetics, DNA as genetic material. To understand Antibiosis, symbiosis, intramicrobial and extramicrobial association.
2	SOA/HC106 T	Principles of Genetics and Cytogenitics	2+1	Historical background, theories and hypothesis of genetics discussed. Physical basis of heredity including cell reproduction, mitosis, meiosis and its significance explained. Mendel's principles of heredity, deviation from Mendelian inheritance workout with different crosses. Phenomenon of pleiotropy, co-dominance, penetrance and expressivity discussed. Chromosome theory of inheritance with gene interaction explained. Theories of multiple alleles, quantitative inheritance linkage and crossing over, sex linked inheritance discussed. Chemical basis of heredity, structure of DNA its replication and evidence to prove DNA and RNA –as genetic material described. Mutation and chromosomal aberrations discussed.
3	SOA/HC 107 T	Apiculture (1)	1+1	To understand about the morphology, anatomy, colony organization, behaviour, lifecycle, diseases and pests of honey bee. To gain knowledge about the apiculture techniques and recent trends of it. To understand the role of honey bee as pollinator and its role in increasing the productivity of horticultural crops in India economy
4	HC108T	Medicinal and aromatic plants	2+1	To know the different definitions of medicinal and aromatic plants To study the importance and scope of production of medicinal and aromatic Crops To know the cultivation practices and importance of pepper,cardamom,clove, ginger and turmeric, To know the cultivation practices and importance of betelvine, periwinkle, rauvolfia and dioscorea, To know the cultivation practices and importance of isabgol, ammi majus, belladonna, cinchona and pyrethrum To know the cultivation practices and importance of citronella grass, khus grass, sweet flag (bach), lavender and geranium To know the cultivation practices and importance of patchouli, bursera, mentha, muskdana (musk mallow), ocimum To study the endangered medicinal and aromatic plants of India and their conservation strategies

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				To know the chemical composition of a few important medicinal and aromatic plants, their extraction and use. To know the therapeutic and pharmaceutical uses of important species.
5	SOA/HC 109 T	Soil Fertility and Nutrient Management	1+1	Introduction to soil fertility and productivity- factors affecting. Essential plant nutrient elements- functions, deficiency systems, transformations and availability. To study about acid, calcareous and salt affected soils -characteristics and management. To know the role of microorganisms in organic matter- decomposition - humus formation. To know the importance of C:N ratio and pH in plant nutrition. Integrated plant nutrient management. To learn soil fertility evaluation methods, critical limits of plant nutrient elements and hunger signs. NPK fertilizers: composition and application methodology, luxury consumption, nutrient interactions, deficiency symptoms, visual diagnosis.
6	HAECC102 T	Environmental science	1+1	To understand appropriate sociological and technological measures in environment management To focus on ecosystem services and human well being and livelihoods. To learn basis of problems and solutions in natural resource management To find solutions towards more sustainable societies around the globe To learn strategies for waste reduction and disposal To contribute meaningfully for analysis of environmental systems planning and management with both a local and global perspective To understand the concept of sustainable development To be able to cope with the impacts of climate change by adopting adaptation and mitigation measures To prepare the students for national and global employability
7	SOA/HE 105T	Fundamentals of Extension Education	1+1	To know Extension education: meaning, definition, nature, scope, objectives, principles, approaches and history. Forestry extension: process, principles and selected programmes of leading national and international forest institutes. People's participation in forestry programmes. To Motivate women community, children, youth and voluntary organizations for forestry extension work. To understand Rural Development: meaning, definition, objectives and genesis. To transfer of technology programmes like lab to land programme (LLP) national demonstration (ND), front line demonstration (FLD) Krishi Vigyan Kendras (KVK), Technology Assessment and Refinement Programme (TARP) etc. of ICAR.

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				Communication: meaning, definition, elements and selected models. Audio – visual aids: importance, classification and selection. Programming planning process – meaning, scope, principles and steps. Evaluation: meaning, importance and methods. To understand the Scope and importance of Participatory Rural Appraisal (PRA) & Rapid Rural Appraisal (RRA). Management and administration: meaning, definition, principles and functions. The Concepts of human resource development (HRD), rural leadership.
8	SOA/HE 106 T	Fundamentals of Horticulture	1+1	To study the Economic importance and classification of horticultural crops. To learn about the nutritive value of fruits and vegetables. To learn about the area and production of horticultural crops. To understand about the exports and imports of horticultural crops. To learn about fruit and vegetable zones of India and of different states To understand the nursery management practices, soil and climate. To gain knowledge about vegetable gardens, nutrition and kitchen garden and other types of gardens. To understand the principles, planning and layout. To learn about the management of orchards. To understand the planting systems and planting densities. To gain knowledge about production and practices for fruit, vegetables and floriculture crops. To gain knowledge about nursery techniques and their management. To understand the principles and methods of pruning and training of fruit crops. To learn about the types and use of growth regulators in horticulture. To learn about water management, weed management and fertility management in horticultural crops. To study about bearing habit and factors influencing fruitfulness and unfruitfulness. To learn about the rejuvenation of old orchards, top working, frame working To understand about the principles of organic farming.
9	SOA/HE 107 T	Agrometeorology	1+1	To study the definition, aim and scope of agrometeorology. To gain knowledge on the factors and elements of weather and climate. To study the composition and structure of atmosphere. To understand the air and soil temperature regimes. To learn about atmospheric humidity and types of clouds and precipitation, hails and frost.

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				To understand the cyclones, anticyclones and thunderstorms. To learn about solar radiations, their components and effect on plant growth. To understand the effect of weather and climate on the growth and development of crops. To gain knowledge on climatic normals of crops. To understand the agroclimatic zones of India and Himachal Pradesh. To understand evaporation and transpiration. To learn the use of remote sensing techniques in agrometeorology. To learn agriculture weather forecasting.
III Semester				
1	SOA/HC 110 T	Tropical and Sub-Tropical Fruits	2+1	To know about Horticultural classification of fruits including genome classification. To learn about Horticultural zones of India. To understand about detailed study of area, production and export potential, varieties, climate and soil requirements, propagation techniques, planting density and systems, after care, training and pruning. Management of water, nutrient and weeds, special horticultural techniques including plant growth regulators, their solution preparation and use in commercial orchards. Physiological disorders. Post-harvest technology, harvest indices, harvesting methods, grading, packaging and storage of the following crops. Mango, banana, bael, banana. To understand about detailed study of area, production and export potential, varieties, climate and soil requirements, propagation techniques, planting density and systems, after care, training and pruning. Management of water, nutrient and weeds, special horticultural techniques including plant growth regulators, their solution preparation and use in commercial orchards. Physiological disorders. Post-harvest technology, harvest indices, harvesting methods, grading, packaging and storage of the following crops, grapes, citrus, papaya, sapota. To understand about detailed study of area, production and export potential, varieties, climate and soil requirements, propagation techniques, planting density and systems, after care, training and pruning. Management of water, nutrient and weeds, special horticultural techniques including plant growth regulators, their solution preparation and use in commercial orchards. Physiological disorders. Post-harvest technology, harvest indices, harvesting methods, grading, packaging and storage of the following crops. guava, pineapple, jackfruit, avocado, mangosteen. To understand about detailed study of area, production and export potential, varieties, climate and soil requirements, propagation techniques, planting density and systems,

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				after care, training and pruning. Management of water, nutrient and weeds, special horticultural techniques including plant growth regulators, their solution preparation and use in commercial orchards. Physiological disorders. Post-harvest technology, harvest indices, harvesting methods, grading, packaging and storage of the following crops. litchi, carambola, durian and passion fruit. To understand the Bearing in mango and citrus, causes and control measures of special production problems, alternate and irregular bearing overcome, control measures. Seediness and kokkan disease in banana, citrus decline and casual factors and their management. Bud forecasting in grapes. To know about sex expression and seed production in papaya, latex extraction and crude papain production, economic of production. To understand about Rainfed horticulture, importance and scope of arid and semi-arid zones of India. To know about the Characters and special adaptation of crops: ber, aonla, annona, jamun, wood apple, bael, pomegranate, carissa, date palm, phalsa, fig, west Indian cherry and tamarind.
2	SOA/HC 111T	Weed Management in Horticultural Crops	1+1	Weeds: Introduction, harmful and beneficial effects, classification, propagation and dissemination To learn about Weed biology and ecology, crop weed association, crop weed competition and allelopathy To understand the Concepts of weed prevention, control and eradication; To know about Methods of weed control: physical, cultural, chemical and biological methods. Integrated weed management. To know about the Herbicides: advantages and limitation of herbicide usage in India. Herbicide classification, formulations, methods of application. Introduction of Adjuvants and their use in herbicides. Introduction of selectivity of herbicides; Compatibility of herbicides with other agro chemicals. To understand the Weed management in major field and horticultural crops, shift of weed flora in cropping systems. The concept of aquatic and problematic weeds and their control.
3	SOA/HC 112 T:	Tropical and Sub-Tropical Vegetables	2+1	To study of Area, production, economic importance and export potential of tropical and sub-tropical vegetable crops. Description of varieties and hybrid, climate and soil requirements, seed rate, preparation of field, nursery practices; transplanting of

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				vegetable crops and planting for directly sown/transplanted vegetable crops. Spacing, planting systems, water and weed management; nutrient management and deficiencies, use of chemicals and growth regulators. Cropping systems, harvest, yield and seed production.Economic of cultivation of tropical and sub- tropical vegetable crops; Post-harvest handling and storage. Marketing of tomato, brinjal, chillies, okra, amaranthus, cluster eans, cowpea, lab-lab, snap bean, cucurbits, moringa, curry leaf, portulaca and basella.
4	SOA/HC 113T	Orchard Management	1+1	To learn about Orchard management, importance, objectives, merits and demerits. To understand the Clean cultivation, sod culture, Sod mulch, herbicides and inorganic and organic mulches. To learn about Tropical, sub-tropical and temperate horticultural systems, competitive and complimentary effect of root and shootsystems. To study about Biological efficiency of cropping systems in horticulture, systems of irrigation. The Soil management in relation to nutrient and water uptake and their effect on soil environment,moisture,organisms and soil properties. Integrated nutrient and pest management. To Utilization of resources constraints in existing systems. To have a Crop model and crop regulation in relation tocropping systems.
5	SOA/HC 114T	Principles of Plant Breeding	2+1	Introduction, limitations and major achievements in plant breeding discussed.Genetic basis of Plant Breeding explained. Sexual and asexual reproduction discussed. Pollination control mechanism viz., male sterility and self incompatibility described. Genetic components of polygenic variation explained. Hybrid development and concepts of heterosis explained.
6	SOA/HSEC 101 T	Plant Propagation and Nursery Management	1+1	To gain knowledge on plant Propagation and its Need, potentialities and types, sexual and asexual methods To study about sexual and asexual methods of plant Propagation and its advantages and disadvantages. To understand Seed dormancy and its types and internal and external factors To learn about nursery techniques, hardening of plants in nurseries, Nursery registration act, tools and implements and Insect/pest/disease control in nursery To study about mono embrony and polyembrony. To gain knowledge on Propagation structures: Mist chamber, humidifiers, greenhouses, glasshouses, cold frames, hot beds and poly-houses

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				To understand about growth regulators and its use in plant Propagation To gain knowledge on cutting, layering, grafting , budding and Micrografting To study about bio chemical basis of rooting, factors influencing rooting of cuttings and layering To learn about Anatomical studies of bud union, selection and maintenance of mother trees, graft incompatibility, collection of scion wood stick, scion-stock relationship, and their influences. To understand about techniques of propagation through specialized organs, corm, runners, suckers
7	SOA/HE 109 T	Fundamentals of Entomology & Nematology	1+1	Introduction to phylum arthropoda. Importance of class Insecta. Insect dominance. Definition, division and scope of entomology. Comparative account of external morphonology. ypes of mouth parts, antennae, legs, wings and genetallia. Anatomy of digestive, excretory, nervous and reproductive systems. Postembryonic developmenteclosion. Matamorphosis. Types of larvae and pupa. Classification of insects upto orders and families of economic importance and their distinguished characters. History of development of nematology- definition, economic importance. General characters of plant parasitic nematodes, their morphology. taxonomy and classification, biology, symptomatology and control of important plant parasitic nematodes of fruits- tropical, subtropical and temperate fruits, vegetables, tubers, ornamental and plantation crops. Role of nematodes in plant disease complex.
8	SOA/HE 110 T	Introduction to major field Crops	1+1	To study about the classification and distribution of major field crops (Cereals, Legumes, Oilseeds, Fodder Crops) To study about the Concept of Multiple Cropping,Mixed Cropping,Inter Cropping,Relay Cropping. To study about the Methods of Raising,Growing of Field crops. To study about Green Manuring To study about Crop Rotation To Identify weeds of Field Crops To study about the Methods of Fertilizer ,Herbicides and Insecticides Application in field Crops.
9	SOA/HE 111 T	Fundamentals of Plant Pathology	1+1	To understand about introduction to the science of phytopathology, its objectives, scope and historical background.

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				To study about Classification of plant diseases, symptoms, signs, and related terminology. To learn the Parasitic causes of plant diseases (fungi, bacteria, viruses, phytoplasma, protozoa, algae and flowering parasitic plants), their characteristics and classification. To understand about non-parasitic causes of plant diseases. To study about infection process, Survival and dispersal of plant pathogens. To learn the Plant disease epidemiology, forecasting and disease assessment. To Understand about the Principles and methods of plant disease management and Integrated plant disease management.
IV Semester				
1	SOA/HC 115 T	Spices and Condiments	1+1	History, scope and importance, area and production, uses, export potential and role in national economy. Classification, soil and climate, propagation-seed, vegetative and micro propagation systems and methods of planting. Nutritional management, irrigation practices, weed control, mulching and cover cropping. Training and pruning practices, role of growth regulators, shade crops and shade regulation. Harvesting, post-harvest technology, packaging, storage, value added products of Cardamom, pepper, ginger, turmeric and clove. Classification, soil and climate, propagation-seed, vegetative and micro propagation systems and methods of planting. Nutritional management, irrigation practices, weed control, mulching and cover cropping. Training and pruning practices, role of growth regulators, shade crops and shade regulation. Harvesting, post-harvest technology, packaging, storage, value added products of nutmeg, cinnamon, all spice, curry leaf, coriander. Classification, soil and climate, propagation-seed, vegetative and micro propagation systems and methods of planting. Nutritional management, irrigation practices, weed control, mulching and cover cropping. Training and pruning practices, role of growth regulators, shade crops and shade regulation. Harvesting, post-harvest technology, packaging, storage, value added products of fenugreek, fennel, cumin, dill, celery, bishops weed, saffron. Classification, soil and climate, propagation-seed, vegetative and micro propagation systems and methods of planting. Nutritional management, irrigation practices, weed control, mulching and cover cropping. Training and pruning practices, role of growth regulators, shade crops and shade regulation. Harvesting, post-harvest technology, packaging, storage, value added products of vanilla, thyme and rosemary. methods of

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				extraction of essential oil and oleoresins. Economics of cultivation, role of Spice Board and Pepper Export Promotion Council, institutions and research centers in R&D.
2	SOA/HC 116 T	Temperate Fruits	2+1	To gain knowledge on introduction and classification of temperate fruits. To study about areas, production, varieties, climate and soil requirements, propagation, planting density, cropping systems, after care training and pruning, self incompatibility and pollinisers, use of growth regulators, nutrient and weed management, harvesting, post-harvest handling and storage of apple, pear, peach, apricot, cherry, persimmon, strawberry, kiwi, Queens land nut (Mecademia nut), almond, walnut, pecan nut, hazel nut and chest nut. To understand about Re- plant problem and special production problems like pre-mature leaf fall, physiological disorders, important insect – pests and diseases and their control measures rejuvenation
3	SOA/HC117T	Ornamental Horticulture	2+1	Exposure to the history, scope of gardening, aesthetic values. To study about different gardens in India and various styles of garden. To acquaint with the term landscaping, its historical background, definition and basic principles and basic components. To gain the knowledge about floriculture industry and its importance, area and production, To get information about lawn making and various methods of designing rockery, water garden, vertical gardens, roof gardens, etc. To identify various ornamental plants like tree, climbers, shrubs, indoor plants, cactus, palm plants and different summer and winter annual flowering plants. To explore various propagation methods of shrubs and herbaceous perennials. To study the different kinds of flower arrangement and the cut flower crop with under subhead like importance, production details and cultural operations, constraints, post-harvest practices. To understand bio-aesthetic planning and its need in round country planning and in urban planning. To learn the various landscaping of schools, villages, railway stations, dam sites, hydroelectric stations, colonies, river banks, play grounds, parks and public gardens. To get introduced to bonsai and art of making bonsai.
4	SOA/HC 118 T	Water Management in	1+1	To study about mportance of water, water resources in India. Area of different crops under irrigation, function of water for plant growth. To study the effect of moisture

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		Horticultural Crops		stress on crop growth. To learn Available and unavailable soil moisture – distribution of soil moisture – water budgeting –rooting characteristics –moisture extraction pattern. To study water requirement of horticultural crops – lysimeter studies – Plant water potential climatological approach – use of pan evaporimeter. To learn about factor for crop growth stages – critical stages of crop growth for irrigation. To understand about irrigation scheduling – different approaches To study the methods of irrigation –surface and sub-surface pressurized methods viz., sprinkler and drip irrigation, their suitability, merits and limitations, fertigation, economic use of irrigation water. To learn about water management problem, soils quality of irrigation water, irrigation management practices for different soils and crops. To study about Layout of different irrigation systems, drip, sprinkler. Layout of underground pipeline system.
5	SOA/HC 119T	Plantation Crops	2+1	History and development, scope and importance, area and production, export and import potential, role in national and state economy, uses, industrial importance, by products utilization, soil and climate, varieties, propagation: principles and practices of seed, vegetative and micro-propagation, planting systems and method, gap filling, systems of cultivation, mulching, shade regulation, weed and water management, training, pruning and handling, nutrition, foliar feeding, role of growth regulators, soil management, liming practices, tipping practices, top working, physiological disorders, harvesting, post-harvest handling and processing, packaging and marketing, yield and economics of coconut, arecanut. History and development, scope and importance, area and production, export and import potential, role in national and state economy, uses, industrial importance, by productsutilization, soil and climate, varieties, propagation: principles and practices of seed, vegetative and micro-propagation, planting systems and method, gap filling, systems of cultivation, mulching, shade regulation, weed and water management, training, pruning and handling, nutrition, foliar feeding, role of growth regulators, soil management, liming practices, tipping practices, top working, physiological disorders, harvesting, post-harvest handling and processing, packaging and marketing, yield and economics of oil palm, palmyrah palm, cocoa. History and development, scope and importance, area and production, export and import potential, role in national and state economy, uses, industrial importance, by

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				productsutilization, soil and climate, varieties, propagation: principles and practices of seed, vegetative and micro-propagation, planting systems and method, gap filling, systems of cultivation, mulching, shade regulation, weed and water management, training, pruning and handling, nutrition, foliar feeding, role of growth regulators, soil management, liming practices, tipping practices, top working, physiological disorders, harvesting, post-harvest handling and processing, packaging and marketing, yield and economics of cshew nut, coffee, tea and rubber.
6	SOA/HSEC 102 T	Organic Farming	1+1	To study about Introduction, concept, relevance in present context. To understand Organic production requirements; Biological intensive nutrient management-organic manures vermicomposting, green manuring. To learn recycling of organic residues, biofertilizers; Soil improvement and amendments. To study about Integrated diseases and pest management use of biocontrol agents, biopesticides pheromones, trap crops, bird perches; Weed management. To understand about Quality considerations, certification, labeling and accreditation processors, marketing, exports.
7	SOA/HE 112 T	Breeding of Fruit and Plantation Crops	1+1	To gain knowledge on Fruit breeding, history, importance in fruit production To study about distribution, domestication and adaptation of commercially important fruits To learn about variability for economic traits, breeding strategies, clonal selection, bud mutations, mutagenesis. To understand about application in crop improvement, policy manipulations, *in vitro* breeding tools of important fruit and plantation crops.
8	SOA/HE113T	Growth and Development of Horticultural Crops	1+1	To study the growth and development, definitions, components, photosynthetic productivity, leaf area index (LAI) - optimum LAI in horticultural crops, canopy development; different stages of growth, growth curves, growth analysis in horticultural crops. To study the Plant bioregulators- auxin, gibberellin, cytokinin, ethylene inhibitors and retardants, basic functions, biosynthesis, role in crop growth and development, propagation, flowering, fruit setting, fruit thinning, fruit development, fruit drop, and fruit ripening. Flowering-factors affecting flowering, physiology of flowering. To study about photoperiodism, long day, short day and day neutral plants, vernalisation and its application in horticulture, pruning and training physiological basis of training and pruning, source and sink relationship, translocation of assimilates. Physiology of seed development and maturation, seed dormancy and bud dormancy,

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				causes and breaking methods in horticultural crops. To understand Physiology of fruit growth and development, fruit setting, factors affecting fruit set and development,physiology of ripening of fruits-climatic and non climacteric fruits.
9	HE114T	Genetic Resources of Horticultural Crops	1+1	To understand the role of genetic resources- centres of origin and diversity of crops plants- law of homologous series To study about the plant introduction in horticultural crops and exchange of genetic resources To know the principles and concepts of plant quarantine To know the germplasm collection and centres- gene band- gene sanctuary- need for conservation- genetic erosion- germplasm exploration- germplasm conservation- in vitro conservation cryopreservation To study the application of DNA finger printing in Horticulture. To know the wild relatives and sources of resistance to biotic, abiotic stresses and quality characters for fruit, vegetable, flower and plantation crops, spices and medicinal plants. To know the International institutes and organizations for germplasm To understand and know the trade Related Intellectual Property Rights (TRIPPS) and IPR for Indian cultivars.
V Semester				
1	SOA/HC 120 T	Temperate Vegetables	2+1	To gain knowledge on Importance of cool season vegetable crops in nutrition and national economy. To study about Area, production, export potential, description of varieties and hybrids, origin, climate and soil, production technologies, seed production, post-harvest technology, Diseases, insect pest , disorders and Marketing of cabbage, cauliflower, knol-khol, sprouting broccoli, Brussels' sprout, lettuce, palak, Chinese cabbage, spinach, garlic, onion, leek, radish, carrot, turnip, beet root, peas, broad beans, rhubarb, asparagus, globe artichoke.
2	SOA/HC 121 T	Principles of Landscape Gardening	1+1	To understand the Landscaping: historical background, basic principles and components. landscape composition of hills and plains. identification and use of landscape drafting equipments. drawing and designing of home gardens, public parks, avenues, farm complexes and institutions. Layout of formal garden, informal garden, terrace garden, rock garden, bog garden, sunken garden, designing of conservatory and lathe house. Landscape design for specific areas.

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3	SOA/HC 122 T	Farm Power and Machinery	1+1	To know the basic concepts of various forms of energy, unit and dimensions of force, energy and power, calculations with realistic examples. IC Engines: basic principles of operation of compression, ignition and spark ignition engines, two stroke and four stroke engines, cooling and lubrication system, power transmission system, broad understanding of performance and efficiency ractors, power tillers and their types and uses. Electric motors: types, construction and performance comparison. To know Tillage: objectives, method of ploughing. Primary tillage implements: construction and function of indigenous ploughs, improved indigenous ploughs, mould board ploughs, disc and rotary ploughs. Secondary tillage implements: construction and function of tillers, harrows, levelers, ridgers and bund formers. Sowing and transplanting equipment: seed drills, potato planters, seedling transplanter. Grafting, pruning and training tools and equipment. To know the Inter-culture equipment: sweep. Junior hoe, weeders, long handle weeders. To know the Crop harvesting equipments: potato diggers, fruit pluckers, tapioca puller and hoists
4	SOA/HC 123 T	Diseases of Fruits, Plantation and Medicinal and Aromatic Crops	2+1	To study about Etiology, symptoms, mode of spread, epidemiology and integrated management of the diseases of fruits crops *viz* mango, banana, grape, citrus, guava, sapota, papaya, jack fruit, pineapple, pomegranate, ber, apple, pear and peach, plum, almond, walnut, strawberry. To learn the Etiology, symptoms, mode of spread, epidemiology and integrated management of the diseases of plantation crops *viz* areca nut, coconut, oil palm, coffee, tea, cocoa, cashew, rubber, betel vine. To understand about the Etiology, symptoms, mode of spread, epidemiology and integrated management of the diseases of medicinal and aromatic crops *viz* senna, neem, hemp, belladonna, pyrethrum, camphor, costus, crotalaria, datura, dioscorea, mint, opium, Solanum khasianum and Tephrosia. To study about the important post-harvest diseases of fruit, plantation and medicinal and aromatic crops and their management.
5	SOA/HC 124 T	Insect Pests of Fruit, Plantation, Medicinal and Aromatic Crops	2+1	General–economic classification of insects; ecology and insect-pest management with reference to fruit, plantation, medicinal and aromatic crops pest surveillance. Distribution, host range, bio-ecology, injury, integrated management of important insect pests affecting tropical, sub- tropical and temperate fruits, plantation, medicinal and aromatic crops like coconut, areca nut, oil palm, cashew, cacao, tea, coffee, cinchona, rubber, betel vine pest surveillance. Distribution, host range, bio-ecology,

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				injury, integrated management of important insect pests affecting crops senna, neem, hemp, belladonna, pyrethrum, camphor, costus, crotalaria, datura, dioscorea, mint, opium, Solanum khasianum and Tephrosia. Storage insects – distribution, host range, bioecology injury, integrated management of important insect pests attacking stored fruits, plantation, medicinal and aromatic crops and their processed products. Toxicology – insecticide residue problems in fruit, plantation, medicinal and aromatic crops and their tolerance limits.
6	SOA/HSEC103T	Communication Skills and Entrepreneurship Development	1+1	To understand about Entrepreneurship development and how to assess overall business environment in the Indian economy To have a brief overview of Indian social, political and economic systems and their implications for decision making by individual entrepreneurs To learn about Globalisation and the emerging business / entrepreneurial environment To learn the Concepts of entrepreneurship, entrepreneurial and managerial characteristics To understand the management of an enterprise, motivation and entrepreneurship development, importance of planning, monitoring, evaluation and follow up, managing competition, entrepreneurship development programs To understand the SWOT analysis, generation, incubation and commercialization of ideas and innovations Government schemes and incentives for promotion of entrepreneurship Government policy on Small and Medium Enterprises (SMEs) / SSIs. Export and Import Policies relevant to horticulture sector. Venture capital. Contract farming and joint ventures To learn about the Characteristics of Indian horticultural processing and export industry. To understand the Social Responsibility of a Business To study about Communication Skills: Structural and functional grammar To gain knowledge on meaning and process of communication, verbal and non-verbal communication listening and note taking, writing skills, oral presentation skills To maintain field diary and lab record To understand indexing, footnote and bibliographic procedures To have a brief knowledge of reading and comprehension of general and technical articles

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				To understand precise writing, summarizing, abstracting, individual and group presentations, impromptu presentation, public speaking, Group discussion To study about organizing seminars and conferences
7	SOA/HE 115 T	Soil and Plant Analysis	1+1	Methods of soil and plant sampling and processing for analysis. Quantification of minerals and their abundance. Soil structure and aggregate analysis. Theories and concepts of soil moisture estimation – gravimetric, tensiometric, gypsum block, neutron probe and pressure methods. Characterization of hydraulic mobility – diffusion and mass flow. Renewal of gases in soil and their abundance. Methods of estimation of oxygen diffusion rate and redox potential. Soil fertility evaluation methods. Use of radio tracer techniques in soil fertility evaluation. Soil micro-organisms and their importance. Saline, alkali, acid, waterlogged and sandy soils, their appraisal and management. Chemical and mineral composition of horticultural crops. Leaf analysis standards, index tissue, interpretation of leaf analysis values. Principles of working of pH meter, electrical conductivity meter, spectrophotometer, flame photometer and atomic absorption spectrophotometer. Quality of irrigation water.
8	SOA/HE 116 T:	Mushroom Culture	1+1	Introduction to mushroom fungi (Pleurotus, Volvariella and Agaricus) nutritional and medicinal value, edible and poisonous types mushroom Genetic improvement of mushroom Preparation of culture, mother spawn production, multiplication of spawn, cultivation techniques, harvesting, packing and storage Problems in cultivation diseases, pest and nematodes – weed moulds and their management strategies. Economics of cultivation Post harvest technologies.
9	SOA/HE117T	Fundamentals of Food Technology	1+1	To study about Food and its function, physico-chemical properties of foods and food preparation techniques To understand nutrition and its relation to good health. To learn about the Characteristics of well and malnourished population To gain knowledge on Energy and its definition, determination of energy requirements, food energy and total energy To study about Carbohydrates, their classification, properties, functions, sources and

S.No.	Course code	Course name	Credits	Course outcomes
				their requirements To learn about the digestion, absorption and utilization of Proteins, their classification, properties, functions, sources, requirements, digestion, absorption, essential and non-essential amino acids, quality of proteins To learn PER/NPR/NPU, supplementary value of proteins and their deficiency To understand about Lipids – classification, properties, functions, sources, requirements, digestion, absorption and utilization, saturated and unsaturated fatty acids, deficiency, rancidity, refining of fats To learn about Mineral nutrition, macro and micro-minerals (Ca, Fe and P), functions, utilization, requirements, sources, effects of deficiency To have a knowledge on Vitamins, functions, sources, effects of deficiency, requirements of water soluble and fat-soluble vitamins To understand about Balanced diet, recommended dietary allowances for various age groups, assessment of nutritional status of the population
VI Semester				
1	SOA/HC 125 T	Potato and Tuber Crops	1+1	To study of origin, area, production economic importance and export potential of potato and tropical, subtropical and temperate tuber crops; To learn description of varieties and hybrids. Climate and soil requirements, season; seed rate; preparation of field; planting practices; spacing; water nutrient and weed management; nutrient deficiencies. To study about the use of chemicals and growth regulators; cropping systems. To learn about harvesting practices, yield; seed production, economics of cultivation. Post-harvest handling and storage, field and seed standards, marketing of the following Crops: potato, tapioca, sweet potato, arrow root, cassava, colocasia, xanthosoma, amorphophallus, dioscorea, jerusalem artichoke, horse radish and other under-exploited tuber crops.
2	SOA/HC 126 T	Breeding of Vegetable Tuber and Spice Crops	2+1	To know the centres of origin, plant bio-diversity and its conservation. Modes of reproduction, pollination systems and genetics of important vegetable, tuber and spice crops. To understand Selfincompatibility and male sterility, its classification and application in crop improvement. To study the principles of breeding self-pollinated crops, pure line selection, mass selection, heterosis breeding, hybridization, pedigree method, mass pedigree method,

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				bulk method, modified bulk method, single seed descent method and back cross method. To study the Polyploidy breeding. To study the Mutation breeding. Principles of breeding cross pollinated crops, mass selection, recurrent selection, heterosis breeding, synthetics and composits. To know the Application of biotechnology in crop improvement of crops: Solanaceous vegetables, cole crops, cucurbits, bulb crops, root crops, leafy vegetables, okra, leguminous crops.
3	SOA/HC 127T	Post-Harvest Management of Horticultural Crops	2+1	To study the importance of post-harvest technology in horticultural crops To learn about maturity indices, harvesting, handling, grading of fruits, vegetables, cut flowers, plantation crops, medicinal and aromatic plants To understand the Pre-harvest factors affecting quality and the factors responsible for deterioration of horticultural produce To learn the physiological and bio-chemical changes, hardening and delaying ripening process To gain knowledge on Post-harvest treatments of horticultural crops. Quality parameters and specification To write about the Structure of fruits, vegetables and cut flowers related to physiological changes after harvest To learn the various Methods of storage for local market and export. To gain knowledge on Pre-harvest treatment and precooling, pre-storage treatments Different systems of storage, packaging methods and types of packages, recent advances in packaging To learn the types of containers and cushioning materials, vacuum packaging, cold storage, poly shrink packaging, grape guard packing treatments To learn about the different Modes of transport in various horticultural crops
4	SOA/HC 128 T	Seed Production of Vegetable, Tuber and Spice	2+1	To study about seed and its history of seed industry in India To gain knowledge on Differences between grain and seed and mportance and scope of vegetable seed production in India To learn about Principles of vegetable seed production. To understand about Role of temperature, humidity and light in vegetable seed production To study about Methods of seed production of cole crops, root vegetables, solanaceous vegetables, cucurbits, leafy vegetables, bulb crops, leguminous vegetables and exotic vegetables.

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				To gain knowledge on Seed germination and purity analysis, Field and seed standards To learn about Seed legislation, Seed drying and extraction.
5	SOA/HC 129 T	Insect Pests of Vegetable, Ornamental and Spice Crops	2+1	To be learn about the economic importance of insects in vegetable, ornamental and spice crops To be introduce the ecology and pest management with reference to these crops. Pest surveillance in important vegetable, ornamental and spice crops. To study the distribution, host range, bio-ecology, injury, integrated management of important insect-pests affecting vegetable, ornamental and spice crops. To introduce the basic concepts of Important storage insect-pests of vegetable, ornamental and spice crops, their host range, bioecology, injury and integrated management. To learn the insect –pests of processed vegetables and ornamental crops, their host range, bio-ecology, injury and integrated management. To Solve the insecticidal residue problems in vegetables and ornamental crops, tolerance limits etc.
6	SOA/HSEC 104 T	Commercial Floriculture	1+1	To study about the scope and importance of commercial floriculture in India, To learn various production techniques of ornamental plants like rose, marigold, chrysanthemum, orchid, carnation, gladiolus, jasmine, dahlia, tuberose, bird of paradise, china aster and gerbera for domestic and export market. To get the knowledge of growing of flowers under protected environments such as glass house, plastic house etc., To get acquaint with the knowledge of post harvest technology of cut flowers in respect of commercial flower crops, dehydration technique for drying of flowers, To learn production techniques for bulbous plants
7	SOA/HE 118T	Breeding and Seed Production of Ornamental Plants	1+1	History and objectives of ornamental plant breeding discussed. Crop improvement methods like introduction, selection, hybridization, mutation and biotechnological technique explained. Breeding strategies for disease resistance described. Development of promising cultivars of important ornamentals. Role of heterosis and its exploitation explained. Hybrid seed production using male sterility elaborated. Production of open pollinated varieties and concept of seed certification described.
8	SOA/HE 119 T	Diseases of Vegetable, Ornamental and	1+1	To study about Etiology, symptoms, mode of spread, epidemiology and integrated management of diseases of the following vegetable crops: tomato, brinjal, chilli, bhindi, cabbage, cauliflower, radish, knol-khol, pea, beans, potato, beet root and onion.

S.No.	Course code	Course name	Credits	Course outcomes
		Spice Crops		To study about Etiology, symptoms, mode of spread epidemiology and integrated management of diseases of the following spice crops: fenugreek, ginger, garlic, turmeric, pepper, cumin, cardamom, nutmeg, coriander, clove, cinnamon. To learn about Etiology, symptoms, mode of spread, epidemiology and integrated management of diseases of the following ornamental crops jasmine, rose, crossandra, tuberose, geranium. To understand Important post-harvest diseases of vegetables and ornamental crops and their management.
9	SOA/HE 120 T	Protected Horticulture	1+1	Importance and scope, basic principles of protected cultivation. Green and polyhouse designs. green house environment control, heating and cooling system- use of portable tunnel. Green house cultivation of important horticultural crops- rose, carnation, gerbera, orchids, anthurium,tomato, bell, pepper and strawberry. Insect pest and disease management under protected cultivation.
VII Semester				
1	SOA/HC 130 T	Processing of Horticultural Crops	2+1	To gain knowledge on Importance and scope of fruit and vegetable preservation industry in India To study about food pipe line, losses in post-harvest operations, unit operations in food processing. To learn about Principles and guidelines for the location of processing units To understand about Principles and methods of preservation by heat pasteurization, canning, bottling To gain knowledge on Methods of preparation of Jam, jelly and marmalade Pickling, chutneys juices, tomato products, mushrooms products squashes, syrups, cordials and fermented beverages. To learn about Processing of plantation crops, products, spoilage in processed foods, quality control of processed products To study about Govt. policy on import and export of processed fruits. Food laws.
2	SOA/HC 131 T	Protected Cultivation of Horticultural Crops 1.Project Preparation 1.Project	3+3	Visit to commercial polyhouses, Project preparation and planning. Specialised lectures by commercial export house.

S.No.	Course code	Course name	Credits	Course outcomes
		Preparation		
3	SOA/HC 132 T	Nursery Production and Management	3+3	Project preparation
4	SOA/HSEC 105 T	Horti- Business Management	2+0	To study farm management definition, nature, characteristics and scope. To learn Farm management principles and decision making, production function, technical relationships, cost concepts, curves and functions – factors, product, relationship – factors relationship, product relationship, optimum conditions, principles of opportunity cost-equi-marginal returns and comparative advantages, To understand time value of money, economic of scale, returns to scale, To learn cost of cultivation and production, break even analysis, decision making under risk and uncertainty. To understand Farming systems and types. Planning – meaning, steps and methods of planning, types of plan, characteristics of effective plans. To learn Organizations – forms of business organizations, organizational principles, division of labour. To understand Unity of command, scalar pattern, job design, span of control responsibility, power authority and accountability. To learn direction – guiding, leading, motivating, supervising, coordination meaning, types and methods of controlling – evaluation, control systems and devices. To understand budgeting as a tool for planning and control. Record keeping as a tool of control. To understand Functional areas of management – operations management – physical facilities, implementing the plan, scheduling the work, controlling production in terms of quantity and quality. To understand the materials management – types of inventories, inventory costs, managing the inventories, economic order quantity (EOQ). To understand Personnel management – recruitment, selection and training, job specialization. To learn Marketing management – definitions, planning the marketing programmes, marketing mix and four P' s. Financial management – financial statements and rations, capital budgeting. To prepare project and its evaluation measures.

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VIII Semester				
1	SOA/HC 132T	Horticultural Work Experience 1.	6	The students will spend one full semester working with State Department of Horticulture; Horticulture based industries, commercial horticulture farms, plantation industries etc. to gain **first hand information and hands-on-training** in the chosen area of interest Project Preparation
2	SOA/HC 133P	Horticultural Work Experience II.	6	Field Work
3	SOA/HC 134 T	Horticultural Work Experience III.	6	Report writing, Presentation and Discussion