

Program Outcomes (POs)
Program Specific Outcomes (PSO)
Course Outcomes (COs)



DEPARTMENT OF HORTICULTURE

**DOON (P.G.) COLLEGE OF AGRICULTURE SCIENCE AND TECHNOLOGY
SELAQUI, DEHRADUN, UTTARAKHAND.**

DEPARTMENT OF HORTICULTURE
H.N.B. Garhwal University, Srinagar (Garhwal), Uttarakhand, India-246 174 Course Curriculum for B. Sc.
Horticulture, 2021-22 under CBCS Course

B.Sc. (Hons.) Horticulture (4-year degree programme)

Programme Outcomes

1. To transfer knowledge of Horticulture in the field of agricultural quality production and management especially in fruits, vegetables, flowers, spices, medicinal and aromatic plants.
2. To develop innovative agro- techniques for enhancing the quality production and productivity of horticultural crops.
3. To create job opportunities for the unemployed youths through teaching, hands-on training and extension activities.
4. To increase farmers' income through adopting hi-tech horticulture.
5. To establish models nurseries for enhancing availability of quality planting materials round the year.
6. To conserve and exploit biological diversity for crop improvement through effective crop management systems.
7. To extend post-harvest shelf life of horticultural commodities and increase income through processing and value addition of the products and to reduce post-harvest losses.

Programme Specific Outcome

The course in Bachelor's programme in Horticulture provides basic knowledge about core, elective and skill enhancement courses like fundamentals of geology and soil science, elementary idea about plant biochemistry & biotechnology, plant physiology, statistics & computer application, structural grammar and spoken English, introductory economics, applied mathematics, introductory biology, sericulture, introductory microbiology, principles of genetics and cytogenetics, apiculture, medicinal and aromatic plants, soil fertility and nutrient management, environmental science, fundamentals of extension education, fundamentals of horticulture, agrometeorology, introductory agroforestry, fundamentals of entomology & nematology, introduction to major field crops, fundamentals of plant pathology,

This degree main focused on tropical and subtropical fruits, weed management in horticultural crops, tropical and subtropical vegetables, orchard management, principles of plant breeding, propagation and nursery management, spices and condiments, spices and condiments, temperate fruits, ornamental horticulture, water management in horticultural crops, plantation crops, organic farming, breeding of fruits and plantation crops, growth and development of horticultural crops, genetic resources of horticultural crops,

temperate vegetables, principles of landscape gardening, farm power and machinery, diseases of fruit, plantation, medicinal and aromatic crops, insect pests of fruit, plantation, medicinal & aromatic crops, communication skills & entrepreneurship development, soil and plant analysis, mushroom culture, fundamentals of food technology, potato and tuber crops, breeding of vegetable, tuber and spice crops, post-harvest management of horticultural crops, seed production of vegetable, tuber and spice crops, insect pests of vegetable, ornamental and spice crops, commercial floriculture, breeding and seed production of ornamental plants, diseases of vegetable, ornamentals and spice crops, protected horticulture, processing of horticultural crops, , Horti-business management.

This course also gives innovative idea during project preparation on protected cultivation of high value horticultural crops, project preparation on nursery production and management and Horticultural Work Experience (HWE).

Scope of B.Sc. Horticulture

Students with a degree in Horticulture enter a broad range of challenging and rewarding professional careers in production, management, marketing, education and research in both public and private sectors. Students often open their own business enterprises such as fruit/vegetable/flower production, landscape design/build and maintenance houses/companies, nurseries, greenhouses, garden centers and off-season cultivation. Because plants are everywhere and plant life is essential to human existence, careers for students with a degree in horticulture are likely to be available throughout the country and abroad.

Course no.	Paper Title	Course outcome
Semester I		
Core		
SOA/HC/UG 01 T	Fundamentals of Soil Science	<ul style="list-style-type: none"> • Understand about the composition of earth's crust, pedology, rocks types and soil forming minerals. • Familiar about weathering of rock, sand and minerals, problem soils and physical parameters of soil. • Relation between BD and PD, factors affecting capillary and non-capillary porosity. • Introduce about soil air composition, distribution of heat, chemical properties of humus. • Know about soil organic matter decomposition, soil buffering capacity and soil water forms. • Have the knowledge of moisture equivalent, maximum water holding capacity and different soils eco-systems and their properties.
SOA/HC/UG 02 T	Elementary Plant Biochemistry	<ul style="list-style-type: none"> • Learn about classification of carbohydrates, lipids, protein and enzymes with occurrence, classification, functions and important. • Understand about metabolism of lipid, lipases and phospholipases fatty acid oxidation. Biosynthesis of fatty acids, protein metabolism proteolytic enzyme.
SOA/HC/UG 03 T	Medicinal and Aromatic Plants	<ul style="list-style-type: none"> • Know about the history, scope, opportunities, importance and constraints in the cultivation and utilization of medicinal and aromatic plants in India. • Understand the origin, distribution, production, climatic and soil requirements, propagation and nursery techniques, planting and aftercare and training of important medicinal and aromatic plants. • Aware about therapeutic and pharmaceutical uses and economics of important medicinal and aromatic plants. • Familiar about endangered medicinal and aromatic plants of India and their conservation. • Know the chemical composition of a few important medicinal and aromatic plants, their extraction and use.
SOA/HC/UG 04 T	Fundamentals of Extension Education	<ul style="list-style-type: none"> • Understand the nature, scope, objectives, principles, approaches and history of extension education. • Explained the extension systems in India, communication, classification and selection of audio-visual aids. • Know the scope and importance of Participatory Rural Appraisal (PRA) & Rapid Rural Appraisal (RRA). • Aware about origin, meaning, definition and objectives of rural development. • Familiar about meaning, importance and methods of evaluation; meaning, definition, principles and functions of management and administration, concepts of human resource development and rural leadership.

Ability Enhancement Compulsory Course (AECC)

SOA/HAECC/UG 01 T	Communication Skills and Personality Development	<ul style="list-style-type: none"> • Aware the overall business environment in the Indian economy, concept of personality development, motivation & communication skills, importance of planning, monitoring, evaluation & follow up, managing competition, , SWOT analysis, commercialization of ideas and innovations. • Understand about communication skills, field diary, lab record, precise writing, summarizing, abstracting and individual & group presentations techniques.
Elective		
SOA/HE/UG 01 T	Economics and Marketing	<ul style="list-style-type: none"> • Know about the nature, scope, concepts, divisions and systems of economics. • Understand the theory of consumer behaviour, laws of consumption, classification of goods, law of diminishing marginal utility, law of equi-marginal utility and indifference curve. • Acquired about theory of demand, demand schedule, market demand, price, income and cross elasticity. • Gain the knowledge of capital and its characteristics, enterprises, laws of return, market equilibrium and distribution.
SOA/HE/UG 02 T	Elementary Plant Biotechnology	<ul style="list-style-type: none"> • Know the historical developments in bio-technology and application of plant tissue culture in plant improvement. • Familiar about genetic engineering techniques, production of secondary metabolites and germplasm conservation. • Understand the introduction to bioinformatics, genomics and proteomics, biodegradation of forestry wastes through genetically engineered microbes.
SOA/HE/UG 03 T	Fundamentals of Horticulture	<ul style="list-style-type: none"> • Understand the economic importance, cultivation, nutritive value, area and production of horticultural crops. • Study of various horticultural zones to assess their suitable growing condition, climate, soil for specific crops. • Understand the fundamentals aspects of vegetable, fruit, flower growing by nursery management practices. • To practice orchard management techniques via; planting system, training, pruning, weed management, water management to lower the input cost and to increase economic yield.
SOA/HE/UG 04 T	Information and Communication Technology	<ul style="list-style-type: none"> • Understand basic concepts of variable statistics, simple, multiple components, bar diagram, pie diagram, histogram, frequency polygon and frequency curve. • Determine average and measures of location, mean, mode, median, dispersion and probability. • Understand the theoretical distributions, binominal, normal distributions, correlation and regression.

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| | | <ul style="list-style-type: none">• Make aware of test of significance and computer application. |
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Course no.	Paper Title	Course outcome
Semester II		
Core		
SOA/HC/UG 05 T	Introductory Crop Physiology	<ul style="list-style-type: none"> • Understand the water relations in plants, stomata, structure, distribution, classification with working principles and factors affecting transpiration. • Get knowledge of different types of stresses, plant nutrition essentiality, photosynthesis, structure and function of chloroplast. • Know the respiration, glycolysis, TCA cycle and Electron transport chain, ATP synthesis and factors affecting the respiration. • Discuss about the photohormones and physiological role in controlling plant process.
SOA/HC/UG 06 T	Principles of Genetics and Cytogenetics	<ul style="list-style-type: none"> • Understand the historical background of genetics, theories, hypothesis, cell reproduction and cell division. • Know about Mendelian genetics, chromosome theory of inheritance and gene interaction. • Acquired knowledge about multiple alleles, quantitative inheritance linkage, sex linked inheritance and characters. • Know the cytoplasmic inheritance and maternal effects, structure of DNA and its replication. • Understand the evidence to prove DNA and RNA – as genetic material, mutations and chromosomal aberrations.
SOA/HC/UG 07 T	Fundamentals of Plant Pathology	<ul style="list-style-type: none"> • Understand the objectives, scope and historical background of phytopathology and classification of plant diseases. • Provided the characteristics and classification of parasitic causes of plant diseases. • Aware the key concepts of non-parasitic causes of plant diseases, infection process, survival and dispersal of plant pathogens. • Knowledge about disease epidemiology, forecasting and disease assessment. • Focused on principles and methods of plant disease management and also IPDM.
SOA/HC/UG 08 T	Elementary Statistics and Computer Application	<ul style="list-style-type: none"> • The methods of data collection, classification and tabulation and presenting the same in diagrammatic and graphic form. To calculate the different measures of central tendency and dispersion for raw and grouped data and their merits and demerits. • The basic concepts of Probability and an idea about the distributions for discrete and continuous random variables. Selecting simple random samples by using random numbers. To calculate the strength of relationship and functional relationship of two variables by applying Karl Pearson's Correlation coefficient and regression techniques • The designs that can be adopted when there are two factors involved in the same experiment like Factorial RBD, Split plot design and Strip plot design and also an idea about the analysis of experiments conducted in different seasons or different locations. • An introduction to basics of computer like hardware, software, operating systems (Windows) . • Learning to do statistical analysis using technology is required of all students and is an integral part of the course.

SOA/HC/UG 09 T	Soil Fertility and Nutrient Management	<ul style="list-style-type: none"> ● Aware about soil fertility and productivity, deficiency systems, transformation and availability of nutrients. ● Understand the differences between problematic soils. ● Familiar about role of micro-organisms in organic matter decomposition, soil fertility evaluation methods and integrated nutrient management. ● Learn about NPK fertilizers with their composition, application methodology, luxury consumption, nutrient interactions, deficiency symptoms, visual diagnosis
Ability Enhancement Compulsory Course		
SOA/HAECC/ UG 02 T	Environmental Science and Disaster Management	<ul style="list-style-type: none"> ● Understand the past and present status of global and Indian environment. ● Know environmental pollution and pollutants, and biological magnification of toxins. ● Gain knowledge about deforestation, India, international and voluntary agencies for environmental conservation. ● Familiar about International conferences, conventions and summits, environmental policy and legislation in India. ● Understand about introduction to environmental impact assessment, causes of environmental degradation and socio-economic factors.
Elective		
SOA/HE/UG 05 T	Introductory Microbiology	<ul style="list-style-type: none"> ● Familiar about history, scope and development of microbiology and composition of microbial world. ● Understand about microscopy and specimen preparation. ● Know the structure, functions and difference between prokaryotic and eucaryotic cells and rokaryotic cell. ● Understand the types of culture media and pre-culture techniques and also deneral properties of viruses and brief description of bacteriophages. ● Aware about general principle of bacterial genetics, antibiosis, symbiosis, intramicrobial and extra-microbial association.
SOA/HE/UG 06 T	Apiculture, Sericulture and Lac culture	<ul style="list-style-type: none"> ● Explained the importance and history of apiculture, different species of bees, morphology, anatomy, colony organization and life cycle. ● Have an idea about bee-keeping equipment, social behaviour, reproduction seasonal management and economics of beekeeping. ● Focused on recent trends in apiculture and role of bees in increasing the productivity of horticultural crops in India economy
SOA/HE/UG 07 T	Agrometeorology	<ul style="list-style-type: none"> ● Know about weather, climate and their different factors and elements. And also composition and structure of atmosphere ● Aware about mechanisms of atmospheric humidity, clouds types, types and complete process of precipitation. ● Remote sensing and its different techniques that are used in agro-metrology. ● Understand about basic knowledge and concept about wind, evapo-transpiration and agro-climatic zones of India ● Different phenomenon's of weather and climate effect on growth and development of crops.

SOA/HE/UG 08 T	Introductory Agroforestry	<ul style="list-style-type: none">• Understand about definition, objectives and potential of agroforestry.• Know the agroforestry system, sub-system and practices.• Familiar about planning for agroforestry with their constraints, diagnosis and design methodology.• Aware about national and overseas agroforestry projects and also management practices of MPTS.• Acquired about economic cultivation of <i>Acacia catechu</i>, <i>Dalbergia sissoo</i>, <i>Tectona</i>, <i>Populus</i>, <i>Morus</i>, <i>Grewia</i>, <i>Eucalyptus</i>, <i>Quercus</i> spp., bamboo, tamarind, neem etc.
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Course no.	Paper Title	Course outcome
Semester III		
Core		
SOA/HC/UG 10 T	Tropical and Subtropical Fruits	<ul style="list-style-type: none"> • Aware about fundamental of fruit cultivation by studying climate, varieties, soil requirement, planting and intercultural operation and other essential techniques for optimum crop yield. • Know about underutilized fruit crops which can be grown in marginal land or waste land. • Capable to identify the various physiological disorders of fruit trees and their suitable control measures to lowers the crop losses. • Assessing maturity indices of fruit to obtain quality produce and practices of handling of fruits to minimize the post harvest losses.
SOA/HC/UG 11 T	Weed Management in Horticultural Crops	<ul style="list-style-type: none"> • Identify the common weeds grown around the cultivated area and also study the adverse effects of weeds on crop yield. • Learn about weed biology, ecology and crop weed association. • Make familiar to various tools and equipments and methods of weeds control to minimize crop yield losses without affecting environment. • Practice of formulation of herbicides.
SOA/HC/UG 12 T	Tropical and Subtropical Vegetables crops	<ul style="list-style-type: none"> • Familiar regarding area, production, economic importance and export potential of tropical and sub-tropical vegetable crops. • Understand about use of chemicals and growth regulators in production of tropical and sub-tropical vegetable crops. • Aware about the importance, production technology, physiological disorder, post-harvest handling, storage, marketing and seed production techniques and of important tropical and subtropical vegetables.
SOA/HC/UG 13 T	Orchard and Estate Management	<ul style="list-style-type: none"> • Know about purpose and maintaining different orchards floor management practices. • Aware about weeds control, soil erosion and to conserve soil moisture in the orchard. • Understand about <i>In-situ</i> conservation of water by reducing its evaporative losses from soil surface. • Learn about increase land use efficiency by different cropping system and proper land use in space and time dimension to get more number of crops • Familiar about water requirement of fruit crops at critical stages of growth and development. • Identifying of major pest, diseases and disorder of different fruit plants in the orchard and also understand about crop modeling.
SOA/HC/UG 14 T	Principles of Plant Breeding	<ul style="list-style-type: none"> • Know about plant breeding, genetic basis, quantitative and molecular aspects. And also concepts, estimation and genetic basis of heterosis • Understand the different sexual and asexual reproduction, also pollination control mechanism with their implications of reproductive systems on population structure. • Familiar about genetic components of polygenic variation and breeding strategies, selection as a basis of crop breeding.

		<ul style="list-style-type: none"> • Understand about the role of hybridization and selection, goals of hybridization, selection of plants population developed by hybridization. • Familiar about simple crosses, bulk crosses and complex crosses and also general and special breeding techniques.
Skill Enhancement Compulsory Course		
SOA/HSEC/UG 01 T	Propagation and Nursery Management	<ul style="list-style-type: none"> • Explained about need and potentialities of plant multiplication. • Familiar about different sexual and asexual method with advantages and disadvantages. • Discussed about different propagation structures like mist chamber, humidifiers, greenhouses etc. • Know the physiological & bio chemical basis of rooting, factors influencing rooting of cuttings and layering, graft incompatibility, anatomical studies of bud union, techniques of propagation through specialized organs, corm, runners, suckers and micro-grafting.
Elective		
SOA/HE/UG 09 T	Fundamentals of Entomology	<ul style="list-style-type: none"> • Explained the phylum arthropoda, insect dominance, history of nematology and scope of entomology and nematology. • Learn about external morphology and anatomy of insect and nematodes. . • Know the postembryonic development and matamorphosis of insects. • Aware about classification of insects and nematodes with role of nematodes in plant disease complex. • Understand the biology, symptomatology and control of important plant parasitic nematodes of important horticultural crops.
SOA/HE/UG 10 T	Introduction to Major Field Crops	<ul style="list-style-type: none"> • Familiar about basic aspect of major field crop with their classification and distribution. • Understand about cropping system, crop rotation, preparation of cropping scheme, green manuring etc • Learn about cultivation practices and management of major cereals, pulses, oil seeds and fodder crops.
SOA/HE/UG 11 T	Water Management in Horticultural Crops	<ul style="list-style-type: none"> • Learn about importance of water and water resources in India. • Know about area of different crops under irrigation, function of water for plant growth, effect of moisture stress on crop growth. Understand about available and unavailable soil moisture and its distribution, water budgeting, moisture extraction pattern, water requirement of horticultural crops and irrigation scheduling. • Learn various irrigation methods and their layout including the traditional ones and the latest methods like sprinkler and drip. • Aware different water management problems, quality of irrigation water and irrigation management practices for different soils and crops.

Course no.	Paper Title	Course outcome
Semester IV		
Core		
SOA/HC/UG 15 T	Spices and Condiments	<ul style="list-style-type: none"> ● Share the history, scope, importance, area, production, uses, export potential and role in national economy of spices. ● Explained the classification, value added product and methods of extraction of essential oil and oleoresins. ● Discuss the botany, varieties, soil & climate, propagation, planting season, training, pruning, manure & fertilizer, inter-cultural operation, growth regulators, shade regulation, harvesting, processing, yield and value added product of important major and minor spices and condiments. ● Know the function of spice board and pepper export promotion council, institutions and research centres in R&D of spices and condiments.
SOA/HC/UG 16 T	Temperate Fruits	<ul style="list-style-type: none"> ● Aware the knowledge of area, production, climate, soil requirement and management of different temperate fruit crops. ● Informed about varieties, hybrid varieties and rootstocks of temperate fruit crops ● Know about application of fertilizer and irrigation in different temperate fruit crops ● Study about different training and pruning methods in temperate fruit crops for better yield and quality attributes. ● Familiar about major insect-pest, diseases and disorders of temperate fruit crops.
SOA/HC/UG 17 T	Ornamental Horticulture	<ul style="list-style-type: none"> ● Familiar about gardens in India, its history, scope and types of gardens, historical background. ● Understand about landscaping, its concept, basic principles and components. ● Learn about construction and designing of lawn, rockery and special types of garden. ● Explain about propagation and utilization of different ornamental plants viz; trees, climbers, creepers, flowers, etc in landscape gardening. ● Aware about art and concept of flower arrangement and bonsai making and also know about bio-aesthetic planning to beautify the public places.
SOA/HC/UG 18 T	Breeding of Fruits and Plantation Crops	<ul style="list-style-type: none"> ● Understand the history and importance in fruit production of India. ● Know distribution, domestication and adaptation of commercially important fruits and variability for economic traits. ● Understand the breeding strategies, clonal selection, bud mutations, mutagenesis and its application in crop improvement. And also <i>in vitro</i> breeding tools.
SOA/HC/UG 19 T	Plantation Crops	<ul style="list-style-type: none"> ● Acquainted about area, production, climate and soil requirement of plantation crops. ● Learn about production and management of plantation crops. ● Learn about different varieties, propagation, fertilizer, irrigation, training and pruning methods of plantation crop ● Understand critical harvesting and processing of various plantation crops. ● Aware about major insect pest, diseases and disorders of plantation crops.
Skill Enhancement Compulsory Course		

SOA/HSEC/UG 02 T	Organic Farming	<ul style="list-style-type: none"> ● Idea of organic farming concept and need of organic crop production. ● Focused on different farming practices such as mixed farming, co-cultivation/polyculture, intercropping, shifting cultivation, organic cyclic optimization and soil improvement and fulfill our requirement of organic crop production. ● Familiar on research regarding new organic techniques that how we can utilize all the form of organic waste. ● Focused on assurance to consumers in term of products quality, consumer acceptance regarding product, practices are eco-friendly and sustain soil's fertility level. ● Understand the organic quality consideration, the role of certification authorities, accreditation, labeling, inspection, marketing, export and explained the present scenario of organic crop production in state wise in India and world.
Elective		
SOA/HE/UG 12 P	Nematode pests of horticultural crops and their Management	<ul style="list-style-type: none"> ● identify plant parasitic nematodes as pests of horticultural crops, ● Describe the types of injury, damage symptoms and life histories of plant parasitic nematodes, ● Calculate the threshold injury level and crop loss due to nematode infestations ● Discuss quarantine regulations procedure implemented against plant parasitic nematodes, ● Demonstrate practical skills in identification of plant parasitic nematodes and their damage symptoms, and quantify nematode populations in a crop field using appropriate sampling technique
SOA/HE/UG 13 T	Growth and Development of Horticultural Crops	<ul style="list-style-type: none"> ● Know the definitions, components, photosynthetic productivity, leaf area index in horticultural crops. ● Understand the canopy development; different stages of growth, growth curves, growth analysis in horticultural crops. ● Know plant bioregulators, flowering factors, physiology of flowering, photoperiodism, vernalisation, pruning and training, source and sink relationship. ● Familiar about physiology of seed development, seed dormancy, bud dormancy, fruit growth and development.
SOA/HE/UG 14 T	Dry land Horticulture	<ul style="list-style-type: none"> ● Aware about importance, limitations, present status, future scope and constraints of dry land horticulture. ● Know the agro-climatic features in rain shadow areas, scarce water resources, high temperature, soil erosion, run-off losses etc. ● Familiar about soil and water conservation methods, in-situ water harvesting methods and methods of reducing evapo-transpiration. ● Familiar about water use efficiency, economic and conjunctive use of water and micro systems of irrigation etc.

Course no.	Paper Title	Course outcome
Semester V		
Core		
SOA/HC/UG 20 T	Temperate Vegetables	<ul style="list-style-type: none"> Familiar regarding importance of vegetables in human diet as well as in Indian economy along with their export potential. Understand regarding importance and nutritive value of vegetables in human diet and nutrition. Know the importance, production technology, post-harvest technology, seed production techniques and physiological disorder of cole crops, root crops, bulb crops, leafy vegetable, pea, broad bean, rhubarb, asparagus and globe artichoke.
SOA/HC/UG 21 T	Principles of Landscape Architecture	<ul style="list-style-type: none"> Understand the landscaping, historical background, basic principles and components. Explained and identification how to use different landscape drafting equipments. Know how to draw and design home gardens, public parks, avenues, farm complexes and institutions. Knowledge of layout of formal garden, informal garden, terrace garden, rock garden, bog garden, sunken garden etc.
SOA/HC/UG 22 T	Farm Power and Machinery	<ul style="list-style-type: none"> Understand the basic concepts of various forms of energy, basic principles of operation of different types of engines, cooling & lubrication system and power transmission system of an IC engines. Learn the major function of tillage operation with their objectives and method of ploughing. Know about the sowing, transplanting, grafting, pruning, training inter-culture and crop harvesting equipments. Explained about the types and uses of tractors and power tillers.
SOA/HC/UG 23 T	Diseases of Fruit, Plantation, Medicinal and Aromatic Crops	<ul style="list-style-type: none"> Explained about etiology, symptoms, mode of spread, epidemiology and integrated management of important diseases of fruits, plantation, medicinal and aromatic crops. Learn the important post-harvest diseases of fruit, plantation and medicinal and aromatic crops and their management
SOA/HC/UG 24 T	Insect Pests of Fruit, Plantation, Medicinal & Aromatic Crops	<ul style="list-style-type: none"> Explained the general economic classification of insects, ecology, pest surveillance and management of fruit, plantation, medicinal and aromatic crops. Aware the distribution, host range, bio-ecology, injury, integrated management of important insect pests affecting fruit, plantation, medicinal and aromatic crops. Understand the distribution, host range, bio-ecology, injury, integrated management of important storage and processed insect pests affecting fruit, plantation, medicinal and aromatic crops.
Skill Enhancement Compulsory Course		
SOA/HSEC/UG 03 T	Entrepreneurship Development and Business Management	<ul style="list-style-type: none"> Learners will pick up about Foundation of Entrepreneurship Development and its theories. Learners will explore entrepreneurial skills and management function of a company with special reference to SME sector. Learners will identify the type of entrepreneur and the steps involved in an entrepreneurial venture.

		<ul style="list-style-type: none"> • Learners will understand various steps involved in starting a venture and to explore marketing methods & new trends in entrepreneurship.
Elective		
SOA/HE/UG 15 T	Soil, Water and Plant Analysis	<ul style="list-style-type: none"> • Collection of soil and plant sample from different soil and plant materials. • Understand the sufficiency or deficiency levels of nutrient in plant and soil sample analysis. • Learn about working principles and procedure of all laboratory machine and equipment. • Developing skills in management of problem soils and poor-quality irrigation waters.
SOA/HE/UG 16 T	Mushroom Culture	<ul style="list-style-type: none"> • Familiar the mushrooms fungi, poisonous and edible types with their nutritional value, medicinal value and genetic improvement. • Focused on types of edible mushroom like <i>Pleurotus</i>, <i>Volvariella</i> and <i>Agaricus</i> • Learn about preparation of culture, mother spawn production, multiplication of spawn, cultivation techniques, harvesting, packing and storage. • Aware about diseases, pest, nematodes, weeds moulds and their management strategies. • Know the idea related to economics of cultivation and post-harvest technologies of mushrooms.
SOA/HE/UG 17 T	Fundamentals of Food Technology	<ul style="list-style-type: none"> • Understand the physico-chemical properties of foods, food preparation techniques and nutrition. • Know the classification and properties of carbohydrates, protein and lipids, essential and non-essential amino acids, quality of proteins, PER/NPR/NPU and deficiency. • Aware about the vitamins and mineral nutrition with their functions and deficiency. • Know the balanced diet of recommended dietary allowances for various age groups and assessment of nutritional status of the population.

Course no.	Paper Title	Course outcome
Semester VI		
Core		
SOA/HC/UG 25 T	Potato and Tuber crops	<ul style="list-style-type: none"> • Know regarding origin, area, production, economic importance and export potential of potato and tropical, subtropical and temperate tuber crops. • Familiar about importance, growing technology (SPT and TPS), seed production practices and physiological disorders of potato. • Understand the importance, production technology and seed production practices of tapioca, sweet potato, dioscorea, amorphophallus, arrow root, colocasia, xanthosoma, jerusalem artichoke, horse radish and other under exploited tuber crops.
SOA/HC/UG 26 T	Breeding of Vegetable, Tuber and Spice Crops	<ul style="list-style-type: none"> • Notify about the historical landmarks and development of modern day varieties of vegetable, tuber and spice crops. • Learn various breeding methods used for crop improvement in vegetable, tuber and spices crops. • Aware about the various types of host reactions in disease resistance and the source of resistance used in breeding for development of resistance. • Focused on role of heterosis in hybrid seed production and different steps involved in seed production of vegetable, tuber and spices. • Familiar about genetics of important vegetable, tuber and spice crops with its breeding objectives and different breeding techniques involved.
SOA/HC/UG 27 T	Post harvest Management of Horticultural Crops	<ul style="list-style-type: none"> • Learn about maintaining shelf life and quality of horticultural commodity for long term use. • Acquainted with harvesting methods of horticultural crops, post harvest handling and management of horticultural crops. • Identify commodity ready to harvest on the basis of different maturity indices. • Understand different storage method and their principles for horticultural crops to reduce losses and increase shelf life of commodity. • Knowledge of application of different treatment to minimize losses and major post harvest insect pest and disorder which caused spoilage and low market value of commodity.
SOA/HC/UG 28 T	Seed production of Vegetable, tuber and Spice Crops	<ul style="list-style-type: none"> • Aware the history of seed industry in India also importance and scope of vegetable seed production in India. • Understand differences between grain and seed and also principles of vegetable seed production. • Familiar about role of temperature, humidity and light in vegetable seed production. • Understand about seed germination, purity analysis, field & seed standards, Seed drying & extraction and seed legislation. • Familiar about methods of seed production of cole crops, root crops, solanaceous vegetables, cucurbits, leafy vegetables, bulb crops, leguminous vegetables.

SOA/HC/UG 29 T	Insect Pests of Vegetable, Ornamental and Spice Crops	<ul style="list-style-type: none"> • Explained the economic importance of insects, ecology, surveillance and pest management with references to vegetable, ornamental and spice crops. • Focused on distribution, host range, bio-ecology, injury, integrated management of important insect-pests affecting vegetable, ornamental and spice crops, storage insect-pests and insect-pests of processed vegetable and ornamental crops. • Knowledge about integrated pest management, insecticidal residue problems and tolerance limits in vegetables and ornamental crops.
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Skill Enhancement Compulsory Course

SOA/HSEC/UG 04 T	Commercial Floriculture	<ul style="list-style-type: none"> • Explained the scope and importance of commercial floriculture in India. • Know about the production techniques of important ornamental plants for domestic and export market. • Understand growing of flowers under protected environments such as glass house, plastic etc. • Aware of post-harvest technology of cut flowers in respect of commercial flower crops and dehydration technique for drying of flowers.
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Elective

SOA/HE/UG 18 T	Breeding and Seed Production of Ornamental Plants	<ul style="list-style-type: none"> • Acquaint about the historical landmarks and development contributed to modern day cultivars of commercial ornamental crops. • Learn various breeding techniques used for crop improvement in ornamental crops. • Understand the role of heterosis in hybrid seed production and importance of F₁ hybrids in ornamental crops • Explained the different steps involved in seed production, harvesting of flower seeds and time of collection of different flower seeds of ornamentals. • Know about genetics of important ornamental crops.
SOA/HE/UG 19 T	Diseases of Vegetable, Ornamentals and Spice Crops	<ul style="list-style-type: none"> • Aware the etiology, symptoms, mode of spread, epidemiology and integrated management of important diseases of vegetables, ornamental and spice crops. • Idea of important post-harvest diseases of vegetables and ornamental crops and their management.
SOA/HE/UG 20 T	Precision Farming and Protected Cultivation	<ul style="list-style-type: none"> • To enhance productivity in agriculture with respect to profit. Prevents soil degradation in cultivable land. • Reduction of chemical use in crop production. Efficient use of water resources • Dissemination of modern farm practices to improve quality, quantity & reduced cost of production in agricultural crops • Understand the history, principles, importance, scope and theoretical aspects of protected cultivation • Developing skills in erection of protected structures and cultivation of horticultural crops. • Aware of environment control in the protected structure as per requirement of the crops.

		<ul style="list-style-type: none"> • Understand soil and water management and also crop regulation methods for protected cultivation. • Learn about post-harvest, insect-pest and disease management methods for protected cultivation
Course no.	Paper Title	Course outcome
Semester VII		
Core		
SOA/HC 130 T	Processing of Horticultural Crops	<ul style="list-style-type: none"> • Learning about preparation of heat-based preservation like canning and bottling. • Know the preparation of many preserve food materials like jam, jelly marmalade, squash, RTS, nectar, pickle etc. with their problems and precaution. • Aware about causes of spoilage and their remedy in food preservation. • Student will learn different preservatives used for preserving for food and also familiar to different machine and equipment used in food preservation laboratory. • Learn about standards for preparing food preserves.
SOA/HC 131 T	Protected Cultivation of High Value Horticultural Crops I. Project preparation	<ul style="list-style-type: none"> • Learn about designs of green- house structures, cultural and management practices of high value crops. • Know about integrated pest management, post-harvest management, certification, distribution and cost of production. • Learn about report writing, presentation and discussion
SOA/HC 132T	Nursery Production and Management I. Project preparation	<ul style="list-style-type: none"> • Familiar about nursery registration methodology, certification, establishment and management of plant propagating structures. • Know the procurement of inputs techniques and management for large scale production of plant material. • Understand about working out economics and aware about report writing, presentation and discussion
Skill Enhancement Compulsory Course		
SOA/HSEC 105 T	Horti-Business Management	<ul style="list-style-type: none"> • Understand the elements, importance and basic principles of farm management. • Familiar about fundamental of Horti-business management and functions of management. • Focused on various tasks to be performed in different functional areas of Horti-business. • Developing ability to take decision regarding choice of enterprise and input use in Horti-business. • Enhancing skills to execute the management function in farm and Horti-business.
Elective		

SOA/HE 121P	Protected Cultivation of High Value Horticultural Crops II. Report writing, presentation and discussion.	<ul style="list-style-type: none"> • Preparing the report regarding protected cultivation of high value horticultural crops. • Presenting and discussing the prepared report on protected cultivation of high value horticultural crops.
SOA/HE 122P	Nursery Production and Management II. Report writing, presentation and discussion.	<ul style="list-style-type: none"> • Preparing the report regarding nursery production and management • Presenting and discussing the prepared report on nursery production and management

Course no.	Paper Title	Course outcome
Semester VIII		
Core		
SOA/HC 132 T	Horticultural Work Experience (HWE) I. Project preparation	
SOA/HC 133 P	Horticultural Work Experience (HWE) II. Field Work	<ul style="list-style-type: none"> • Spending 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.
SOA/HC 134 T	Horticultural Work Experience (HWE) III. Report writing, presentation and discussion	<ul style="list-style-type: none"> • Preparation of report about the studied topic. • Presentation and discussing the report of the studied topic.



