

**Semester wise distribution of courses offered for
Under Graduate Program B.Sc. (Hons.) Horticulture**

Semester –I

Sr. No.	Course Code	Course Title	Credit hr.
1.	MAS – 303	Mathematics - I	2(2+0)
2.	SES – 316	Fundamental of Soil Science	3(2+2)
3.	BCBT – 304	Elementary Biochemistry & Biotechnology	3(2+2)
4.	BIOL – 315	Introductory Crop Physiology	3(2+2)
5.	HORT – 311	Fundamentals of Horticulture	3(2+2)
6.	HORT – 312	Principles of Landscape Gardening	2(1+2)
7.	MBFT – 348	Introduction to Microbiology	3(2+2)
8.	GPB – 318	Principles of Genetics and Cytogenetics	3(2+2)
9.	MVE – 301	Moral and value education	2(2+0)
10.	LNG – 301	Structural grammar and Spoken English (New)	3(2+2)
11.	PED – 303	Physical Education (New)	1(0+2)
Total			28 (19+18)

Total Classes = 38

Semester –II

Sr. No.	Course Code	Course Title	Credit hr.
1.	MAS – 304	Mathematics - II	2(2+0)
2.	HORT – 317	Tropical and Subtropical Fruits	3(2+2)
3.	HORT – 316	Tropical and Subtropical Vegetables	3(2+2)
4.	GPB – 319	Principles of Plant Breeding	3(2+2)
5.	SES – 317	Soil Fertility and Nutrient Management	3(2+2)
6.	APFE – 302	Principles of Food Technology	2(1+2)
7.	SWLE – 303	Water Management in Horticultural Crops	3(2+2)
8.	HORT – 315	Plant Propagation and Nursery Management	3(2+2)
9.	BIOL – 316	Growth and Development of Horticultural Crops	3(2+2)
10.	ENVS – 512	Agriculture Disaster Management	2(2+0)
Total			27(19+16)

Total Classes = 35

Semester –III

Sr. No.	Course Code	Course Title	Credit hr.
1.	PPR – 411	Fundamentals of Plant Pathology	3(2+2)
2.	ENT – 412	Fundamentals of Entomology	3(2+2)
3.	HORT – 413	Temperate Vegetables	3(2+2)
4.	PPR – 413	Nematode pests of Horticultural crops and their Mgt.	3(2+2)
5.	PPR – 422	Diseases of Fruit, Plantation, Medicinal and Aromatic Crops	3(2+2)
6.	FMPE – 416	Farm Power and Machinery	3(2+2)
7.	HORT – 415	Temperate Fruits	3(2+2)
8.	AGRN – 426	Weed Management in Horticultural Crops	3(2+2)
9.	HORT – 414	Commercial Floriculture	3(2+2)
Total			27(18+18)

Total Classes = 36

Semester –IV

Sr. No.	Course Code	Course Title	Credit hr.
1.	HORT – 411	Spices and Condiments	3(2+2)
2.	PPR – 412	Mushroom Culture	2(1+2)
3.	HORT – 423	Ornamental Horticulture	3(2+2)
4.	HORT – 424	Plantation Crops	3(2+2)
5.	HORT – 417	Breeding of Fruit and Plantation Crops	3(2+2)
6.	HORT – 416	Orchard Management	2(1+2)
7.	SES – 413	Soil and Plant Analysis	3(2+2)
8.	PPR – 418	Insect Pests of Fruit, Plantation, Medicinal & Aromatic Crops	3(2+2)
9.	AEAB – 419	Introductory Economics	2(2+0)
10.	AEAB – 423	Agricultural Marketing, Trade & Price	2(1+2)
11.	EXT – 419	Entrepreneurship Development & Communication Skills	3(2+2)
Total			29 (19+20)

Total Classes = 39

Semester –V

Sr. No.	Course Code	Course Title	Credit hr.
1.	HORT – 511	Organic Farming	3(2+2)
2.	ENVS – 511	Environmental Science	2(1+2)
3.	AGRN – 513	Introduction to Major Field Crops	3(2+2)
4.	HORT – 512	Medicinal and Aromatic crops	3(2+2)
5.	AGFO – 512	Introductory Agro-forestry	3(2+2)
6.	GPB – 524	Breeding of Vegetable, tuber and Spice Crops	3(2+2)
7.	PPR – 514	Diseases of Vegetable, Ornamentals and Spice Crops	3(2+2)
8.	EXT – 516	Fundamentals of Extension Education	3(2+2)
9.	SWLE – 607	Remote Sensing & GIS	2(1+2)
Total			25(16+18)

Total Classes = 34

Semester –VI

Sr. No.	Course Code	Course Title	Credit hr.
1.	PPR – 517	Apiculture	3(2+2)
2.	PPR – 520	Insect Pests of Vegetable, Ornamental and Spice Crops	3(2+2)
3.	HORT – 525	Post-harvest Management of Horticultural Crops	3(2+2)
4.	HORT – 526	Seed production of Vegetable, tuber and Spice Crops	3(2+2)
5.	HORT – 527	Breeding and Seed Production of Ornamental Plants	3(2+2)
6.	HORT – 528	Processing of Horticultural Crops	3(2+2)
7.	AEAB – 521	Horti-Business Management	3(2+2)
8.	SWLE – 516	Landscape Engineering	3(2+2)
9.	HORT – 529	Communication Skills & Entrepreneurship Development	2(1+2)
Total			26(17+18)

Total Classes = 31

VII and VIII Semester

Sr. No.	Course Code	Course Title	Credit hr.	Weeks
1.	RAEDP – 623	Experiential Learning	20	24
2.	RAEDP – 624	Village visit / Research Station	10	10
3.	RAEDP – 625	In-plant training/Entrepreneurship Development	10	10
Total			40	44

1st Semester

MAS – 303

Mathematics - I

2(2-0)

Algebra

Theory of quadratic, Binomial-Theorem (for +ve index), Use of natural & common logarithms, exponential series, partial-fractions, Determinants of order 3, Theory of Matrices, addition, subtraction, multiplication, transpose, elementary ideas on adjoint & inverse. Solution of linear equations, inequalities, permutation & combination.

Trigonometry

Trigonometrical- functions, addition & subtraction formula, double & half angle formula laws of sines & cosines, solutions of triangles, height & distance, real & complex-numbers, hyperbolic trigonometric functions. De-Moivre's Theorem.

Coordinate-Geometry: Distance between two points, Area of triangle, Straight-lines

SES – 316

Fundamentals of Soil Science

3(2+2)

Theory: Composition of earth's crust, soil as a natural body – major components. Problem soils: salt soils, permeable, flooded, sandy soil properties. Physical parameters; texture – definition, methods of textural analysis, Stokes' law, assumption, limitations, textural classes, use of textural triangle; absolute specific gravity, definition, apparent specific gravity/bulk density – factors influencing, field bulk density. Relation between BD (bulk density), AD – practical problems. Pore space – definition, factors affecting capillary and non-capillary porosity, soil colour – definition, its significance, colour variable, value hue and chroma. Munsell colour chart, factors influencing, parent material, soil moisture, organic matter, soil structure, definition, classification, clay prism like structure, factors influencing genesis of soil structure, soil consistency, plasticity, Atterberg's constants. Soil air, air capacity, composition, factors influencing, amount of air space, soil air renewal, soil temperature, factors influencing, measurement, chemical properties, soil colloids, organic, humus, inorganic, secondary silicate, clay, hydrous oxides. Ion exchange, cation-anion importance, soil organic matter decomposition, pH and 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, soil orders; land capability classification; soil of different eco-systems and their properties, management of problem soils– soils environmental quality. Determination of quality parameters.

Practical: Collection and preparation of soil samples, estimation of moisture, EC, pH and bulk density. Textural analysis of soil by Robinson's pipette method, chemical analysis of soil – Fe₂O₃, P, K, Ca, Mg and S, total N, organic carbon and cation exchange capacity.

Theory: Carbohydrates: Occurrence classification and structure, physical and chemical properties of carbohydrates, isomerism, optical activity, reducing property, reaction with acids and alkalis, ozone formation. Lipids: Classification, important fatty acids and triglycerides, essential fatty acids. Physical and chemical control of oils, their rancidity, phospholipids, types and importance. Plant pigments – structure and function of chlorophyll and carotenoids, sterols, basic structure, role of brassinosterols in plants. Proteins: Classification, function and solubility, amino acids – classification and structure, essential amino acids, properties of amino acids, colour reactions, amphoteric nature and isomerism; structure of proteins – primary, secondary tertiary and quaternary properties and reaction of proteins. Enzymes: Classification and mechanism of action; factors affecting enzyme action, co-factors and coenzymes. Vitamins and minerals as co-enzymes/co-factors. Carbohydrate metabolism – glycolysis and TCA-cycle; metabolism of lipids, fatty acid oxidation, biosynthesis of fatty acids, electron transport chain, bioenergetics of glucose and fatty acids, structure and function of nucleic acid replication, transcription and translation. History of biotechnology. Fundamental principles, micro-propagation and scope for commercialization. Application of micro-grafting in horticultural crops, meristem culture, anther culture, pollen culture, embryo culture, callus culture, cell culture, somoclonal variation, protoplast isolation, culture, fusion and applications. Cryopreservation .Genetic engineering. Future scope and present trends. Importance of biotechnology in horticulture

Practical: Preparation of standard solutions and reagents. Carbohydrates – qualitative reaction, estimation of starch, reducing and non-reducing sugars; reaction of proteins, estimation of proteins by Lowery method. Estimation of free fatty acids; determination of iodine number of vegetable oils. Vitamins – estimation of ascorbic acid. Paper and thin layer chromatography. Sterilization techniques – composition and preparation of media – micropropagation of tomato. Callus culture, sub-culturing, induction of rooting-techniques in hardening

Theory: Water Relations in Plants: Role of water in plant metabolism, osmosis inhibition, diffusion, water potential and its components, measurement of water potential in plants, absorption of water, mechanism of absorption and ascent of sap. Stomata: Structure, distribution, classification, mechanism of opening and closing of stomata. Osmotic pressure, guttation, stem bleeding; transpiration methods and mechanism and factors affecting transpiration. Drought: Different types of stresses; water, heat and cold tolerance; mechanism of tolerance. Plant Nutrition: Essentiality, mechanism of absorption and its role in plant metabolism. Photosynthesis, structure and function of chloroplast, dark and light reactions, cyclic and non-cyclic electron transfer, CO₂ fixation – C₃, C₄ and CA metabolism, advantages of C₄ pathway. Photorespiration and its implications, factors affecting photosynthesis. Phytohormones, physiological role in controlling plant processes. Environmental stimuli for plant development.

Practical: Measurement of water potential, osmosis, root pressure, structure of the stomata, distribution, opening and closing of the stomata, measurement, transpiration and calculation of transpirational pull demonstration. Importance of light and chlorophyll in photosynthesis, pigment identification in horticultural crops and studying the enzyme activity of catalase, estimation of phenols, studying plant movements, root initiation in cuttings.

Theory: Economic importance and classification of horticultural crops and their culture and nutritive value, area and production, exports and imports, fruit and vegetable zones of India and of different states, nursery management practices, soil and climate, vegetable gardens, nutrition and kitchen garden and other types of gardens – principles, planning and layout, management of orchards, planting systems and planting densities. Production and practices for fruit, vegetable and floriculture crops, nursery techniques and their management. Principles and methods of pruning and training of fruit crops, types and use of growth regulators in horticulture, water management, weed management, fertility management in horticultural crops, cropping systems, intercropping, multi-tier cropping, mulching, bearing habits, factors influencing the fruitfulness and unfruitfulness. Rejuvenation of old orchards, top working, frame working, principles of organic farming. Methods of propagation of Horticultural crops.

Practical: Features of orchard, planning and layout of orchard, tools and implements, layout of nutrition garden, preparation of nursery beds for sowing of vegetable seeds, digging of pits for fruit plants, planting systems, training and pruning of orchard trees, preparation of fertilizer mixtures and field application, preparation and application of growth regulators, layout of different irrigation systems, identification and management of nutritional disorder in fruits and vegetables, assessment of bearing habits, maturity standards, harvesting, grading, packaging and storage.

Theory: Scope and importance of landscape gardening in India. Bio-aesthetic planning,– definition and need ornamental landscaping in environmental protection study of foliage and flowering plants and their design and values in landscaping ornamental annuals, shrubs, trees, herbaceous perennials, climbers and creepers, palms, cacti and succulents ,Geographical information systems (GIS), Landscape planning, home-garden, public, urban, industrial garden, Avenue planting, principles plants suitability and planting .

Practical: Principles and elements of landscape design, plant material for landscaping, symbols, tools and implements used in landscape design, layout of formal gardens, informal gardens, special type of gardens (bog garden, sunken garden, terrace garden, rock garden) and designing of conservatory and lathe house. Landscape design for specific areas.

Theory: History and Scope of Microbiology: The discovery of micro-organism, spontaneous generation conflict, germ theory of diseases, microbial effect on organic and inorganic matter. Development of microbiology in India and composition of microbial world. Microscopy and Specimen Preparation: The bright field microscope, fixation, dyes and simple staining, differential staining. Difference between prokaryotic and eucaryotic cells. Procaryotic cell structure and functions. Types of culture media and pre-culture techniques. Microbial growth in models of bacterial, yeast and mycelial growth curve. Measurement of bacterial growth. General properties of viruses and brief description of bacteriophages. General principle of bacterial genetics, DNA as genetic material. Antibiosis, symbiosis, intramicrobial and extra-microbial association.

Practical: Examination of natural infusion and living bacteria; examination of stained cells by simple staining and Gram staining. Methods for sterilization and nutrient agar preparation. Broth culture, agar slopes, streak plates and pour plats, turbidometric estimation of microbial growth

Theory: Historical background of genetics, theories and hypothesis. Physical basis of heredity, cell reproduction, mitosis, meiosis and its significance. Mendelian genetics–Mendel’s principles of heredity, deviation from Mendelian inheritance, pleiotropy, threshold characters, co-dominance, penetrance and expressivity. Chromosome theory of inheritance, gene interaction. Modification of monohybrid and dihybrid ratios. Multiple alleles, quantitative inheritance linkage and crossing over, sex linked inheritance and characters. Cytoplasmic inheritance and maternal effects. Chemical basis of heredity, structure of DNA and its replication. Evidence to prove DNA and RNA – as genetic material. Mutations and their classification. Chromosomal aberrations, changes in chromosome structure and number.

Practical: Study of fixatives and stains. Squash and smear techniques. Demonstrations of permanent slides and cell division, illustration in plant cells, pollen fertility and viability, determination of gametes, Solving problems of monohybrid, dihybrid, and test cross ratios using chi-square test, gene interactions, estimation of linkages using three point test cross from F2 data and construction of linkage maps.

Objectives:

- To mould the students with a good moral character.
- To create awareness of the responsibility towards other creations.
- To impart values of humanity and solidarity in the local, national and international levels.

a. Background of Value Education

- What is Value Education
- Importance of Value Education
- Definition of Values, Morals and Ethics
- The Aims and Objectives of Value Education
- Culture and Values and Values Crisis
- Some Areas of Concern in Value Education – Education for peace, respect for life, justice, issues of women, job-oriented education, faith in God, democracy, self-respect, ecology, the meaning of success, noble truths in all religions.

b. My Country, My People.

- Truly Indian, Really Modern, Deeply Human
- Nationalism and Internationalism
- The Fundamental Rights and Duties of a Citizen

c. Inter Personal Relationship.

- Areas of interpersonal relationship (the home, among friends etc.)
- Issues hindering Inter-personal relationship
- Towards improving inter-personal relationship

d. Personality Development

- Definition of Personality
- Elements and Stages of Personality Development

e. Motivations and Will Power

- Motivation for Study
- Motivation and setting Goals
- Decision Making

f. Choice of Vocation / Career Guidance

- Sociologists and Psychologists' Contribution
- Implication for counseling
- Youth and Career (Objectives, Components and Career Planning)
- Career Development Activities

g. Some Issues and Concerns in Moral Education

- Morality and Religion (Traditional morality and religious faith, Views and debates on morality and religion), Spiritual Nature of Man, Marriage, Love and Sexuality, Aids, Abortion, War and Terrorism, Corruption as Omnibus, Drug Addiction and Alcoholism, Tobacco and its Evils, Women Issues (Gender Inequalities), Ecological Crises, Human Right Issues, Media and its Impact, Value of work and Value of Time. Indian Education System, Human Communication.

LNG – 301

Structural Grammar and Spoken English

3 (2+2)

Theory: Structural Grammar: Introduction of Word Classes; Structure of Verb in English; Uses of Tenses; Prepositions; Sentence Patterns in English. Spoken English: Conversations of different situations in everyday life; the concept of stress; stress shift in words and sentences; silent letters in words and pronunciation of words with silent letters, the basic intonation patterns.

Practical: Structural Grammar: Exercises in word classes, identification and study of verbs in sentences, application of tenses and voice, exercises in conjunctions and prepositions, other structural grammar exercises, report writing, letter writing (different types of letters). Spoken English: Conversations of everyday life, the concept of stress; stress shift. Silent letters in words, basic intonation patterns, preparing and address.

PED – 303

Physical Education

1(0+1)

Physical Education: Introduction to physical education. Posture, exercise for good posture, physical fitness exercises for agility, strength, coordination, endurance and speed. Rules are regulations of important games, skill development in any one of the games – football, hockey, cricket, volleyball, ball badminton, throw ball, tennikoit. Participation in one of the indoor games – shuttle badminton, chess and table tennis. Rules and regulations of athletic events, participation in any one of the athletic events – broad jump, high jump, triple jump, javelin throw, discuss throw, shot put, short and long distance running, Safety education, movement education, effective way of doing day-today activities. First-aid training, coaching for major games and indoor games. Asans and indigenous ways for physical fitness and curative exercises. Exercises and games for leisure time, use and experience.

Note: Warming up and conditioning exercises are compulsory before the commencement of each class.

Semester –II

MAS – 304

Mathematics – II

2(2-0)

Real numbers, coordinate line & planes, straight lines, function.

Limits, properties, derivatives, differentiation of sine & cosine, continuity, properties of continuous functions, differentiation of algebraic, trigonometric, logarithmic & exponential functions, product of functions, function of a function.

Derivative as a rate change, maxima & minima of a single variable.

Integral of a real function, integration by substitution, integral of trigonometric & Transcendental function.

Vector in a plane, vector function, sum & difference of vectors of vectors, dot & cross-product.

HORT – 317

Tropical and Sub-Tropical Fruits

3(2+2)

Theory: Horticultural classification of fruits including genome classification. Horticultural zones of India, 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, grapes, citrus, papaya, sapota, guava, pineapple, jackfruit, avocado, mangosteen, litchi, carambola, durian and passion fruit. 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, sex expression and seed production in papaya, latex extraction and crude papain production, economic of production. Rainfed horticulture, importance and scope of arid and semi-arid zones of India. Characters and special adaptation of crops: ber, aonla, annona, jamun, wood apple, bael, pomegranate, carissa, date palm, phalsa, fig, west Indian cherry and tamarind.

Practical: Description and identification of varieties based on flower and fruit morphology in above crops. Training and pruning of grapes, mango, guava and citrus. Selection of site and planting system, pre-treatment of banana suckers, desuckering in banana, sex forms in papaya. Use of plastics in fruit production. Visit to commercial orchards and diagnosis of maladies. Manure and fertilizer application including bio-fertilizer in fruit crops, preparation and application of growth regulators in banana, grapes and mango. Seed production in papaya, latex extraction and preparation of crude papain. Ripening of fruits, grading and packaging, production economics for tropical and sub-tropical fruits. Mapping of arid and semi-arid zones of India. Botanical description and identification of ber, fig, jamun, pomegranate, carissa, phalsa, wood apple, West Indian cherry, tamarind, aonla, bael and annona.

HORT – 316

Tropical and Sub-Tropical Vegetables

3(2+2)

Theory: 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 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 beans, cowpea, lab-lab, snap bean, cucurbits, moringa, curry leaf, portulaca and basella.

Practical: Identification and description of tropical and sub-tropical vegetable crops; nursery practices and transplanting, preparation of field and sowing/planting for direct sown and planted vegetable crops. Herbicide use in vegetable culture; top dressing of fertilizers and intercultural; use of growth regulators; identification of nutrient deficiencies. Physiological disorder. Harvest indices and maturity standards, post-harvest handling and storage, marketing, seed extraction (cost of cultivation for tropical and sub-tropical vegetable crops), project preparation for commercial cultivation.

GPB – 319

Principles of Plant Breeding

3 (2+2)

Theory: Plant breeding as a dynamic science, genetic basis of Plant Breeding – classical, quantitative and molecular, Plant Breeding in India – limitations, major achievements, goal setting for future. Sexual reproduction (cross and self pollination), asexual reproduction, pollination control mechanism (incompatibility and sterility and implications of reproductive systems on population structure). Genetic components of polygenic variation and breeding strategies, selection as a basis of crop breeding. Hybridization and selection – goals of hybridization, selection of plants; population developed by hybridization – simple crosses, bulk crosses and complex crosses. General and special breeding techniques. Heterosis – concepts, estimation and its genetic basis.

Practical: Breeding objectives and techniques in major field crop plants. Floral biology – its measurement, emasculation, crossing and selfing techniques in major crops. Determination of mode of reproduction in crop plants, handling of breeding material and maintenance of experimental records in self and cross pollinated crops. Demonstration of hybrid variation and production techniques.

Theory: Introduction to soil fertility and productivity- factors affecting. Essential plant nutrient elements- functions, deficiency systems, transformations and availability. Fertilizers classifications, manufacturing process and properties of major nitrogenous (ammonium sulphate urea, calcium ammonium nitrate, ammonium sulphate nitrate) phosphate (single super phosphate, enriched super phosphate, diammonium phosphate, ammonium poly phosphate), potassic and complex fertilizers their fate and reaction in soil. Acid, calcareous and salt affected soils –characteristics and management. Role of microorganisms in organic matter- decomposition – humus formation. Importance of C:N ratio and pH in plant nutrition. Integrated plant nutrient management. 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.

Practical: Soil sampling wapping, PH, EC, SAR, and CEZ. Analysis of soil for organic matter, available N, P, K and Micronutrients and interpretations. Gypsum requirement of saline and alkali soils. Lime requirement of acid soils.

Theory: Food and its function, physico-chemical properties of foods, food preparation techniques, nutrition, relation of nutrition of good health. Characteristics of well and malnourished population. Energy, definition, determination of energy requirements, food energy, total energy needs of the body. Carbohydrates: classification, properties, functions, source, requirements, digestion, absorption and utilization. Protein, classification, properties, functions, sources, requirements, digestion, absorption, essential and non-essential amino acids, quality of proteins, PER/NPR/NPU, supplementary value of proteins and deficiency. Lipids – classification, properties, functions, sources, requirements, digestion, absorption and utilization, saturated and unsaturated fatty acids, deficiency, rancidity, refining of fats. Mineral nutrition: macro and micro-minerals (Ca, Fe and P), function, utilization, requirements, sources, effects of deficiency. Vitamins: functions, sources, effects of deficiency, requirements of water soluble and fat-soluble vitamins. Balanced diet: recommended dietary allowances for various age groups, assessment of nutritional status of the population.

Practical: Methods of measuring food ingredients, effect of cooking on volume and weight, determination of percentage of edible portion. Browning reactions of fruits and vegetables. Microscopic examination of starches, estimation of energy, value proteins and fats of foods. Planning diet for various age groups.

Theory: Importance of water, water resources in India. Area of different crops under irrigation, function of water for plant growth, effect of moisture stress on crop growth. Available and unavailable soil moisture – distribution of soil moisture – water budgeting – rooting characteristics – moisture extraction pattern. Water requirement of horticultural crops – lysimeter studies – Plant water potential climatological approach – use of pan evaporimeter factor for crop growth stages – critical stages of crop growth for irrigation. Irrigation scheduling – different approaches – 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. Water management problem, soils quality of irrigation water, irrigation management practices for different soils and crops. Layout of different irrigation systems, drip, sprinkler. Layout of underground pipeline system.

Practical: Measurements of irrigation water by using water measuring devices, use of common formula in irrigation practices, practicing of land leveling and land shaping implements, layout for different methods of irrigation. Estimation of soil moisture constants and soil moisture by using different, methods and instruments, scheduling of irrigation, different approaches, practicing use of instruments, estimation of irrigation efficiency and water requirements of horticultural crops, irrigation planning and scheduling, soil moisture conservation practices.

Theory: Propagation: Need and potentialities for plant multiplication, sexual and asexual methods of propagation, advantages and disadvantages. Seed dormancy (scarification & stratification) internal and external factors, nursery techniques, apomixes – mono-embryony, polyembryony, chimera & bud sport. Propagation Structures: Mist chamber, humidifiers, greenhouses, glasshouses, cold frames, hot beds, poly-houses, nursery (tools and implements), use of growth regulators in seed and vegetative propagation, methods and techniques of cutting, layering, grafting and budding physiological & bio chemical basis of rooting, factors influencing rooting of cuttings and layering, graft incompatibility. Anatomical studies of bud union, selection and maintenance of mother trees, collection of scion wood stick, scion-stock relationship, and their influences, bud wood certification, techniques of propagation through specialized organs, corm, runners, suckers. Micrografting, hardening of plants in nurseries. Nursery registration act. Insect/pest/disease control in nursery.

Practical: Media for propagation of plants in nursery beds, pot and mist chamber. Preparation of nursery beds and sowing of seeds. Raising of rootstock. Seed treatments for breaking dormancy and inducing vigorous seedling growth. Preparation of plant material for potting. Hardening plants in the nursery. Practicing different types of cuttings, layering, graftings and buddings including opacity and grafting, etc. Use of mist chamber in propagation and hardening of plants. Preparation of plant growth regulators for seed germination and vegetative propagation. Visit to a tissue culture laboratory. Digging, labeling and packing of fruit plants. Maintenance of nursery records. Use of different types of nursery tools and implements for general nursery and virus tested plant material in the nursery. Cost of establishment of a mist chamber, greenhouse, glasshouse, polyhouse and their maintenance. Top grafting, bridge grafting and nursery management. Nutrient and plant protection applications during nursery.

<u>Unit I</u>	General Aspects - Novel features of plant growth and development; Analysis of plant growth. Different stages of growth, growth curves, growth analysis in horticultural crops
<u>UNIT II</u>	Seed Germination and Seedling Growth - Mobilization of food reserves during seed germination; tropisms; hormonal control of seed germination and seedling growth.
<u>UNIT III</u>	Shoot, Leaf and Root Development - Organization of shoot apical meristem (SAM); Molecular analysis of SAM; Leaf development and differentiation; Organization of root apical meristem (RAM).
<u>UNIT IV</u>	Floral Induction and Development - Photoperiodism and its significance; Vernalization and hormonal control; Molecular genetics of floral development and floral organ differentiation; Physiology of fruit growth and development, factors affecting fruit set and development, physiology of ripening of fruits climatic and non-climacteric fruits.
<u>UNIT V</u>	Seed Development and Dormancy - Embryo and endosperm development; Cell lineages during late embryo development; Molecular and genetic determinants; Seed maturation and dormancy.
<u>UNIT VI</u>	Senescence and Programmed Cell Death (PCD) - Senescence and its regulation; Hormonal and environmental control of senescence; PCD in the life cycle of plants.
<u>UNIT VII</u>	Light Control of Plant Development - Discovery of phytochromes and cryptochromes, their structure, biochemical properties and cellular distribution; Molecular mechanisms of light perception, signal transduction; Biological clocks
<u>UNIT VIII</u>	Regeneration and totipotency; Organ differentiation and development; Cell lineages and developmental control genes in maize.
<u>UNIT IX</u>	Plant bioregulators- auxin, gibberellin, cytokinin, ethylene inhibitors and retardants, basic functions, biosynthesis, role in crop growth and development.
<u>Practical:</u>	Estimation of photosynthetic potential of horticultural crops, leaf area index, growth analysis parameters including harvest index, bioassay of plant hormones, identification of synthetic plant hormones and growth retardants, preparations of hormonal solution and induction of rooting in cuttings, ripening of fruits and control of flower and fruit drop. Important physiological disorders and their remedial measures in fruits and vegetables, rapid tissue test, seed dormancy, seed viability by tetrazolium test, seed germination and breaking seed dormancy with chemicals and growth regulators.

1. **Basic concepts of disaster:** Definition, Introduction to natural and manmade disasters. History of natural disasters in India, Concept of risk, hazard, and vulnerability.
2. **Natural Disaster:**
 - a) **Floods and Flash floods:** general characteristics, causes, nature and frequency of flooding floodplains, flood hydrographs, river and coastal floods.
 - b) **Droughts;** causes, classification - agricultural, hydrological and meteorological droughts; drought frequency and intensity.
 - c) **Cyclones and Tsunamis;** structure and nature of cyclones and tsunamis, characteristics factors, hazard potential
 - d) **Landslides,** causes, susceptibility to landslides and slope failures.
3. **Disaster Impact Assessment:** severity, extent of damage on agricultural production systems, economic losses affecting livelihood, social and economic perspective.
 - a) **Crop loss;** quantity, quality, social and economic perspective.
 - b) **Livestock/Fish/Poultry:** mortality, morbidity, health, reproduction, yield, feed and fodder availability.
 - c) **Irrigation Infrastructure:** siltation, damage to canal network, tube wells, open wells, dug wells, channels, ponds etc.
 - d) **Soil and Water:** Impact on soil erosion, water availability, accessibility and quality.
4. **Planning and Preparedness for Disaster Management:** strategies for disaster management planning, role of IT, remote sensing, GIS and GPS in disaster preparedness,
5. **Frameworks, Approaches and Methods for Disaster Risk Reduction:** understanding resilience, disaster response and post disaster recovery, nature and type of immediate response, disaster management plans,
6. **Contingency Planning for Disaster Risk Reduction:** agronomic, engineering other non-engineering interventions for drought, flood, agro-met advisories, crop advisories, community nursery, contingent seed bank, mini-kit availability, strategies for fisheries management in flood prone areas, livestock shelters, feed and fodder banks, mass vaccination of livestock, etc.
7. **Policies for Disaster Management:** Disaster Management act and Policies in India, Insurance and loan schemes: criteria and constraints of crop/animals insurance and credit guarantee schemes.
8. **Case studies and field visits.**

Semester –III

PPR – 411 Fundamentals of Plant Pathology 3(2+2)

Theory: Introduction to the science of phytopathology, its objectives, scope and historical background. Classification of plant diseases, symptoms, signs, and related terminology. Parasitic causes of plant diseases (fungi, bacteria, viruses, phytoplasma, protozoa, algae and flowering parasitic plants), their characteristics and classification. Non-parasitic causes of plant diseases. Infection process. Survival and dispersal of plant pathogens. Plant disease epidemiology, forecasting and disease assessment. Principles and methods of plant disease management. Integrated plant disease management.

Practical: Familiarity with general plant pathological laboratory and field equipments. Study of disease symptoms and signs and host parasite relationship. Identification and isolation of plant pathogens. Koch's postulates. Preparation of fungicidal solutions, slurries, pastes and their applications.

ENT – 412 Fundamentals of Entomology 3(2+2)

Theory: Introduction to phylum arthropoda. Importance of class Insecta. Insect dominance. Definition, division and scope of entomology. Comparative account of external morphonology- types 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.

Practical: Insect collection and preservation. Identification of important insects. General body organization of insects. Study on morphology of grasshopper. Preparation of permanent mounts of mouth parts, antennae, legs and wings. Dissection of grasshopper and caterpillar for study of internal morphology. Observations on metamorphosis of larvae and pupae.

HORT – 413 Temperate Vegetables 3(2+2)

Theory: Importance of cool season vegetable crops in nutrition and national economy. Area, production, export potential, description of varieties and hybrids, origin, climate and soil,

FMPE – 416

Farm Power and Machinery

3 (2+2)

Theory: 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, tractors, power tillers and their types and uses. Electric motors: types, construction and performance comparison. 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, planters, transplanter. Grafting, pruning and training tools and equipment. Inter-culture equipment: sweep. Junior hoe, weeders, long handle weeders. Crop harvesting equipments: potato diggers, fruit pluckers.

Practical: IC engines – showing the components of dismantled engines and motors. Primary and secondary tillage implements, hitching, adjustments and operations. Spraying equipment, calibration and operation. Plant protection equipment.

HORT – 415

Temperate Fruits

3(2+2)

Theory: Classification of temperate fruits, detailed study of 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. Re- plant problem, rejuvenation and special production problems like pre-mature leaf fall, physiological disorders, important insect – pests and diseases and their control measures.

Practical: Nursery management practices, description and identification of varieties of above crops, manuring and fertilization, planting systems, preparation and use of growth regulators, training and pruning in apple, pear, plum, peach and nut crops. Visit to private orchards to diagnose maladies. Working out economics for apple, pear, plum and peach.

AGRN – 426

Weed Management in Horticultural Crops

3(2+2)

Theory: Weeds: Introduction, harmful and beneficial effects, classification, propagation and dissemination; crop weed competition and allelopathy concepts of weed prevention, control and eradication, Methods of weed control: physical, cultural, chemical and biological methods. Integrated weed management; Herbicides: advantages and limitation of herbicide usage in India, Herbicide classification, formulations, methods of application; Introduction to Weed management in horticultural crops, aquatic and problematic weeds and their control.

Practical: Identification of weeds; Survey of weeds in horticultural crops; Preparation of herbarium of weeds; Calculations on weed control efficiency and weed index; Herbicide label information; Computation of herbicide doses; Study of herbicide application equipment and calibration; Demonstration of methods of herbicide application; Preparation of list of commonly available herbicides; Study of phytotoxicity symptoms of herbicides in different crops; Biology of nut sedge, bermuda grass, parthenium and celosia; Economics of weed control practices; Tours and visits of problem areas.

HORT – 414

Commercial Floriculture

3(2+2)

Theory: Scope and importance of commercial floriculture in India, 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, growing of flowers under protected environments such as glass house, plastic house etc., post harvest technology of cut flowers in respect of commercial flower crops, dehydration technique for drying of flowers, production techniques for bulbous.

Practical: Identification of commercially important floricultural crops. Propagation practices in chrysanthemum, sowing of seeds and raising of seedlings of annuals. Propagation by cutting, layering, budding and grafting. Training and pruning of roses. Use of chemicals and other compounds for prolonging the vase life of cut flowers. Drying and preservation of flowers. Flower arrangement practices

Semester –IV

HORT – 411

Spices and Condiments

3(2+2)

Theory: History, scope and importance, area and production, uses, export potential and role in national economy. Classification, soil and climate, propagation-seed, vegetative and micropropagation 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, methods of 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. Crops: Cardamom, pepper, ginger, turmeric, clove, nutmeg, cinnamon, all spice, curry leaf, coriander, fenugreek, fennel, cumin, dill, celery, Garlic, saffron, thyme and rosemary.

Practical:

Identification of varieties: propagation, seed treatment – sowing; layout, planting; hoeing and earthing up; manuring and use of weedicides, training and pruning; fixing maturity standards, harvesting, curing, processing, grading and extraction of essential oils and oleoresins. Visit to commercial plantations.

PPR – 412

Mushroom Culture

2(1+2)

Theory: Introduction to mushrooms fungi – nutritional value, edible and poisonous types, edible mushrooms, Pleurotus, calocybe indica (milky mushroom) and Agaricus, medicinal value of mushrooms, 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.

Practical:

Equipments and sterilization techniques for culture media, isolation of mother culture, and spawn preparation and maintenance of mushroom beds of oyster mushroom, caloybe indica (milky mushroom) and Agaricus. Processing and preservations of mushrooms, economics of spawn and mushroom production and mushroom recipies.

HORT – 423

Ornamental Horticulture

3 (2+2)

Theory: History, scope of gardening, aesthetic values. Gardens in India, types of gardens. Landscaping, historical background, definition. Floriculture industry: importance, area and production, industrial importance in India. Landscaping, basic principles and basic components. Principles of gardening, garden components, adornments, lawn making, methods of designing rockery, water garden, etc. Special types of gardens, their walk-paths, bridges, constructed features. Greenhouse. Special types of gardens, trees, their design, values in landscaping, propagation, planting shrubs and herbaceous perennials. Importance, design values, propagation, plating, climbers and creep*ers, palms, ferns, grasses and cacti succulents. Flower arrangement: importance, production details and cultural operations, constraints, post-harvest practices. Bio-aesthetic planning, definition, need, round country planning, urban planning and planting avenues, schools, villages, beautifying railway stations, dam sites, hydroelectric stations, river banks, planting material for play grounds. Vertical gardens, roof gardens. Culture of bonsai, art of making bonsai. Parks and public gardens.

Practical:

Identification and description of annuals, herbaceous, perennials, climbers, creepers, foliage flowering shrubs, trees, palms, ferns, ornamental grasses; cacti succulents. Planning and designing gardens, layout of location of components of garden study, functional uses of plants in the landscape. Panning design of house garden, roadside planting, avenues for new colonies, traffic islands, preparation of land for lawn and planting. Description and design of garden structures, layout of rockery, water garden, terrace garden, and Japanese gardens, recreational and children’s corner. Layout of terrarium, traffic islands, bottle garden, dish garden. Flower arrangement, bonsai practicing and training. Visit to nearby gardens. Identification and description of species/varieties of jasmine, chrysanthemum, marigold, dahlia, gladiolus, carnation, aster and their important inter-culture practices

HORT – 424

Plantation Crops

3(2+1)

Theory: 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, oil palm, palmyrah palm, cacao, cashew nut, coffee, tea and rubber, vanilla, betel vine.

Practical: Description and identification of coconut varieties, selection of coconut and arecanut mother palm and seed nut, planting of seed nuts in nursery, layout and planting of coconut, arecanut, oil palm, cashew nut, cacao gardens, manuring, irrigation; mulching, raising masonry nursery for palm, nursery management in cacao. Description and identification of species and varieties in coffee, harvesting, grading, pulping, fermenting, washing, drying and packing of coffee, seed berry collection, seed extraction, treatment and sowing of coffee, epicotyl, softwood, grafting and top working in cashew, working out the economics and project preparation for coconut, arecanut, oil palm, cashew nut, cacao, etc. Mother plant selection, preparation of cuttings and rooting of tea under specialized structure, training, centering, pruning, tipping and harvesting of tea.

HORT – 417

Breeding of Fruit and Plantation Crops

3 (2 +2)

Theory: Fruit breeding - History, importance in fruit production, distribution, domestication and adaptation of commercially important fruits, variability for economic traits, breeding strategies, clonal selection, bud mutations, mutagenesis and its application in crop improvement hybridization techniques – in vitro breeding tools (important fruit and plantation crops).

Practical: Exercises on floral biology, pollen viability; emasculation and pollination procedures; hybrid seed germination; raising and evaluation of segregating populations; use of mutagens to induce mutations and polyploidy.

HORT – 416

Orchard Management

2(1+2)

Theory: Orchard management, importance, objectives, merits and demerits, clean cultivation, sod culture, Sod mulch, herbicides and inorganic and organic mulches. Tropical, sub-tropical and temperate horticultural systems, competitive and complimentary effect of root and shoot systems. Biological efficiency of cropping systems in horticulture, systems of irrigation. 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. Utilization of resources constraints in existing systems.

Practical: Layout of different systems of orchard soil management, clean, inter, cover and mixed cropping, fillers. Use of mulch materials, organic and inorganic, moisture conservation, weed control. Layout of various irrigation systems.

SES-413

Soil and Plant Analysis

3(2+2)

Theory: 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.

Practical: Collection and preparation of soil and plant samples for analysis. Determination of water holding capacity and hydraulic conductivity of soil. Estimation of moisture content in soils and plants. Determination of pH, electrical conductivity, sodium adsorption ratio and exchangeable sodium percentage of soils. Enumeration of soil microbes. Estimation of

AEAB – 423

Agricultural Marketing, Trade and Price

2 (1+2)

Theory: Agricultural Marketing: Concepts and Definition, Scope and subject matter, Market and Marketing: Meaning, Definitions, Components of a market, Classification. Market structure, Conduct, performance. Marketing structure, Market functionaries or agencies, Producer's surplus: Meaning, Types of producers surplus, marketable surplus. Marketed surplus, importance, Factors affecting Marketable surplus. Marketing channels: Meaning, Definition, Channels for different products. Market integration, Meaning, Definition, Types of Market Integration. Marketing efficiency: Meaning, Definition, Marketing costs, Margins and price spread, Factors affecting the cost of marketing, Reasons for higher marketing costs of farm commodities, Ways of reducing marketing costs. Theories of International Trade: Domestic Trade, Free trade, International Trade, GATT, WTO, Implications of AOA. Market access, Domestic support, Export subsidies, EXIM-Policy & Ministerial conferences. Cooperative Marketing. State Trading. Ware Housing Corporation; Central and State, Objectives, Functions, Advantages. Food Corporation of India: Objectives and Functions. Quality Control, Agricultural Products, AGMARK. Price Characteristics of agricultural product process, Meaning, Need for Agricultural Price Policy. Risk in Marketing: Meaning and importance, Types of Risk in Marketing. Speculations and Hedging, Futures trading, Contract farming.

Practical: Identification of marketing channels; Study of Rythu Bazars, Regulated markets; Study of unregulated markets; Study of livestock markets; Price spread analysis; Visit to market institutions, NAFED; Study of SWC, CWC and STC; Analysis of information of daily prices; Marketed and marketable surplus of different commodities.

EXT – 419 Entrepreneurship Development and Communication Skills**3(2+2)**

Theory: Entrepreneurship Development: Assessing overall business environment in the Indian economy. Overview of Indian social, political and economic system and their implications for decision making by individual entrepreneurs. Globalization and the emerging business/entrepreneurial environment. Concept of entrepreneurship; entrepreneurial and managerial characteristics; managing an enterprise: motivation and entrepreneurship development; importance of planning, monitoring, evaluation and follow up; managing competition; entrepreneurship development programs; 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)/SSI. Export and Import Policies relevant to agriculture sector. Venture capital. Contract farming and joint ventures, public-private partnerships. Overview of agri inputs industry. Characteristics of Indian agricultural processing and export industry. Social Responsibility of Business. Communication Skills: Structural and functional grammar; meaning and process of communication, verbal and non-verbal communication; listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing footnote and bibliographic procedures. Reading and comprehension of general and technical articles, précis writing, summarizing abstracting; individual and group presentations, impromptu presentation, public speaking; group discussion. Organizing seminars and conferences.

Practical: Listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing footnote and bibliography procedures. Reading and comprehension of general and technical articles, précis writing, summarizing, abstracting; individual and group presentation.

Practical:

Visit to local areas - river/forest/ grassland/catchment etc. to document components of ecosystem. Study of common plants, insects, birds and animals. Visit to industries to study pollution abatement techniques.

AGRN-513**Introduction to Major Field Crops****3 (2+2)**

Theory: Classification and distribution of field crops, definitions and concept of multiple cropping, mixed cropping, intercropping, relay and alley cropping, cultural practices for raising major cereals, pulses, oil seeds and fodder crops, green manuring, crop rotation.

Practical: Identification of crop plants, seeds and weeds. Preparation of cropping scheme. Application of herbicides in field crops

HORT-512**Medicinal and Aromatic Crops****3 (2+2)**

Theory: History, scope, opportunities and constraints in the cultivation and maintenance of medicinal and aromatic plants in India. Importance, origin, distribution, area, production, climatic and soil requirements, propagation and nursery techniques, planting and after care, cultural practices, training and pruning, nutritional and water requirements. Plant protection, harvesting and processing of under mentioned important medicinal and aromatic plants. Study of chemical composition of a few important medicinal and aromatic plants, extraction, use and economics of drugs and essential oils in medicinal and aromatic plants. Therapeutic and pharmaceutical uses of important species. Medicinal Plants: Betelvine, periwinkle, Rauvolfia, Dioscorea, Isabgol, Ammi majus, Belladonna, Cinchona, Pyrethrum and other species relevant to local conditions. Aromatic Plants: Citronella grass, khus grass, mint, lavender, geranium, patchouli, vetiver, Ashwagandha, Asparagus, Safedmusli, Aloe vera Senna opium poppy.

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

AGFO-512

Introductory Agro forestry

3 (2+2)

Theory: Agroforestry – definition, objectives and potential. Distinction between agroforestry and social forestry. Status of Indian forests and role in India farming systems. Agroforestry system, sub-system and practice: agri-silviculture, silvipastoral, horti-silviculture, hortisilvipastoral, shifting cultivation, taungya, home gardens, alley cropping, intercropping, wind breaks, shelterbelts and energy plantations. Planning for agroforestry – constraints, diagnosis and design methodology, selection of tree crop species for agro-forestry. Agroforestry projects – national, overseas, MPTS – their management practices, economics of cultivation – nursery and planting (Acacia catechu, Dalbergia sissoo,, Tectona, Populus, Morus, Grewia, Eucalyptus, Quercus spp. and bamboo, tamarind, neem etc.)

Practical: Identification of seeds and seedlings of multipurpose tree species. Nursery practices for poplar, Grewia optiva, Morus alba, Acacia catechu, Dalbergia sissoo, robinia, leucaena etc. Visit to agro-forestry fields to study the compatibility of MPTS with agricultural crops: silvipastoral, alley cropping, horti-silviculture, agro-silvipasture, fuel and fodder blocks. Visit to social forestry plantations – railway line plantations, canal plantations, roadside plantations, industrial plantations and shelterbelts. Rapid assessment of farmers needs for green manure, fodder, fuel wood in selected villages. Economics and marketing of products raised in agro-forestry systems.

GPB-524

Breeding of Vegetable, Tuber and Spice Crops

3(2+2)

Theory: Centres of origin, plant bio-diversity and its conservation. Models of reproduction, pollination systems and genetics of important vegetable, tuber and spice crops. Self incompatibility and male sterility, its classification and application in crop improvement. Principles of breeding self-pollinated crops, pure line selection, mass selection, heterosis breeding, hybridization, pedigree method, mass pedigree method, bulk method, modified bulk method, single seed descent method and back cross method. Polyploidy breeding. Mutation

Practical: Visits to study structure, functions, linkages and extension programmes of ICFRE institutes/voluntary organizations/Mahila Mandal, Village Panchayat, State Deptt. Of Forests/All India Radio (AIR). Exercises on distortion of message, script writing for farm broadcasts and telecasts, planning, preparation & use of NPVA like poster, chart, flash cards, folders etc. and AVA like OHP & 35 mm slide projector transparencies. Identification of local leaders to study their role in extension work. Evaluation of some selected case studies of forestry extension programmes. Preparation of Village Agricultural productions plan.

SWLE – 607

Remote Sensing and GIS

2 (1+2)

Theory: Remote Sensing: Definition, stage in remote sensing, modern remote sensing technology versus conventional aerial photography; visual image interpretation, image interpretation, basic principles of image interpretation, factors governing the quality of an image; factors governing interpretability, visibility of objects, elements of image interpretation, techniques of image interpretation, digital image processing, digital image; remote sensing in agriculture progress and prospects, microwave radiometry for monitoring agriculture crops and hydrologic forecasting; aerial photo interpretation for water resources development and soil conservation survey.

GIS: History of development of GIS definition, basic components, and standard GIS packages; data-entry, storage and maintenance; data types-spatial-non-spatial (attribute data), data structure, data format- point line vector-raster – polygon-object structural model, files, files organization-data base management systems (DBMS), entering data in computerdigitizer-scanner-data compression.

Practical: Familiarization with remote sensing and GIS hardware; use of instruments for aerial photo interpretation; interpretation of aerial photographs and satellite imagery; basic GIS operations such as image display; study the various features of GIS software package; scanning and digitization of maps; data base query and map algebra; GIS supported case studies in water resources management

Semester –VI

PPR – 517

Apiculture

3(2+2)

Theory: Importance and history of apiculture, different species of bees, morphology, anatomy, structural adaptation colony organization and life cycles, bee-keeping equipment, social behaviour, reproduction, queen rearing, bee pasturage, seasonal management, economics of beekeeping, bee enemies, diseases of bees, role of bees in increasing the productivity of Horticultural crops in Indian economy, bee products and their uses, recent trends in apiculture. bee forage plants. collection and preservation of beeflora.

Practical: Identification of honey bee species, bee castes and special adaptations, identification and handling of bee-keeping equipments. Handling of honey bees-hive and frame inspection. Honey extraction and processing methods of hive products extraction. Preparation of bee-keeping projects for funding. Visit to bee nursery and commercial apiaries. Silkworm rearing and management. Handling of bee colonies and manipulation for honey production.

PPR – 520

Insect Pests of Vegetable, Ornamental and Spice Crops

3 (2+2)

Theory: Economic importance of insects in vegetable, ornamental and spice crops -ecology and pestmanagement with reference to these crops. Pest surveillance in important vegetable, ornamental and spice crops. Distribution, host range, bio-ecology, injury, integrated management of important insect-pests affecting vegetable, ornamental and spice crops. Important storage insect-pests of vegetable, ornamental and spice crops, their host range, bioecology, injury and integrated management. Insect –pests of processed vegetables and ornamental crops, their host range, bio-ecology, injury and integrated management. Insecticidal residue problems in vegetables and ornamental crops, tolerance limits etc.

Practical: Study of symptoms, damage, collection, identification, preservation, assessment of damage/population of important insect-pests affecting vegetable, ornamental and spice crops in field and during storage.

HORT – 525

Post Harvest Management of Horticultural Crops

3 (2+2)

Theory: Importance of post-harvest technology in horticultural crops. Maturity indices, harvesting, handling, grading of fruits, vegetables, cut flowers, plantation crops, medicinal and aromatic plants. Pre-harvest factors affecting quality, factors responsible for deterioration of Horticultural produce, physiological and bio-chemical changes, hardening and delaying ripening process. Post-harvest treatments of horticultural crops. Quality parameters and specification. Structure of fruits, vegetables and cut flowers related to physiological changes after harvest. Methods of storage for local market and export. Pre-harvest treatment and precooling, pre-storage treatments. Different systems of storage, packaging methods and types of packages, recent advances in packaging. Types of containers and cushioning materials, vacuum packaging, cold storage, poly shrink packaging, grape guard packing treatments. Modes of transport.

Practical: Practice in judging the maturity of various horticultural produce, determination of physiological loss in weight and quality. Grading of horticultural produce, post-harvest treatment of horticultural crops, physical and chemical methods. Packaging studies in fruits, vegetables, plantation crops and cut flowers by using different packaging materials, methods of storage, post-harvest disorders in horticultural produce. Identification of storage pests and diseases in spices. Visit to markets, packaging houses and cold storage units.

HORT-526

Seed Production of Vegetable, Tuber and Spice Crops

3(2+2)

Theory: Introduction and history of seed industry in India. Definition of seed. Differences between grain and seed. Importance and scope of vegetable seed production in India. Principles of vegetable seed production. Role of temperature, humidity and light in vegetable seed production. Methods of seed production of cole crops, root vegetables, solanaceous vegetables, cucurbits, leafy vegetables, bulb crops, leguminous vegetables and exotic vegetables. Seed germination and purity analysis. Field and seed standards. Seed drying and extraction. Seed legislation.

Practical: Study of seed structure, colour size, shape and texture. Field inspection of seed crops. Practices in rouging. Harvesting and seed extraction. Germination and purity analysis. Methods of seed production in cole crops, root vegetables, bulb crops, solanaceous vegetables, cucurbits, leafy vegetables, leguminous vegetables and exotic vegetables. Seed processing machines. Visit to seed production units.

HORT-527 Breeding and Seed Production of Ornamental Plants 3(2+2)

Theory: History of improvements of ornamental plants, objectives and techniques in ornamental plant breeding. Introduction, selection, hybridization, mutation and biotechnological technique for improvement of ornamental plants. Breeding for disease resistance. Development of promising cultivars of important ornamentals. Role of heterosis and its exploitation, production of F1 hybrids and utilization of male sterility, production of open pollinated seed. Harvesting processing and storage of seeds, seed certification.

Practical: Study of floral biology and pollination in important species and cultivars. Techniques of inducing polyploidy and mutation. Production of pure and hybrid seeds. Harvesting, conditioning and testing of seeds. Practice in seed production methods.

HORT – 528 Processing of Horticultural Crops 3 (2+2)

Theory: Importance and scope of fruit and vegetable preservation industry in India, food pipe line, losses in post-harvest operations, unit operations in food processing. Principles and guidelines for the location of processing units. Principles and methods of preservation by heat pasteurization, canning, bottling. Methods of preparation of juices, squashes, syrups, cordials and fermented beverages. Jam, jelly and marmalade. Preservation by sugar and chemicals, candies, crystallized fruits, preserves chemical preservatives, preservation with salt and vinegar, pickling, chutneys and sauces, tomato and mushrooms, freezing preservation. Processing of plantation crops, products, spoilage in processed foods, quality control of processed products, Govt. policy on import and export of processed fruits. Food laws. Importance and role of value addition in processing of value addition in Horticultural crops, value added products preparation methods of guava cheese, mango, anola, apple based value added products.

Practical: Equipment used in food processing units. Physico-chemical analysis of fruits and vegetables. Canning of fruits and vegetables, preparation of squash, RTS, cordial, syrup, jam, jelly, marmalade, candies, preserves, chutneys, sauces, pickles (hot and sweet). Dehydration of fruits and vegetables – tomato product dehydration, refrigeration and freezing, cut out analysis of processed foods. Processing of plantation crops. Visit to processing units.

AEAB- 521

Horti- Business Management

3 (2+2)

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

Practical: Study of input markets: seed, fertilizers, pesticides. Study of output markets, gain, fruits, vegetables, flowers. Study of product markets, retail trades commodity trading and value added products. Study of financing institutions cooperatives commercial banks, RRBs, Agribusiness Finance Limited, NABARD; preparations of projects, Feasibility reports; Project appraisal techniques; Case study horticulture based industries.

HORT-529

Communication Skills & Entrepreneurship Development

2 (1+2)

Theory: Entrepreneurship Development: Assessing overall business environment in the Indian economy. Overview of Indian social, political and economic systems and their implications for decision making by individual entrepreneurs. Globalisation and the emerging business /entrepreneurial environment. Concept of entrepreneurship; entrepreneurial and managerial characteristics; managing an enterprise; motivation and entrepreneurship development; importance of planning, monitoring, evaluation and follow up; managing competition; entrepreneurship development programs; 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, public-private partnerships. Overview of horti inputs industry. Characteristics of Indian horticultural processing and export industry. Social Responsibility of Business. Communication Skills: Structural and functional grammar; meaning and process of communication, verbal and non-verbal communication; listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures. Reading and comprehension of general and technical articles, precis writing, summarizing, abstracting; individual and group presentations, impromptu presentation, public speaking; Group discussion. Organizing seminars and conferences.

Practical: Listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures. Reading and comprehension of general and technical articles, precis writing, summarizing, abstracting; individual and group presentations.