

**Programme: B.Sc. Agriculture****Programme Code:** 102**Course Summary**

Duration: 4 years

**Eligibility**

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

**Programme Outcomes:**

- To get acquaintance with basics and principles of Elementary Statistics, Computer, English, Rural Sociology & Educational Psychology, Elementary Agriculture, Plant Biochemistry, Microbiology.
- To understand the fundamentals of Principles of Agronomy, Soil Science, e.g. Chemistry, soil fertility and nutrient management, Environmental Science, Horticulture.
- To learn the Control of Weed Management in different agricultural and horticultural crops.
- To understand the effect of meteorology on crops production and weather forecasting models which are helpful for prediction of Indian weather conditions?
- To gain the preliminary knowledge of genetic principles and thereby implementing for breeding of field crops.
- To learn the basic concepts of plant pathology for best growth of crops against the prevalent crop diseases of particular crop-zones.
- To develop the Principles and skills of vegetable production, fruit production, ornamental plants and medicinal & aromatics plants.
- To learn principles and techniques of field crops (Kharif & Rabi) production in diverse agroclimatic conditions of India.
- To learn the different methods of irrigating field crops, horticultural crops and managing water as precious element of crop production and increasing water use efficiency.
- To develop skills to conduct various field based activities related to agricultural aspects.
- It imparts the general ideas for the allied aspects of agriculture like Mushroom production, Beekeeping, Sericulture and Lac cultivation.
- To understand and gain the preliminary knowledge for plant biotechnology, establishment of tissue culture lab., generation of transgenic plants.
- To learn the basic concepts of agriculture co-operation, finance and business management related to agriculture products, it gives knowledge for availing different types of agriculture credits by Institutional and non-institutional sources.
- To learn the basic principles and techniques for control of insects, pests on cereals, sugar crops, fruit crops, vegetable crops, plantation crops, stored grain and house hold pests.
- It provides the in-depth knowledge for breeding and nutritional aspects for increasing the production of livestock products like milk, meat, egg, and its by-products and controlling livestock, poultry diseases.
- To learn the in-depth information of crop physiology for augmenting crop productivity. Physiology of growth and development, growth regulators which influence productivity of major cereals, pulses and oilseed crops.
- It provides general idea about the farm machinery which includes sources of farm power, tillage equipments, plant protection equipments, harvesting and threshing machineries, different types of tractors etc.

- To gain the knowledge of extension education different extension and rural development related programmes to understand extension training centres etc.
- To gain the knowledge and applying the principles and practices for different processing techniques for fruits and vegetables after their harvest and increasing their shelf life.
- To learn the principles and practices of farming systems and sustainable agriculture by using LEISA and HEISA. Using different conservation and management practices for soil & water resources.
- It provides basic knowledge for soil survey, soil taxonomy and the role of remote sensing in agriculture.
- The skills for seed production, seed storage, seed testing for purity, viability, moisture and germination related to field crops.
- After learning and imbibing the technical and articulated aspects of agriculture production students' undergoe Rural Agriculture Work Experience (RAWEx) of any four components of their choice wherein students gets exposure in real field experience.

### Course outcomes of B.Sc. Agriculture programmes:

Sr.No.	Course name	Credits	Course outcome
<b>1<sup>st</sup> Semester</b>			
1	Elementary Statistics	1+1	<p>To learn about Introduction to statistics, arithmetic mean, median, mode and partition values range, interquartile range, quartile deviation, mean deviation, variances, standard deviation, coefficient of variation, moments, skewness, Kurtosis and its measure.</p> <p>To gain knowledge of Simple problems based on probability theory; Definition of correlation; Scatter diagram; Karl pearson's coefficient of correlation; Linear regression equations; introduction to test of significance, one sample and two sample test for mean.</p>
2	Agriculture Meteorology	1+1	<p>To understand the basic concepts of Earth atmosphere its composition, extent and structure; Atmospheric weather variables: Atmospheric pressure, its variation with height; Daily and seasonal variation of wind speed and direction. Cyclones and anticyclones, air masses and fronts.</p> <p>To receive knowledge about Agriculture and weather relations: Modification of crop microclimate, use of weather data for irrigation scheduling, pesticides sprays, fertilizer application, climatic normals for crop production. Nature and properties of solar radiation, solar constant, depletion of solar radiation, short wave and thermal radiation, net radiation, albedo, atmospheric temperature – temperature inversion, daily and seasonal variation of temperature balance of earth;</p> <p>To understand the concept of atmospheric humidity; saturation, vapour process of condensation, formation of dew, fog, mist, frost, snow rain and hail: precipitation cloud formation and movement.</p>
3	Computer Application	1+1	<p>To learn Introduction to personal computer, peripherals, operating systems (Dos &amp; Windows) and high-level language- Interaction with software pack-ages (Lotus, Foxpro, Statistical, packages) and its execution for applications in relation to solution of simultaneous equations, plotting of graph and diagrams. Simple agricultural statistics computations. Database file; creation and Query.</p>
4	Str. & Spoken English	1+1	<p>To understand the structural patterns of communicative grammar; modern usages; functional language disorder and common structural errors in part of speech-noun, pronoun, verb, adjective, adverb, preposition, conjunction; articles; word-formation and vocabulary building-affixes, prefixes, suffixes, synonyms, antonyms, substitutions and foreign words; prepositions; phrases idioms; gerunds; participles; infinitives; time and tense; modal verbs, conditional parities; synthesis; transformation controlled writing; paragraph writing;</p> <p>To learn and make use of modern technical prose; listening and reading skills; comprehension; phonetic and scientific systems of spoken English – speech mechanism; symbols and sounds; stress and intonation.</p>
5	Elementary Agriculture	2+1	<p>To learn about the basic concepts of Indian agriculture its scope and resources; crop plants-their significance as source of food, feed, fuel and raw material for various industries. Crop seasons and classification of crops according to seasons.</p> <p>To understand the basic concepts of Soils-their formation, classification, physical and chemical properties and</p>

			<p>manures and fertilizers-essential plant nutrients, uptake of N,P &amp; K by important crops, methods of manure &amp; fertilizer application, composition of bulky organic manures, concentrated organic manures, green manures and various types of inorganic fertilizers,</p> <p>To learn about Irrigation and drainage-importance of water, quality of irrigation water; sources methods and measurement of irrigation water, disadvantages of excessive soil moisture necessity and methods of drainage.</p> <p>The students will be able to understand cultivation of important crops in the state such as wheat, rice cotton, sorghum, maize, groundnut, rape seed &amp; mustard, chickpea, pigeonpea, tobacco, berseem, potato and sugarcane. Acquaintance with horticultural crops such as cabbage, cauliflower, onion, garlic, cucurbits, root crops, peas, tomato, brinjal, banana, apple, mango, litchi, citrus, guava.</p> <p>The students will be able to understand the concepts of introductory economics-Factors of production, exchange, different types of markets; pricing, bank and credits, law of diminishing returns, elementary rural sociology, place of agriculture in five year plans, statistics relating to agricultural production.</p> <p>The students will be able to explain of main breeds of animals such as cows, buffaloes, goats, sheep and poultry. Elementary physiology and anatomy of cow and buffaloes. Characteristics of milch cattles. Care of animal, poultry management, principles of nutrition, common medicines.</p> <p>The students will be able to learn types of iron and steel used in agricultural implements; different types of plough, mechanical devices, their management and cost. Water lifting devices, tillage, different methods of ploughing. Power transmission through belts, pullies, gears, chaff, cutter, cane crusher. Necessity for drainage, damage to soil due to excess moisture, land development, prevention and formation of acidic and alkali soils.</p>
6	Principles of Agronomy	2+1	<p>The students will be able to understand the Principles of agronomy as a science and its scope.</p> <p>The students will be able to quantify and explain the plant growth and development, environmental effects on growth, ideal plant type, tillage, seed quality, sowing, crop density and spatial arrangement, crop nutrition, organic manures and fertilizers, irrigation and drainage, The students will be able to understand weed management, distribution of crops, cropping systems, selection of crops and varieties for multiple cropping, crop yield contributing characters;</p> <p>The students will be able to understand the organic farming-concept, practice and scope in India. Crop production in dry lands, salt affected, acidic, flood affected, waterlogged and eroded areas.</p>
7	Rural Sociology & Educational Psychology	2+1	<p>The students will be able to explain the concepts, methods, tools, characteristics of rural society and people; rural – urban continuum and differences, Rural social structure: interaction, processes, institutions groups.</p> <p>The students will be able to understand rural social stratification: status, roles, class, castes etc. Panchyati Raj and Block Development Organizations as rural peoples participative agencies for planned development, Specific, programs for rural area upliftment/ employment: JRY, IAT, EAS, MWS, IRDP, GKY, DWCRA, TRYSEM, DPAP, DDP, NSAP, Land reforms, etc. Council for Advancement of peoples Action and Rural Technology</p>

			(CAPART), National Fund for Rural Development (NFRD), NGOs/Voluntary Sector.  The students will learn about Conceptual /Clarifications on educational psychology, Psychology of individual differences; MA & IQ; the gifted, Slow Learner and Socially disadvantaged child. Learning and motivation, mental hygiene and adjustment, guidance and counselling.
<b>2<sup>nd</sup> Semester</b>			
<b>8</b>	Fundamentals of Soil Science	2+1	The students will be able to understand soil as a natural body and medium for plant growth; soil compounds and soil plants relationship; soil forming rocks and minerals; weathering and processes of soil formation;  The students will be able to explain physical properties of soils – texture, structure, density and porosity, soil colour, consistence and plasticity, soil reaction pH and its measurement, soil acidity and alkalinity, buffering, effect of pH on nutrient availability, soil colloids – inorganic and organic; silicate clays: constitution and properties; humic substances nature and properties; ion exchange, cation exchange capacity, base saturation; soil organic matter: composition, properties and influence on soil properties, transformation of organic and inorganic constituents of soil; biological nitrogen fixation; recycling of organic wastes in soils – Urban and industrial wastes.  Students will be able to describe Soil water retention, dynamics and availability; soil air composition and dynamics; source, amount and flow of heat in soils; soil temperature and plant growth; soil survey and classification, soils of India.  Students will be able to describe soil pollution – behaviour of pesticides and inorganic contaminants, prevention and mitigation of soil pollution.
<b>9</b>	Fundamentals of Horticulture	2+1	To learn about fundamentals of horticulture: its definition and branches; importance and scope; horticultural and botanical classification; climate, soil and distribution of fruit crops. Students will be able to learn the techniques of propagation and nursery raising; principles of orchard establishment and management. flower bud differentiation and pollination; causes of unfruitfulness, pollinizers and pollinators.  Students will be able to explain environmental and soil factors affecting vegetable production, kitchen gardening; garden types and parts; care and maintenance of ornamental plants; lawn. making; knowledge of landscaping of rural and urban areas; exposure to important medicinal aromatic plants, spices and condiments, use of plant bio-regulators in horticulture, Post Harvest Technology-Principles and Practices.
<b>10</b>	Elementary Plant Biochemistry	2+1	Students will be able to understand recapitulation of basic chemistry and biology, water, pH and buffer, Cellular constituents: Structure and function – amino acids and protein, carbohydrates, lipids and biomembrances and nucleic acids;  Students will be able to explain enzymes-function, properties and mechanism, metabolism of cellular

			<p>constituents: Central Metabolic Pathways: Degradative path ways – glycolysis, hexose monophosphate pathway, degradation of starch, sucrose, other sugars, fatty acids and acylglycerols, proteins and amino acids; Biosynthetic pathways – photosynthesis, formation of sucrose and starch, Kreb’s cycle and electron transport chain;</p> <p>To learn Nitrogen and sulphur cycles; Nitrogen fixation, assimilation of ammonia; Synthesis of DNA, RNA and proteins; Secondary metabolites – structure, function and metabolism</p>
11	Weed Management	1+1	<p>Student will learn weed control, costs to society from weeds, classification of weeds. Ecology of weeds: Reproduction (seed production, seeds dissemination, seeds germination, vegetative reproduction), geographics, distribution, factors influencing weed distribution, weed succession of uncultivated sites, competition between crops and weeds. Concepts of prevention, eradication and control.</p> <p>Students will be able to manage weeds by controlling different methods: Physical, cultural, biological, chemical, integrated weed management.</p> <p>Students will get exposure to herbicides: basic concepts, polar vs. Non-polar, Esters, Salts, acids, etc. surfactant chemistry. Factors influencing foliage active herbicides: reaching the target plant, spray retention, absorption into leaf, translocation, factors influencing soil applied herbicides: microbiological effect, soil absorption, photo-decomposition and volatilization, spray of herbicides.</p>
12	Element of Genetics	2+1	<p>Students will get exposure to the historical aspects of Pre Mendelian and post-Mendelian concepts of heredity, Mendelian principles of heredity, Probability and chi-square.</p> <p>Students will learn concepts of Cell plant cell and animal cell, chromosome structure. Cell division mitosis, meiosis, variation in chromosomes polytene chromosome, Lampbrush chromosomes. Dominance relationship gene interaction. Multiple alleles, pleiotropism and pseudoalleles. Sex determination and sex linkage, sex limited and sex influenced traits. Linkage, Crossing over mechanism, Chromosomes mapping, structural changes in chromosomes: Deletion and Duplication, Translocation and inversion, “Numerical changes in chromosomes, chemical basis of heredity”.</p> <p>Students will learn the gene concept mode of replication of genetic material, transcription and translational mechanism of genetic material. Gene regulation and operon concept. Mutations: chemical and physical mutagens, mode of action of mutagens. Extracellular inheritance. Polygene and quantitative inheritance. Introduction to plant tissue culture.</p>
13	Introductory Entomology	2+1	<p>Students will be able to understand the scope of Entomology, brief history of entomology in India, insects as Arthropods and its relationship with phylum Annelida and other classes of Arthropoda, origin in insects major points related to dominance of insects in Animal Kingdom.</p> <p>Students will learn external morphology and anatomy of grass hopper; body segmentation, integument, thorax and abdomen, antennae, legs and wings and their modifications, generalized mouth parts and their modifications, Alimentary, Circulatory, Excretory, Respiratory, Reproductive and nervous systems, major sensory organs like simple and compound eyes chemoreceptors, endocrine glands; basic embryology and post embryonic development, basic groups of present day insects with special emphasis to orders and families of agricultural</p>

			importance like Orthoptera; Tetigonidae, Gryllidae, Gryllotalpidae, Acrididae, Dictyoptera; Mantidae, Blattidae; Isoptera; Hemiptera; Pentatomidae; Coreidae; Cimicidae, Cicadellidae, Delphacidae, Lophophidae, Aleurodidae; Aphididae; Coccidae; Thysanoptera, Coleoptera. Carabidae, Meloidae, Coccinellidae, Bruchidae, Chrysomelidae, Curculionidae, Cerambycidae; Diptera; Culicidae Cephritidae, Agromyzidae, Muscidae; Lepidoptera, Pteridae; Papilionidae, Hespirlidae, Sphingidae, Noctuidae, Artilidae, Pyralidae, Saturnidae, Bombycidae; Hymenoptera. Tenthredinidae, Braconidae, Chalcididae, Trichogrammatidae.
	Introductory Plant Pathology	2+1	<p>Students will be able to understand the importance of plant diseases, scope and objectives of plant pathology concept of plant disease, of cause of plant disease, inanimate causes and plant viruses.</p> <p>Students will be able to explain classification of plant diseases. Definition and terms, parasites, pathogens biotrophs, heribiotrophs, necrotroph, pathogenicity, pathogene is virulence, infection primary infection, inoculum, invasion and colonization, inoculation potential, symptoms, incubation period, disease cycle, disease syndrome, single cycle disease, multiple cycle, single cycle period, multiple cycle disease, alternate host collateral host, predisposition, biotype, symbiosis, mutualism, antagonism.</p> <p>Students will be able to explain history of plant pathology with special reference to Indian work. Pathogenesis and parasitism, Koch's postulate. Effect of pathogenesis on the plants, morphological changes, physiological changes, symptom of plant diseases. Development of identities. Principles and methods of plant disease management.</p> <p>Students will be able to understand the basic concepts of avoidance, exclusion, eradication, disease resistance and therapy. Methods of plant disease management. Genera morphology, characters of fungi and somatic structure, reproduction of various structure.</p> <p>Students will learn Basic and different methods of classification of fungi, taxonomy and nomenclature. Study of selected genera, <i>Plasmodiophora</i>, <i>spongospora (myconycota)</i>, <i>Synchitrum</i>, <i>Thyseoderma</i>, <i>pythium phytophthora</i>, <i>albugo selerophthora</i>, <i>periosdocrospora and percnosi on (Mastigomyccinal)</i>; <i>Taplrina</i>, <i>Erisyphe</i>, <i>Claviceps</i>, <i>Sclerotinia (Ascomycocina)</i>, <i>Puccinia Melarapsora</i>, <i>Uromyces</i>, <i>Ustillgo</i>, <i>Tilletia</i>, <i>Neovosain</i>, <i>Splacelothera</i>, <i>Telyposporium (Besidimycotina)</i>; <i>Collectotrichum Alternate Cercospora</i>, <i>Fusarium</i>, <i>Helmilthosporium</i>, <i>Pyricularia</i>, <i>Seletorian</i>. <i>Rhizoctonia</i>, <i>Phyllostica</i>, <i>Phoma (Deuteromycotina)</i>. General morphological and cultural characters of prokaryotes (bacteria), basic methods of classification taxonomy and nomenclature. Nutrition and effects of physiochemical factor on growth, reproduction and life cycle genetics and variability.</p> <p>Students will be able to understand the importance and general original characters of morcoplasms, spiroplasma and fastidions bacteria. Reproduction nomenclature and classification physical architecture and chemical composition of viruses and viroids, nomenclature and criteria for identification, multiplication, transmission and infective nature. General morphological characters, life cycle and reproduction of nematodes, behaviour in soil and nematodes as vectors for other plant pathogens. Classification and general identifying characters of phanerogamic plant parasite reproduction and life-cycle.</p>
15	Microbiology	1+1	The student will learn microbial world history- History of microbiology prokaryotic and eukaryotic microbes,

			<p>their cell structure, genetics distribution in nature and importance in agriculture, microorganisms in soil fertility and crop production; carbon, nitrogen, phosphorus and sulphur cycles, plant microbes association symbiotic associative and a symbiotic nitrogen fixation, Azolla and mycorrhiza biodegradation of agricultural chemicals pesticides, herbicides and agricultural organic wastes.</p> <p>The students will learn microbiology of milk and milk products, rural microbiology and silage production; Microbes in human welfare biofertilizers, biopesticides, waste treatment and recycling; composting, ethanol production, antibiotic production, Human and plant pathogenic microbes</p>
<b>3<sup>rd</sup> Semester</b>			
<b>16</b>	Vegetable Production	2+1	<p>Students will be able to understand the importance of vegetables in human nutrition and national economy, factors affecting vegetable productivity viz. light, temperature, moisture, oxygen, CO<sub>2</sub> mineral nutrients, soil reaction, disease and insect pests; types of vegetable farming; types of classification of vegetable viz, botanical, classification, based on color: mandarin, parts used duration of crop; weed management, use of bioregulation seed production, harvesting and marketing.</p> <p>Students will be able to understand the cultivation practices viz. time of sowing nursery management, transplanting, sowing/planting distance, recommended cultivars seed rate, manure and fertilizers doses, harvesting, storage, physiological disorders, diseases and insect pests and their control measure of various vegetable crops namely potato, tomato, onion, garlic, okra, sweet corn pea, beans, cucurbitaceous crops-pumpkin, bottle gourd, sponge gourd, ridge gourd, pointed gourd, bitter melon, cucumbers etc.</p>
<b>17</b>	Irrigation Water Management	2+1	<p>Students will be able to know the water resources of India, source of irrigation, irrigation water demand, supply and resources development of irrigation, soil moisture and its characteristics soil water potential, retention and movement of soil water. Water intake and infiltration. Importance of water in plants life, plant water status, absorption, transportation and transpiration, moisture sensitive stage, water availability and nutrient uptake. Scheduling of irrigation based on soil moisture status. Physiological stages of crop and meteorological parameters, irrigation under limited water supply conditions. Methods of irrigation; surface irrigation, flooding, furrow, border and basin irrigation. Irrigation; drip and sprinkler irrigations.</p> <p>Students will be able to explain water stress and plant growth effect of water stress on physio-morphological characteristics and productivity of plant, deficit irrigation and strategy for optimizing yield. Water quality standards and its suitability for irrigation, water use efficiency, agronomic technique to boost water use efficiency, factors affecting water use-efficiency.</p> <p>Students will be able to understand irrigation management in soils with low intake rate, saline and alkali soil, soil with shallow ground water table and in poorly drained soil. Water requirement of crops, factors affecting the water requirement of crops, method of determining water requirement, effective rainfall, anti-transpiration and potential evapotranspiration and consumptive use. Irrigation of principal crops critical stages of crops, depth and schedule of irrigation, reducing irrigation requirement of major crops.</p>
<b>18</b>	Principles of Plant Breeding & Breeding of	3+1	The students will get exposure to historical development of plant breeding plant breeding concept, nature and role of plant breeding major achievements and future prospects, genetics in relation of plant breeding, modes of

	Field Crops		<p>reproduction, self-incompatibility and male sterility. Plant Breeders materials domestication, centres of origin, centres of density acclimatization and components of genetic variation and heritability.</p> <p>Student will be able to explain breeding methods in self-pollinated crops: Introduction, selection pure line theory, multilane varieties, hybridization techniques and handling of segregating populations, Hardy-Weinberg law, Methods of breeding cross pollinated crops system of mating heterosis and inbreeding depression development of inbred lines and hybrids and synthetic varieties, breeding methods in asexually propagated crops, clonal selection and hybridization polyploidy in relation to plant breeding, mutation breeding methods, uses nature of gene mutation mutagenic agents, induced mutation in plant breeding, breeding for important biotic and abiotic stresses, and use of biotechnology implant breeding, procedure for release of new varieties.</p> <p>The students will learn concepts of crop systematic, species relationship, floral biology and inheritance of economically important characters, breeding objectives development of varieties with desired yield, adaptability, stability, disease and pest resistance and quality (Physical, chemical, nutritional) and marketing Important varieties along with parentage and characteristics, future thrust area in varietals improvement in crops like wheat, rice, make, soybean, field-pea, pigeon pea, urd bean and rapeseed mustard, sunflower, groundnut, sorghum, sugarcane, potato, cotton and tobacco.</p>
19	Soil Fertility and Nutrient Management	2+1	<p>The students will get exposure to the history of plant nutrition and soil fertility, soil fertility and productivity, problems of soil fertility in India, plant growth and development, factors affecting plant growth; essential plant nutrients, their role and deficiency and toxicity symptoms; Ion exchange phenomena in soil and its role in plant nutrient availability; movement of nutrients from soil to plant roots, their uptake and translocation.</p> <p>The students will be able to explain chemistry of soil nitrogen- Nitrogen cycle, mineralization and immobilization, properties and use of inorganic and organic nitrogenous fertilizers in crop production. Chemistry of phosphorus in soil, phosphate fixation and availability chemistry of potassium in soil, potassium fixation and availability; properties and use of phosphorus and potassium fertilizers, chemistry of calcium, magnesium and sulphur in soil, their sources and usage; soil fertility evaluation and fertilizer recommendations; biofertilizers; integrated nutrient management ; methods and time of application of fertilizers, efficient of fertilizers.</p>
20	Agri. Marketing and International Trade	2+1	<p>Students will be able to understand he concepts of marketing, human needs and marketing the marketing mix, the marketing strategy, product planning, promotion Physical distribution and pricing, marketing and different levels of development, function of prices and role of price in economic development, marketing planning and organizational elements of marketing mix, Concept of market segment, market segmentation, basis of market segmentation, Types of markets, classification and characteristics of agricultural market.</p> <p>Students will be able to explain demand for farm products; determinants of consumer behaviour, consumers of farm products factors affecting demand and consumption of farm products; supply of farm produces; product decision and strategies, product life cycle and new product development, characteristics of farm firm, farm products and farm production, spatial and temporal distribution of farm products, marketed and marketable surplus, factors affecting supply of marketed surplus and marketable surplus of farm products;</p> <p>Students will be able to describe women’s role in agricultural produce marketing; pricing and promotion</p>

			<p>strategies market structure, determination of price under alternates market structures, price movement overtime seasonal cyclical and trend marketing communication, advertising, publicity, personnel selling and sales promotion; Marketing function, exchange function's buying and selling physical function storage, transportation and processing; facilitating functions- packaging, branding, financing, market information, grading etc.</p> <p>Management of marketing functions, marketing channels; stages of marketing, selection and management of marketing channels for farm products; meaning and components of marketing cost, price spread and market margins, Marketing efficiency, concept and measurements of marketing efficiency;</p> <p>Students will be able to understand the role of government in Agricultural marketing, public sector institutions. CACP, FCL, CWC, DMI, Fair price shops, Exim Bants etc. The concept and importance of inter-regional and International trade; emerging scenario of international trade in Agricultural commodities; basic theories of international trade; concept of terms of trade and BOP, implications of new GATT agreement (WTO).</p>
21	Field Crops I (Kharif)	2+1	<p>Students will be able to get exposure of origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices yield of kharif crops.</p> <p>Students will be able to take information for cereals-rice, maize, sorghum pearl millet and finger millet; pulses – pigeon pea, mungbean and urbeans oilseeds groundnut, sesame and soybean; fibre crops cotton, jute and sunhemp; and forage crops sorghum, maize, cowpea, cluster bean and napier.</p>
22	Crop Diseases and their Management	2+1	<p>Students will be able to understand and explain wheat disease rusts, loose nut, kernalbunt, powdery mildew, alternaria blight, yellow ear rot, ear cocile, Rice disease blast, brown spot, bacterial blight, sheath blight khaira and tungro; Maize disease stalk rots, downy mildews, leaf spots and Heininthosporium leaf sports; Sorghum disease smuts. Grain mold, anthracites and strgaa; Bajra disease downy mildews and ergot; Sugarcane disease redrot, smut, and with Groundnut disease early and late leaf sports, Sclerotium stem rot, seedling rot and seedling blight; Sunflower disease Sclerotinia stem rot and Alternaria blight; mustard disease. Alterniaria blight, white rust, downy mildew, Sclerotinia stem rot, and bacterial rot; soybean disease Rhizoctonia blight, pod blight, seed rot, bacterial pustule seedling blight and mosaic; pigeonpea diseases Phytophthora blight, wilt and sterility mosaic; Gram diseases Wilt, grey mould and Ascochyia blight; Lentil disease rust and wilt; Cotton disease anthracnose; vascular wilt, and black gram; Tobacco diseases damping off early and late blight, black scarf, common scab, bacterial wilt and virus diseases; Tomato diseases damping off, late and early blight, wilts root knot and virus diseases; Brinjal diseases Phomopsis blight, fruit rot, Sclerotinia rot, bacteria wilt and rot knot, Chilies diseases anthracnose and virus diseases, vegetable crucifer diseases damping off, Downey mildew, and black not, vegetable cucurbit diseases powdery mildew and rust, Bean diseases anthracnose, blights, and virus diseases; Mango diseases Mango malformation. Powdery mildew and bacterial blight; Apple diseases scab, collar rot, powdery mildew; fire blight, stem black and brown, pink diseases, Papaya diseases stem and foot rot, leaf curl, and mosaic, Citrus diseases canker, anthracnose, citrus decline and virus disease; Peach and pear disease leaf curl, brown rot, and scab; Guava wilt, anthracrose and stem canker.</p>
<b>4<sup>th</sup> Semester</b>			
23	Economic Entomology	2+1	<p>Students will be able to explain how insects become pest economic importance of insects, classification of pests, principles and methods of pest control, viz, physical mechanical, cultural, legal, genetical chemical. Biological,</p>

			<p>principles and methods of insecticidal applications.</p> <p>Students will be able to understand the concepts of apiculture, sericulture and lac cultivation with special reference to equipment used insect pests and diseases, production and marketing.</p>
24	Introduction to Plant Biotechnology	1+1	<p>The students will get exposure to the introduction: History of Plant tissue culture and biotechnology, scope and importance of agricultural biotechnology, Gene technology, Tissue and cell culture: Media, various modes of culture and their application. Organ culture cell suspension culture, Callus culture, Micro-propagation methods.</p> <p>Students will be able to explain organogenesis and embryogenesis, their significance, Anther culture; haploid production, diploidization and their significance, Proto plasts isolation, fusion, somatic hybridization and hybrids, Somaclonal variation and its use in crop improvement, Germplasm storage and cryopreservation, Secondary metabolite production, Students will be able to understand introduction to genetic engineering and genetechonology. Gene transfer methods: Physical Chemical and Agrobacterium dependent methods, Generation of transgenic plants and their identification, Molecular markets, RGLP, RAPD, Simple sequence repeats etc, Role of biotechnology in crop improvement.</p>
25	Field Crops II (Rabi)	2+1	<p>Students will be able to get exposure of origin geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of rabi crops.</p> <p>Students will be able to take information for cereals wheat, barley and triticale; pulses chickpea, lentil, peas, frenchbean; Oil seeds, rapeseed and mustard, sunflower, safflower and linseed; sugar crops sugarcane and sugarbeet, Regional medicinal and aromatic crops such as mentha, lemon grass, citronella, palma rosa, Isabgol and posts, potato and tobacco, Forage crops berseem, Luceme and Oat.</p>
26	Agriculture Co-operation, Finance and Busi. Mgt.	2+1	<p>Students will be able to understand the concepts of cooperation- Meaning, significance under Indian agricultural conditions, objectives principles of cooperatives.</p> <p>Students will be able to explain agricultural cooperation in India credit marketing consumer and multi- purpose cooperatives, farming cooperatives, processing cooperatives, cooperative warehousing, role of ICA, NCU, NCDC, NAFED etc.</p> <p>Students will be able to explain about women cooperatives, Agriculture finance meaning, scope and significance, credit needs of Indian agriculture, economic principles in capital acquisition and use decisions, preparation and analysis of financial statements, balance sheet and income statement, cost of credit, Access for women to agricultural credit facilities. Agricultural credit market- institutional and non-institutional sources of credit, cooperatives credit system.</p> <p>Students will be able to describe commercial banks and regional rural banks, NABARD and AFC, problems and issues in institutional agricultural credit system. Business management environment of agricultural business, tasks of a professional manager, management system and processes, types of management decisions, decisions, decision making techniques and processes, organizational culture and management ethics.</p>
27	Insect Pest and their Management	2+1	<p>Students will be able to explain nature and extent of damage, life cycle seasonal history, host range, distribution and management of the major insect pests attacking field drops; Cereals, pulses, oilseeds, fiber, sugar crops,</p>

			<p>Horticultural crops; brinjal, okra, potato, tomato, cole crops, leguminous vegetables, cucurbits, chillies sweet potato, leafy vegetables, onion and garlic, colocasia, yarn. Fruit crops (tropical/sub tropical); jack fruit, papaya, coconut and date palm, mango, citrus, litchi, banana, guava, peach, poar, plum, apricot, chestnut, almond. Plantation and garden crops: marcptics, spices and condiments.</p> <p>Students will be able to get information of stored grain and household pests; Locust and other major polyphagous insects, Rodents and mites of agricultural importance.</p>
28	Fruit and Plantation Crops	2+1	<p>Students will be able to understand the importance and scope of fruit and plantation crop industries in India Cultivation practices of important fruit and plantation crops with reference to their origin, soil and climatic requirements; botany, important cultivars, plant propagation practices, resources and planting.</p> <p>Students will be able to learn care and management in respect of irrigation, nutrition and other cultural operations including training and pruning, nutrient deficiencies of fruit plant and their collection, inter cropping, major cultivation problem and their control measures, harvesting, yield, storage and marketing; application of plant bioregulators; post-harvest and technology of plantation crops.</p> <p>Students will be able to describe management of major insect- pests and disease, principles and methods of evaluation of fruit trees, project formulation and evaluation, commercial orchard.</p>
29	Livestock Production	2+1	<p>Students will be able to get exposure to the place of livestock in the national economy, efficient livestock development programme of government of India.</p> <p>Students will be able to get information about importance of exotic and Indian breeds of cattle, buffalo, sheep, goat and swine. Measures and factors affecting livestock fertility, reproductive behavior like estrus, parturition, farrowing, milk secretion, milking of animal and factors affection milk yield and composition of milk.</p> <p>Students will learn selection and breeding of livestock for higher milk and meat production. Feeding and management of calves, growing of heifers and milch animal and other classes and types of animals. Housing principles, space requirement for different species of livestock. Disease control and measures of measure livestock diseases, sanitation and care. Breeding feeding and production records.</p>
30	Rainfed Agriculture	1+1	<p>The students will get exposure to history of rainfed agriculture, magnitude of its problem and delineating criteria for rainfed and drylands, soil and climatic conditions prevalent in rainfed area.</p> <p>The students will be able to explain water stress in relation to crop productivity, concept of crop productivity and plant type for rainfed farming areas and crop improvement for efficient water use, drought resistance in crop plants.</p> <p>Students will be able to understand the concepts of efficient utilization of water through soil and crop management practices; reducing water losses through mulching and use of anti-transpirants, their kinds, mode of action and effect on crop yield. Increasing water storage by reducing run off and increasing infiltration through mechanical and cultural measures, water harvesting techniques, watershed management. Efficient management of rainfed crops; land preparation, seeding and crop density, selection of efficient crops and their varieties, alternate</p>

			cropping and land use strategies, soil fertility management and fertilizer use techniques, weed control and interculture operation, mid season correction for mitigating the aberrant weather, agro techniques for hilly tracts.
<b>5<sup>th</sup> Semester</b>			
<b>31</b>	Poultry Management	2+1	<p>Students will be able to get exposure to important Breed characteristics of poultry, their methods of rearing, breeding, feeding and management. Incubation hatching and breeding, vaccination and prevention of diseases.</p> <p>Students will be able to explain about preservation and marketing of eggs, its economics and keeping quality. Broiler production and rearing, hatchery management.</p>
<b>32</b>	Mushroom Cultivation	1+1	<p>Students will be able to get exposure first record of cultivated edible fungi, definition of mushrooms, present scenario of mushroom cultivation uses nutritional and medicinal values of mushrooms, general morphological features and important characters for identification of different edible mushrooms and biological backgrounds for mushroom breeding.</p> <p>Students will be able to explain definition of spawn and their types, methods of spawn production raising cultures, preparation of spawn media/master culture/commercial grade spawn, characteristics of good spawn, storage of spawn. Cultivation of <i>Agricus</i> species: Students will be able to understand the concept of compost and its formulations, preparation of compost using short and long methods of composting, turning schedules, compost microflora and different temperatures zones. Spawning and methods of spawning. Preparation of casing mixture and its sterilization, identification, isolation and management of different diseases, pests and competitors/moulds. Methods of harvesting mushrooms, after care of harvested fruit bodies, after care of beds and crop rooms on ruminant of crop. Cultivation of <i>Pleurotus</i>, <i>Volvariella</i>, <i>Lentinus</i> and <i>Auricularia</i> sp: Types of substrate, substrate preparation and its sterilization; spawn and methods of spawning, spawn run and cropping, harvesting and packing, processing of mushrooms: Different methods- canning, dehydration, freeze drying and bringing etc.</p>
<b>33</b>	Elementary Crop Physiology	2+1	<p>Students will be able to get exposure to introduction to plant physiology, plant cell an introduction, laws of thermodynamics, diffusion and osmosis.</p> <p>Students will be able to understand concept of water potential, cell water relations, absorption of water, transpiration, stomatal physiology, ascent of sap, ion uptake and metabolic utilization of mineral ions, deficiencies of mineral ions in plants, photosynthesis, respiration, fat metabolism, physiology of growth and development, growth regulators, physiological parameters influencing the productivity of major cereal, pulse and oilseed crops.</p>
<b>34</b>	Farm Machinery and Power	2+1	<p>Students will be able to understand the concepts of sources of farm power including non-conventional sources, farm mechanization, tillage, primary and secondary tillage equipment, specialized tillage tools, seeding and fertilizer machinery, specialized sowing and planting machine, inter culture equipment, plant protection equipment, harvesting and threshing machinery, chaff cutter.</p> <p>Students will be able to get information for estimation of operating cost of farm equipment. Basic engine types, parts of I.C. engine, working of different engine systems, types of tractors, working of different tractor systems</p>
<b>35</b>	Farm Mgt. and Natural	2+1	Students will be able to understand meaning, concept, objectives, nature and scope of farm management.

	Resource Economics		<p>Meaning and definition of farm, structure and characteristics of farm business. Students can explain different types of farms and factors determining types and size of farm.</p> <p>Students will be able to explain basic principles of farm management factor – factor and product-product relationships, law of equilmarginal returns and law of comparative advantage. Students will understand meaning and concept of cost, types of cost and their importance in farm management decision making. Concepts of farm returns.</p> <p>Students will be able to analyse farm business and various measures of efficiency.</p> <p>Students will understand importance of farm business records and accounts, inventory balance sheet. Profit and loss accounts of farm.</p> <p>Students will be able to explain status of farm inputs land, labour, capital. Farm planning and budgeting meaning and importance of farm plan and farm budget, partial and complete budgeting, formulation of farm plan and budget. Concept, subject matter and importance of natural resources economics.</p> <p>Students will be able to Classify natural resources and explain the basic terms ecosystem, biomass, biosphere, reserves, rate of use, environment, pollution etc. and concepts of natural resources of economics-ecology.</p> <p>Students will understand natural resources management and conservation, issues in natural resource use of management the benefit cost approach to natural resource problems.</p> <p>Students will be able to explain time element in decision making and benefit cost analysis. The basic theory of natural resource economics efficiency in private market economy, externalities in natural resource use and alternative solution thereof,</p> <p>The students will understand important issues in economics and management of land, water and forest resources and the environment. Natural resources administration and policy formulation.</p>
36	Fundamentals of Extension Education and Rural Development	2+1	<p>Students will be able to understand meaning, concept and process of extension education, objectives, principles and philosophy of extension.</p> <p>Students will be able to explain history of extension work. Education-formal and non-formal. Components of behaviour-knowledge, attitude, skills and motivation.</p> <p>Students will understand Principles and steps in teaching learning process, learning situation, Implications of teaching. Concept need and steps in programme planning. Students will be able to use principles of programme planning, programme planning process.</p> <p>Students will understand concepts of Panchayati Raj Institute, reorganization and its role in programme planning.</p>

			<p>Extension evaluation its meaning, principles, steps, techniques and criteria. Students will be able to analyse Critically various extension programme.</p> <p>Students will understand meaning and importance of rural leadership, Types, selection and qualities, training of leadership.</p> <p>Students will be able to explain meaning of administration, public administration and extension administration. Coordination and team work. Organization POSDCORB, organization and management of NES and reorganized extension system. Rural development programme: an over view of CD programme before 1952, agricultural/rural development programme ADP, LAAP, CADP, HYVP, SFDA, hill area development programme, integrated tribal development project.</p> <p>Students will be able to prepare integrated dryland farming project.</p> <p>Students will be able to understand integrated child development scheme, IRDP, TRYSEM, JRY, DWCRA, <i>mahila uthan yojana</i>, <i>Sunishchit rojgar yojana</i>. Role of voluntary organizations in rural development, women in agriculture and rural development.</p>
37	Post-Harvest Mgt. & Processing of Fruits and Vegetables	2+1	<p>To study the importance of Post-harvest management for fruits and vegetable</p> <p>To learn total production and consumption pattern</p> <p>To understand the Post harvest losses in fruits and vegetables</p> <p>To learn about Maturity and ripening process</p> <p>To understand the biochemical changes after harvesting</p> <p>To learn the quality management for fresh marketing and processing</p> <p>To study Storage of fruits and vegetables – ambient, low temperature and controlled atmosphere storage system</p> <p>To learn about Packaging of fresh and processed products</p> <p>To learn about Transportation system, mode of marketing, sorting, grading and handling</p> <p>To study the Pretreatment of fresh produce for marketing and processing</p> <p>To study the general principles and methods of preservation and preparation of jam, marmalade, tomato products, pickles and chutney, drying fruits and vegetables, fruit beverages, juices, squashes, nectars, cordials, by products of fruits and vegetables processing industries such as vinegar, cider</p> <p>To study about Canned fruits and vegetable products, frozen fruits and vegetables</p> <p>To study about government policies, regulation and specifications for fresh and processed products</p> <p>To learn about the export promotion agencies and their role in export of fresh and processed products.</p>
38	Practical Crops Production – I	0+2	<p>Students will be able to understand the complete Practical acquaintance relating to scientific production techniques of major field crops of the season (kharif) including sowing weeding hoeing fertilizer and manure application, harvesting etc.</p>
<b>6<sup>th</sup> Semester</b>			
39	Farming System and Sustainable Agriculture	2+1	<p>Students will be able to recycle of agricultural and industrial organic wastes; wastelands and their management; reclamation and management of acidic, saline and sodic soils, soil erosion; extent, type and effects; soil</p>

			<p>conservation techniques, watershed mgt.; application of remote sensing for assessment of soil and water resources.</p> <p>Students will be able to utilise mulching, wind breaks, water harvesting, tied ridging, strip cropping. Permeable contour line barriers and water ponds.</p>
40	Conservation and Management of soil and water resources	1+1	<p>Students will be able to understand different soil resources of India; distribution of waste land problem soils; water resources of India and their utilization in crop production; soil tilth management and relationship with tillage; tilth requirement of different crops; soil impedance layers and their improvement; management of soil water energy state of water in soil and availability to plants; management of soil moisture under different climates; water harvesting techniques, effect of water quality on soil and plants; soil aeration problems and management; soil thermal regimes in relation to crops and their optimization.</p> <p>Students will be able to recycling of agricultural and industrial organic wastes; wastelands and their management; reclamation and management of acidic, saline and sodic soils, soil erosion; extent, type and effects; soil conservation techniques, watershed mgt.; application of remote sensing for assessment of soil and water resources.</p>
41	Ornamental Horticulture	2+1	<p>Students will be able to explain importance of ornamental gardening in human life, theory and practice of landscape and formal garden for various places, identification, use of ornamental plants for the beautification of private and public places, styles of gardens, formal, informal etc.</p> <p>Students will be able to understand different concepts of landscape and town planning, ornamental plants for rural and urban areas, indoor gardening, post culture; bonsai, hanging baskets etc.</p> <p>Students will be able to understand principles and practices involved in growing ornamental annual and perennial plants, planning and layout of various parts of garden, herbaceous and shrubbery borders, lilly pots, rock gardens etc. cultivation of important ornamental plants, rose, gladiolus, chrysanthemum, tuberose, orchids, athurium, gerbera, dahlia, fern, palms, cycades, cacti etc. Post-harvest technology, project formulation and evaluation.</p>
42	Environmental Science	2+1	<p><b>Students will be able to understand Introduction to Environmental Sciences for following heads:</b></p> <ul style="list-style-type: none"> <li>▪ Definition, scope and importance (the multidisciplinary nature of environmental sciences)</li> <li>▪ Need for public awareness on Environment, Role of individual in Environmental protection</li> </ul> <p><b>Students will be able to explain Natural Resources (Renewable and Non-renewable Resources):</b></p> <ul style="list-style-type: none"> <li>▪ Natural Resource conservation: concepts</li> <li>▪ Freshwater resources: use and over-exploitation of surface and ground water, conflict over water, hydroelectric projects, problems, traditional methods of harvesting of freshwater resources.</li> <li>▪ Mineral resources: use and exploitation, environmental effects of extracting mineral resources, Lime stone quarrying in Uttaranchal</li> <li>▪ Food resources: World food problems, changes caused by agriculture and overgrazing, effect of modern agriculture, fertilizer operated problem, water logging, salinity.</li> <li>▪ Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources.</li> <li>▪ Land resources: Land as a resources, land degradation, landslides, soil crosion and desertification.</li> </ul>

		<p><b>Ecosystems:</b></p> <ul style="list-style-type: none"> <li>▪ Concept, structure, and components of an ecosystem.</li> <li>▪ Abiotic and biotic variables.</li> <li>▪ Ecosystem function, trophic levels, energy flow, food chain, food web, Ecosystem, homeostasis.</li> <li>▪ Examples of ecosystems (aquatic: pond, lake, river)</li> <li>▪ Terrestrial ecosystem: Forest, mountain</li> <li>▪ Ecological succession.</li> </ul> <p><b>Biodiversity and its conservation:</b></p> <ul style="list-style-type: none"> <li>▪ Introduction:- Definition, genetic, species and ecosystem diversity.</li> <li>▪ Bio-geographical classification of India</li> <li>▪ Values of biodiversity: 5 Es (Esthetic (Aesthetic), Economic, Environment, Ethical, Emotional).</li> <li>▪ Biodiversity at global, national and local levels.</li> <li>▪ India as a mega diversity nation, hot spots of biodiversity.</li> <li>▪ Himalayan wildlife: Habitual loss/poaching of wildlife, man-wildlife conflicts, and conservation.</li> <li>▪ Threatened categories as per IUCN.</li> <li>▪ Conservation of biodiversity: <i>In-situ</i> and <i>Ex-situ</i> conservation of biodiversity.</li> </ul> <p><b>Students will be able to understand the concepts of Applied environmental science</b> Environmental Pollution</p> <ul style="list-style-type: none"> <li>▪ Definition, causes, effects and measures of Air pollution.</li> <li>▪ Water pollution and thermal pollution.</li> <li>▪ Marine pollution.</li> <li>▪ Noise and radioactive pollution.</li> <li>▪ Solid waste and their management (municipal, industrial (hazardous and non-hazardous), problems of solid waste disposal in Uttaranchal and integrated Solid Waste Management (ISWM).</li> <li>▪ Environmental hazards in Himalayas (floods, river, blockades, cloud burst, landslides, earthquakes).</li> </ul> <p>Students will be able to explain Environmental problems and Environmental Protection</p> <ul style="list-style-type: none"> <li>▪ <i>Anthropogenic</i> and natural environmental problems.</li> <li>▪ Environmental ethics; issues and possible solutions.</li> <li>▪ Climate change, global warming: causes, effects and mitigation (national and international efforts)</li> <li>▪ Ozone layer depletion: causes, effects and mitigation. (national and international)</li> <li>▪ Environmental Protection Act 1986</li> <li>▪ Air (Prevention and Control of pollution) Act, Water (Prevention and control of Pollution) Act.</li> <li>▪ Wildlife Protection Act 1972</li> <li>▪ Forest Conservation Act 1980</li> <li>▪ The Biological Diversity Act 2002</li> <li>▪ Issues involved in enforcement of environmental legislation, public awareness, Article 48A and 51A</li> <li>▪ Automobile Emission standards (Eco/Bharat), Ecomark</li> </ul> <p><b>Human Population and the Environment:</b></p> <ul style="list-style-type: none"> <li>▪ Population growth, variation among nations, population explosion Family Welfare Programme.</li> <li>▪ Environment and human health.</li> </ul>
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43	Silviculture and Agro Forestry	2+1	<p>Students will be able to understand Introduction basic terms, concepts and scope, national and global need, growth and development of trees and forest stands growth and developmental stages and growth measurements, factors affecting tree and stand growth, plant succession kinds and causes, natural and artificial regeneration establishment and care of tree nurseries tending operations cleaning, weeding, thinning, pruning.</p> <p>Students will be able to explain cultural operation classification, regeneration and crop characteristics of major Silvicultural systems, basic concepts of rotation, sustainable yield management and multiple use, establishment of forest stands/crops and agroforestry-selection and management of tree and crop species i.e. planting density, geometry and Silviculture, comparison among various land uses-mixed farming, multiple cropping and agroforestry, Interactions between components of agroforests for various resources and productivity. Problems, choice and management of agro-forestry systems in various agro-climatic zones.</p>
44	Seed Production and Processing Technology	2+1	<p>Students will be able to understand the concepts of Seed, its importance in green revolution difference between grain and seed, concept of seed quality, steps involved in seed production. Seed technology, its objectives and its role in increasing agriculture production. Seed industry in India.</p> <p>Students will be able to explain development of seed programmes, general principles of seed production. Seed replacement rate, multiplication rate, Breeder's, foundation and certified seed, maintenance of genetic purity, Nucleus and breeders seed production of newly released and established varieties of self-pollinated crops, viz, Rice, Wheat Soybean/chickpea, Pigeonpea, Rapeseed and Mustard etc.</p> <p>Students will be able to know maintenance of nucleus and breeder's seed in cross pollinated crop varieties, inbreds and non-inbreds, maintenance of seed of established varieties. Foundation and certified seed production of maize inbreds, single and double cross hybrids. Hybrid seed production of Sunflower, Sorghum, pearl millet and Rice using male sterility systems. Latest released hybrids of Maize, Sorghum, Bajra and Rice their characteristic feature, seed production of Wheat, Rice, Oats, Soybean, Gram, Urd, Moong, Sunflower, Pigeonpea etc. seed certification, its concepts, roles and goals, seed certification agencies, certified and truthfully labeled seeds.</p> <p>Students will be able to explain seed processing, storage and marketing, Minimum seed certification standards for self and cross-pollinated crops. Field and seed inspections objectives, general principles and methods, Seed sampling and seed testing for analytical purity, varietal identification through electrophoreses, Grow out test for cultivar purity, seed legislation and seed law enforcement including IPR, PBR in India, Record developments in seed.</p>
45	Practical Crops	0+2	Students will be able to understand the complete Practical acquaintance relating to scientific production technique

	Production – II		of major field of the season crop(s) including sowing weeding, hoeing, fertilizer and manure application, harvesting etc.
<b>7<sup>th</sup> Semester</b>			
46	General Economics	2+0	<p>The students will be able to understand Nature and scope and subject matter of economics and also approaches to economic analysis and nature of economic theory.</p> <p>The students will be able to state the basic terms and concepts of economics</p> <p>The students will be able to state the various theories related to consumer behavior such as equi-marginal utility, indifference curve, diminishing marginal utility.</p> <p>The students will be able to define law of demand and understand the concept of price, income and cross elasticities.</p> <p>The students will be able to explain factors of production i.e. land, labour, capital and enterprise and also understand and input-output relationships.</p> <p>The students will be able to describe law of variable proportions and laws of scale.</p> <p>The students will be able to understand the concepts of cost.</p> <p>The students will be able to describe Law of diminishing marginal returns.</p> <p>The students will be able to explain the Law of supply.</p> <p>The students will be able to explain the theories of rent, wage, interest and profit.</p> <p>The students will be able to understand the concepts of various types of markets and also Price determination and forecasting under them.</p> <p>The students will be able to understand the concepts of National Income and also approaches of measuring national income.</p> <p>The students will be able to explain theories of population.</p> <p>The students will be able to describe the concept and types of inflation.</p> <p>The students will be able to understand barter system of exchange and its problems.</p> <p>The students will be able to understand the concept of money and explain quantity theory of money.</p> <p>The students will be able to tell the various types of banks and their function.</p> <p>The students will be able to explain the basic feature of various economic systems,</p> <p>The students will understand the concept of international trade.</p> <p>The students will be able to specify special characteristics of agriculture and its role in economic development.</p> <p>The students will be able to explain the role of women in Indian Agriculture.</p>
47	Breeding and Improvement of Farm Animals	1+1	<p>Students will be able to understand reproductive systems of farm animals. Qualitative and quantitative inheritance and effect of environment on them. Various qualitative and quantitative traits of livestock. Weinberg law, variation, its measures, genetic, phenotypic and environmental variances.</p> <p>Students will be able to explain heritability and repeatability, its measurement and uses. Selection its genetic effect, selection for dominant and recessive gene and quantitative traits, selection differential, response to selection, generation interval and annual rate of gain.</p> <p>Students will be able to explain Genetic correlation and correlated response. Basic of selection, individual, family, progeny, pedigree and combined selection. Methods of selection for one or more traits random,</p>

			independent culling level and selection index. Inbreeding its consequences, inbred lines, line breeding, inbreeding, coefficient and relationship coefficient, out breeding – various types of our crossing and cross-breeding, species hybridization and development of new breeds.
48	Principles of Animal Nutrition	2+1	<p>Students will be able to understand Introduction to expanding field of nutrition, chemical composition of animal and its food, digestive systems and processes of farm animals. Digestion, absorption and metabolism of carbohydrates, lipids and proteins in protein content in various classes of feeds. Concept of essential amino acids for non-ruminants and protein quality of feeds.</p> <p>Students will be able to explain the absorption and metabolism of essential minerals and vitamins; symptoms of their deficiencies; minerals and vitamin content of various classes of feeds. The nutritive evaluation of feeds for energy and protein, digestibility of feeds values of feeds, nutrient requirements of farm animals for maintenance, growth reproduction and lactation. Growth stimulating substances.</p>
49	Element of Food Technology	2+1	<p>Students will be able to understand the scope and importance of food technology in Indian economy. Handling, transportation and storage of food grains, fresh milk, meat, fish and eggs; physical, chemical and nutritional characteristics of food grains – fresh meat, fish, milk and eggs; role of milling and size reduction in food processing;</p> <p>Students will be able to explain use of low temperatures in processing and storage of food grains, fresh milk, meat, fish and eggs; Drying and dehydration of food grains and concentration and evaporation of milk; Food fermentations and their application in food processing.</p> <p>Students will be able to know the role of food additives in the processing of food grains, milk, meat, fish, eggs and their products; Food irradiation and its application in extending shelf life of food grains, meat, fish, eggs and their products; Food packaging and its functions; By product's utilization and disposal of food industry wastes; quality control, total quality assurance (TQA) and various systems of TQA.</p>
50	Human Food and Nutrition	2+1	<p>Students will be able to understand different trends in food production and consumption in India. Role of agricultural scientists and food technologist in meeting national nutritional requirements. Definition of human nutrition, nutrient, nutritional care, health, nutritional status and good nutrition.</p> <p>Students will be able to explain food and its functions and functional classification. Calorific value of foods and its measurement. Digestion and absorption of various nutrients present in foods. Energy and nutrient needs of human body. Recommended dietary allowances for various age groups and classes of individuals.</p> <p>Students will be able to know common nutritional problems in India and their causes. Specific nutritional deficiencies and disorders including protein calorie malnutrition, nutritional anaemias, vitamin deficiencies, obesity, atherosclerosis. Clinical symptoms and diagnosis of deficiency disorders. Important food groups and their role in the management of deficiency disorders and diseases. Food habits and their effect on regional balance. Balanced diet and its formulation.</p> <p>Students will be able to understand the food born infections and food hygiene. Effect of processing on the nutritional value of foods. Applied nutritional programme in country, nutritional policies of government. Food fortification, enrichment and restoration, supplementary feeding programmes for vulnerable groups. State,</p>

			national and international agencies dealing with nutritional programmes.
51	Soil Taxonomy, Survey and remote sensing	2+1	<p>Students will be able to explain types of soil survey, morphological, physical and chemical properties used in distinguishing and classifying soils.</p> <p>Students will be able to understand principles of soil taxonomy, classification system. Soils of India and their classification. Advantages of taxonomic classification of soils. Remote sensing introduction, definition, concept, principles, importance, scope, types, merits and demerits and its application in agriculture and soil classification.</p>
52	Production Technology of Medicinal and Aromatic Plants	0+2	<p>Students will be able to know importance and scope of medicinal and aromatic plants, geographical distribution of species, botanical description, management of nurseries, climate and relation to medicinal and aromatic plants, improved varieties, soil and land preparation, intercultural practices, irrigation and insect-pest management, post-harvest techniques, harvesting processing, storage and herbage/constituent yield.</p> <p>Students will be able to know the following medicinal and aromatic plants.  <i>Medicinal Plants:</i> Sarpagandha, poppy, sadabahar, digitailis, dioscora, solanum, brahmi, isabgol, senna, aloe, neem, cinchona and Ipecac.  <i>Aromatic Plants:</i> Essential oils: Mints-menthol mint, pepper mint, Spearmint, bergamot mint; Aromatic grasses lemon grass, palmarosa, citronella, vetiver; Ocimum, geranium, pachauli, dill (Sowa), Cinamon, pine, eucalyptus, sandalwood, liquorice  <i>Flower perfume:</i> lavender, rose, rosemary, jasmine</p>
<b>8<sup>th</sup> Semester</b>			
53	Rural Agriculture Work Experience	0+20	<p>Students will be able to learn and understand different below mentioned topics each student will have a choice to opt any of the four components given below. He/she will submit his/her work in form of a report and present the results in the seminar.</p> <ol style="list-style-type: none"> <li>i. Agro-based Industries – Seed processing plants and industries, fruit preservation industries, food processing industries etc.</li> <li>ii. Plant clinics</li> <li>iii. NGO</li> <li>iv. Socio economic studies</li> <li>v. Apiculture</li> <li>vi. Sericulture</li> <li>vii. Mushroom Cultivation</li> <li>viii. Attachment with agriculture Departments</li> <li>ix. Attachment with Agriculture research institutes/organizations/agencies.</li> </ol>