

B.Sc. (HONS.)Ag: Syllabus Revision in 2017-18.

S. No	Course Code	Session 2016-17	Session 2017-18	Remark Syllabus Change/new course
1	AG101	<p>Introductory Agriculture and Principles of Agronomy</p> <p>Definition and importance of Agriculture; Meaning and scope of Agronomy; Plant growth and development– concept and differences; general growth curves, factors affecting crop production, Classification of crops; Meaning and types of tillage and tith; Soil fertility and productivity ; Soil erosion- nature, and abroad. Art, science and business of crop production; Agricultural heritage; Chronological agricultural technology development in India; Ancient Indian Agriculture in Civilization Era; Conversion of man from food gatherer to food producer; Development of Agriculture through Kautilya’s work; Tools to predict monsoon rain; Plant protection in ancient and medieval India; Forest management and products, history of some indigenous trees.extent and types; Soil conservation- meaning , agronomic and common mechanical practices; Agro-climatic zones of Rajasthan and India and National, International Agricultural Research Institutes in India</p> <p>Practical: Identification of crop seeds and plants; Identification of fertilizers and manures; Acquaintance with farm tools and implements; Methods of ploughing and sowing; Preparation of seed beds of crops; Calculation on plant population ; Calculation of soil and water losses from runoff plots ; Identification of grasses, legumes and trees for soil conservation.</p>	<p>AG101: Fundamentals of horticulture</p> <p>UNIT-AHorticulture- Its definition and branches, importance and scope; horticultural and botanicalclassification; climate and soil for horticultural crops.</p> <p>UNIT-BPlant propagation-methods and propagating structures; Seed dormancy, Seed germination.</p> <p>UNIT-CPrinciples of orchard establishment; Principles and methods of training and pruning, juvenility and flower bud differentiation, unfruitfulness.</p> <p>UNIT-DPollination, polliizers and pollinators, fertilization and parthenocarp, medicinal and aromatic plants.</p> <p>UNIT-EImportance of plant bio-regulators in horticulture. Irrigation – methods, Fertilizer application in horticultural crops.</p> <p>Practical Identification of garden tools.Identification of horticultural crops.Preparation of seed bed/nursery bed. Practice of sexual and asexual methods of propagation including micro-propagation. Layout and planting of orchard. Training and pruning of fruit trees. Preparation of potting mixture. Fertilizer application in different crops.Visits to commercial nurseries/orchard.</p>	New course
2	AG102	<p>Principles of Genetics Theory:</p> <p>History of Genetics, ultra structure of cell. Cell organelles and their function. Chromosomes structure, function and their chemical composition-karyotype and ideogram. Cell division: types and their significance. Mendel’s law of inheritance. Gene interaction and their types. Multiples alleles and some classical examples. Inheritance of</p>	<p>AG102 Fundamentals of Plant Biochemistry and Biotechnology</p> <p>UNIT-A Importance of Biochemistry. Properties of Water, pH and Buffer. Carbohydrate: Importanceand classification. Structures of Monosaccharides, Reducing and oxidizing properties of Monosaccharides, Mutarotation; Structure of Disaccharides and Poly saccharides. Lipid: Importance</p>	New course

	<p>qualitative and quantitative characters and difference between them. Multiple factor hypothesis. Pleiotropism, penetrance and expressivity. Mechanism of crossing over and cytological proof of crossing over. Linkage types and importance. Estimation of linkage. DNA and its structure, function, types, mode of replication and repair. RNA and its structure, function and its types, transcription, translation, genetic code and protein synthesis. cytoplasmic inheritance-its characteristics features and difference between chromosomal and cytoplasmic inheritance. Structural chromosomal aberrations. Numerical chromosomal aberrations (polyploidy) and evolution of different crop species like cotton, wheat, tobacco and brassicas. Mutation -characteristics, classification and induction.</p> <p>Practical: Introduction to microscopy-simple and compound microscope. study of typical plant cell. Preparation and use of fixatives and stains. Preparation of micro slides and identification of various stage of cell division. Monohybrid ratio and its modification. Test of goodness of fit of genetic ratio. Study of different types of gene interaction and modifications of typical dihybrid f₂ ratio. Study and detection of linkage in f₂ and test cross progeny. Demonstration of structural aberrations and polyploidy.</p>	<p>and classification; Structures and properties of fatty acids; storage lipids and membrane lipids. Proteins: Importance of proteins and classification; Structures, titration and zwitterions nature of amino acids; Structural organization of proteins.</p> <p>UNIT-B Enzymes: General properties; Classification; Mechanism of action; Michaelis & Menten and Line Weaver Burk equation & plots; Introduction to allosteric enzymes.</p> <p>UNIT-C Nucleic acids: Importance and classification; Structure of Nucleotides, A, B & Z DNA; RNA: Types and Secondary & Tertiary structure. Metabolism of carbohydrates: Glycolysis, TCA cycle, Glyoxylate cycle, Electron transport chain. Metabolism of lipids: Beta oxidation, Biosynthesis of fatty acids.</p> <p>UNIT-D Concepts and applications of plant biotechnology: Scope, organ culture, embryo culture, cell suspension culture, callus culture, anther culture, pollen culture and ovule culture and their applications; Micro-propagation methods; organogenesis and embryogenesis, Synthetic seeds and their significance; Embryo rescue and its significance; somatic hybridization cybrids; Somaclonal variation and its use in crop improvement; cryo-preservation;</p> <p>UNIT-E Introduction to recombinant DNA methods: physical (Gene gun method), chemical (PEG mediated) and Agrobacterium mediated gene transfer methods; Transgenics and its importance in crop improvement; PCR techniques and its applications; RFLP, RAPD, SSR; Marker Assisted Breeding in crop improvement; Biotechnology regulations.</p> <p>Practical Preparation of solution, pH & buffers, Qualitative tests of carbohydrates and amino acids. Quantitative estimation of glucose/ proteins. Titration methods for estimation of amino acids/lipids, Effect of pH, temperature and substrate concentration on enzyme action, Paper chromatography/ TLC demonstration for separation of amino acids/ Monosaccharides. Sterilization techniques. Composition of various tissue culture media and preparation of stock solutions for MS nutrient medium. Callus induction from various explants. Micro-propagation, hardening and acclimatization. Demonstration on isolation of DNA. Demonstration of gel electrophoresis techniques and DNA</p>	<p>Course code and Course name changed in 2017-2018</p> <p>Highlighted portion added in 2017-2018</p>
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3	AG103	<p>Introduction to Soil Science Soil: Pedological and edaphological concepts. Origin of properties, Soil texture, Textural classes, Particle size analysis, Soil structure, Classification the earth, Earth's crust, Composition, Rocks and minerals. Weathering, Soil formation factors and processes, Components of soils. Soil profile, Soil physical, Soil aggregates, significance, Soil consistency, Soil crusting, Bulk density and particle density of soils & porosity and their significance and manipulation. Soil colour, Soil water, Retention and potentials, Soil moisture constants, Movement of soil water, Infiltration, Percolation, Permeability, Drainage. Methods of determination of soil moisture. Thermal properties of soils, Soil temperature, Soil air, Gaseous exchange, Influence of soil temperature and air on plant growth. Soil colloids: Properties, nature, types and significance; Layer silicate clays, and sources of charges. Adsorption of ions, Ion exchange, CEC & AEC, Soil reaction and buffering capacity. Factors influencing ion exchange and its Significance. Problem soils – acid, salt affected and calcareous soils, characteristics. Reclamation – mechanical, chemical and biological methods. Irrigations water – Quality of irrigation water and its appraisal. Indian standards for water quality. Use of saline water for agriculture.</p> <p>Practical: Collection and processing of soil sample. Identification of rocks and minerals. Determination of bulk density and particle density, Soil moisture determination, Soil moisture constants – Field capacity, permanent wilting point, Water holding capacity Infiltration rate, Soil texture and mechanical analysis, Soil temperature, Soil analysis for CEC, pH, EC, soluble cations& anions.</p>	<p>Fundamental of Soil Science</p> <p>Theory UNIT-A Soil as a natural body, Pedological and edaphological concepts of soil; Soil genesis: soil forming rocks and minerals; weathering, processes and factors of soil formation; Soil Profile, component of soil; Soil physical properties: soil texture, structure, density and porosity, soil colour, consistence and plasticity; UNIT-B Elementary knowledge of soil taxonomy classification and soils of India; Soil water retention, movement and availability; Soil air, composition, gaseous exchange, problem and plant growth, Soil temperature; source, amount and flow of heat in soil; effect on plant growth, UNIT-C Soil reaction- pH, soil acidity and alkalinity, buffering, effect of pH on nutrient availability; soil colloids- inorganic and organic; silicate clays: constitution and properties; sources of charge; ion exchange, cation exchange capacity, base saturation; UNIT-D Soil organic matter: composition, properties and its influence on soil properties; humic substances- nature and properties; soil organisms: macro and microorganisms, their beneficial and harmful effects; UNIT-E Soil pollution -behavior of pesticides and inorganic contaminants, prevention and mitigation of soil pollution.</p> <p>Practical Study of soil profile in field. Study of soil sampling tools, collection of representative soil sample, its processing and storage. Study of soil forming rocks and minerals. Determination of soil density, moisture content and porosity. Determination of soil texture by feel and Bouyoucos Methods. Studies of capillary rise phenomenon of water in soil column and water movement in soil. Determination of soil pH and electrical conductivity. Determination of cation exchange capacity of soil. Study of soil map. Determination of soil colour. Demonstration of heat transfer in soil. Estimation of organic matter content of soil.</p>	1. Title changed.
4	AG104	Dimensions of Agricultural Extension	AG-104 Introduction to Forestry	

		<p>Education- Meaning, Definition, Types- Formal, Informal and Non-formal Education. Extension Education - Meaning, Definition, Concept, Objectives, Principles, Scope and Importance. Development programmes of pre-independence era – Sriniketan, Marthandam, Gurgaon experiment and Gandhian constructive programme with special reference to year of start, objectives and activities. Development Programmes of post-independence era- Etawah Pilot Project, Community Development Programme–Meaning, Definition, Concept, Objectives, Difference between Community Development and Extension Education, National Extension Service. Panchayati Raj System/Democratic Decentralization/Three tiers system of Panchayati Raj–Concept, Meaning, Organizational set-up and Functions. Agricultural Development Programmes with reference to year of start, objectives & salient features- Institution Village Linkage Programme (IVLP), National Agricultural Technology Project (NATP), ATMA, ATIC, KVK & NAIP. Poverty Alleviation Programmes- Integrated Rural Development Programme (IRDP), Swarna Jayanti Gram Swarojgar Yojana (SGSY), National Rural employment act (NREGA). Reorganized Extension System (T & V System) – Concept & Methodology.</p> <p>Practical: Visit to KVK/ Extension Wing/ ATIC/ ATMA to study their functioning. Visit to Panchayati Raj Institutions to study the functioning of Gram Panchayat (GP) & Other Institutions. Visit and study the District Rural Development Agency (DRDA). Visit to a village to study the Self Help Groups (SHG). Visit to a voluntary organization to study the developmental activities. Organizing PRA techniques in a village to identify the agricultural problems.</p>	<p>UNIT-A Introduction – definitions of basic terms related to forestry, objectives of silviculture, forest classification, salient features of Indian Forest Policies.</p> <p>UNIT-B Forest regeneration, Natural regeneration-natural regeneration from seed and vegetative parts, coppicing, pollarding, root suckers; Artificial regeneration – objectives, choice between natural and artificial regeneration, essential preliminary considerations. Crown classification.</p> <p>UNIT-C Tending operations – weeding, cleaning, thinning – mechanical, ordinary, crown and advance thinning. Forest menstruation – objectives, diameter measurement, instruments used in diameter measurement; Non instrumental methods of height measurement - shadow and single pole method</p> <p>UNIT-D Instrumental methods of height measurement - geometric and trigonometric principles, instruments used in height measurement; tree stem form, form factor, form quotient, measurement of volume of felled and standing trees, age determination of trees.</p> <p>UNIT-E Agroforestry – definitions, importance, criteria of selection of trees in agro forestry, different agroforestry systems prevalent in the country, shifting cultivation, taungya, alley cropping, wind breaks and shelter belts, home gardens. Cultivation practices of two important fast growing tree species of the region.</p> <p>Practical Identification of tree-species. Diameter measurements using calipers and tape, diameter measurements of forked, buttressed, fluted and leaning trees. Height measurement of standing trees by shadow method, single pole method and hypsometer. Volume measurement of logs using various formulae. Nursery lay out, seed sowing, vegetative propagation techniques. Forest plantations and their management. Visits of nearby forest based industries.</p>	<p>New course</p>
5	<p>AG105</p>	<p>Agricultural Microbiology History of microbiology: Theory of spontaneous generation, role of microbes in fermentation, germ theory of disease, protection against infections. Applied areas of microbiology, Metabolism in bacteria: ATP generation, chemoautotrophy, photoautotrophy, respiration, fermentation. Bacteriophages: structure and properties - Lytic and lysogenic cycles: viroids, prions. Bacterial</p>	<p>AG 105 Comprehension & Communication Skills in English</p> <p>UNIT-A War Minus Shooting- The sporting Spirit. A Dilemma- A layman looks at science Raymond B. Fosdick. You and Your English – Spoken English and broken English G.B. Shaw.</p> <p>UNIT-B Reading Comprehension, Vocabulary- Antonym, Synonym,</p>	<p>New Course</p>

		<p>genetics: Genetic recombination, transformation, conjugation and transduction. Genetic engineering, plasmids, episomes, genetically modified organisms. Soil microbiology: microbial groups in soil; microbial transformations of carbon, nitrogen, phosphorus and sulphur; Biological nitrogen fixation. Plant microbe interaction. Rhizosphere and phyllosphere microflora. Beneficial microorganism in agriculture: biofertilizers – Rhizobium, mycorrhiza, azolla; microbial insecticides, microbial agents for control of plant diseases. Microbes in composting. Microbiology of water: marine water, fresh water, potable water; Food microbiology: microbial spoilage and food preservation. Biodegradation of pesticides. Biogas production.</p> <p>Practical: Acquaintance with equipments, glasswares etc. in microbiology laboratory. Acquaintance with microscope. Disinfection and sterilization methods. Preparation of culture media for fungi and bacteria. Isolation of microbes from infected plant parts. Isolation and purification of bacteria by streak plate method. Staining and slide preparation of fungi. Staining of bacteria- simple and differential staining. Staining of endospore. Determination of quality of milk sample by methylene blue reductase test. Enumeration of bacteria present in soil and water.</p>	<p>Homophones, Homonyms, often confused words.</p> <p>UNIT-C Exercises to Help the students in the enrichment of vocabulary based on TOEFL and other competitive examinations. Functional grammar: Articles, Prepositions, Verb, Subject verb Agreement, Transformation, Synthesis</p> <p>UNIT-D Direct and Indirect Narration. Written Skills: Paragraph writing, Precise writing, Report writing and Proposal writing.</p> <p>UNIT-E The Style: Importance of professional writing. Preparation of Curriculum Vitae and Job applications. Synopsis Writing Interviews: kinds, Importance and process.</p> <p>Practical Listening Comprehension: Listening to short talks lectures, speeches (scientific, commercial and general in nature). Oral Communication: Phonetics, stress and intonation, Conversation practice. Conversation: rate of speech, clarity of voice, speaking and Listening, politeness & Reading skills: reading dialogues, rapid reading, intensive reading, improving reading skills. Mock Interviews: testing initiative, team spirit, leadership, intellectual ability. Group Discussions.</p>	
6	AG 106	<p>Elementary Mathematics</p> <p>Elementary idea of complex number. Arithmetic and Geometric progressions. Elementary idea of permutation and combinations. Binomial theorem for positive integral index, any index and their applications, addition and subtraction formulae. A, B and C, D formulae. Sine and Cosine formulae. Inverse Trigonometric functions. Introduction to matrices and determinants, special type of matrices, addition, subtraction and multiplication of matrices. Inverse of a matrix solution of system of linear equations using Cramer's rule and matrices method. Measures of central tendency and dispersion. Correlation and Regression. Elementary idea of probability theory.</p>	<p>Fundamentals of Agronomy</p> <p>UNIT-A Agronomy and its scope, seeds and sowing, tillage and tilling, crop density and geometry, Crop nutrition, manures and fertilizers, nutrient use efficiency</p> <p>UNIT-B Water resources, soil-plant-water relationship, crop water requirement, water use efficiency, irrigation- scheduling criteria and methods, quality of irrigation water, logging.</p> <p>UNIT-C Weeds- importance, classification, crop weed competition, concepts of weed management principles and methods, herbicides- classification, selectivity and resistance, allelopathy.</p> <p>UNIT-D Growth and development of crops, factors affecting growth and development, plant ideotypes, crop rotation and its principles</p>	New Course

			<p>UNIT- E Adaptation and distribution of crops, crop management technologies in problematic areas, harvesting and threshing of crops.</p> <p>Practical</p> <p>Identification of crops, seeds, fertilizers, pesticides and tillage implements, study of agroclimatic zones of India, Identification of weeds in crops, Methods of herbicide and fertilizer application, Study of yield contributing characters and yield estimation, Seed germination and viability test, Numerical exercises on fertilizer requirement, plant population, herbicides and water requirement, Use of tillage implements-reversible plough, one way plough, harrow, leveler, seed drill, Study of soil moisture measuring devices, Measurement of field capacity, bulk density and infiltration rate, Measurement of irrigation water.</p>	
7	AG 107	<p>Comprehensive and Communication Skills in English</p> <p>Grammar & usage i.e.Tense, Modals, Active & Passive voice, Direct & Indirect Speech, Question Tags, Determiners, Comprehension i.e. The Solitary Reaper : William Wordsworth, Mending Wall: Robert Frost, Of Studies: Francis Bacon, The Luncheon: W. S. Maugham.</p> <p>Practical:</p> <p>Composition i.e. Paragraph Writing, Letter Writing: Personal/Business Correspondence, Covering Letter and C.V. Writing, E-Mails Writing</p>	<p>AG 107A Introductory Biology*</p> <p>UNIT-A Introduction to the living world, diversity and characteristics of life, Origin of life, Evolution and Eugenics</p> <p>UNIT-B Binomial nomenclature and classification Cell and cell division</p> <p>UNIT-C Morphology of flowering plants. Seed and seed germination</p> <p>UNIT-D Plant systematic- viz; Brassicaceae, Fabaceae and Poaceae</p> <p>UNIT-E Role of animals in agriculture. <i>ICAR Fifth Deans' Committee</i></p> <p>Practical</p> <p>Morphology of flowering plants – root, stem and leaf and their modifications. Inflorescence, flower and fruits. Cell, tissues & cell division. Internal structure of root, stem and leaf. Study of specimens and slides. Description of plants - Brassicaceae, Fabaceae and Poaceae.</p>	New Course
8	AG108	<p>Introduction to Computer Applications</p> <p>Historical Evolution of Computers, Computer System Concepts, Capabilities and Limitations, Types of computer: Analog, Digital, Hybrid, General Purpose, Special Purpose, Micro, Mini, Mainframe, Super, Generations of Computers, Type of PCs- Desktop, Laptop, Palmtop etc. their Characteristics, Computer Security, Basic Components of Computer System CPU, Input/Output and Memory, their Functions and Characteristics. Memory-RAM, ROM,</p>	<p>Agricultural Heritage</p> <p>UNIT-A Introduction of Indian agricultural heritage; Ancient agricultural practices, Relevance of heritage to present day agriculture;</p> <p>UNIT-B Past and present status of agriculture and farmers in society ;Journey of Indian agriculture and its development from past to modern era;</p> <p>UNIT-C Plant production and protection through indigenous traditional knowledge; Crop voyage in India and world;</p>	New Course

	<p>EPROM, PROM and other type of Memory, Keyboard, Mouse, Digitizing Tablets, Scanners, Digital Cameras, MICR, OCR, OMR, Bar Code Reader, Voice Recognition, Light Pen, Touch Screen, Input/Output Devices, Monitors-Analog, Digital and Characteristics-size, Resolution, Video Standard-VGA, SVGA, XGA etc. Printers-Dot Matrix, Inkjet, Laser, Line Printer, Plotter, Sound Card and Speakers, Various Storage Devices-Magnetic Tape, Magnetic Disk, Cartridge Tape, Hard Disk Device, Floppy Disk, Optical Disk-CD, VCD, CD-R, CD-RW, DVD, Zip Drive, MS-Windows: Introduction to MS-Windows, Concept of GUI, Desktop and its elements, Windows explorer, Control Panel, Accessories, Running Application under MS Windows, Advantages and Limitation of Windows, various Versions of windows Like (Win 95,98,Win ME, 2000 XP), Hardware requirement for Windows XP, Basic concept of MS Word Processor, MS Excel, MS Power Point, Features of word processing packages, MS Excel packages, Power Point Package. Internet: world Wide Web (WWW), Concept, Web Browsing and Electronic Mail, concept of Networking.</p> <p>Practical: Study of Computer Components; Booting of Computer and its Shut Down; Practicing WINDOWS Operating System, Use of Mouse and Keyboard, Title Bar, Start Menu, Minimum, Maximum and Close Buttons, Scroll Bars, Menus and Tool Bars; Setting time and date, Starting and Shutting down of Window, WINDOWS Explorer, Creating File and Folders, COPY and PASTE functions, MS-Word: Introduction to MS Word. Creating a Document, Saving and Editing, Word Proofing Tools-Using Spelling Checker, Working with Grammar Checker, Using Thesaurus, Working with Auto Text Feature in Word, Using Auto Correct Feature, Word Count. Text Formatting, Document Formatting (Page Formatting), Alignment of text, Creating Tables, Merging of Cells, Column and Row width and Chart in Word, Working with Mail Merge, Graphics and Web Pages in word, MS-Power Point: Introduction to MS Power Point. Power Point Slide Creation, Slide Show, Editing,</p>	<p>UNIT-D Agriculture scope; Importance of agriculture and agricultural resources available inIndia;</p> <p>UNIT-E Crop significance and classifications; National agriculture setup in India; Current scenario of Indian agriculture; Indian agricultural concerns and future prospects.</p>	
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9	AG109	<p>NCC/NSS/ Physical Education</p> <p>NSS: Orientation of students in national programmes, study of philosophy of NSS, fundamental rights, directive principles of state policy, socio-economic structure of Indian society, population problems, brief of five year plan. Functional literacy, non formal education of rural youth, eradication of social evils, awareness programme, consumer awareness, highlights of consumer act. Environment enrichment and conservation, health, family welfare and nutrition.</p> <p>NCC: Introduction to NCC, defence services, system of NCC training, foot drill, sizing, forming up in three ranks, open and close order march, dressing, getting on parade, dismissing and falling out, saluting, marching, arms drill, shoulder arm, order arm, present arm, guard of honour, ceremonial drill, weapon training- rifle bayonet, light machine gun, sten machine carbine. Introduction and characteristic stripping, assembling and cleaning, loading, unloading and firing. Field craft, visual training, targets, judging distance, fire discipline and fire control orders, battle craft, field signals, description of ground, section formation, section battle drill, scouts and patrols, ambush, field engineering, map reading, conventional signs, grid systems, use of service protractor, prismatic compass and its use, self defence, general principles, precautions and training, attacks and counter attacks, marching and searching, first aid, hygiene and sanitation, civil defence, leadership and NCC song.</p> <p>Physical Education: Introduction to physical education. Posture, exercise for</p>	<p>AG 109 Rural Sociology & Educational Psychology</p> <p>UNIT-A Sociology and Rural sociology: Definition and scope, its significance in agriculture extension.</p> <p>UNIT-B Social ecology, Rural society, Social Groups, Social Stratification, Culture concept, Social Institution, Social Change & Development.</p> <p>UNIT-C Educational psychology: Meaning & its importance in agriculture extension.</p> <p>UNIT-D Behavior: Cognitive, affective, psychomotor domain, Personality, Learning, Motivation.</p> <p>UNIT-E Theories of Motivation, Intelligence.</p>	New Course

		<p>good posture, physical fitness exercises agility, strength, coordination, endurance and speed. Rules and regulations of important games, skill development in any one of the games- football,hockey, cricket, volleyball,, badminton, throw ball, tennis. Participation in one of the indoor games-badminton, chess and table tannis. Rules and regulations of athletic events, participation in any one of the athletic events- long jump, high jump, triple jump, javlin throw, discuss throw, shot put, short and long distance runnings. Safety education, movement education, effective way of doing day to day activities. First - aid training, coaching for major games and indoor games. Asans and indigenous way for physical fitness and curative exercises. Exercises and games for leisure time, use and experiences.</p>		
10	AG 110		<p>Human Value and Ethics (Non Gradiual)</p> <p>UNIT-A Values and Ethics- An Introduction. Goal and Mission of Life. Vision of Life.</p> <p>UNIT-B Principles and Philosophy Self Exploration. Self Awareness. Self Satisfaction.</p> <p>UNIT-C Decision Making, Motivation, Sensitivity.</p> <p>UNIT-D Success.Selfless Service.Case Study of Ethical Lives.Positive Spirit.Body, Mind andSoul.</p> <p>UNIT-E Attachment and Detachment.Spirituality Quotient.Examination.</p>	<p>New Course introduced in the year 2017-18</p>
IInd Semester				
1	AG 201	<p>Agricultural Meteorology. 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, anticyclones and air masses; Nature and properties of solar radiation, solar constant, depletion of solar radiation, short wave and thermal radiation ,net radiation, albedo; Atmospheric temperature, daily and seasonal variations of temperature, heat balance of earth and global warming; Atmospheric humidity, concept of saturation, vapor pressure, process of condensation, formation of dew, fog, mist, frost, snow, rain and hail;</p>	<p>Fundamentals of Genetics</p> <p>Theory</p> <p>UNIT-A Pre and Post Mendelian concepts of heredity, Mendelian principles of heredity.Architecture of chromosome; chromonemata, chromosome matrix, chromomeres, centromere, secondary constriction and telomere; special types of chromosomes.</p> <p>UNIT-B Chromosomal theory of inheritance- cell cycle and cell division-mitosis and meiosis.Probability and Chi-square.Dominance relationships, Epistatic interactions with example.Multiple alleles, pleiotropism and pseudoalleles.</p> <p>UNIT-C Sex determination and sex</p>	<p>New course</p>

		<p>Precipitation, cloud formation and movement; Agriculture and weather relations; Introduction to monsoon; Use of weather data for irrigation scheduling, pesticide sprays, fertilizer application; Climatic normals for crop production, Basics of weather forecasting.</p> <p>Practical: Agro-meteorological observatory – its site selection, installation and exposure of instruments, weather data recording; Measurement of total solar radiation, short wave and long wave radiation, albedo and sunshine duration; Maximum and minimum air temperature, soil temperature, dew point temperature; Determination of vapor pressure, relative humidity, atmospheric pressure, wind speed and wind direction; Measurement of rain, open pan evaporation and evapo-transpiration; Processing, tabulation and presentation of weather data.</p>	<p>linkage, sex limited and sex influenced traits, Blood group genetics, Linkage and its estimation, crossing over mechanisms, chromosome mapping. Structural and numerical variations in chromosome and their implications, Use of haploids, dihaploids and doubled haploids in Genetics.</p> <p>UNIT-D Mutation, classification, Methods of inducing mutations & CIB technique, mutagenic agents and induction of mutation. Qualitative & Quantitative traits, Polygenes and continuous variations, multiple factor hypothesis, Cytoplasmic inheritance.</p> <p>UNIT-E Genetic disorders. Nature, structure & replication of genetic material. Protein synthesis, Transcription and translational mechanism of genetic material, Gene concept: Gene structure, function and regulation, Lac and Trp operons.</p> <p>Practical Study of microscope. Study of cell structure. Mitosis and Meiosis cell division. Experiments on monohybrid, dihybrid, trihybrid, test cross and back cross, Experiments on epistatic interactions including test cross and back cross, Practice on mitotic and meiotic cell division, Experiments on probability and Chi-square test. Determination of linkage and cross-over analysis (through two point test cross and three point test cross data). Study on sex linked inheritance in Drosophila. Study of models on DNA and RNA structures.</p>	
2	AG202	<p>Principles of Plant Breeding Introduction to ecological and taxonomical classification of plants. Historical development, nature and role of plant breeding. Modes of reproduction (Sexual, asexual and vegetative) and their relation with plant breeding. Fertility regulatory mechanisms (incompatibility, male sterility and apomixes), their classification and importance in plant breeding. Inheritance of qualitative and quantitative characters and heritability. Pure line theory and genetic basis of selection. Hardy- Weinberg law. Heterosis and theories of Heterosis and inbreeding depression. Germplasm resources and center of diversity. Domestication, introduction and acclimatization in relation to plant improvement. Improved genotypes of different crop plant- variety, Different</p>	<p>AG202 Agricultural Microbiology UNIT-A Introduction Microbial world: Prokaryotic and eukaryotic microbes. Bacteria: cell structure, chemoautotrophy, photo autotrophy, growth. UNIT-B Bacterial genetics: Genetic recombination transformation, conjugation and transduction, plasmids, transposing. UNIT-C Role of microbes in soil fertility and crop production: Carbon, Nitrogen, Phosphorus and Sulphur cycles. UNIT-D Biological nitrogen fixation- symbiotic, associative and asymbiotic. Azolla, bluegreen algae and mycorrhiza. Rhizosphere and phyllosphere. UNIT-E Microbes in human welfare: silage production, biofertilizers, biopesticides, biofuel production and biodegradation of agro-</p>	New course

		<p>breeding methods of their development. Inbred line, different hybrids, synthetic, composite, multiline, clone, etc Polyploidy in relation to plant breeding. Mutation breeding –types, role and methods of mutation breeding. Use of biotechnology in plant breeding. Procedure for release of new variety.</p> <p>Practical: Identification of plants of different ecological groups. Floral biology of different crop plants. T.S. of ovary. Mounting of different types of ovules. Study of microsporogenesis and megasporogenesis. Study of pollen viability. Study of pollen size. Emasculation and hybridization techniques in important self and cross pollinated crops. Study of male sterility in sorghum/bajra. Calculation of mean, range, variance and standard deviation.</p>	<p>waste.</p> <p>Practical Introduction to microbiology laboratory and its equipments; Microscope- parts, principles of microscopy, resolving power and numerical aperture. Methods of sterilization. Nutritional media and their preparations. Enumeration of microbial population in soil- bacteria, fungi, actinomycetes. Methods of isolation and purification of microbial cultures. Isolation of Rhizobium from legume root nodule. Isolation of Azotobacter from soil. Isolation of Azospirillum from roots. Isolation of BGA. Staining and microscopic examination of microbes.</p>	
3	AG203	<p>Plant Pathogens and Principles of Plant Pathology</p> <p>Introduction, Important plant pathogenic organisms, different groups, fungi, bacteria, fastidious vesicular bacteria, phytoplasmas, spiroplasmas, viruses, viroids, algae, protozoa and phanerogamic parasites with examples of diseases caused by them. Prokaryotes: classification of prokaryotes according to Bergey's Manual of Systematic Bacteriology. General Characters of fungi, Definition of fungus, somatic structures, types of fungal thalli, fungal tissues, modifications of thallus, reproduction in fungi (asexual and sexual). Nomenclature, Binomial system of nomenclature, rules of nomenclature, classification of fungi. Key to kingdoms and phylum, Introduction: Definition and objectives of Plant Pathology. History of Plant Pathology. Terms and concepts in Plant Pathology. Phenomenon of infection - pre-penetration, penetration and post penetration. Pathogenesis – Role of enzymes, toxins, growth regulators and polysaccharides. Defense mechanism in plants – structural and biochemical. Plant disease epidemiology. Plant Disease Forecasting - Remote sensing - General principles of plant diseases management - Importance, general Principles - Avoidance, exclusion, protection - Plant Quarantine and Inspection - Quarantine Rules and Regulations. Cultural methods - Rouging, eradication of alternate and</p>	<p>Introductory Soil and Water Conservation Engineering</p> <p>UNIT-A Introduction to Soil and Water Conservation, causes of soil erosion. Definition and agents of soil erosion, water erosion.</p> <p>UNIT-B Forms of water erosion. Gully classification and control measures. Soil loss estimation by universal Loss Soil Equation. Soil loss measurement techniques.</p> <p>UNIT-C Principles of erosion control: Introduction to contouring, strip cropping. Contour bund. Graded bund and bench terracing.</p> <p>UNIT-D Grassed water ways and their design. Water harvesting and its techniques.</p> <p>UNIT-E Wind erosion: mechanics of wind erosion, types of soil movement. Principles of wind erosion control and its control measures.</p> <p>Practical General status of soil conservation in India. Calculation of erosion index. Estimation of soil loss. Measurement of soil loss. Preparation of contour maps. Design of grassed water ways. Design of contour bunds. Design of graded bunds. Design of bench terracing system. Problem on wind erosion.</p>	New course

		<p>collateral hosts, crop rotation, manure and fertilizer management, mixed cropping, sanitation, hot weather ploughing, soil amendments, time of sowing, seed rate and plant density, irrigation and drainage. Role and mechanisms of biological control and PGPR classification of fungicides and their uses. Host plant resistance – Application of biotechnology in plant disease management -Development of disease resistant transgenic plants through gene cloning. Integrated plant disease management (IDM) - Concept, advantages and importance.</p> <p>Practical:</p> <p>Acquaintance to plant pathology laboratory and equipments; Preparation of culture media for fungi and bacteria; Isolation techniques, preservation of disease samples; Study of Pythium, Phytophthora and Albugo; Study of Sclerospora, Peronosclerospora, Pseudoperonospora, Peronospora, Plasmopara and Bremia; Study of genera Mucor and Rhizopus. Study of Oidium, Oidiopsis, Ovulariopsis, Erysiphe, Phyllactinia, Uncinula and Podosphaera; Study of Puccinia (different stages), Uromyces, Hemileia; Study of Sphacelotheca, Ustilago and Tolyposporium; Study of Agaricus, Pleurotus and Ganoderma; Study of Septoria, Colletotrichum, Pestalotiopsis and Pyricularia; Study of Aspergillus, Penicillium, Trichoderma, and Fusarium; Study of Helminthosporium, Drechslera, Alternaria, Stemphyllium, Cercospora, Phaeoisariopsis, Rhizoctonia and Sclerotium; Demonstration of Koch's postulates. Preparation of fungicides – Bordeaux mixture, Bordeaux paste. Chestnut compounds; Methods of application of fungicides – seed, soil and foliar. Visit of quarantine station and remote sensing laboratory.</p>		
4	AG204	<p>Insect Morphology and Systematics History of Entomology in India. Factors for insect dominance. Classification of phylum Arthropoda upto classes. Morphology: Structure and functions of insect cuticle and moulting. Body segmentation; structure of head, thorax and abdomen of grasshopper. Structure and modifications of insect antennae, mouth parts and legs. Wing venation, modifications and wing coupling apparatus. Sensory organs. Metamorphosis in insects. Types of larvae and pupae. Structure and</p>	<p>AG 204 Fundamentals of Crop Physiology UNIT-A Introduction to crop physiology and its importance in Agriculture; Plant cell: an Overview; Diffusion and osmosis; Absorption of water, transpiration and Stomatal Physiology; UNIT-B Mineral nutrition of Plants: Functions and deficiency symptoms of nutrients, nutrient uptake mechanisms; UNIT-C Photosynthesis: Light and Dark reactions, C3, C4 and CAM plants; Respiration: Glycolysis, TCA cycle and</p>	1. New course

		<p>functions of digestive, circulatory, excretory, respiratory, nervous, secretory (endocrine) and reproductive systems in grasshopper. Types of reproduction in insects. Systematics: Taxonomy -importance, history and binomial nomenclature. Definitions of species, sub-species sibling species and biotype, Classification of class Insecta up to families:</p> <p>Orthoptera- Acrididae Isoptera- Termitidae Thysanoptera- Thripidae Hemiptera- Pentatomidae, Coreidae, Pyrrhocoridae, Lygaeidae, Cicadellidae, Delphacidae, Aphididae, Coccidae, Aleurodidae, Pseudococcidae Lepidoptera- Noctuidae, Sphingidae, Pyralidae, Gelechiidae, Arctiidae Coleoptera- Coccinellidae, Galerucidae, Cerambycidae, Curculionidae, Bruchidae, Melonithidae Hymenoptera- Tenthredinidae, Apidae, Trichogrammatidae, Ichneumonidae, Braconidae Diptera- Cecidomyiidae, Trypetidae, Tachinidae, Agromyzidae. Dictyoptera- Mantidae, Blattidae</p> <p>Practical: Methods of collection and preservation of insects including immature stages; External features of Grasshopper/Cockroach; Types of insect antennae, mouthparts and legs; Wing venation, types of wings and wing coupling apparatus; Dissection of digestive and nervous system in insects; Study of characters of orders Orthoptera, Dictyoptera, Isoptera, Thysanoptera, Hemiptera, Lepidoptera, Coleoptera, Hymenoptera, Diptera and their families of agricultural importance.</p>	<p>electron transport chain;</p> <p>UNIT-D Fat Metabolism: Fatty acid synthesis and Breakdown; Plant growth regulators: Physiological roles and agricultural uses.</p> <p>UNIT-E Physiological aspects of growth and development of major crops: Growth analysis, Role of Physiological growth parameters in crop productivity.</p> <p>Practical</p> <p>Study of plant cells, structure and distribution of stomata, imbibitions, osmosis, plasmolysis, Measurement of root pressure, rate of transpiration, Separation of photosynthetic pigments</p> <p>Through paper chromatography, Rate of transpiration, photosynthesis, respiration, tissue test for mineral nutrients, estimation of relative water content, Measurement of photosynthetic CO₂ assimilation by Infra Red Gas Analyser (IRGA).</p>	
5	AG205	<p>Principles of Agricultural Economics</p> <p>Meaning, definition, subject matter, Division and Importance of economics. Meaning, definition of Agricultural Economics. Basic concepts of goods, service, utility, value, price, wealth & welfare economics. Meaning, characteristics, importance and classification of wants. Theory of consumption. Law of diminishing marginal utility – meaning & importance. Demand - meaning, definition and kinds of demands, Demand schedule and demand curve. Law of demand - extension and contraction Vs increase and decrease in</p>	<p>AG 205 Fundamentals of Agricultural Economics</p> <p>UNIT-A Economics: Meaning, scope and subject matter, definitions, activities, approaches to economic analysis; micro and macroeconomics, positive and normative analysis. Nature of economic theory; rationality assumption, concept of equilibrium, economic laws as generalization of human behavior. Basic concepts: Goods and services, desire, want, demand, utility, cost and price, wealth, capital, income and welfare.</p> <p>UNIT-B- Agricultural economics: meaning, definition, characteristics of agriculture, importance and its role in</p>	<p>Course Name changed and Higelighted Portion added in 2017-18.</p>

		<p>demand. Elasticity of demand – meaning and definition, types of elasticity of demand, degree of price elasticity of demand, Method of measuring elasticity – factors influencing elasticity of demand and importance of elasticity of demand. Laws of supply – meaning & definition, supply schedule, supply curve, elasticity of supply and factor influencing in elasticity of supply. National income– concepts & measurement. Meaning and classification of taxes and canons of taxation. Inflation- meaning, definition, kinds of inflation .</p>	<p>economic development. Agricultural planning and development in the country. Demand: meaning, law of demand, schedule and demand curve, determinants, utility theory; law of diminishing marginal utility, equi-marginal utility principle. Consumer’s equilibrium and derivation of demand curve, concept of consumer surplus. Elasticity of demand: concept and measurement of elasticity, income elasticity and cross elasticity.</p> <p>UNIT-C Production: process, creation of utility, factors of production, input output relationship. Laws of returns: Law of variable proportions and law of returns to scale. Cost: concepts, short run and long run cost curves. Supply: Stock v/s supply, law of supply, schedule, supply curve, determinants of supply, elasticity of supply. Market structure: meaning and types of market, basic features of perfectly competitive and imperfect markets. Price determination under perfect competition; short run and long run equilibrium of firm and industry, shut down and break even points.</p> <p>UNIT-D Distribution theory: meaning, factor market and pricing of factors of production. Concepts of rent, wage, interest and profit. National income: Meaning and importance, circular flow, concepts of national income accounting and approaches to measurement, difficulties in measurement. Population: Importance, Malthusian and Optimum population theories, natural and socioeconomic determinants, current policies and programmes on population control. Money: Barter system of exchange and its problems, evolution, meaning and functions of money, classification of money, supply, general price index, inflation and deflation.</p>	
6	AG 206	<p>Fundamentals of Soil and Water Conservation Engineering Classification of irrigation projects and components of canal system; Ground water sources- types of aquifers; Centrifugal pumps; Measurement of irrigation water; Water conveyance system; Pressurized irrigation methods- sprinkler and drip; Soil erosion- types and factors affecting soil erosion; Brief description about erosion control structures for agricultural lands; for non-</p>	<p>Fundamentals of Plant Pathology</p> <p>UNIT-A Introduction: Importance of plant diseases, scope and objectives of Plant Pathology. History of Plant Pathology with special reference to Indian work. Terms and concepts in Plant Pathology. Pathogenesis. Causes / factors affecting disease development: disease triangle and tetrahedron and classification of plant diseases.</p>	New course

		<p>agricultural, denuded and wastelands; Temporary gully control structures.</p> <p>Practical: Power calculation for pumps; Field measurement of irrigation water; Design of open channels; Determination of fertilizers doses, uniformity coefficient and capacity of a sprinkler irrigation system; Visit to farmers adopting sprinkler and drip irrigation systems; Visit to watershed areas.</p>	<p>UNIT-B Important plant pathogenic organisms, different groups: fungi, bacteria, fastidious vesicular bacteria, phytoplasmas, spiroplasmas, viruses, viroids, algae, protozoa, phanerogamic parasites and nematodes with examples of diseases caused by them. Diseases and symptoms due to abiotic causes. Deans' Committee</p> <p>UNIT-C Fungi: general characters, definition of fungus, somatic structures, types of fungal thalli, fungal tissues, modifications of thallus, reproduction (asexual and sexual). Nomenclature, Binomial system of nomenclature, rules of nomenclature, classification of fungi. Key to divisions, sub-divisions, orders and classes. Bacteria and mollicutes: general morphological characters. Basic methods of classification and reproduction.</p> <p>UNIT-D Viruses: nature, structure, replication and transmission. Study of phanerogamic plant parasites. Nematodes: General morphology and reproduction, classification, symptoms and nature of damage caused by plant nematodes (Heterodera, Meloidogyne, Anguina, Radopholus etc.) Growth and reproduction of plant pathogens. Liberation / dispersal and survival of plant pathogens.</p> <p>UNIT-E Types of parasitism and variability in plant pathogens. Pathogenesis. Role of enzymes, toxins and growth regulators in disease development. Defense mechanism in plants. Epidemiology: Factors affecting disease development. Principles and methods of plant disease management. Nature, chemical combination, classification, mode of action and formulations of fungicides and antibiotics.</p> <p>Practical Acquaintance with various laboratory equipments and microscopy. Collection and preservation of disease specimen. Preparation of media, isolation and Koch's postulates. General study of different structures of fungi. Study of symptoms of various plant diseases. Study of representative fungal genera. Staining and identification of plant pathogenic bacteria. Transmission of plant viruses. Study of phanerogamic plant parasites. Study of morphological features and identification of plant parasitic nematodes. Sampling and extraction of nematodes from soil and plant material, preparation of nematode mounting. Study of fungicides and their formulations. Methods of pesticide application and their safe use. Calculation of fungicide spray concentrations.</p>	
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7	AG 207	<p>Biochemistry Biochemistry – Introduction and importance. Plant cell, cell wall and its role in livestock, food and paper industries. Structure, properties & applications of biomolecules: amino acids, peptides and proteins. Plant proteins and their quality. Enzymes – classification, factors affecting the activity, immobilization a Practical General status of soil conservation in India. Calculation of erosion index. Estimation of soil loss. Measurement of soil loss. Preparation of contour maps. Design of grassed water ways. Design of contour bunds. Design of graded bunds. Design of bench terracing system. Problem on wind erosion and other industrial applications. Lipids – classification, properties and their industrial application in soaps, paints, lubricants, plastics including biodegradable plastics, bio-diesel etc. Carbohydrates – classification, structure and functions. Nucleotides and nucleic acids. Metabolism – basic concepts, glycolysis, citric acid cycle, pentose phosphate pathway, oxidative phosphorylation and fatty acid oxidation. General reactions of amino acids. Biosynthesis – carbohydrates, lipids, proteins and nucleic acids. Metabolic regulation. Secondary metabolites - terpenoids, alkaloids, phenolics and their applications in food and pharmaceutical industries.</p>	<p>Fundamentals of Entomology</p> <p>UNIT-A History of Entomology in India. Major points related to dominance of Insecta in Animal kingdom. Classification of phylum Arthropoda upto classes. Relationship of class Insecta with other classes of Arthropoda. Morphology: Structure and functions of insect cuticle and molting. Body segmentation. Structure of Head, thorax and abdomen. Structure and modifications of insect antennae, mouth parts, legs, Wing venation, modifications and wing coupling apparatus. Structure of male and female genital organ. Metamorphosis and diapause in insects. Types of larvae and pupae. Structure and functions of digestive, circulatory, excretory, respiratory, nervous, secretory (Endocrine) and reproductive system, in insects. Types of reproduction in insects. Major sensory organs like simple and compound eyes, chemoreceptor.</p> <p>UNIT-B Insect Ecology: Introduction, Environment and its components. Effect of abiotic factors – temperature, moisture, humidity, rainfall, light, atmospheric pressure and air currents. Effect of biotic factors – food competition, natural and environmental resistance.</p> <p>UNIT-C Categories of pests. Concept of IPM, Practices, scope and limitations of IPM. Classification of insecticides, toxicity of insecticides and formulations of insecticides. Chemical control importance, hazards and limitations. Recent methods of pest control, repellents, anti feed ants, hormones, attractants, gamma radiation. Insecticides Act 1968- Important provisions. Application techniques of spray fluids. Symptoms of poisoning, first aid and antidotes.</p> <p>UNIT-D Systematics: Taxonomy – importance, history and development and binomial nomenclature. Definitions of Biotype, Sub-species, Species, Genus, Family and Order. Classification of class Insecta upto Orders, basic groups of present day insects with special emphasis to orders and families of Agricultural importance like Orthoptera: Acrididae, Tettigonidae, Gryllidae, Gryllotalpidae; Dictyoptera: Mantidae, Blattidae; Odonata; Isoptera: Termitidae;</p>	New course
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8	AG208	<p>Soil Chemistry, Soil Fertility and Nutrient Management</p> <p>Essential and beneficial elements, criteria of essentiality, forms of nutrients in soil, mechanisms of nutrient transport to plants, factors affecting nutrient availability to plants. Measures to overcome deficiencies and toxicities, nutrient availability to plants in Acid, salt affected and calcareous soils: Concept of soil fertility, different approaches/methods for soil fertility evaluation -- Biological method. Plant analysis method: DRIS methods, critical</p>	<p>Fundamentals of Agricultural Extension Education</p> <p>UNIT-A Education: Meaning, definition & Types; Extension Education-meaning, definition, scope and process; objectives and principles of Extension Education; Extension Programme planning- Meaning, Process, Principles and Steps in Programme Development. Extension systems in India: extension efforts in pre-independence era (Sriniketan, Marthandam, Firka Development Scheme, Gurgaon</p>	New Course

	<p>levels in plants. Rapid tissue tests. Indicator plants. Soil analysis methods: critical levels of different nutrients in soil. Soil test based fertilizer recommendations to crops. Factors influencing nutrient use efficiency (NUE) in respect of N, P, K, S, Fe and Zn fertilizers. Integrated nutrient management.</p> <p>Practical: Analytical chemistry – Basic concepts, techniques and calculations, Principles of analytical instruments and their calibration and applications, Estimation of available N, P, K, S, Zn and Fe in soil, Estimation of N, P and K in plants.</p>	<p>Experiment, etc.) and post-independence era (Etawah Pilot Project, Nilokheri Experiment, etc.);</p> <p>UNIT-B Various extension/ agriculture development programmes launched by ICAR/Govt. of India (IADP, IAAP, HYVP, KVK, IVLP, ORP, ND,NATP, NAIP, etc.). New trends in agriculture extension: privatization extension, cyber extension/ e-extension, market-led extension, farmer-led extension, expert systems, etc.</p> <p>UNIT-C Rural Development: concept, meaning, definition; various rural development programmes launched by Govt. of India. Community Dev.- meaning, definition, concept & principles, Philosophy of C.D. Rural Leadership: concept and definition, types of leaders in rural context; extension administration: meaning and concept, principles and functions.</p> <p>UNIT-D Monitoring and evaluation: concept and definition, monitoring and evaluation of extension programmes; transfer of technology: concept and models, capacity building of extension personnel; extension teaching methods: meaning, classification, individual, group and mass contact methods, ICT Applications in TOT (New and Social Media), media mix strategies.</p> <p>UNIT-E Communication: meaning and definition; Principles and Functions of Communication, models and barriers to communication. Agriculture journalism; diffusion and adoption of innovation: concept and meaning, process and stages of adoption, adopter categories.</p> <p>Practical</p> <p>To get acquainted with university extension system. Group discussion-exercise; handling and use of audio visual equipment's and digital camera and LCD projector; preparation and use of AV aids, preparation of extension literature – leaflet, booklet, folder, pamphlet news stories and success stories; Presentation skills exercise; micro teaching exercise; A visit to village to understand the problems being encountered by the villagers/ farmers; to study organization and functioning of DRDA and other development departments at district level; visit to NGO and learning from their experience in rural development; understanding PRA techniques and their application in village development planning; exposure</p>	
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			to mass media: visit to community radio and television studio for understanding the process of programme production; script writing, writing for print and electronic media, developing script for radio and television.	
9	AG 209		<p>Communication Skills and Personality Development</p> <p>UNIT-A Communication Skills: Structural and functional grammar; meaning and process of communication, verbal and nonverbal communication;</p> <p>UNIT-B Listening and note taking, writing skills, oral presentation skills;</p> <p>UNIT-C Field diary and lab record; indexing, footnote and bibliographic procedures. Reading and comprehension of general and technical articles,</p> <p>UNIT-D Precise writing, summarizing, abstracting; individual and group presentations, impromptu presentation, public speaking;</p> <p>UNIT- E Group discussion. Organizing seminars and conferences.</p>	Introduction of New Course
10				
IIIrd Semester				
1	AG301	<p>Field Crops-I (Kharif)</p> <p>Origin, geographic distribution, importance, soil and climatic requirement, varieties; cultural practices viz. seed and sowing, intercultural operations, fertilizer, water and weed management, plant protection; harvesting and yield of – rice, maize, sorghum, (grain and forage), pearl millet (grain and forage); pigeonpea, groundnut, soybean and cotton; Package of practices of mungbean, urdbean, cowpea, mothbean, clusterbean, sunhemp, castor, sesame, minor millets and napier. Acquaintance about <i>Panicum</i>, <i>Lasiurus</i> and <i>Cenchrus</i>.</p> <p>Practical: Rice nursery preparation, seed bed preparation and sowing of kharif crops; Calculations on seed rate; Sowing of mungbean, pearl millet, and cotton; Effect of seed size on germination and seedling vigour; Identification of weeds in pearl millet and other crops; Fertilizer application and top dressing of nitrogen in pearl millet and study on fertilizer experiments; Study of yield contributing characters, yield</p>	<p>AG 301 Crop Production Technology – I (Kharif crops)</p> <p>UNIT- A Origin, geographical distribution, economic importance of Kharif Crop.</p> <p>UNIT- B Soil and climatic requirements, varieties, cultural practices and yield of <i>Kharif crops</i>.</p> <p>UNIT- C Agronomical practices for Kharif Cereals – rice, maize, sorghum, pearl millet and finger millet.</p> <p>UNIT- D Agronomical practices for Kharif pulses -pigeon pea, mungbean and urdbean and Oilseeds Crops- Groundnut, and soybean.</p> <p>UNIT E Cultural Practices for fibre crops- cotton & Jute and forage crops-sorghum, cowpea, cluster bean and Napier.</p> <p>Practical Rice nursery preparation, transplanting of Rice, sowing of soybean, pigeonpea and mungbean. maize, groundnut and cotton, effect of seed size on germination and seedling vigour of kharif season crops, effect of sowing depth on germination of kharif crops, identification of weeds in kharif season crops, top dressing and foliar feeding of nutrients, study of yield contributing characters and yield calculation of kharif season crops, study of crop varieties and important</p>	1. Subject Name Change.

		calculations, harvesting and yield estimation ; Study of crop varieties and important agronomic experiments	agronomic experiments at experimental farm. study of forage experiments, morphological description of kharif season crops, visit to research centres of related crops.	
2	AG 302	<p>Weed Management Weeds- introduction, harmful and beneficial effects, classification, propagation and dissemination; Weed biology and ecology, crop weed association, 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 Adjuvants and their use in herbicides; Introduction to selectivity of herbicides; Compatibility of herbicides with other agro chemicals; Weed management in major field crops. Aquatic weeds and their management.</p> <p>Practical: Identification of weeds; Preparation of herbarium of weeds; Study of crop weed competition ; 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; visits of problem areas (field).</p>	<p>Fundamentals of Plant Breeding Theory UNIT-A Historical development, concept, nature and role of plant breeding, major achievements and future prospects; Genetics in relation to plant breeding, modes of reproduction and apomixes, self-incompatibility and male sterility- genetic consequences, cultivar options. Domestication, Acclimatization and Introduction; UNIT-B Centres of origin/diversity, components of Genetic variation; Heritability and genetic advance; Genetic basis and breeding methods in self- pollinated crops - mass and pure line selection, hybridization techniques and handling of segregating population; Multiline concept. UNIT-C Concepts of population genetics and Hardy-Weinberg Law, Genetic basis and methods of breeding cross pollinated crops, modes of selection; Population improvement Schemes-Ear to row method, Modified Ear to Row, recurrent selection schemes; Heterosis and inbreedingdepression, development of inbred lines and hybrids, composite and synthetic varieties; UNIT-D Breeding methods in asexually propagated crops, clonal selection and hybridization; maintenance of breeding records and data collection; Wide hybridization and prebreeding; Polyploidy in relation to plant breeding, mutation breeding-methods and uses; UNIT-E Breeding for important biotic and abiotic stresses; Biotechnological tools- DNAMarkers and marker assisted selection. Participatory plant breeding; IntellectualProperty Rights, Patenting, Plant Breeders and & Farmer's Rights.</p> <p>Practical Plant Breeder's kit, Study of germplasm of various crops. Study of floral structure of self pollinated and cross pollinated crops. Emasculation and hybridization techniques in self & cross pollinated crops. Consequences of inbreeding on genetic structure of resulting populations. Study of male sterility system. Handling of segregating populations. Methods of calculating mean, range, variance, standard deviation, heritability. Designs used in plant breeding experiment, analysis of Randomized Block Design and components of genetic variance. To work out the mode of pollination in a given crop and extent of natural out crossing. Prediction of performance of double cross hybrids.</p>	New course
3	AG303	<p>Introductory Nematology History and economic importance of plant parasitic nematodes; Characters of Phylum Nematoda and systematic position of plant parasitic nematodes</p>	<p>Agricultural Finance and Co-Operation UNIT-A Agricultural Finance- meaning, scope and significance, credit needs and its role in Indian agriculture. Agricultural</p>	New course

		<p>(outline classification upto Generic level); General morphology, ecology and biology; Plant nematode relationship; Kinds of parasitism and symptomology; Nematode interaction with other micro-organisms; Nematode diseases of crop plants of economic importance in State with special reference to <i>Meloidogyne</i> spp; <i>Heterodera avenae</i>, <i>Anguina tritici</i> and <i>Rotylenchulus reniformis</i> Tylenchulus <i>semipenetrans</i>; Principles of nematode management.</p> <p>Practical: Study of compound microscope alongwith other laboratory necessities, Survey and Collection of soil and plant samples, extraction of nematodes from soil and roots, killing and fixing of nematodes, staining and separation of nematodes in plants tissue, preparation of temporary and semi-permanent mounts of nematodes, identification of important plant parasitic nematodes, collection and preservation of nematode diseased plant samples; Nematicides and their uses.</p>	<p>credit: meaning, definition, need, classification. Credit analysis: 4 R's, and 3C's of credits. Sources of agricultural finance: institutional and non-institutional sources, commercial banks, social control and nationalization of commercial banks,</p> <p>UNIT-B. Micro financing including KCC. Lead bank scheme, RRBs, Scale of finance and unit cost. An introduction to higher financing institutions – RBI, NABARD, ADB, IMF, world bank,</p> <p>UNIT-C. Insurance and Credit Guarantee Corporation of India. Cost of credit. Recent development in agricultural credit. Preparation and analysis of financial statements – Balance Sheet and Income Statement. Basic guidelines for preparation of project reports- Bank norms – SWOT analysis.</p> <p>UNIT-D. Agricultural Cooperation – Meaning, brief history of cooperative development in India, objectives, principles of cooperation, significance of cooperatives in Indian agriculture.</p> <p>UNIT-E. Agricultural Cooperation in India- credit, marketing, consumer and multi-purpose cooperatives, farmers' service cooperative societies, processing cooperatives, farming cooperatives, cooperative warehousing; role of ICA, NCUI, NCDC, NAFED.</p> <p>Practical Determination of most profitable level of capital use. Optimum allocation of limited amount of capital among different enterprise. Analysis of progress and performance of cooperatives using published data. Analysis of progress and performance of commercial banks and RRBs using published data. Visit to a commercial bank, cooperative bank and cooperative society to acquire firsthand knowledge of their management, schemes and procedures. Estimation of credit requirement of farm business – A case study. Preparation and analysis of balance sheet – A case study. Preparation and analysis of incom statement – A case study. Appraisal of a loan proposal.– A case study. Techno-economic parameters for preparation of projects Preparation of Bankable projects for various agricultural products and its value add products. Seminar on selected topics.</p>	
4	AG304	Statistics Theory	Agricultural Informatics Theory	New Course

		<p>Introduction: Definition of statistics by seligman and Horac Secrist. Aims, Scope and limitation of statistics. Classification: Definition and its type (According to attributes and class intervals). Measures of central tendency: A.M., G.M., H.M. median, mode, Properties of A.M. Merits, demerits and uses of above measures. Dispersion: range, M.D. Q.D., S.D., variance and c.v., Merits and demerits of above measures. Correlation and regression: scatter diagram, Karl pearson's correlation coefficient, Simple linear regression; regression lines and their fitting, properties of correlation and regression coefficients. Probability and simple problems based on probability. Test of significance: Null and alternative hypothesis, two types of errors, level of significance, critical region, d.f. standard normal deviate test and students. t-test for single mean and difference between two means, paired t-test. Test of significance of correlation and regression coefficients. Chisquare test for Goodness of fit and for testing independence of attributes, Yates correction (No mathematical derivatives).</p> <p>Practical: Preparation of frequency table of quantitative data. Computation of A.M. for raw data and frequency distribution by direct method and short cut method. Computation of G.M. and H.M. for raw data and frequency distribution. Computation of median and mode for raw data and frequency distribution. Computation of M.D.; Q.D. for raw data and frequency distribution. Computation of S.D. and C.V. for raw data and frequency distribution. Computation of correlation coefficient. Estimation of regression lines, t & S.N.D. test for single mean and difference between two means, paired t-test. Test of significance of correlation and regression coefficients. Chisquare test for Goodness of fit & test of independence in 2x2 contingency table and m x n contingency table.</p>	<p>UNIT-A Introduction to Computers, Anatomy of computer, Operating Systems, definition and type, Applications of MS Office for document creation & Editing, Data presentation, interpretation and graph creation, statistical analysis, mathematical expressions, Database, concepts and types, uses of DBMS in Agriculture.</p> <p>UNIT-B World Wide Web (WWW): Concepts and components Introduction to computer programming languages, concepts and standard input/output operations.</p> <p>UNIT-C e-Agriculture, concepts and applications, Use of ICT in Agriculture Computer Models for understanding plant processes. IT application for computation of water and nutrient requirement of crops, Computer-controlled devices (automated systems) for Agri-input management.</p> <p>UNIT-D Smartphone Apps in Agriculture for farm advises, market price, postharvest management etc. Geospatial technology for generating valuable agri-information. Decision support systems, concepts, components and applications in Agriculture.</p> <p>UNIT-E Agriculture Expert System, Soil Information Systems etc. for supporting Farm decisions. Preparation of contingent crop-planning using IT tools.</p>	
5	AG305	<p>Fundamentals of Rural Sociology and Educational Psychology</p> <p>Sociology and Rural Sociology-Meaning, Definition, Scope, Importance of rural sociology in Agricultural Extension and Interrelationship between Rural Sociology and Agricultural</p>	<p>AG-305 Farm Machinery and Power</p> <p>UNIT- A Status of Farm Power in India, Sources of Farm Power , I.C. engines, working principles of I C engines, comparison of two stroke and four stroke cycle engines</p>	New Course

		<p>Extension. Indian Rural Society, Important characteristics, differences & Relationship between Rural and Urban societies. Social Groups: Meaning, Definition, Classification, Factors considered in formation and organization of groups. Social Stratification – Meaning, Definition, Functions, Forms of Social stratification. Cultural concepts - Culture, Customs, Folkways, Mores, Taboos, Rituals and Traditions - Meaning, Definition and their role in Agricultural Extension. Social Values and Attitude - Meaning, Definition, Types and Role of social values and Attitudes in Agricultural Extension. Social Institutions - Meaning, Definition, Major institutions in Rural society, Functions. Social Control - Meaning, Definition, Need and Means of Social control. Social change - Meaning, Definition, Nature of Social change and factors of social change. Leadership- Meaning, Definition, Classification, Roles of Leader, Methods of selection of leaders. Psychology and Educational psychology- Meaning, Definition, Scope and Importance of Educational Psychology in Agricultural Extension. Intelligence - Meaning, Definition, Types, Factors affecting intelligence. Personality- Meaning, Definition, Types, Factors influencing the Personality and Role of Personality in Agricultural Extension. Teaching-Learning process- Meaning and Definition of Teaching, Learning, Learning experience and Learning situation, Elements of learning situation and its characteristics.</p>	<p>UNIT- B Study of different components of I.C. engine, I.C. engine terminology and numerical</p> <p>UNIT-C Familiarization with different systems of I.C. engines: Air cleaning, cooling, lubrication ,fuel supply and hydraulic control system of a tractor, Familiarization with Power transmission system : clutch, gear box, differential and final drive of a tractor , Tractor types, Cost analysis of tractor power</p> <p>UNIT- D Estimation of field capacity and power requirements of implements Familiarization with Primary and Secondary Tillage implement, implement for interculturaloperations</p> <p>UNIT- E Familiarization with sowing and planting equipment, Familiarization with Plant Protection equipment, Familiarization with harvesting and threshing equipment.</p> <p>Practicals Study of different components of I.C. engine. To study air cleaning and cooling system of engine, Familiarization with clutch, transmission, differential and final drive of a tractor, Familiarization with lubrication and fuel supply system of engine, Familiarization with brake, steering, hydraulic control system of engine, Learning of tractor driving, Familiarization with operation of power tiller, Familiarization with different types of primary and secondary tillage implements: mould board plough, disc plough and disc harrow . Familiarization with seed metering mechanism and calibration of seed drill, Familiarization with different types of sprayers and dusters Familiarization with different inter-culture implement, Familiarization with harvesting and threshing equipments and machinery.</p>	
6	AG306	<p>Production Technology of Fruit and Plantation Crops</p> <p>Importance, introduction and scope of horticulture. Classification of fruits according to climate. Selection of site, planning, establishment and layout of orchard. Propagation methods of fruit crops. Methods of training and pruning in fruit crops. Use of growth regulators in fruit production. Package of practices for the cultivation of major fruits with the emphasis on botanical name, family,</p>	<p>Production Technology for Vegetables and Spices</p> <p>UNIT-A Importance of vegetables & spices in human nutrition and national economy, kitchen gardening. UNIT-B Brief about origin, area, climate, soil, improved varieties and Cultivation practices such as time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting and yield. UNIT-C Physiological disorders, of important vegetable and spices (Tomato, Brinjal, Chilli, Capsicum, Cucumber, Melons, Gourds, Pumpkin, French bean, Peas</p>	New course

		<p>origin, distribution, climate, soil, varieties, propagation, planting, manures and fertilizers, irrigation, training and pruning, intercultural operation, harvesting, yield and plant protection measures including physiological disorders – mango, banana, citrus, grape, guava, sapota, apple, papaya, pineapple, pomegranate, ber, jack, aonla, bael, date palm; plantation crops -coconut, areca nut, cashew, oil palm and tea.</p> <p>Practical: Identification of fruit and plantation crops. Study of horticultural tools and implements and their uses; Plant propagation methods, by seeds, cuttings (soft wood, hard wood and semi-hardwood), budding and grafting, layering (simple layering, Air layering,); Layout and planting systems, Methods of pruning and training of important fruit crops .Irrigation methods in fruit crops including drip – Micro irrigation methods for establishment of orchard; Methods of fertilizer application in fruit crops. Visit to local commercial orchards with in state; Preparation of growth regulator solutions for propagation; Application of growth regulators for improving fruit set, fruit size and quality.</p>	<p>UNIT-D Cole crops such as Cabbage, Cauliflower, Knol-khol; Bulb crops such as Onion, Garlic, Root crops such as Carrot, Radish, and Beetroot UNIT-E Tuber crops such as Potato; Leafy vegetables such as Amaranth, Palak.Perennial vegetables).</p> <p>Practical Identification of vegetables & spice crops and their seeds. Nursery raising. Direct seed sowing and transplanting.Study of morphological characters of different vegetables & spices.Fertilizers applications.Harvesting & preparation for market.Economics of vegetables and spices cultivation.</p>	
7	AG-307	<p>Production Economics and Farm Management</p> <p>Production Economics: Meaning, Definition, Nature and Scope of Agricultural Production Economics. Basic concepts and terms. Concepts of Production. Production Functions: Meaning, Definition, Types. Laws of returns: Increasing, Constant and decreasing. Factor Product Relationship. Determination of optimum input and output. Factor relationship. Product relationship. Types of enterprise relationships. Returns to scale: Meaning, Definition, Importance. Farm Management. Economic principles applied to the Organisations of farm business. Types and systems of farming. Farm planning and budgeting. Risk and uncertainty. Farm budgeting. Linear programming: Assumptions, Advantages and Limitations of Linear programming.</p> <p>Practical: Computation of cost concepts; Methods of computation of depreciation; Analysis of Net worth statement; Farm inventory analysis; Preparation of farm plans and budgets; Types of farm</p>	<p>AG-307 Environmental Studies and Disaster Management</p> <p>UNIT-A Multidisciplinary nature of environmental studies Definition, scope and importance. Natural Resources: Renewable and non-renewable resources, Natural resources and associated problems. a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, waterlogging, salinity, case studies. e) Energy resources: Growing energy needs, renewable and nonrenewable energy sources, use of alternate energy sources. Case studies.</p>	New course

		<p>records and accounts; Preparation of profit and loss account; Break, Even analysis; Economics analysis of different crop and livestock enterprises; Application of Farm Management Principles.</p>	<p>UNIT-B f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles. Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem. Ecological succession, Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem: a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) Biodiversity and its conservation: - Introduction, definition, genetic, species & ecosystem diversity and biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.</p> <p>UNIT-C Biodiversity at global, National and local levels, India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. Environmental Pollution: definition, cause, effects and control measures of: a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear hazards. Solid Waste Management: causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Social Issues and the Environment: From Unsustainable to Sustainable</p> <p>Practical</p> <p>Pollution case studies. Case Studies- Field work: Visit to a local area to document environmental assets river/ forest/ grassland/ hill/ mountain, visit to a local polluted site- Urban/Rural/Industrial/Agricultural, study of common plants, insects, birds and study of simple ecosystems-pond, river, hill slopes, etc.</p>	
8	AG308	Farm Power and Machinery	Statistical Methods	New course

		<p>Sources of farm power; Scope and development of farm mechanization; Elementary knowledge of principle, operation, types and components of I.C. engines; I.C. engine terminology and related numerical. Different systems of I.C. engines- Air supply and exhaust system; Fuel supply system; Lubricating system; Cooling system; Transmission system; Daily and periodic maintenance of tractors; Tractor driving; Numerical on field capacity and draw bar horse power requirements of implements; Primary tillage implements- tractor drawn mould board plough and disk plough; Secondary tillage implements- cultivators, harrows and hoes; Ferti-seed drill- parts and calibration (including numerical).</p> <p>Practical: Identification of engine parts; Study of air and fuel supply system; Study of lubricating and cooling system; Study of transmission system; Tractor driving; Daily and periodic maintenance of tractor; Study of tractor drawn mould board plough and disk plough; Study of different cultivators, harrows and hoes; Study and calibration of seed cum ferti-drill; Estimation of tractor operational cost; Numerical problems on field capacity, field efficiency and power requirement of implements; and numericals on engine terminology.</p>	<p>Theory UNIT-A Introduction to Statistics and its Applications in Agriculture, Graphical Representation of Data, Measures of Central Tendency & Dispersion, Definition of Probability, Addition and Multiplication Theorem (without proof). UNIT-B Simple Problems Based on Probability, Binomial & Poisson Distributions, Definition of Correlation, Scatter Diagram, Karl Pearson's Coefficient of Correlation, Linear Regression Equations. UNIT-C Introduction to Test of Significance, One sample & two sample test t for Means, Chi-Square Test of Independence of Attributes in 2×2 Contingency Table. UNIT-D Introduction to Analysis of Variance, Analysis of One Way Classification. UNIT-E Introduction to Sampling Methods, Sampling versus Complete Enumeration, Simple Random Sampling with and without replacement, Use of Random Number Tables for selection of Simple Random Sample.</p> <p>Practical Graphical Representation of Data. Measures of Central Tendency (Ungrouped data) with Calculation of Quartiles, Deciles & Percentiles. Measures of Central Tendency (Grouped data) with Calculation of Quartiles, Deciles & Percentiles. Measures of Dispersion (Ungrouped Data). Measures of Dispersion (Grouped Data). Moments, Measures of Skewness & Kurtosis (Ungrouped Data). Moments, Measures of Skewness & Kurtosis (Grouped Data). Correlation & Regression Analysis. Application of One Sample t-test. Application of Two Sample Fisher's t-test. Chi-Square test of Goodness of Fit. Chi-Square test of Independence of Attributes for 2×2 contingency table. Analysis of Variance One Way Classification. Analysis of Variance Two Way Classification. Selection of random sample using Simple Random Sampling.</p>	
9	AG309	<p>Manures and Fertilizers Soil organic matter, Composition, Decomposability, C: N ratio. Soil biology, Biomass, Soil organisms and their beneficial and harmful roles. Raw materials – Manures – Bulky and concentrated – FYM, Composts – Different methods, Mechanical compost plants, Vermicomposting, Green manures, Oil cakes, Sewage and sludge – Biogas plant slurry, Plant and animal refuges. Fertilizers – classifications, Chemistry of manufacturing and properties of major nitrogenous (ammonium sulphate, urea, calcium ammonium nitrate, ammonium nitrate, ammonium sulphate nitrate) phosphatic (single super phosphate, enriched super phosphate, diammonium phosphate, ammonium poly phosphate), potassic and complex fertilizers, their fate and reactions in the soil, Secondary and micronutrients fertilizers,</p>	<p>Livestock and Poultry Management Theory UNIT-A Role of livestock in the national economy. Reproduction in farm animals and poultry. Housing principles, space requirements for different species of livestock and poultry. UNIT-B Management of calves, growing heifers and milch animals. Management of sheep, goat and swine. Incubation, hatching and brooding. Management of growers and layers. Important Indian and exotic breeds of cattle, buffalo, sheep, goat, swine and poultry. UNIT-C Improvement of farm animals and poultry. Digestion in livestock and poultry. Classification of feedstuffs. Proximate principles offered. UNIT-D Nutrients and their functions. Feed ingredients for ration for livestock and poultry. Feed supplements and feed additives. Feeding of livestock and poultry. UNIT-E Introduction of livestock and poultry diseases. Prevention (including vaccination</p>	New Course

		<p>amendments, Fertilizer Control Order, Fertilizer storage; Important Biofertilizers and their advantage.</p> <p>Practical: Determination of organic carbon and microbial biomass C, N and P. Total nitrogen and phosphorus in manures / composts – Ammoniacal and nitrate nitrogen – Water soluble P₂O₅, potassium, calcium, sulphur and zinc contents of fertilizers, Adulteration in fertilizer.</p>	<p>schedule)and control of important diseases of livestock and poultry.</p> <p>Practical External body parts of cattle, buffalo, sheep, swine and poultry. Handling and restraining of livestock. Identification methods of farm animals and poultry. Visit to IDF and IPF to study breeds of livestock and poultry and daily routine farm operations and farm records. Judging of cattle, buffalo and poultry.Culling of livestock and poultry.Planning and layout of housing for different types of livestock.Computation of rations for livestock.Formulation of concentrate mixtures. Clean milk production, milking methods. Hatchery operations, incubation and hatching equipments.Management of chicks, growers and layers.Debeaking, dusting and vaccination. Economics of cattle, buffalo, sheep, goat, swine and poultry production.</p>	
IVth Semester				
1	AG401	<p>Field Crops- II (Rabi) Origin, geographical distribution, importance, production in Rajasthan and India, soil and climatic requirements, varieties, cultural practices viz. seed and sowing , intercropping operations, fertilizer, water and weed management, plant protection measures; harvesting and yield of wheat, barley; chickpea, rapeseed and mustard, potato, sugarcane and lucerne; Package of practices of tobacco, sunflower, safflower, linseed, sugarbeet, isabgol , lentil ,berseem ,oats, opium poppy, frenchbean, taramira and peas.</p> <p>Practical Identification of seeds of rabi crops ,Seed bed preparation and sowing of wheat and sugarcane ; Calculations on seed rate; Top dressing of nitrogen in wheat and study of fertilizer experiments on rabi crops ; Identification of weeds in wheat and other rabi crops; Application of herbicides and study of weed control experiments; Morphological characteristics of wheat, barley, oats, rapeseed and mustard ; Yield contributing characters of crops, Judging sugarcane maturity and quality tests.</p>	<p>AG 401 Crop Production Technology – II (Rabi crops)</p> <p>Unit –A Origin, geographical distribution,economic importance, soil and climatic requirements.</p> <p>Unit – B varieties, cultural practices and yield of Rabi crops; cereals –wheat and barley,</p> <p>UNIT-C pulses-chickpea, lentil, peas,</p> <p>UNIT-D oilseeds-rapeseed, mustard and sunflower; sugar crops-sugarcane;</p> <p>UNIT-E medicinal and aromatic crops-mentha, lemon grass and citronella, Forage crops-berseem, lucerne and oat.</p> <p>Practical Sowing methods of wheat and sugarcane, identification of weeds in rabiseason crops, study of morphological characteristics of rabi crops, study of yield contributing characters of rabi season crops, yield and juice quality analysis of sugarcane, study of important agronomic experiments of rabi crops at experimental farms. Study of rabiforage experiments, oil extraction of medicinal crops, visit to research stations of related crops</p>	<p>1.Subject name change.</p> <p>2.New crops added.</p>
2	AG 402	<p>Water Management</p> <p>Irrigation: definition and objectives; Water resources and irrigation development in India and Rajasthan; Soil moisture constants and theories of soil water availability; Methods of soil moisture estimation; Evapotranspiration</p>	<p>Production Technology for Ornamental Crops, MAP and Landscaping</p> <p>Theory</p> <p>UNIT-A Importance and scope of ornamental crops, medicinal and aromatic plants and landscaping. Principles of landscaping.Landscape uses of trees, shrubs and climbers.</p> <p>UNIT-B Production technology of important cut</p>	<p>New course</p>

		<p>and crop water requirement; Scheduling of irrigation; Methods of irrigation: surface, sprinkler and drip irrigation; Irrigation efficiency and water use efficiency, Irrigation water quality and its management including conjunctive use of water; Water management of different crops (rice, wheat, maize, groundnut, sugarcane, pearl millet, chickpea, mustard); Agricultural drainage</p> <p>Practical</p> <p>Determination of bulk density by field method; Determination of soil moisture content by gravimetric, tensiometer, electrical resistance blocks and neutron moisture meter methods; Determination of field capacity by field method; Determination of permanent wilting point; Measurement of irrigation water using different devices; Calculations on irrigation water requirement and irrigation efficiencies (problems); Determination of infiltration rate; Demonstration of border method of irrigation ; Demonstration of furrow method of irrigation; Demonstration of check basin and basin method of irrigation; Acquaintance and upkeep of sprinkler and drip irrigation systems; Determination of EC, pH, carbonates biocarbonates and Ca+ Mg in irrigation water (quality parameters).</p>	<p>flowers like rose, gerbera, carnation, liliun and orchids under protected conditions and gladiolus, tuberose, chrysanthemum under open conditions.</p> <p>UNIT-C Package of practices for loose flowers like marigold and jasmine under open conditions. Production technology of important medicinal plants like ashwagandha, asparagus, aloe, costus, cinnamomum, periwinkle, isabgol.</p> <p>UNIT-D Aromatic plants like mint, lemongrass, citronella, palmarosa, ocimum, rose, geranium, vetiver.</p> <p>UNIT-E Processing and value addition in ornamental crops and MAPs produce.</p> <p>Practical</p> <p>Identification of Ornamental plants. Identification of Medicinal and Aromatic Plants. Nursery bed preparation and seed sowing. Training and pruning of Ornamental plants. Planning and layout of garden. Bed preparation and planting of MAP. Protected structures – care and maintenance. Intercultural operations in flowers and MAP. Harvesting and post harvest handling of cut and loose flowers. Processing of MAP. Visit to commercial flower/MAP unit.</p>	
3	AG403	<p>Soil Survey, Land Use Planning and Remote Sensing</p> <p>Soil profile development, soil survey: Significance and purpose of soil survey, methods of soil survey and mapping. Types of soil surveys: Detailed, Reconnaissance, and Detailed—reconnaissance soil survey. Land use planning: Land capability classification, Soil mapping units. Soil survey interpretations and soil survey report. Major soil groups of India with special reference to Rajasthan. Soil taxonomy – a comprehensive US system of soil classification. Remote sensing: concept of remote sensing. Aerial photography, Aerial and satellite sensor imagery, image processing and interpretations.</p> <p>Practical :</p> <p>Examinations and description of typical soil profile. Interpretation of topographic map and delineation of physiographic boundaries based on important characters, typifying pedon excavation, examination and classification, interpretation of the identified soil characteristics and their</p>	<p>AG403: Renewable Energy and Green Technology</p> <p>Theory</p> <p>UNIT-A Classification of energy sources, contribution of these of sources in agricultural sector, Familiarization with biomass utilization for biofuel production and their application.</p> <p>UNIT-B Familiarization with types of biogas plants and gasifiers, biogas, bioalcohol, biodiesel and biooil production and their utilization as bioenergy resource.</p> <p>UNIT-C introduction of solar energy, collection and their application, Familiarization with solar energy gadgets: solar cooker, solar water heater.</p> <p>UNIT-D Application of solar energy: solar drying, solar pond, solar distillation, solar photovoltaic system and their application.</p> <p>UNIT-E Introduction of wind energy and their application.</p> <p>Practical</p> <p>Familiarization with renewable energy gadgets. To study biogas plants, to study gasifier, To study the production process of biodiesel, To study briquetting machine, To study the production process of bio-fuels. Familiarization with different solar energy gadgets. To study solar photovoltaic system: solar light, solar pumping, solar fencing. To study solar cooker, To study solar drying system. To study solar distillation and solar pond.</p>	New course

		evaluation for land use planning. Preparation of the soil survey report, interpretation of remote sensing information.		
4	AG404	<p>Insect Ecology and Integrated Pest Management Including Beneficial Insects</p> <p>Insect Ecology: Definition, scope and concept. Environment and its components. Agroecosystem. Effect of abiotic factors- temperature, moisture, humidity, rainfall, light, atmospheric pressure and air currents. Effect of biotic factors – positive and negative interactions. Causes of pest outbreak. Pest surveillance and forecasting. Categories of pests. IPM: Introduction, importance, scope, concepts and limitations. Tools of IPM- Host plant resistance, cultural, mechanical and physical, legislative and biological control (parasites, predators and pathogens such as bacteria, fungi and viruses). Chemical control- Classification, toxicity and formulations of insecticides. Study of important insecticides- Botanicals, chlorinated hydrocarbons, organophosphates, carbamates, synthetic pyrethroids and novel insecticides, chitin synthesis inhibitors, rodenticides, acaricides and fumigants. Hormones and pheromones, repellents, antifeedants, attractants, gamma radiation and genetic control. Insecticides Act 1968- Important provisions. Application techniques of insecticides. Symptoms of insecticide poisoning, first aid and antidotes.</p> <p>Beneficial insects: Honeybee- Important species, rearing techniques, diseases and natural enemies. Silkworm- Important species, rearing techniques, diseases and natural enemies. Lac insect - rearing techniques, diseases and natural enemies.</p> <p>Practical: Visit to meteorological observatory and IPM laboratory. Pest surveillance through light traps, pheromone traps and field incidence. Study of sampling techniques for the estimation of insect population. Practicable IPM practices- Mechanical, physical and cultural methods Identification and application of parasites and predators. Botanical insecticides- Neem based products Chemical control- Insecticides and their formulations. Handling of plant protection equipments. Calibration of spray equipments. Calculation of doses/concentrations of insecticides.</p>	<p>Problematic soils and their management</p> <p>UNIT-A Soil quality and health, Distribution of Waste land and problem soils in India. Their categorization based on properties. Reclamation and management of Saline and sodic soils, Acidsoils, Acid Sulphate soils, Eroded and Compacted soils, Flooded soils, Polluted soils. Irrigation water – quality and standards, utilization of saline water in agriculture. Remote sensing and GIS in diagnosis and management of problem soils.</p> <p>UNIT-B Multipurpose tree species, bio remediation through MPTs of soils, land capability and classification, land suitability classification. Problematic soils under different Agro- ecosystems.</p>	New course

		<p>Calculation of doses/concentrations of insecticides. IPM case studies of one important field crop. Poison bait preparation for rodent control and its application. Safe handling of pesticides. Rearing technique for honeybees. Rearing technique for silkworm. Rearing technique for lac insect.</p>		
5	AG405	<p>Production Technology of Vegetables and Flowers</p> <p>Importance and scope of Olericulture. Types of vegetable gardening. Classification of vegetables. Package of practices with reference to botanical name, family, origin, distribution, climate, soil, varieties, sowing, manure and fertilizers, irrigation, intercultural operations, harvesting, yield and plant protection measures including physiological disorders for fruit vegetables– tomato, brinjal, chilies, and okra; Cucurbitaceous vegetables–cucumber, ridge gourd, bottle gourd, bitter gourd, melons– water melon, musk melon and round melon, Cole crops–cabbage, cauliflower and knol-khol. Bulb crops– onion and garlic. Beans and peas– French bean, cluster bean, dolichos bean, peas and cowpea. Tuber crops– potato, sweet potato, colocasia;; Root crops– carrot, radish, turnip and beet root; Leafy vegetables– amaranths and palak. Introduction to protected cultivation of important vegetables viz. cucumber, capsicum and tomato. Importance and scope of floriculture. Principles of landscape gardening. Types and styles of ornamental gardening. Planting, care and management of lawn, ornamental trees, shrubs, climbers, palms, indoor- plants and seasonal flowers in the gardens. Package of practices for rose, jasmine, chrysanthemum, marigold and gladiolus. Introduction to protected cultivation of important flower crops viz. rose and gerbera.</p> <p>Practical: Planning and layout of kitchen garden; Identification of important vegetable and ornamental plants; trees (shrubs, climbers, house plants, palms etc.) Raising of vegetable nurseries. Transplanting of vegetable seedlings in main field; Layout of lawns and maintenance; Potting, repotting and maintenance of house plants; Visit to commercial vegetable farms ;Training and pruning of rose (standards, hybrid</p>	<p>Production Technology for Fruit and Plantation Crops UNIT-A Importance and scope of fruit and plantation crop industry in India. UNIT-B Importance of rootstocks. UNIT-C Production technologies for the cultivation of major fruits-mango, banana, citrus, grape, guava, litchi, papaya, sapota, apple, pear, peach, walnut, almond. UNIT-D Minor fruits- date, ber, pineapple, pomegranate, jackfruit, strawberry. UNIT-E Plantation crops-coconut, arecanut, cashew, tea, coffee & rubber. Practical Seed propagation. Scarification and stratification of seeds. Propagation methods for fruit and plantation crops. Description and identification of fruit. Preparation of plant bio regulators and their uses, important pests, diseases and physiological disorders of above fruit and plantation crops, Visit to commercial orchards.</p>	New course

		<p>'T' roses scented roses) and chrysanthemum (pinching and disbudding); Planning and layout of gardens and garden designs for public and private areas; Harvesting indices of different vegetable crops; Grading and packing of vegetables; Prolonging the shelf life of cut flowers. Visit to different styles and types of gardens.</p>		
6	AG406	<p>Agricultural Finance and Co-Operation Agricultural finance: nature and scope. Time value of money, Compounding and Discounting. Agricultural credit: meaning, definition, need, classification. Credit analysis: 4R's 5C's and 7 P's of credit, repayment plans. History of financing agriculture in India. Commercial banks, nationalization of commercial banks. Lead bank scheme, regional rural banks, scale of finance. Higher financing agencies, RBI, NABARD, AFC, Asian Development Bank, World Bank, Insurance and Credit Guarantee Corporation of India. Assessment of crop losses, determination of compensation. Crop insurance, advantages and limitations in application, estimation of crop yields. Agricultural cooperation: philosophy and principles. History of Indian cooperative Movement, pre-independence and post independence periods, cooperation in different plan periods, cooperative credit structure: PACS, FSCS. Reorganisation of cooperative credit structure in Andhra Pradesh and single window system. Successful cooperative systems in Gujarat, Maharashtra. Punjab etc Practical: Factors governing use of Capital and identification of credit needs; Time value of money, Compounding and discounting; Tools of financial management, Balance sheet, Income statement and cash flow analysis, Estimations of credit needs and determining unit costs; Preparations and analysis of loan proposals; Types of repayment loans; Study of financial institutions: PACS, DCCB, Apex Banks, RRBs, CBs, NABARD.</p>	<p>AG-406- Principles of Seed Technology UNIT-A Seed and seed technology: introduction, definition and importance. Deterioration causes of crop varieties and their control; Maintenance of genetic purity during seed production, seed quality; Definition, Characters of good quality seed, different classes of seed. UNIT-B Foundation and certified seed production of important cereals, pulses, oilseeds, fodder and vegetables. Seed certification, phases of certification, procedure for seed certification, field inspection. Seed Act and Seed Act enforcement. Duty and powers of seed inspector, offences and penalties. UNIT-C Seeds Control Order 1983, Varietal Identification through Grow Out Test and Electrophoresis, Molecular and Biochemical test. Detection of genetically modified crops, Transgene contamination in non-GM crops, GM crops and organic seed production. UNIT-D Seed drying, processing and their steps, seed testing for quality assessment, seed treatment, its importance, method of application and seed packing. Seed storage; general principles, stages and factors affecting seed longevity during storage. Measures for pest and disease control during storage. UNIT-E Seed marketing: structure and organization, sales generation activities, promotional media. Factors affecting seed marketing, Role of WTO and OECD in seed marketing. Private and public sectors and their production and marketing strategies. Practical Seed production in major cereals: Wheat, Rice, Maize, Sorghum and Bajra. Seed production in major pulses: Urd, Mung, Cowpea, Pigeonpea, Lentil, Gram, Fieldpea. Seed production in major oilseeds: Soybean, Rapeseed and Mustard, Groundnut. Seed production in vegetable crops & Seed spices. Seed sampling and testing: Physical purity, germination, viability, etc. Seed</p>	New course

			and seedling vigour test. Genetic purity test: Grow out test and electrophoresis. Seed certification: Procedure, Field inspection, Preparation of field inspection report. Visit to seed production farms, seed testing laboratories and seed processing plant.	New Topic Added in 2017-18 Higlighted Portion added in 2017-18
7	AG 407	Crop Physiology Introduction – Definition of Crop Physiology – Importance in Agriculture and Horticulture. Crop Water Relations – Physiological importance of water to plants – Water potential and its components, measurement of water status in plants. Crop water relations (contd.) Transpiration – Definition – significance – Transpiration in relation to Crop productivity – Water Use Efficiency – WUE in C3, C4 and CAM plants – Factors affecting WUE. Photosynthesis – Energy synthesis – Significance of C3, C4 and CAM pathway – Relationship of Photosynthesis and crop productivity – Translocation of assimilates – Phloem loading, apoplastic and symplastic transport of assimilates – Source and sink concept – Factors affecting Photosynthesis for productivity – Methods of measuring photosynthesis – Photosynthetic efficiency – Dry matter partitioning – Harvesting index of crops. Photorespiration and crop productivity. Respiration and its significance – Importance of glycolysis, TCA cycle. Pentose Phosphate Pathway – Growth respiration and maintenance respiration, Alternate respiration– Salt respiration–wound respiration – measurement of respiration. Nutriophysiology– Definition – Mengel’s classification of plant nutrients – Physiology of nutrient uptake– Functions of Plant nutrients – Deficience and todocity symptoms of plant nutrients – Foliar nutrition – Hydroponics – solution and sand culture. Physiology of flowering – Photoperiodism and Vernalisation in relation to crop productivity – Classification of plants – Commercial application of photoperiodism. Growth and Development – Definition – Types of growth – Determinate and Indeterminate growth – Monocarpic and Polycarpic species with examples, Measurement of growth – Growth analysis Growth characteristics – Definitions and mathematical formulae.	Farming System & Sustainable Agriculture UNIT-A Farming System-scope, importance, and concept, Types and systems of farming system and factors affecting types of farming, Farming system components and their maintenance. UNIT-B Cropping system and pattern, multiple cropping system, Efficient cropping system and their evaluation, Allied enterprises and their importance, Tools for determining production and efficiencies in cropping and farming system. UNIT-C Sustainable agriculture-problems and its impact on agriculture, indicators of sustainability, adaptation and mitigation, conservation agriculture strategies in agriculture, HEIA, LEIA and LEISA and its techniques for sustainability. UNIT-D Integrated farming system-historical background, objectives and characteristics, components of IFS and its advantages, Site specific development of IFS model for different agro-climatic zones, resource use efficiency and optimization techniques. UNIT-E Resource cycling and flow of energy in different farming system, farming system and environment, Visit of IFS model in different agro-climatic zones of nearby states University/institutes and farmers field.	New course

		<p>Plant Growth Regulators – Occurrence – Biosynthesis – Mode of action of Auxins, Gibberellins, Cytokinins, ABA, Ethylene. Novel plant growth regulators – Commercial application of plant growth regulator in agriculture and horticulture. Senescence and abscission – Definition – Classification – Theories of mechanism and control of senescence – Physiological and biochemical changes and their significance. Abscission and its relationship with senescence. Seed Physiology – Seed dormancy – Definition – types of seed dormancy – Advantages and disadvantages of seed dormancy - Causes and remedial measures for breaking seed dormancy with examples – Optimum conditions of seed storage – Factors influencing seed storage (ISTA standards). Post Harvest Physiology - Fruit ripening – Metamorphic changes – Climacteric and non-climacteric fruits – Hormonal regulation of fruit ripening (with ethrel, CCC, Polaris, paclobuterozole) – Use of hormones in increasing vase life of flowers.</p> <p>Practical: Preparation of solutions. Growth analysis: Calculation of growth parameters. Methods of measuring water status in roots, stems and leaves. Estimation of water potential by Chardakov’s method. Measurement of absorption spectrum of chloroplastic pigments and fluorescence. Measurement of leaf area by various methods. Stomatal frequency and index. Leaf anatomy of C3 and C4 plants (Demonstration by already prepared slides). Respirometer – measurement of respiration. Measurement of transpiration by different methods. Measurement of respiratory quotient (RQ). Optimum conditions for seed germination. Breaking seed dormancy (a.) Chemical method (b.) Mechanical method. Yield analysis. Seed viability and vigour tests. Effect of ethylene on regulation of stomata.</p>		
8	AG 408	<p>Entrepreneurship Development and Communication Skills</p> <p>Communication Skills: Meaning and Process of communication, verbal and non-verbal communication; listening and note taking, writing skills, oral presentation skills. Public speaking. Entrepreneurship Development: Concept & Meaning. Overview of Indian social, political and economic systems and their implications for decision making by</p>	<p>Agricultural Marketing, Trade & Prices</p> <p>UNIT-A Agricultural Marketing: Concepts and definitions of market, marketing, agricultural marketing, market structure, marketing mix and market segmentation, classification and characteristics of agricultural markets; demand, supply and producer’s surplus of agri-commodities: nature and determinants of demand and supply of farm products, producer’s.</p>	New Course

	<p>individual entrepreneurs. Globalization and the emerging business / entrepreneurial environment. Entrepreneurial and managerial characteristics; managing an enterprise; motivational drives; entrepreneurial ethics; Entrepreneurship development Programmes- 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. Contract farming and joint ventures, public- private partnerships.</p> <p>Practical : Listening and note taking, writing skills, oral presentation skills; field diary and lad record; indexing, footnote and bibliographic procedures. Summarizing, abstracting; individual and group presentation. Practice on SWOT Analysis, visit to SMEs / SSIs. □</p>	<p>UNIT-B Surplus – meaning and its types, marketable and marketed surplus, factors affecting marketable surplus of agri-commodities; product life cycle (PLC) and competitive strategies: Meaning and stages in PLC; characteristics of PLC; strategies in different stages of PLC; pricing and promotion strategies: pricing considerations and approaches – cost based and competition based pricing; market promotion – advertising, personal selling, sales promotion and publicity – their meaning and merits & demerits; marketing process and functions;</p> <p>UNIT-C Marketing process- concentration, dispersion and equalization; exchange functions – buying and selling; physical functions – storage, transport and processing; facilitating functions – packaging, branding, grading, quality control and labeling (Agmark); Market functionaries and marketing channels: Types and importance of agencies involved in agricultural marketing; meaning and definition of marketing channel; number of channel levels; marketing channels for different farm products;</p> <p>UNIT-D Integration, efficiency, costs and price spread: Meaning, definition and types of market integration; marketing efficiency; marketing costs, margins and price spread; factors affecting cost of marketing; reasons for higher marketing costs of farm commodities; ways of reducing marketing costs; Role of Govt. in agricultural marketing: Public sector institutions- CWC, SWC, FCI, CACP & DMI – their objectives and functions; cooperative marketing in India;</p> <p>UNIT-E Risk in marketing: Types of risk in marketing; speculation & hedging; an overview of futures trading; Agricultural prices and policy: Meaning and functions of price; administered prices; need for agricultural price policy; Trade: Concept of International Trade and its need, theories of absolute and comparative advantage. Present status and prospects of international trade in agri-commodities; GATT and WTO; Agreement on Agriculture (AoA) and its implications on Indian agriculture; IPR.</p> <p>Practical Plotting and study of demand and supply curves and calculation of elasticities; Study of relationship between market arrivals and prices of some selected commodities; Computation of marketable</p>	
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9	AG 409		<p>Introductory Agro meteorology & Climate Change</p> <p>UNIT-A Meaning and scope of agricultural meteorology; Earth atmosphere- its composition, extent and structure; Atmospheric weather variables; Atmospheric pressure, its variation with height; Wind, types of wind, daily and seasonal variation of wind speed, cyclone, anticyclone, land breeze and sea breeze;</p> <p>UNIT-B Nature and properties of solar radiation, solar constant, depletion of solar radiation, short wave, long wave and thermal radiation, net radiation, albedo; Atmospheric temperature, temperature inversion, lapse rate, daily and seasonal variations of temperature, vertical profile of temperature,</p> <p>UNIT-C Energy balance of earth; Atmospheric humidity, concept of saturation, vapor pressure, process of condensation, formation of dew, fog, mist, frost, cloud; Precipitation, process of precipitation, types of precipitation such as rain, snow, sleet, and hail, cloud formation and classification; Artificial rainmaking.</p> <p>UNIT-D Monsoon- mechanism and importance in Indian agriculture, Weather hazards - drought, floods, frost, tropical cyclones and extreme weather conditions such as heat- wave and cold-wave. Agriculture and weather relations; Modifications of crop microclimate, climatic normals for crop and livestock production.</p> <p>UNIT-E Weather forecasting- types of weather forecast and their uses. Climate change, climatic variability, global warming, causes of climate change and its impact on regional and national Agriculture.</p>	New course introduced

			<p>Practical</p> <p>Visit of Agrometeorological Observatory, site selection of observatory, exposure of instruments and weather data recording. Measurement of total, shortwave and longwave radiation, and its estimation using Planck's intensity law. Measurement of albedo and sunshine duration, computation of Radiation Intensity using BSS. Measurement of maximum and minimum air temperatures, its tabulation, trend and variation analysis. Measurement of soil temperature and computation of soil heat flux. Determination of vapor pressure and relative humidity. Determination of dew point temperature. Measurement of atmospheric pressure and analysis of atmospheric conditions. Measurement of wind speed and wind direction, preparation of wind rose. Measurement, tabulation and analysis of rain. Measurement of open pan evaporation and evapotranspiration. Computation of PET and AET.</p>	
10	AG 410 A		<p>Protected Cultivation</p> <p>UNIT-A Green house technology: Introduction, Types of Green Houses; Plant response to Green house environment, Planning and design of greenhouses.</p> <p>UNIT-B Green house equipments, Irrigation systems used in greenhouses, typical applications, passive solar greenhouse, hot air green house heating systems.</p> <p>UNIT-C Plastic Mulching and soil solarization..</p> <p>UNIT-D Organic Farming and Vermi Bed Preparation.</p> <p>UNIT-E Water Resource Management and water ponds.</p> <p>Practical:</p> <p>Mulching - Surface covered cultivation – plastics mulching – code of practice. Greenhouse - Plastic film for Greenhouses - Recommendations for Layout, Design and Construction of Greenhouse Structures . Recommendations for Heating, Ventilating and cooling of Greenhouses Steel Tubes for Structural Purpose. Agro Shade nets for Agriculture & Horticulture Purpose</p> <p>Protection Nets Plant. Vermi-Bed Agro Textiles- High Density Polyethylene</p>	New course introduced

			(HDPE) Woven Beds For Vermi- culture Specification.	
11	AG 410 B		<p>AGRIBUSINESS MANAGEMENT</p> <p>Theory</p> <p>UNIT- A Transformation of agriculture into agribusiness, various stakeholders and components of agribusiness systems, Importance of agribusiness in the Indian economy and New Agricultural Policy. Distinctive features of Agribusiness Management. Importance and needs of agro-based industries, Classification of industries and types of agro based industries.</p> <p>UNIT-B Institutional arrangement, procedures to set up agro based industries, Constraints in establishing agro-based industries, Agri-value chain, Understanding primary and support activities and their linkages.</p> <p>UNIT-C Business environment: PEST & SWOT analysis. Management functions, Roles & activities, Organization culture. Planning, meaning, definition, types of plans. Purpose or mission, goals or objectives, Strategies, policies procedures, rules, programs and budget.</p> <p>UNIT-D Components of a business plan, steps in planning and implementation. Ordering, leading, supervision, communications, control. Capital Management and Financial management of Agribusiness. Financial statements and their importance. Marketing Management: Segmentation, targeting & positioning. Marketing mix and marketing strategies.</p> <p>UNIT-E Consumer behavior analysis, Product Life Cycle (PLC). Sales & Distribution Management. Pricing policy, various pricing methods. Project Management definition, project cycle, identification, formulation, appraisal, implementation, monitoring and evaluation. Project Appraisal and evaluation techniques.</p> <p>Practical</p> <p>Study of Agri - input markets. Seed, fertilizers, pesticides. Study of output markets: grains, fruits, vegetables, flowers. Study of product markets, retails trade commodity trading, and value added products. Study of financing institutions- Cooperative, Commercial banks, RRBs, Agribusiness Finance Limited, NABARD. Preparations of projects and Feasibility reports for agribusiness entrepreneur. Appraisal/evaluation techniques of identifying viable project- Non-discounting techniques. Case study of agro-based industries. Trend and growth rate of prices of agricultural commodities. Net present worth technique for selection of viable project. Internal rate of return.</p>	New course added
12	AG 410 C		<p>Agrochemicals (Elective Course)</p> <p>Theory</p> <p>UNIT-A An introduction to agrochemicals, their type and role in agriculture, effect on environment, soil, human and animal health, merits and demerits of their</p>	New course added

			<p>uses in agriculture, management of agrochemicals for sustainable agriculture. Herbicides- Major classes, properties and important herbicides.Fate of herbicides.</p> <p>UNIT-B Fungicides - Classification – Inorganic fungicides - characteristics, preparation and use of sulfur and copper, Mode of action-Bordeaux mixture and copper oxychloride.Organic fungicides- Mode of action- Dithiocarbamates-characteristics, preparation and use of Zineb and maneb.Systemic fungicides-Benomyl, carboxin, oxycarboxin, Metalaxyl, Carbendazim, characteristics and use.</p> <p>UNIT-C Introduction and classification of insecticides: inorganic and organic insecticides Organochlorine, Organophosphates, Carbamates, Synthetic pyrethroids Neonicotinoids, Biorationals, Insecticide Act and rules, Insecticides banned, withdrawn and restricted use, Fate of insecticides in soil & plant. IGRs Biopesticides, Reduced risk insecticides, Botanicals, plant and animal systemic insecticides their characteristics and uses.Fertilizers and their importance. Nitrogenous fertilizers: Feedstocks and Manufacturing of ammonium sulphate, ammonium nitrate, ammonium chloride, urea.</p> <p>UNIT-D Slow release N-fertilizers. Phosphatic fertilizers: feedstock and manufacturing of single superphosphate. Preparation of bone meal and basic slag. Potassic fertilizers: Natural sources of potash, manufacturing of potassiumchloride, potassium sulphate and potassium nitrate. Mixed and complex fertilizers: Sources and compatibility– preparation of major, secondary and micronutrient mixtures.</p> <p>UNIT-E Complex fertilizers: Manufacturing of ammonium phosphates, nitrophosphates and NPK complexes. Fertilizer control order. Fertilizer logistics and marketing.Plant bio- pesticides for ecological agriculture, Bio-insect repellent.</p> <p>Practical</p> <p>Sampling of fertilizers and pesticides.Pesticides application technology to study about various pesticides appliances.Quick tests for identification of common fertilizers.Identification of anion and cation in fertilizer.Calculation of doses of insecticides to be used.To study and identify various formulations of insecticide available in market.Estimation of nitrogen in Urea.Estimation of water soluble P₂O₅ and citrate soluble P₂O₅ in single super phosphate.Estimation of potassium in Murexite of Potash/ Sulphate of Potash by flame photometer.Determination of copper content in copper oxychloride.Determination of sulphur content in sulphur fungicide.Determination of thiram.Determination of ziram content.</p>	
13	AG 410 D		<p>Commercial Plant Breeding (Elective Course)</p> <p>Theory</p> <p>UNIT-A Types of crops and modes of plant reproduction. Line development and maintenance breeding in self and cross pollinated crops (A/B/R and two line system) for development of hybrids and seed production.</p> <p>UNIT-B Genetic purity test of commercial hybrids.</p>	New course added

		<p>Advances in hybrid seed production of maize, rice, sorghum, pearl millet, castor, sunflower, cotton pigeon pea, Brassica etc.</p> <p>UNIT-C Quality seed production of vegetable crops under open and protected environment. Alternative strategies for the development of the line and cultivars: haploid inducer, tissue culture techniques and biotechnological tools.</p> <p>UNIT-D IPR issues in commercial plant breeding: DUS testing and registration of varieties under PPV & FR Act.</p> <p>UNIT-E Variety testing, release and notification systems in India. Principles and techniques of seed production, types of seeds, quality testing in self and cross pollinated crops.</p> <p>Practical</p> <p>Floral biology in self and cross pollinated species, selfing and crossing techniques. Techniques of seed production in self and cross pollinated crops using A/B/R and two line system. Learning techniques in hybrid seed production using male-sterility in field crops. Understanding the difficulties in hybrid seed production, Tools and techniques for optimizing hybrid seed production. Concept of rouging in seed production plot. Concept of line its multiplication and purification in hybrid seed production. Role of pollinators in hybrid seed production. Hybrid seed production techniques in sorghum, pearl millet, maize, rice, rapeseed-mustard, sunflower, castor, pigeon pea, cotton and vegetable crops. Sampling and analytical procedures for purity testing and detection of spurious seed. Seed drying and storage structure in quality seed management. Screening techniques during seed processing viz., grading and packaging. Visit to public private seed production and processing plants.</p>	
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Vth Semester				
1	AG501	<p>Practical Crop Production -1(Kharif crops)</p> <p>Practical:</p> <p>Crop planning, raising field crops in multiple cropping system, Field preparation, seed treatment, nursery raising, sowing, nutrient management, water management, weed management and management of insect pests and diseases of crops; Harvesting, threshing, drying, winnowing, storage and marketing of produce. Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of a group of students.</p>	<p>Principles of Integrated Pest and Disease Management</p> <p>UNIT-A Categories of insect pests and diseases, IPM: Introduction, history, importance, concepts, principles and tools of IPM. Economic importance of insect pests, diseases and pest risk analysis.</p> <p>UNIT-B Methods of detection and diagnosis of insect pest and diseases. Calculation and dynamics of economic injury level and importance of Economic threshold level. Methods of control:</p> <p>UNIT-C Host plant resistance, cultural, mechanical, physical, legislative, biological and chemical control. Ecological management of crop environment. Introduction to conventional pesticides for the insect pests and disease management. Survey surveillance and forecasting of Insect pest and diseases.</p> <p>UNIT-D Development and validation of IPM module. Implementation and impact of IPM (IPM module for Insect pest and disease).</p> <p>UNIT-E Safety issues in pesticide uses. Political, social and legal implication of IPM. Case histories of important IPM programmes. Case histories of important IPM programmes.</p>	<p>New course Title changed Semester changed</p>

			<p>Practical Methods of diagnosis and detection of various insect pests, and plant diseases, Methods of insect pests and plant disease measurement, Assessment of crop yield losses, calculations based on economics of IPM, Identification of biocontrol agents, different predators and natural enemies. Mass multiplication of Trichoderma, Pseudomonas, Trichogramma, NPV etc. Identification and nature of damage of important insect pests and diseases and their management. Crop (agroecosystem) dynamics of a selected insect pest and diseases. Plan & assess preventive strategies (IPM module) and decision making. crop monitoring attacked by insect, pest and diseases. Awareness campaign at farmer's fields.</p>	
2	AG 502	<p>Rainfed Farming</p> <p>History of rainfed agriculture and its importance in India with particular reference to Rajasthan, extent of problem and constraints related to climate, soil, technological and socio-economic conditions; Delineating criteria for rainfed and drylands; Efficient utilization of water through soil and crop management practices-reducing water losses through mulching (use of mulching), Use of antitranspirants- their kind and 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- its concept, objectives and principles; Integrated watershed management for drylands; Efficient management of rainfed crops-land preparation, seeding and crop density, selection of crops and varieties for dryland, alternate cropping and land use strategies, soil fertility management and fertilizer use techniques, weed control and inter-cultural operations, mid season corrections for mitigating the aberrant weather.</p> <p>Practical: Delineating criteria for rainfed and drylands; Onset and withdrawal of the monsoon, amount, intensity and distribution in Rajasthan and India ; Critical analysis of rainfall and estimation of moisture index and aridity index, crops and cropping systems for drylands; Acquiring skill in tillage methods for <i>in situ</i> moisture conservation, effects of soil mulching and its effect on soil moisture. Spray of antitranspirants on dryland crops and their effects on crops; Seed soaking and seed treatment with chemicals for</p>	<p>Manures Fertilizers and fertility Management</p> <p>UNIT-A Introduction and importance of organic manures, properties and methods of preparation of bulky and concentrated manures. Green manuring. Fertilizer recommendation approaches. Integrated nutrient management.</p> <p>UNIT-B Chemical fertilizers: classification, composition and properties of major nitrogenous, phosphatic, potassic fertilizers, secondary & micronutrient fertilizers, Complex fertilizers, nanofertilizers Soil amendments, Fertilizer Storage, Fertilizer Control Order.</p> <p>UNIT-C History of soil fertility and plant nutrition. criteria of essentiality. role, deficiency and toxicity symptoms of essential plant nutrients, Mechanisms of nutrient transport to plants, factors affecting nutrient availability to plants.</p> <p>UNIT-D Chemistry of soil nitrogen, phosphorus, potassium, calcium, magnesium, sulphur and micronutrients. Soil fertility evaluation, Soil testing.</p> <p>UNIT-E Critical levels of different nutrients in soil. Forms of nutrients in soil, plant analysis, rapid plant tissue tests. Indicator plants, Methods of fertilizer recommendations to crops. Factor influencing nutrient use efficiency (NUE), methods of application under rainfed and irrigated conditions.</p> <p>Practical Introduction of analytical instruments and their principles, calibration and applications, Colorimetry and flame photometry. Estimation of soil organic carbon, Estimation of alkaline hydrolysable N in soils. Estimation of soil extractable P in soils. Estimation of exchangeable K; Ca and Mg in soils . Estimation of soil extractable S in soils. Estimation of DTPA extractable Zn in soils. Estimation of N in plants. Estimation of P in plants. Estimation of K in plants. Estimation of S in plants.</p>	<p>New course Title changed Semester changed</p>

		<p>sowing under moisture stress conditions, methods of fertilizer application in dry land areas; Effect of plant density, thinning, leaf removal on crop growth under moisture stress condition; Study of the salient features of a model water shed; Alternate land use strategies-- Agro-forestry, grass legume forage and alley cropping systems; Visit to dry land experiments ; to expose students to the latest agro-techniques and watershed management practices; Study of runoff plots and soil /nutrient losses.</p>		
3	AG 503	<p>Principles of Plant Biotechnology</p> <p>Concepts of Plant Biotechnology: History of Plant Tissue Culture and Plant Genetic Engineering: Scope and importance in crop Improvement : Totipotency and Morphogenesis, Nutritional requirements of in vitro cultures; Techniques of in vitro cultures, Micropropagation, anther culture, pollen culture, ovule culture, embryo culture, Test tube fertilization, Endosperm culture, factors effecting above in vitro cultures, Applications and achievements, somaclonal variation, Types, Reasons, somatic embryogenesis and synthetic seed production technology, Protoplast isolation, culture, manipulation and fusion, Products of somatic hybrids and cybrids, Applications in crop improvements, Genetic Engineering, Restriction enzymes, Vectors for gene transfer-, gene cloning, Direct and Indirect method of gene transfer- Transgenic plants and their applications. Introductory knowledge about blotting techniques, molecular markers, QTL, Marker assisted selection and application in crop improvement.</p> <p>Practical: Requirements of Plant tissue culture laboratory: Techniques in Plant tissue culture- Media Components and preparation; sterilization techniques and inoculation of various explants, callus induction and plant regeneration; Demonstration of Micropropagation, Anther culture, embryo culture, Hardening/ Acclimatization of regenerated plants, somatic embryogenesis and synthetic seed production, Demonstration of isolation and culture of protoplast, demonstration of isolation of DNA, gene transfer technique and gel electrophoresis techniques.</p>	<p>Pests of Crops and Stored Grains and Their Management</p> <p>UNIT-A General account on nature and type of damage by different arthropods pests. Scientific name, order, family, host range, distribution, biology and bionomics, nature of damage, and management of major pests and</p> <p>UNIT-B Scientific name, order, family, host range, distribution, nature of damage and control practice other important arthropod pests of various field crop, vegetable crop, fruit crop, plantation crops, ornamental crops, spices and condiments.</p> <p>UNIT-C Factors affecting losses of stored grain and role of physical, biological, mechanical and chemical factors in deterioration of grain.</p> <p>UNIT-D Insect pests, mites, rodents, birds and microorganisms associated with stored grain and their management.</p> <p>UNIT-E Storage structure and methods of grain storage and fundamental principles of grain store management.</p> <p>Practical Identification of different types of damage. Identification and study of life cycle and seasonal history of various insect pests attacking crops and their produce: (a) Field Crops; (b) Vegetable Crops; (c) Fruit Crops; (d) Plantation, gardens, Narcotics, spices & condiments. Identification of insect pests and Mites associated with stored grain. Determination of insect infestation by different methods. Assessment of losses due to insects. Calculations on the doses of insecticides application technique. Fumigation of grain store / godown. Identification of rodents and rodent control operations in godowns. Identification of birds and bird control operations in godowns. Determination of moisture content of grain. Methods of grain sampling under storage condition. Visit to Indian Storage Management and Research Institute, Hapur and Quality Laboratory, Department of Food., Delhi. Visit to nearest FCI godowns.</p>	<p>New course Title changed Semester changed</p>

4	AG504	<p>Crop and Stored Grain Pests and Their Management</p> <p>Polyphagous pests: Red hairy caterpillar, White grub, Termite, Locust, Grasshopper. Crop pests: Distribution, biology, nature and symptoms of damage, and management of insect pests of rice, pearl millet, sorghum, maize, wheat, sugarcane, cotton, pulses (Gram and <i>Kharif</i> pulses), groundnut, castor, sesame, sunflower, mustard, soybean, brinjal, okra, tomato, cruciferous and cucurbitaceous vegetables, potato, chillies, onion, garlic, mango, citrus, pomegranate, guava, ber, apple, coconut and ornamental plants. Stored grain pests: Coleopteran and Lepidopteran pests, their identification, biology and damage. Preventive and curative methods for control of stored grain pests.</p> <p>Practical: Identification, damage symptoms and management of insect pests of rice, pearl millet, sorghum, maize, wheat, sugarcane, cotton, pulses, castor, mustard, brinjal, tomato, okra, cruciferous and cucurbitaceous vegetables, onion, garlic, chillies, mango, guava, citrus, pomegranate, ber, coconut. Identification, biology, damage symptoms and management of stored grain and polyphagous insect pests.</p>	<p>Diseases of Field and Horticultural Crops and their Management-I</p> <p>UNIT-A Symptoms, etiology, disease cycle and management of major diseases of following crops: Field Crops: Rice: blast, brown spot, bacterial blight, sheath blight, false smut, khaira and tungro; Maize: stalk rots, downy mildew, leaf spots; Sorghum: smuts, grain mold and anthracnose.</p> <p>UNIT-B Bajra :downy mildew and ergot; Groundnut: early and late leaf spots, wilt Soybean: Rhizoctonia blight, bacterial spot, seed and seedling rot and mosaic; Pigeonpea:</p> <p>UNIT-C Phytophthora blight, wilt and sterility mosaic; Finger millet: Blast and leaf spot; black & green gram: Cercospora leaf spot and anthracnose, web blight and yellow mosaic; Castor: Phytophthora blight; Tobacco: black shank, black root rot and mosaic.</p> <p>UNIT-D Horticultural Crops: Guava: wilt and anthracnose; Banana: Panama wilt, bacterial wilt, Sigatoka and bunchy top; Papaya: foot rot, leaf curl and mosaic, Pomegranate: bacterial blight; Cruciferous vegetables: Alternaria leaf spot and black rot; Brinjal: Phomopsis blight and fruit rot and</p> <p>UNIT-E Sclerotinia blight; Tomato: damping off, wilt, early and late blight, buck eye rot and leaf curl and mosaic; Okra: Yellow Vein Mosaic; Beans: anthracnose and bacterial blight; Ginger: soft rot; Colocasia: Phytophthora blight; Coconut: wilt and bud rot; Tea: blister blight; Coffee: rust</p> <p>Practical Identification and histopathological studies of selected diseases of field and horticultural crops covered in theory. Field visit for the diagnosis of field problems. Collection and preservation of plant diseased specimens for Herbarium; Note: Students should submit 50 pressed and well mounted specimens.</p>	New course Title changed Semester changed
5	AG505	<p>Breeding of Field and Horticultural Crops</p> <p>Botany and taxonomy, chromosome number, center of origin, species relationship, floral biology, breeding objectives and constraints, disease and pest resistance and quality (physical, chemical, nutritional and marketing) improvement, conventional and non-conventional</p>	<p>Crop Improvement-I (Kharif crops)</p> <p>UNIT-A Centers of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fibres; fodders and cash crops; vegetable and horticultural crops;</p> <p>UNIT-B Plant genetic resources, its utilization and conservation, study of genetics of qualitative and quantitative characters;</p>	New course

		<p>breeding methods, important varieties and future thrust area in crops like wheat, rice, maize, pearl millet, gram, moth, groundnut, mustard, cotton, potato, tomato, rose, chillies, cauliflower, coriander, fenugreek, and amla.</p> <p>Practical: Study of floral biology, hybridization technique, germplasm and segregating populations. Layout of breeding experiments. Observation recording, analysis and interpretation of breeding trials. Calculation of variability parameters, heterosis and inbreeding depression. Salient features of varieties recommended for the region for the crops as listed in theory portion. viz., rice, wheat, maize, sorghum, groundnut, cotton, potato, tomato, sugarcane, rose, marigold, mango and papaya (available at the time of semester).</p>	<p>UNIT-C Important concepts of breeding self pollinated, cross pollinated and vegetatively propagated crops; Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, adaptability, stability, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional);</p> <p>UNIT-D Hybrid seed production technology in Maize, Rice, Sorghum, Pearl millet and Pigeonpea, etc.</p> <p>UNIT-E Ideotype concept and climate resilient crop varieties for future.</p> <p>Practical Emasculation and hybridization techniques in different crop species; viz., Rice, Maize, Sorghum, Pearl Millet, Ragi, Pigeonpea, Urdbean, Mungbean, Soybean, Groundnut, Sesame, Castor, Cotton, Cowpea, Pearl millet and Tobacco. Maintenance breeding of different kharif crops. Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed descent methods; Study of field techniques for seed production and hybrid seeds production in <i>Kharif</i> crops; Estimation of heterosis, inbreeding depression and heritability; Layout of field experiments; Study of quality characters, donor parents for different characters; Visit to seed production plots; Visit to AICRP plots of different field crops.</p>	
6	AG506	<p>Agricultural Marketing, Trade and Prices</p> <p>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 producer's surplus, marketable surplus. Marketed surplus, importance, Factors affecting Marketable surplus. Marketing channels: Meaning, Definition, Channels for different products.</p>	<p>Entrepreneurship Development and Business Communication</p> <p>UNIT-A Concept of Entrepreneur, Entrepreneurship Development, Characteristics of entrepreneurs; SWOT Analysis & achievement motivation,</p> <p>UNIT-B Government policy and programs and institutions for entrepreneurship development, Impact of economic reforms on Agribusiness/ Agri enterprises,</p> <p>UNIT-C Entrepreneurial Development Process; Business Leadership Skills; Developing organizational skills (controlling, supervising, problem</p>	New course

		<p>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.</p> <p>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.</p>	<p>solving, monitoring & evaluation), Developing Managerial skills, Business Leadership Skills (Communication, direction and motivation Skills),</p> <p>UNIT-D Problem solving skill, Supply chain management and Total quality management, UNIT-E Project planning Formulation and report preparation; Financing of enterprise, Opportunities for agri entrepreneurship and rural enterprise.</p> <p>Practical Assessing entrepreneurial traits, problem solving skills, managerial skills and achievement motivation, exercise in creativity, time audit through planning, monitoring and supervision, identification and selection of business idea, preparation of business plan and proposal writing, visit to entrepreneurship development institute and entrepreneurs.</p>	
7	AG507	<p>Protected Cultivation and Post Harvest Technology</p> <p>Green house technology- Introduction, types of green houses; Green houses equipments; Material of construction for traditional and low cost green houses; Irrigation systems used in green houses; Introduction: Scope and development of post harvest engineering; Basic engineering properties of cereals; Parts, care and maintenance of threshers and winnowers; Basic concepts and equipments used for cleaning and grading; Conveying equipment; Grain drying- need, methods, factors affecting</p>	<p>Geoinformatics and Nanotechnology and Precision Farming</p> <p>UNIT-A Precision agriculture: concepts and techniques; their issues and concerns for Indian agriculture; Geo-informatics- definition, concepts, tool and techniques; their use in Precision Agriculture.</p> <p>UNIT-B Crop discrimination and Yield monitoring, soil mapping; fertilizer recommendation using geospatial technologies;</p> <p>UNIT-C Spatial data and their management in GIS; Remote sensing concepts and application in agriculture; Image processing and interpretation;</p> <p>UNIT-D Global positioning system(GPS), components and its functions; Introduction to crop Simulation Models and their uses for optimization of</p>	New course

		<p>drying and the different types of dryers; Silos; Grain storage structures and requirements of good storage structure.</p> <p>Practical: Determination of basic engineering properties and moisture content of grains; Study of thresher and winnower; Screen cleaners; Air- screen and other cleaners; Conveying equipments; Mechanical dryers; Silos and grain storage structures.</p>	<p>Agricultural Inputs; STCR approach for precision agriculture; UNIT-E Nanotechnology, definition, concepts and techniques, brief introduction about nanoscale effects, nano-particles, nano-pesticides, nano-fertilizers, nano-sensors, Use of nanotechnology in seed, water, fertilizer, plant protection for scaling-up farm productivity.</p> <p>Practical Introduction to GIS software, spatial data creation and editing. Introduction to image processing software. Visual and digital interpretation of remote sensing images. Generation of spectral profiles of different objects. Supervised and unsupervised classification and acreage estimation. Multispectral remote sensing for soil mapping. Creation of thematic layers of soil fertility based on GIS. Creation of productivity and management zones. Fertilizers recommendations based of VRT and STCR techniques. Crop stress (biotic/abiotic) monitoring using geospatial technology. Use of GPS for agricultural survey. Formulation, characterization and applications of nanoparticles in agriculture. Projects formulation and execution related to precision farming.</p>	
8	AG508	<p>Disease of Field Crops and Their Management Economic importance , symptoms , etiology, disease cycle and management of diseases of Wheat (rusts, loose smut and Karnal bunt); Barley (covered smut and stripe disease); Bengal gram (Ascochyta blight and wilt); Mustard (white rust, Alternaria blight and white rot); Rice (blast, bacterial blight and khaira); Maize (brown stripe downy mildew , sugarcane downy mildew and Fusarium stalk rot); Sorghum (grain smut , loose smut and anthracnose); Bajra (ergot, smut and downy mildew); Sugarcane (red rot, whip smut and grassy shoot disease); Groundnut (tikka and collar rot); Cotton (root rot ,bacterial blight and leaf curl); Sesamum (bacterial leaf blight and phyllody); Pigeonpea (wilt and sterility mosaic); Clusterbean (Alternaria blight); Castor (Fusarium wilt and bacterial blight); Soybean (bacterial pustule and charcoal rot); Moth and Mungbean (yellow mosaic virus).</p> <p>Practical: Study of symptoms, etiology, host-parasite relationship and control measures of diseases of wheat, barley, bengal gram, rice, maize, sorghum, bajra, sugarcane, groundnut, cotton, clusterbean, moth and mungbean. Visits of diseased field during the semester. Student should submit at least 25 pressed well mounted disease</p>	<p>Practical Crop Production – I (Kharif crops)</p> <p>Practical Crop planning, raising field crops in multiple cropping systems: Field preparation, seed, treatment, nursery raising, sowing, nutrient, water and weed management and management of insect-pests diseases of crops, harvesting, threshing, drying winnowing, storage and marketing of produce. The emphasis will be given to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies. Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of 8-10 students.</p>	New course

		specimens.		
9	AG 509	<p>Production Technology of Spices, Aromatic and Medicinal Crops Importance and scope of Spices, Aromatic and Medicinal crops. Cultivation technology of Spices, Aromatic and Medicinal crops– ginger, turmeric, pepper, cardamom, coriander, cumin, fenugreek, fennel; Aromatic crops – lemon grass, citronella, palmarose, vetiver; Medicinal plants – opium, ocimum, aloe, guggal, senna, plantago, stevia, curry leaf, drumstick.</p> <p>Practical: Identification of spices, aromatic and medicinal plants, Propagation techniques of spices, aromatic and medicinal crops. Propagation and planting methods of turmeric; Harvesting procedures in aromatic plants; Processing and curing of spices (ginger, turmeric and black pepper); Cost of cultivation of spices. Visit to aromatic & medicinal plant nurseries and seed spices field.</p>	<p>Intellectual Property Rights UNIT-A Introduction and meaning of intellectual property, brief introduction to GATT, WTO, TRIPS and WIPO, Treaties for IPR protection: Madrid protocol, Berne Convention, Budapest treaty, etc. UNIT-B Types of Intellectual Property and legislations covering IPR in India:-Patents, Copyrights, Trademark, Industrial design, Geographical indications, Integrated circuits, UNIT-C Trade secrets. Patents Act 1970 and Patent system in India, patentability, process and product patent, filing of patent, patent specification, patent claims, Patent opposition and revocation, infringement, Compulsory licensing, Patent Cooperation Treaty, Patent search and patent database. UNIT-D Origin and history including a brief introduction to UPOV for protection of plant varieties, Protection of plant varieties under UPOV and PPV&FR Act of India, Plant breeder's rights, UNIT-E Registration of plant varieties under PPV&FR Act 2001, breeders, researcher and farmers rights. Traditional knowledge-meaning and rights of TK holders. Convention on Biological Diversity, International treaty on plant genetic resources for food and agriculture (ITPGRFA). Indian Biological Diversity Act, 2002 and its salient features, access and benefit sharing.</p>	New course
10	AG 510A		<p>Agricultural Journalism (Elective Course) UNIT-A Agricultural Journalism: The nature and scope of agricultural journalism characteristics and training of the agricultural journalist, how agricultural journalism is similar to and different from other types of journalism. UNIT-B Newspapers and magazines as communication media: Characteristics; kinds and functions of newspapers and magazines, characteristics of newspaper and magazine readers. Form and content of newspapers and magazines: Style and language of newspapers and magazines, parts of newspapers and magazines. UNIT-C The agricultural story: Types of agricultural stories, subject matter of the agricultural story, structure of the agricultural story. Gathering agricultural information: Sources of agricultural information, interviews, coverage of events, abstracting from research and scientific materials, wire services, other agricultural news sources. UNIT-D Writing the story: Organizing the material, treatment of the story, writing the news lead and the body, readability measures. UNIT-E Illustrating agricultural stories: Use of photographs, use of artwork (graphs, charts, maps, etc.), writing the captions. Editorial mechanics: Copy</p>	New Course added

		<p>reading, headline and title writing, proofreading, lay outing.</p> <p>Practical Practice in interviewing. Covering agricultural events. Abstracting stories from research and scientific materials and from wire services. Writing different types of agricultural stories. Selecting pictures and artwork for the agricultural story. Practice in editing, copy reading, headline and title writing, proofreading, layouting. Testing copy with a readability formula. Visit to a publishing office.</p>	
11	AG 510B	<p>Landscaping (Elective Course)</p> <p>UNIT-A Importance and scope of landscaping. Principles of landscaping, garden styles and types, terrace gardening, vertical gardening, garden components, adornments, lawn making, rockery, water garden, walk-paths, bridges, other constructed features etc. gardens for special purposes.</p> <p>UNIT-B Trees: selection, propagation, planting schemes, canopy management, shrubs and herbaceous perennials: selection, propagation, planting schemes, architecture. Climber and creepers: importance, selection, propagation, planting, Annuals: selection, propagation, planting scheme, Other garden plants: palms, ferns, grasses and cacti succulents.</p> <p>UNIT-C Pot plants: selection, arrangement, management. Bio-aesthetic planning: definition, need, planning; landscaping of urban and rural areas</p> <p>UNIT-D Peri-urban landscaping, Landscaping of schools, public places like bus station, railway station, townships, river banks, hospitals, play grounds, airports, industries, institutions.</p> <p>UNIT-E Bonsai: principles and management, lawn: establishment and maintenance. CAD application.ort of the ICAR Fifth</p> <p>Practical Identification of trees, shrubs, annuals, pot plants; Propagation of trees, shrubs and annuals, care and maintenance of plants, potting and repotting, identification of tools and implements used in landscape design, training and pruning of plants for special effects, lawn establishment and maintenance, layout of formal gardens, informal gardens, special type of gardens (sunken garden, terrace garden, rock garden) and designing of conservatory and lathe house. Use of computer software, visit to important gardens/ parks/ institutes.</p>	New Course added
12	AG 510C	Food Safety and Standards (Elective Course)	New Course added

			<p>UNIT-A Food Safety – Definition, Importance, Scope and Factors affecting Food Safety. Hazards and Risks, Types of hazards - Biological, Chemical, Physical hazards. Management of hazards - Need. Control of parameters.</p> <p>UNIT-B Temperature control. Food storage. Product design. Hygiene and Sanitation in Food Service Establishments- Introduction. Sources of contamination and their control. Waste Disposal. Pest and Rodent Control.</p> <p>UNIT-C Personnel Hygiene. Food Safety Measures. Food Safety Management Tools- Basic concepts. PRPs, GHPs, GMPs, SSOPs etc. HACCP. ISO series. TQM - concept and need for quality, components of TQM, Kaizen. Risk Analysis. Accreditation and Auditing. Water Analysis, Surface Sanitation and Personal Hygiene.</p> <p>UNIT-D Food laws and Standards- Indian Food Regulatory Regime, FSSAI. Global Scenario CAC. Other laws and standards related to food. Recent concerns- New and Emerging Pathogens. Packaging, Product labeling and Nutritional labeling. Genetically modified foods\ transgenics.</p> <p>UNIT-E Organic foods. Newer approaches to food safety. Recent Outbreaks. Indian and International Standards for food products.</p> <p>Practical Water quality analysis physico-chemical and microbiological. Preparation of different types of media. Microbiological Examination of different food samples. Assessment of surface sanitation by swab/rinse method. Assessment of personal hygiene. Biochemical tests for identification of bacteria. Scheme for the detection of food borne pathogens. Preparation of plans for Implementation of FSMS - HACCP, ISO: 22000.</p>	
13	AG 510D		<p>Bio-pesticides & Bio-fertilizers (Elective Course)</p> <p>UNIT-A History and concept of biopesticides. Importance, scope and potential of biopesticide. Definitions, concepts and classification of biopesticides viz. pathogen, botanical pesticides, and biorationals. Botanicals and their uses. Mass production technology of bio-pesticides. Virulence, pathogenicity and symptoms of entomopathogenic pathogens and nematodes.</p> <p>UNIT-B Methods of application of biopesticides. Methods of quality control and Techniques of bio-</p>	New Course added

			<p>pesticides. Impediments and limitation in production and use of bio-pesticide. Bio-fertilizers - Introduction, status and scope. Structure and characteristic features of bacterial bio-fertilizers- <i>Azospirillum</i>, <i>Azotobacter</i>, <i>Bacillus</i>, <i>Pseudomonas</i>, <i>Rhizobium</i> and <i>Frankia</i>; Cyanobacterial.</p> <p>UNIT-C Bio-fertilizers- Anabaena, Nostoc, Hapalosiphon and fungal bio-fertilizers- AM mycorrhiza and ectomycorrhiza. Nitrogen fixation -Free living and symbiotic nitrogen fixation.</p> <p>UNIT-D Mechanism of phosphate solubilization and phosphate mobilization, K solubilization. Production technology: Strain selection, sterilization, growth and fermentation, mass production of carrier based and liquid bio-fertilizers.</p> <p>UNIT-E FCO specifications and quality control of bio-fertilizers. Application technology for seeds, seedlings, tubers, sets etc. Bio-fertilizers -Storage, shelf life, quality control and marketing. Factors influencing the efficacy of bio-fertilizers.</p> <p>Practical Isolation and purification of important biopesticides: <i>Trichoderma</i>, <i>Pseudomonas</i>, <i>Bacillus</i>, <i>Metarhizium</i> etc. and its production. Identification of important botanicals. Visit to biopesticide laboratory in nearby area. Field visit to explore naturally infected cadavers. Identification of entomopathogenic entities in field condition. Quality control of biopesticides. Isolation and purification of <i>Azospirillum</i>, <i>Azotobacter</i>, <i>Rhizobium</i>, P-solubilizers and cyanobacteria. Mass multiplication and inoculums production of biofertilizers. Isolation of AM fungi - Wet sieving method and sucrose gradient method. Mass production of AM inoculants.</p>	
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VIth Semester				
1	AG 601	<p>Practical Crop Production –II (Rabi) Crop planting, raising field crops in multiple cropping systems: Field preparation, seed treatment, nursery raising sowing, fertilizer application, water management, weed management, intercropping operation, management of insect, pest and diseases of crop; Harvesting, threshing, drying, winnowing, storage and marketing of produce; Preparation of balance sheet including cost of cultivation, net return per student as well as per team of a group of students.</p>	<p>Rainfed Agriculture & Watershed Management</p> <p>Theory UNIT- A Rainfed agriculture: Introduction, types, History of rainfed agriculture and watershed in India. UNIT- B Problems and prospects of rainfed agriculture in India; Soil and climatic conditions prevalent in rainfed areas; Soil and water conservation techniques. UNIT- C Drought: types, effect of water deficit on physio- morphological characteristics of the plants, Crop adaptation and mitigation to drought. UNIT- D Concept and importance of Water harvesting and its techniques.</p>	New course

			<p>efficient utilization of water through soil and crop management practices, Management of crops in rainfed areas. UNIT- E Contingent crop planning for aberrant weather conditions, Concept, objective, principles and components of watershed management, factors affecting watershed management.</p> <p>Practical Studies on climate classification, studies on rainfall pattern in rainfed areas of the country and pattern of onset and withdrawal of monsoons. Studies on cropping pattern of different rainfed areas in the country and demarcation of rainfed area on map of India. Interpretation of meteorological data and scheduling of supplemental irrigation on the basis of evapo-transpiration demand of crops. Critical analysis of rainfall and possible drought period in the country, effective rainfall and its calculation. Studies on cultural practices for mitigating moisture stress. Characterization and delineation of model watershed. Field demonstration on soil & moisture conservation measures. Field demonstration on construction of water harvesting structures. Visit to rainfed research station/watershed.</p>	
2	AG 602	<p>Farming Systems, Sustainable Agriculture and Organic Farming Sustainable agriculture: definition, current concept ; Factors affecting ecological balance and ameliorative measures; Land degradation and conservation of natural resources; Low external input agriculture (LEIA) & high external input agricultural (HEIA); Irrigation problems; Waste lands and their development; Differences between conventional and sustainable agricultural systems; Organic farming: definition, principles , components and relevance in present context; Organic production requirements; Biological intensive nutrient management-organic manures, vermicomposting, green manuring, recycling of organic residues, biofertilizers; Soil amendments; Integrated diseases and pest management – use of biocontrol agents, biopesticides, pheromones, trap crops, bird perches; Organic produce: quality considerations, certification, and accreditation; Farming systems: definition, principles and components, Intergrated farming system (I F S) models for wetland, irrigated dryland and dryland situations.</p> <p>Practical: Preparation of cropping scheme for irrigated situations; Preparation of cropping scheme for dryland</p>	<p>Protected Cultivation and Secondary Agriculture</p> <p>Theory</p> <p>UNIT-A Green house technology: Introduction, Types of Green Houses; Plant response to Green house environment, Planning and design of greenhouses, Design criteria of green house for cooling and heating purposes.</p> <p>UNIT-B Green house equipments, materials of construction for traditional and low cost green houses. Irrigation systems used in greenhouses, typical applications, passive solar greenhouse, hot air green house heating systems, green house drying.</p> <p>UNIT-C Cost estimation and economic analysis .Important Engineering properties such as physical, thermal and aero & hydrodynamic properties of cereals, pulses and oilseed, their application in PHT equipment design and operation.</p> <p>UNIT-D Drying and dehydration; moisture measurement, EMC, drying theory, various drying method, commercial grain dryer (deep bed dryer, flat bed dryer, tray dryer, fluidized bed dryer, recirculatory dryer and solar dryer).</p> <p>UNIT-E Material handling equipment; conveyer and elevators, their principle, working and selection.</p>	New course

		<p>situations; Study of existing farming systems in nearby villages; Preparation of integrated farming system model for wetlands; Preparation of integrated farming system model for drylands; Preparation of enriched Farm Yard Manure; Preparation of Vermicompost; Study of profitable utilization of agricultural wastes; Visit to poultry and dairy units to study resource allocation, utilization and economics; Visit to an organic farm to study various components and utilization; Manurial requirement through vermicompost, FYM and poultry manure based on major nutrients; Estimation of organic carbon in organic manures; Technique for treating legume seed with Rhizobium and use of Azotobactor, Azospirillum and PSB in field crops; Sustainable yield index and sustainable value index; Productivity index of some important cropping sequences; Raising of crops organically.</p>	<p>Practical</p> <p>Study of different type of green houses based on shape. Determine the rate of air exchange in an active summer winter cooling system. Determination of drying rate of agricultural products inside green house. Study of green house equipments. Visit to various Post Harvest Laboratories. Determination of Moisture content of various grains by oven drying & infrared moisture methods. Determination of engineering properties (shape and size, bulk density and porosity of biomaterials). Determination of Moisture content of various grains by moisture meter. Field visit to seed processing plant.</p>	
3	AG 603	<p>Principles of Seed Technology</p> <p>Importance of improved seed in agriculture. Seed technology-definition, objective, relationship with other sciences. Seed quality-definition, characters of good quality seed and classes of seed. Seed policy, seed demand forecasting and planning of certified, foundation and breeder seed production. Determination of crop seed varieties, factors affecting deterioration and their control; Maintenance of genetic purity during seed production. Steps involved in development of seed programme and seed multiplication. Production of nucleus of & breeder seed, Maintenance and multiplication of pre-release and newly released varieties in self and cross pollinated crops. Seed production- foundation and certified seed production of maize, bajra, sorghum (hybrids, synthetics and composites), rice, cotton, tomato and hybrids: chillies and cucurbits (varieties and hybrids): seed production of wheat, barley, gram and rape seed mustard. Seed certification phases of certification, procedure for seed certification and field inspection, fields counts. Seed act 1966 and Seed act enforcement, Central seed committee, Central Seed Certification Board, State Seed Certification</p>	<p>Diseases of Field and Horticultural Crops and their Management-II</p> <p>UNIT-A Symptoms, etiology, disease cycle and management of following diseases: Field Crops: Wheat: rusts, loose smut, karnal bunt, powdery mildew, alternaria blight, and ear cockle; Sugarcane: red rot, smut, wilt, grassy shoot, ratoon stunting and Pokkah Boeng; Sunflower: n</p> <p>UNIT-B Sclerotinia stem rot and Alternaria blight; Mustard: Alternaria blight, white rust, downy mildew and Sclerotinia stem rot; Gram: wilt, grey mould and Ascochyta blight; Lentil: rust and wilt; Cotton: anthracnose, vascular wilt, and black arm; Pea: downy mildew, powdery mildew and rust. Horticultural Crops:</p> <p>UNIT-C Mango: anthracnose, malformation, bacterial blight and powdery mildew; Citrus: canker and gummosis; Grape vine: downy mildew, Powdery mildew and anthracnose; Apple: scab, powdery mildew, fire blight and crown gall; Peach: leaf curl. Strawberry:</p> <p>UNIT-D Leaf spot Potato: early and late blight, black scurf, leaf roll, and mosaic; Cucurbits: downy mildew, powdery mildew, wilt;</p>	New course

		<p>Agency. Central and State Seed Testing Laboratories; Duties and powers of seed inspectors, offences and penalties. Seed control order: Seed control order 1983. Intellectual Properties Rights, Patenting, WTO, Plant Breeders Rights and Farmer's Right. Seed drying- Forced air seed drying, principle, properties of air and their effect on seed drying, moisture equilibrium between seed and air. Seed processing- planning and establishment of seed processing plant; air screen machine and its working principle, different upgrading equipment and their use. Principles of seed treatment, Seed storage; stages of seed storage, factors affecting seed longevity storage and conditions required for good storage, general principles of seed storage. Seed marketing- marketing structure, marketing organization.</p> <p>Practical:</p> <p>Seed sampling principles and procedures. Physical purity analysis of field and horticultural crops; Moisture testing; Germination analysis and viability test of field and horticultural crops; Vigour test of field and horticultural crops; KOH and NaOH test for varietal identification; Visit of GOT field at University farms; Varietal identification in seed production plots; Planting ratio, Minimum seed certification standards of important crops in the vicinity.</p>	<p>UNIT-E Onion and garlic: purple blotch, and Stemphylium blight; Chillies: anthracnose and fruit rot, wilt and leaf curl; Turmeric: leaf spot Coriander: stem gall Marigold: Botrytis blight; Rose: dieback, powdery mildew and black leaf spot.</p> <p>Practical</p> <p>Identification and histopathological studies of selected diseases of field and horticultural crops covered in theory. Field visit for the diagnosis of field problems. Collection and preservation of plant diseased specimens for herbarium.</p>	
4	AG 604	<p>Extension Methodologies for Transfer of Agricultural Technology</p> <p>Communication - Meaning, Definition, Models, Elements and their Characteristics, Barriers in Communication. Extension Programme Planning - Meaning, Definition of Planning, Programme, Project, Principles and Steps in Programme Planning Evaluation - Meaning, concept and types. Extension Teaching methods - Meaning, Definition and Classification. Individual contact methods – Farm and Home visit, Telephone call, E-mail. Group contact methods – Group discussion, Method and Result demonstrations; Small group discussion techniques – Lecture, Panel, Workshop, Syndicate group, Brain Storming, Seminar, Conference and Buzz group. Mass contact Methods- Campaign,</p>	<p>Post-Harvest Management and Value Addition of Fruits and Vegetables</p> <p>UNIT-A Importance of post-harvest processing of fruits and vegetables, extent and possible causes of post harvest losses;</p> <p>UNIT-B Pre-harvest factors affecting postharvest quality, maturity, ripening and changes occurring during ripening;</p> <p>UNIT-C Respiration and factors affecting respiration rate; Harvesting and field handling; Storage (ZECC, cold storage, CA, MA, and hypobaric); Value addition concept;</p> <p>UNIT-D Principles and methods of preservation; Intermediate moisture food- Jam, jelly, marmalade, preserve, candy – Concepts and Standards; Fermented and non-fermented beverages.</p> <p>UNIT-D Tomato products- Concepts and Standards; Drying/ Dehydration of fruits and vegetables – Concept and methods,</p>	New course

		<p>Exhibition, Kisan Mela, Radio & Television -Meaning, Importance, steps, Merits & Demerits. Factors influencing in selection of Extension Teaching methods. Innovative Information sources – Internet, Cyber Cafes, Video and Tele conferences, Kisan call centers. Diffusion-Meaning, Definition and Elements. Adoption Process- Meaning, Stages, Innovation decision process, Adopter categories and their characteristics, Factors influencing adoption process.</p> <p>Practical: Organization of Group discussion and Method demonstration. Planning and Writing of scripts for Radio and Television. Preparation of selected audio-visual aids- Charts, Posters, Over Head Projector(OHP) Transparencies, Power Point Slides. Leaflet, Folder, Pamphlet, News Stories and Success Stories. Handling of Public Address Equipment (PAE) System, Still Camera, Video Camera and Liquid Crystal Display (LCD) Projector.</p>	<p>osmotic drying. Canning – Concepts and Standards, packaging of products.</p> <p>Practical Applications of different types of packaging, containers for shelf life extension.Effect of temperature on shelf life and quality of produce.Demonstration of chilling and freezing injury in vegetables and fruits.Extraction and preservation of pulps and juices. Preparation of jam, jelly, RTS, nectar, squash, osmotically dried products, fruit bar and candy and tomato products, canned products. Quality evaluation of products -- physico-chemical and sensory. Visit to processing unit/ industry.</p>	
5	AG605	<p>Livestock Production and Management</p> <p>Place of livestock in the national economy. Different livestock development programs of Government of India. Important exotic and Indian breeds of cattle, buffalo, sheep, goat and swine. Measures and factor affecting fertility in livestock. Reproductive behaviors like puberty, estrus, pregnancy and parturition. Milk secretion, milking of animal and factor affecting milk yield and composition. Selection and breeding of livestock for higher milk and meat production. Feeding and management of calves, growing heifers and milch animals. Housing principles, space requirements for different species of livestock. Disease control measures, sanitation and care. Breeding, feeding and production records. Breed characteristics of poultry. Systems of housing, feeding and management. Incubation, hatching and brooding. Vaccination and prevention of diseases, Preservation and marketing of eggs, its economics and keeping quality. Cost of production of milk.</p>	<p>Management of Beneficial Insects</p> <p>UNIT-A Importance of beneficial Insects, Beekeeping and pollinators, bee biology, commercial methods of rearing, equipment used, seasonal management, bee enemies and disease. Bee pasturage, bee foraging and communication.</p> <p>UNIT-B Insect pests and diseases of honey bee. Role of pollinators in cross pollinated plants. Types of silkworm, voltinism and biology of silkworm. Mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves.</p> <p>UNIT-C Rearing, mounting and harvesting of cocoons. Pest and diseases of silkworm, management, rearing appliances of mulberry silkworm and methods of disinfection.</p> <p>UNIT-D Species of lac insect, morphology, biology, and host plant, lac production – seed lac, button lac, shellac, lac- products.</p> <p>UNIT-E Identification of major parasitoids and predators commonly being used in biological control. Insect orders bearing predators and parasitoids used in pest control and their mass</p>	New course

		<p>Practical: Identification, handling and restraining of farm animals. Judging and culling of dairy cattle and poultry. Feeding and ration formulation for categories of livestock. Housing and management of poultry. Visit to livestock farms. Economics of livestock production.</p>	<p>multiplication techniques. Important species of pollinator, weed killers and scavengers with their importance. Practical Honey bee species, castes of bees. Beekeeping appliances and seasonal management, bee enemies and disease. Bee pasturage, bee foraging and communication. Types of silkworm, voltinism and biology of silkworm. Mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves. Species of lac insect, host plant identification. Identification of other important pollinators, weed killers and scavengers. Visit to research and training institutions devoted to beekeeping, sericulture, lac culture and natural enemies. Identification and techniques for mass multiplication of natural enemies.</p>	
6	AG 606	<p>Environmental Science</p> <p>Scope and importance of environmental studies and biological chemistry. Renewable resources : Forest, Water, Food, energy and land - various environmental cycles viz. carbon, nitrogen and water etc. Energy flow in the ecosystem : concept of photosynthesis and respiration. Woman and child welfare – food, balance diet, vitamins and minerals etc. HIV/AIDS – viruses and nucleic acids, modification and propagation. Role of information technology on environment and human health – nutrition/malnutrition in communities. Concept of biological processing of industrial wastes. *</p> <p>Ecology : Definition and scope. Ecosystems: Definition, types, concept, structure, functions, components and food pyramids. Producers, consumers and decomposers of an ecosystem. Biodiversity: Definition, classification, threats to biodiversity and its conservation. The Environment Protection Act, The Air Act, The water Act, The Wildlife Protection Act and Forest Conservation Act. **</p> <p>Environmental pollution: Causes, effects and control of air, water, soil, thermal, noise and marine pollution. Causes, effects and management of soil nuclear hazards and industrial wastes.</p>	<p>Crop Improvement-II (Rabi crops)</p> <p>UNIT-A Centers of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fodder crops and cash crops; vegetable and horticultural crops;</p> <p>UNIT-B Plant genetic resources, its utilization and conservation; UNIT-C Study of genetics of qualitative and quantitative characters;</p> <p>UNIT-D Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, adaptability, stability, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional);</p> <p>UNIT-E Hybrid seed production technology of rabi crops. Ideotype concept and climate resilient crop varieties for future.</p> <p>Practical Emasculation and hybridization techniques in different crop species namely Wheat, Oat, Barley, Chickpea, Lentil, Field pea, Rapeseed Mustard, Sunflower, Potato, Berseem. Sugarcane, Cowpea; Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed descent methods; Study of field techniques for seed production and hybrid seeds production in Rabi crops; Estimation of heterosis, inbreeding</p>	New course

			depression and heritability; Layout of field experiments; Study of quality characters, study of donor parents for different characters; Visit to seed production plots; Visit to AICRP plots of different field crops.	
7	AG607	<p>Post Harvest Management and Value Addition of Fruits and Vegetables</p> <p>Importance of post harvest technology in horticultural crops. Maturity indices, harvesting and post-harvest handling of fruits and vegetables. Classification of fruit crops on the basis of ripening and ripening process. Factors affecting ripening of fruits and vegetables. Pre-harvest factors affecting quality on post-harvest shelf-life of fruits and vegetables. Factors responsible for deterioration of harvested fruits and vegetables. Chemicals used for hastening and delaying ripening of fruits and vegetables. Primary processing of fruits and vegetables. Methods of storage – pre-cooling, pre-storage treatments, low temperature storage, controlled atmospheric storage, hypobaric storage, irradiation and low cost storage structures. Various methods of packing, packaging materials and transport. Importance and scope of fruit and vegetable preservation in India. Principles of preservation by heat, low temperature, chemicals and fermentation. Unit layout– selection of site and precautions for hygienic conditions of the unit. Preservation through canning, bottling, freezing, dehydration, drying, ultraviolet and ionizing radiations. Preparation of jams, jellies, marmalades, candies, crystallized and glazed fruits, preserves, chutneys, pickles, ketchup, sauce, puree, syrups, juices, squashes and cordials Spoilage of canned products, biochemical, enzymatic and microbial spoilage. Laws prohibiting processed fruit and vegetables food adulteration in India</p> <p>Practical:</p> <p>Practice in judging the maturity of various fruits and vegetables. Construction of zero energy cool chambers for on farm storage. Determination of physiological loss in weight (PLW), total soluble solids (TSS), total sugars, acidity and ascorbic acid content in fruits and vegetables. Effect of ethylene on ripening of banana, sapota and mango. Identification of</p>	<p>Practical Crop Production – II (Rabi crops)</p> <p>Practical</p> <p>Crop planning, raising field crops in multiple cropping systems: Field preparation, seed, treatment, nursery raising, sowing, nutrient, water and weed management and management of insect-pests diseases of crops, harvesting, threshing, drying winnowing, storage and marketing of produce. The emphasis will be given to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies. Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of 8-10 students.</p>	New course

		equipment and machinery used in preservation of fruits and vegetables. Preservation by drying and dehydration. Preparation of jam, jelly and marmalades. Preparation of squash, cordials and syrups. Preparation of chutneys, pickles, sauces and ketchup. Visit to processing units, market yards, cold storage units and packing industries.		
8	AG 608	<p>Diseases of Horticultural Crops and Their Management</p> <p>Economic importance, symptoms, etiology, disease cycle and management of diseases of citrus (canker, dieback); mango (malformation and black tip); banana (panama wilt and sigatoka); grapevine (downy mildew and anthracnose); pomegranate (bacterial blight); papaya (foot rot and ring spot); guava (wilt and Zn deficiency); apple (scab); ber (powdery mildew); potato (late blight and black heart); tomato (early blight and leaf curl); chilli (anthracnose); brinjal (Phomopsis blight and little leaf disease); bhindi (yellow vein mosaic); pea (powdery mildew); cabbage (black rot); cucurbits (downy mildew); onion (purple blotch); ginger (rhizome rot) and rose (powdery mildew).</p> <p>Practical:</p> <p>Study of symptoms, etiology, host-parasite relationship and control measures of diseases of citrus, mango, grapevine, pomegranate, papaya, guava, ber, potato, tomato, chilli, brinjal, bhindi, pea, onion. Field visits at orchards and vegetable fields during the semester.</p>	<p>Principles of Organic Farming.</p> <p>UNIT-A Organic farming, principles and its scope in India; Initiatives taken by Government (central/ state), NGOs and other organizations for promotion of organic agriculture;</p> <p>UNIT-B Organic ecosystem and their concepts; Organic nutrient resources and its fortification; Restrictions to nutrient use in organic farming;</p> <p>UNIT-C Choice of crops and varieties in organic farming; Fundamentals of insect, pest, disease and weed management under organic mode of production;</p> <p>UNIT-D Operational structure of NPOP; Certification process and standards of organic farming;</p> <p>UNIT-E Processing, leveling, economic considerations and viability, marketing and export potential of organic products.</p> <p>Practical</p> <p>Visit of organic farms to study the various components and their utilization; Preparation of enrich compost, vermicompost, bio-fertilizers/bio-inoculants and their quality analysis; Indigenous technology knowledge (ITK) for nutrient, insect, pest disease and weed management; Cost of organic production system; Post harvest management; Quality aspect, grading, packaging and handling.</p>	New Course
9	AG 609	Fundamentals of Agri. Business	Farm Management, Production & Resource	New course

	<p>Management (including Project Development, Appraisal and Monitoring)</p> <p>Agribusiness: Meaning. Definition, Structure of Agribusiness, (Input. Farm. Product Sectors). Importance of Agribusiness in the Indian Economy, Agricultural Policy. Agribusiness Management. Distinctive features, Importance of Good Management. Definitions of Management. Management Functions, Planning. Meaning, Definition, Types of Plans (Purpose or Mission. Goals or Objectives. Strategies, Polices. Procedures, rules. programmes, Budget) characteristics of sound plan, Steps in planning, Organisation. Staffing, Directing. Motivation, Ordering, Leading. Supervision, Communication, control. Capital Management. Financial Management of Agribusiness: Importance of Financial Statements, Balance sheet, Profit and Loss Statement, Analysis of Financial statements. Agro-based Industries: Importance and Need, Classification of Industries, Types of Agro-based Industries. Institutional arrangement, Procedure to set up agro-based industries, Constraints in establishing agro-based industries. Marketing Management: Meaning, Definitions. Marketing Mix. 4Ps of Marketing. Mix, Market segmentation, Methods of Market. Product life cycle. Pricing policy, Meaning. pricing method. Prices at various stages of Marketing. Project, definitions, project cycle. Identification, Formulation. Appraisal, Implementation. Monitoring and evaluation, Appraisal and Evaluation techniques, NPW, BCR. IRR, N/C ratio, sensitivity analysis. characteristics of agricultural projects: preparation of project reports for various activities in agriculture and allied sectors: Dairying, poultry, fisheries. agro-industries etc.</p> <p>Practical:</p>	<p>Economics</p> <p>UNIT-A Meaning and concept of farm management, objectives and relationship with other sciences. Meaning and definition of farms, its types and characteristics, factor determining types and size of farms. Principles of farm management: concept of production function and its type, use of production function in decision-making on a farm, factor-product, factor-factor and product product relationship, law of equip-marginal/or principles of opportunity cost and law of comparative advantage.</p> <p>UNIT-B Meaning and concept of cost, types of costs and their interrelationship, importance of cost in managing farm business and estimation of gross farm income, net farm income, family labour income and farm business income. Farm business analysis: meaning and concept of farm income and profitability, technical and economic efficiency measures in crop and livestock enterprises.</p> <p>UNIT-C Importance of farm records and accounts in managing a farm, various types of farm records needed to maintain on farm, farm inventory, balance sheet, profit and loss accounts. Meaning and importance of farm planning and budgeting, partial and complete budgeting, steps in farm planning and budgeting-linear programming, appraisal of farm resources, selection of crops and livestock's enterprises.</p> <p>UNIT-D Concept of risk and uncertainty occurs in agriculture production, nature and sources of risks and its management strategies, Crop/livestock/machinery insurance-weather based crop insurance, features, determinants of compensation. Concepts of resource economics, differences between NRE and agricultural economics, unique properties of natural resources.</p> <p>UNIT-E Positive and negative externalities in agriculture, Inefficiency and welfare loss, solutions, Important issues in economics and management of common property resources of land, water, pasture and forest resources etc.</p> <p>Practical</p> <p>Preparation of farm layout.Determination of cost of fencing of a farm. Computation of depreciation cost of farm assets. Application of equip-marginal returns/opportunity cost principle in allocation of farm</p>	
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10	AG 610		<p>Principles of Food Science & Nutrition</p> <p>UNIT-A Concepts of Food Science (definitions, measurements, density, phase change, pH, osmosis, surface tension, colloidal systems etc.);</p> <p>UNIT-B Food composition and chemistry (water, carbohydrates, proteins, fats, vitamins, minerals, flavours, colours, miscellaneous bioactives, important reactions);</p> <p>UNIT-C Food microbiology (bacteria, yeast, moulds, spoilage of fresh & processed foods, Production of fermented foods);</p> <p>UNIT-D Principles and methods of food processing and preservation (use of heat, low temperature, chemicals, radiation, drying etc.);</p> <p>UNIT-E Food and nutrition, Malnutrition (over and under nutrition), nutritional disorders; Energy metabolism (carbohydrate, fat, proteins); Balanced/modified diets, Menu planning, New trends in food science and nutrition</p>	Introduction of New Course
11	AG 611A		<p>Weed Management (Elective Course)</p> <p>UNIT-A Introduction to weeds, characteristics of weeds their harmful and beneficial effects on ecosystem. Classification, reproduction and dissemination of weeds.</p> <p>UNIT-B Herbicide classification, concept of adjuvant, surfactant, herbicide formulation and their use. Introduction to mode of action of herbicides and selectivity.</p> <p>UNIT-C Allelopathy and its application for weed management. Bio-herbicides and their application in agriculture.</p> <p>UNIT-D Concept of herbicide mixture and utility in agriculture. Herbicide compatibility with agro-chemicals and their application.</p>	New course added

		<p>UNIT-EIntegration of Herbicides with non chemical methods of weed management. Herbicide Resistance and its management.</p> <p>Practical</p> <p>Techniques of weed preservation. Weed identification and their losses study. Biology of important weeds. Study of herbicide formulations and mixture of herbicide. Herbicide and agrochemicals study. Shift of weed flora study in long term experiments. Study of methods of herbicide application, spraying equipments. Calculations of herbicide doses and weed control efficiency and weed index.</p>	
12	AG 611B	<p>Micro Propagation Technologies (Elective Course)</p> <p>UNIT-A Introduction, History, Advantages and limitations; Types of cultures (seed, embryo, organ, callus, cell),</p> <p>UNIT-B Stages of micropropagation, Axillary bud proliferation (Shoot tip and meristem culture, bud culture),</p> <p>UNIT-C Organogenesis (callus and direct organ formation), UNIT-D Somatic embryogenesis, cell suspension cultures, UNIT-E Production of secondary metabolites, Somaclonal variation, Cryopreservation</p> <p>Practical</p> <p>Identification and use of equipments in tissue culture Laboratory, Nutrition media composition, sterilization techniques for media, containers and small instruments, sterilization techniques for explants, Preparation of stocks and working solution, Preparation of working medium, Culturing of explants: Seeds, shoot tip and single node, Callus induction, Induction of somatic embryos regeneration of whole plants from different explants, Hardening procedures.</p>	New course added
13	AG 611C	<p>Hi-Tech Horticulture (Elective Course)</p> <p>UNIT-A Introduction & importance; Nursery management and mechanization; micro propagation of horticultural crops, Modern field preparation and planting methods.</p> <p>UNIT-B Protected cultivation: advantages, controlled conditions, method and techniques,</p>	New course added

			<p>UNIT-C Micro irrigation systems and its components; EC, pH based fertilizer scheduling, canopy management, high density orcharding.</p> <p>UNIT-D Components of precision farming: Remote sensing, Geographical Information System(GIS).</p> <p>UNIT-E Differential Geo-positioning System (DGPS), Variable Rate applicator (VRA), application of precision farming in horticultural crops (fruits, vegetables and ornamental crops); mechanized harvesting of produce.</p> <p>Practical Types of polyhouses and shade net houses, Intercultural operations, tools and equipments identification and application, Micro propagation, Nursery-protrays, micro-irrigation, EC, pH based fertilizer scheduling, canopy management, visit to hi-tech orchard/nursery.</p>	
14	AG 611D		<p>System Simulation and Agro-Advisory (Elective Course)</p> <p>UNIT-A System Approach for representing soil-plant-atmospheric continuum, system boundaries, Crop models, concepts & techniques, types of crop models, data requirements, relational diagrams.</p> <p>UNIT-B Evaluation of crop responses to weather elements; Elementary crop growth models; calibration, validation, verification and sensitivity analysis.</p> <p>UNIT-C Potential and achievable crop production-concept and modelling techniques for their estimation. Crop production in moisture and nutrients limited conditions; components of soil water and nutrients balance.</p> <p>UNIT-D Weather forecasting, types, methods, tools & techniques, forecast verification; Value added weather forecast, ITK for weather forecast and its validity;</p> <p>UNIT-E Crop weather calendars; preparation of agro-advisory bulletin based on weather forecast. Use of crop simulation model for preparation of Agro-advisory and its effective dissemination.</p> <p>Practical Preparation of crop weather calendars. Preparation of agro-advisories based on weather forecast using various approaches and synoptic charts. Working with statistical and simulation models for crop growth. Potential & achievable production; yield forecasting, insect & disease forecasting models. Simulation with limitations of water and nutrient management options. Sensitivity analysis of varying weather and crop management practices. Use of statistical approaches in data analysis and preparation of historical, past and present meteorological data for medium range weather forecast. Feedback from farmers about the agro-advisory.</p>	New course added

VII th Semester			
1	AGA701	<p>Applied Weed Management</p> <p>Theory: Heterosis: Inbred line production and maintenance, Production of inbreds by various methods, Evaluation of inbreds, Maintenance of inbreds, Production of hybrids, Emasculation techniques.</p> <p>Use of male sterility, Use of self incompatibility, Maintenance of MS lines, Production of composites and synthetics, Exploitation of apomixes, Visit to seed production units</p> <p>Seed technology: Setting up of Seed testing laboratory, Different tests of seed quality for seed legislation, Awareness of seed processing equipment, Setting up of seed processing unit, Visit to different seed processing units. Seed marketing: Setting up of marketing units, Economics of seed production, Supply chain management, Storage and packaging, Obtaining Licenses for seed production and processing units., Private and public seed production systems. Risk factor analysis in seed business. Model crops for seed production-Wheat, maize, pearl millet, gram, moth, guar and cowpea, rapeseed mustard, cotton, vegetables – tomato, cucurbits, chilli, seed spices.</p> <p>Practical: Different methods of emasculation .Setting up of Seed testing laboratory. Different tests of seed quality for seed legislation. Awareness of seed processing equipment. Model crops for seed production. Wheat, maize, pearl millet, gram, moth, guar and cowpea, rapeseed mustard, cotton, vegetables – tomato, cucurbits, chilli, seed spices. Setting up of seed processing unit. Visit to seed production units. Visit to different seed processing units. Demonstration/visit of inbred plots.</p>	
2	AGA702	<p>Applied Weed Management</p> <p>Theory: Weed: definition, damages caused; Elements of weed prevention and control; Concept of Integrated weed management ; Physical weed control methods: manual, mechanical and soil</p>	

		<p>solarization; Weed control through agronomic practices; Biological weed control : Classical approach and bio-herbicides, Herbicidal control; Classes and methods of herbicide application; Sprayers: components and calibration. Weed management in field crops viz., paddy, wheat, maize and millets, groundnut, linseed, rapeseed and mustard, soybean, chickpea, pigeonpea, lentil, sugarcane, cotton, cumin, fenugreek, Lucerne, berseem and vegetable crops; Control of parasitic weeds viz, <i>Striga</i>, <i>Orobanchae</i>, <i>Cuscutta</i> , and <i>Loranthus</i>.</p> <p>Practical: Identification and preservation of seasonal and perennial weeds; Practice in manual and mechanical weed control and use of improved implements; Acquaintance with herbicides – their manufacturers and potential uses; Visit to weed control trials to record observations on density, intensity and dry matter; Herbicide application equipments and their calibration; Herbicide calculations; Herbicide spray in cropped and non- cropped area; Recording herbicide toxicity ; Economics of weed control; Qualitative and quantitative analysis of weedy vegetation; Bioassay for herbicide residue estimation; Control of <i>Parthenium hysterophorous</i>; Visits to observe weed problems on farmers fields and aquatic ecosystem.</p>		
3	AGA703	<p>Vermi-composting and Organic Farming</p> <p>Theory: Vermicompost: Definition and objectives of vermitechnology. Importance of vermicomposting in utilization of Agriculture waste and organic recycling of nutrients. Classification of earthworm's. Method of preparation of vermicompost. Method and doses of vermicompost application for cereals, vegetables, tress and pots. Role of vermicomposting in organic farming and soil fertility. Organic farming: concept, definition, objectives and scope of organic farming. Role of organic farming in improving soil health and quality. Biofertilizers: Definition, importance of biofertilizers in organic farming and sustainability of soil fertility and productivity. Types of microbiological inoculants and method of application</p>		

and doses.

Practical:

Identification of earthworms.
Preparation of vermicompost.
Separation and procurement of vermiculture and vermicompost.
Analysis for quality standards and fractionation of vermicompost.
Drawing of flow-sheet chart and preparation of vermicompost project.
Measurement of changes in bulk density, infiltration rate, water holding capacity and organic carbon content of soil with the application of vermicompost. Determination of organic carbon, N, P and K content of soils under organic farming . Visits of organic farming fields. Identification of different strains of biofertilizers and isolation of rhizobium from nodules.

Theory:

Principle of pH meter, EC meter, spectrophotometer, flame photometer and A A S Soil analysis: Objectives, Sampling of soil, procedure and precautions. Interpretation of analytical data and nutrient index Plant analysis: Sampling, stages and plant part to be sampled .Total plant analysis, Quantitative rating of plant analysis data and interpretation of results, critical nutrient concentration (CNC), critical nutrient range (CNR). Nutrient use efficiency. Rapid plant tissue test for N, P, K and their interpretation for fertilizer recommendation,. Visual diagnostic criteria for the nutrient deficiency and toxicity of plants. Errors in soil and plant analysis. Classification and minimization of errors. Water analysis: Quality criteria, classification and suitability of irrigation water and water quality index

Practical:

Standardization of solutions and reagents, collection and preparation of soil samples, estimation of pH, EC, organic carbon, NPKS, micronutrients, CEC and exchangeable sodium in soil. Determination of EC and pH of saturation extract / paste. Estimation of cations (Ca^{++} , Mg^{++} and Na^{+}) and anions (CO_3^{-} and HCO_3^{-}) in saturation extract . Plant sampling and sample preparation for analysis, digestion of plant material and estimation of N, P, K in plant. Rapid plant tissue test for N, P and K Determination of EC, pH, cations (Ca^{++} + Mg^{++} , Na^{+} , K^{+}) and anions (CO_3^{-} , HCO_3^{-} , Cl^{-}) in irrigation water and.

		Computation of S A R and R S C .		
4	AGA704	<p>Soil Plant and Water Analysis</p> <p>Theory: Soil resources of India; distribution of wasteland and problematic soils with special reference to Rajasthan; soil tilth management; soil crusting and its management; management of soil moisture under different climates; effect of water quality on soils and plants; soil aeration problems and management; soil thermal regimes in relation to crops and their optimization. Recycling of agricultural and industrial wastes, waste land and their management; reclamation and management of acidic, saline and sodic soils, constraints and management of highly and slowly permeable soils; soil erosion, extent, type and effects, soil conservation technique, water harvesting techniques and watershed management, remote sensing for soil and watershed management.</p> <p>Practical: Determination of saturated hydraulic conductivity, bulk density measurement of soil measurement of water holding and field capacities of soil, measurement of infiltration rate and moisture retention characteristics curve in normal, problematic and reclaimed soils. Preparation of saturation paste and saturation extracts of salt affected soils. Determination of pH, EC, cations and anions in saturation extract. Determination of CaCO₃ equivalent of liming material. Estimation of lime requirement of acid soils and gypsum requirement of sodic soils. Measurement of ODR of soil. Estimation of water stable aggregate in soil and field trip to study the areas of problematic soils.</p>		
5	AGA705	<p>Soil Management</p> <p>Theory: Soil resources of India; distribution of wasteland and problematic soils with special reference to Rajasthan; soil tilth management; soil crusting and its management; management of soil moisture under different climates; effect of water quality on soils and plants; soil aeration problems and management; soil thermal regimes in relation to crops and their optimization. Recycling of agricultural and industrial wastes, waste land and their</p>		

		<p>management; reclamation and management of acidic, saline and sodic soils, constraints and management of highly and slowly permeable soils; soil erosion, extent, type and effects, soil conservation technique, water harvesting techniques and watershed management, remote sensing for soil and watershed management.</p> <p>Practical: Determination of saturated hydraulic conductivity, bulk density measurement of soil measurement of water holding and field capacities of soil, measurement of infiltration rate and moisture retention characteristics curve in normal, problematic and reclaimed soils. Preparation of saturation paste and saturation extracts of salt affected soils. Determination of pH, EC, cations and anions in saturation extract. Determination of CaCO₃ equivalent of liming material. Estimation of lime requirement of acid soils and gypsum requirement of sodic soils. Measurement of ODR of soil. Estimation of water stable aggregate in soil and field trip to study the areas of problematic soils.</p>		
6	AGA706	<p>Dairy Cattle Production</p> <p>Importance of dairying. Important milch breeds of cattle and buffalo. Selection, purchase and insurance of dairy animals. Scientific management of calves, heifers, bull calves, dry, pregnant and lactating dairy animals. Least cost ration formulation. Systems of breeding. Factors affecting productive and reproductive efficiency of dairy animals.</p> <p>Practical: Selection of site for dairy farm. Layout of dairy farm building. Computation and formulation of milk replacer, calf starter, concentrate mixture for lactating, pregnant and dry animals. Computation of balance ration for various categories of dairy animals. Physical and chemical treatment of low quality roughages. Plan for supplying green fodder throughout the year. Vaccination in various categories of dairy animals. Dehorning in dairy calves. Castration of male calves. Control of ecto and endo parasites. Colostrums and its utility. Weaning and rearing of dairy calves. Determination of age of animal. Care and management of dairy calves. Management of lactating, dry and</p>		1. Not running in 2017-18

		<p>pregnant cows. Dairy hygiene. Clean milk production and its marketing. Cleaning and sanitization of dairy equipments. Milking machine and its operation. Management of milch animals during adverse climatic conditions. Symptoms of estrus in dairy animals. Pregnancy diagnosis. Artificial insemination and its importance. Hay and silage making. Temperature, pulse and respiration rate in dairy animals.</p>		
3	AGA707	<p>Plant Growth Regulators in Agriculture Theory: Introduction and historical background of Plant growth regulators. Classification of plant hormones and their synthetic analogues. Surfactants – Physiology and performance. Plant hormones vis-à-vis control of flowering and sex expression. Role of plant hormone in seed, fruit and grain formation. Weed control and plant hormones. Economic and social aspects of PGRs applications</p> <p>Practical: Methods of application of synthetic plant hormones and precautions. Doses, responses and growth stages for the application of hormones. Plant hormones and propagation through cell, tissue, organ culture and differentiation. Plant hormones vis-à-vis seed and propagule storage. Abiotic and biotic stress management through plant hormones. Vist to orchards for demonstration of flower and fruit drop and their control measures.</p>		1.Course not running in 2017-18
4	AGA708	<p>Plasticulture in Agriculture Theory: Introduction of Plasticulture, Types and quality of plastics used in agriculture, Quality control measures, Present status and future prospective of plasticulture in India, Use of plastics in water management and in -situ moisture conservation, Plastic pipes for sub-surface drainage, Plastic film lining in canal, pond or water reservoir. Plastic mulch technique, Use of plastic in nursery raising, Plastics as cladding material for controlled environmental cultivation- poly houses, shade net houses, poly tunnels, low tunnels and crop covers.</p>		

		<p>Plastic nets for crop protection - anti insect nets, bird protection nets. Plastic fencing. Innovative packaging solutions-leno bags, carets, vacuum packing .Plastic cap covers for storage of food gain in open. Use of plastics in farm equipments and machineries - sprayers, seed drill tubes and other spare parts of equipments and machineries. Plastic vermi-beds. Silage film technique for fodder preservation. Agencies involved in the promotion of plasticulture at national and state level.</p> <p>Practical: Study of sub- surface drainage system model, design of farm pond and estimation of plastic film, laying and flushing of drip laterals, plastic mulch laying, construction of low tunnels, use of leno bags, design, installation and cost estimate of cap cover, use of plastic in nursery under anti insect/ bird protection net, use of plastic vermi-bed, use of silage film for fodder preservation, visit to a nearby- PVC pipe manufacturing unit/dealer/ farmer' s field, sprinkler manufacturing unit/ dealer, poly house, shade net house.</p>		
5	AG B701	<p>Advanced Seed Technology</p> <p>Theory: Heterosis: Inbred line production and maintenance, Production of inbreds by various methods, Evaluation of inbreds,Maintenance of inbreds,Production of hybrids,Emasculatation techniques. Use of male sterility, Use of self incompatibility, Maintenance of MS lines, Production of composites and synthetics, Exploitation of apomixes, Visit to seed production units</p> <p>Seed technology: Setting up of Seed testing laboratory, Different tests of seed quality for seed legislation, Awareness of seed processing equipment, Setting up of seed processing unit, Visit to different seed processing units. Seed marketing:Setting up of marketing units, Economics of seed production, Supply chain management, Storage and packaging, Obtaining Licenses for seed production and processing units.,</p>		

		<p>Private and public seed production systems. Risk factor analysis in seed business. Model crops for seed production-Wheat, maize, pearl millet, gram, moth, guar and cowpea, rapeseed mustard, cotton, vegetables – tomato, cucurbits, chilli, seed spices.</p> <p>Practical: Different methods of emasculation .Setting up of Seed testing laboratory.Different tests of seed quality for seed legislation. Awareness of seed processing equipment. Model crops for seed production. Wheat, maize, pearl millet, gram, moth, guar and cowpea, rapeseed mustard, cotton, vegetables – tomato, cucurbits, chilli, seed spices. Setting up of seed processing unit. Visit to seed production units. Visit to different seed processing units. Demonstration/visit of inbred plots.</p>		
6	AG B702	<p>Tissue Culture and Micro Propagation Techniques</p> <p>Theory: Setting up of commercial micro propagation unit - Lab and hardening unit design, Equipment, lab wares and consumables, Energy requirement and use of alternate energy sources. Man power requirement, Biosafety measures and waste disposal, Legislative requirement and govt. incentive. Major techniques in micro propagation- Axillary enhancement, Automated somatic embryogenesis systems, Synthetic seeds, Hardening procedures, Sterilization procedure and clean air environment, Risk factor analysis, Handling of contamination, Packaging and transportation, Marketing and Supply chain management, Economics of micropropagation, Material procurement, Stores handling, Cost reduction during production and hardening. GMP and HACCP requirement. Visit to commercial production units and case studies.</p> <p>Practical: Lab and hardening unit design. Familiarity with equipments, lab wares and consumables. Procedures of autoclaving, Media preparation Explant preparation, Surface sterilization, Axillary bud, nodal</p>		1.Course removed in the year 2017-18.

		<p>explant culture, experiments to induce somatic embryos. Preparation of synthetic seeds, Experiments for hardening of in vitro explants. Visit to commercial Production units and case studies.</p>	
7	AG B703	<p>Bio-agents and Integrated Disease Management</p> <p>Introduction, definition and concepts of Integrated Disease Management. Components of IDM-physical, chemical, cultural, biocontrol, resistance and legislative methods. Different biocontrol agents-<i>Trichoderma</i>, <i>Pseudomonas</i> and <i>Bacillus</i>. Mass production of bioagents. Mechanism of action of biocontrol agents. Methods of application of bioagents. IDM in important crops - rice, wheat, cotton, rapeseed and mustard, chickpea, groundnut and potato.</p> <p>Practical:</p> <p>Preparation of culture media for fungi and bacteria. Isolation and purification of antagonistic fungi and bacteria from rhizosphere soil. <i>In vitro</i> evaluation of antagonism against pathogens. Mass multiplication of bioagents (<i>Trichoderma</i>, <i>Pseudomonas</i>, <i>Bacillus</i> spp.) in different liquid and solid media. Evaluation of fungitoxicity against pathogens. Bioefficacy of antagonists against important pathogens. Visit to biopesticide production units.</p>	<p>1.Course removed in the year 2017-18.</p>
8	AG B704	<p>Detection and Management of Seed-borne Pathogens</p> <p>Theory:</p> <p>Importance of seed-borne pathogens. A brief account of seed-borne fungal, bacterial and viral pathogens. Seed transmission. Paths of infection – ovule, embryo, endosperm, seed-coat & pericarp infection and seed contamination. Seed health testing methods. Management of seed-borne pathogens- physical, cultural, chemical and biological methods. Quarantine laws and procedures for seed certification. Pest risk analysis.</p> <p>Practical:</p> <p>Inspection of dry seeds. Detection of seed-borne pathogens by Seed-Washing Test, Seedling-Symptom Test,</p>	

		Blotter Method and Agar Plate Method. Embryo-Count Method. Molecular techniques for detection of seed-borne pathogens (ELISA & PCR). Identification of common seed-borne fungi – <i>Alternaria</i> , <i>Colletotrichum</i> , <i>Drechslera</i> , <i>Fusarium</i> etc. under microscope. Effect of chemical and biological seed treatments on seed-borne pathogens.		
9	AG B705	<p>Non-Insect Pests and Their Management</p> <p>Theory: Rodents: Rodent pests of agricultural importance. Field and storage losses due to rodents. Taxonomy, distribution, habitat behavior, burrowing pattern and breeding potential. Methods of rodent management in field and godowns-mechanical, physical, biological, chemical (rodenticides, fumigants etc.). Bait shyness and bait preference,. Other methods- sanitation, rodent proof structures, electromagnetic repellents etc. Agricultural Ornithology: Important phytophagous bird species in India, potential losses, host range, feeding behaviour and management. Snails and Slugs: Important species of agricultural importance. Mammal pests: Major mammals of agricultural importance, nature of damage and management. Phytophagous mites: General morphology and biology. Important species of mites of Agricultural importance (<i>Petrobia latens</i>, <i>Larvacarus transitans</i>, <i>Eutetranychus orientalis</i> and <i>Tetranychus cinnabarinus</i>), nature and extent of damage and their management.</p> <p>Practical: Identification of important rodent species in different habitats. Burrow patterns and feeding habits of important rodent species . Assessment and monitoring rodent pest population.Study of rodenticides Study of mechanical method of rodent control Pre-baiting, baiting and their application. Fumigation of burrows. Rodent management in field crops, threshing floors and godowns. Placement of baits, evaluation and efficacy of baits.Organizati on of rodent control campaigns. Identification and food habits of birds associated with agricultural crops. Crop protection measures for birds: traditional and</p>		

		modern methods. Study of external morphology of phytophagous mite species. Diagnostic study of symptoms caused by different groups of mites. on different crops. Study of different acaricides. Study of major mammalian pests. Study of snails and slugs. Visit to zoological museum.		
	AG B706	<p>Bio-control Agents and Bio-pesticides</p> <p>Theory: Definition, concept and principles of biological control. Attributes of an effective natural enemies. Types of natural enemies- Parasitoids and predators. Techniques of biological control. Microbial control- Pathogenicity, virulence and factors that enhance the use of microorganisms. Classification, mode of action and uses of microbial agents, factors influencing their effectiveness. Advantages and limitations of biological control in IPM. Role of biological control in IPM. Mass production and multiplication of biocontrol agents- viruses, bacteria, fungi and parasitoids and predators and their application techniques. Potential of plant products in IPM.</p> <p>Practical: Handling, maintenance and upkeep of equipments related to biological control. Identification of important biological agents. Mass rearing techniques of important host insects of parasitoids (one field and one storage Lepidopteran pest). Mass rearing techniques and inundative release of important parasitoids - <i>Trichogramma</i> sp./ <i>Campoletis chloridae</i>. Mass rearing technique of important predators- Lady bird beetle and green lacewing. Collection and preservation of bio-agents. Mass production of NPV, Bt and <i>Metarrhizium anisopliae</i>. Field visit to study the behavior of natural enemies and their collection. Visits of mass production and biological control centers of national repute. Preparation of neem seed kernel extract.</p>		
	AGB 707	<p>Plant Growth Regulators in Agriculture</p> <p>Theory: Introduction and historical background of Plant growth regulators. Classification of plant hormones and</p>		

		<p>their synthetic analogues. Surfactants – Physiology and performance. Plant hormones vis-à-vis control of flowering and sex expression. Role of plant hormone in seed, fruit and grain formation. Weed control and plant hormones. Economic and social aspects of PGRs applications</p> <p>Practical: Methods of application of synthetic plant hormones and precautions. Doses, responses and growth stages for the application of hormones. Plant hormones and propagation through cell, tissue, organ culture and differentiation. Plant hormones vis-à-vis seed and propagule storage. Abiotic and biotic stress management through plant hormones. Vist to orchards for demonstration of flower and fruit drop and their control measures.</p>		
	<p>AG B708</p>	<p>Economic Nematology Theory: Objectives: to impart the basic and practical knowledge related with economic importance of nematodes in field and horticulture crop.historical perspectives, economic importance and symptoms of nematode disease in plants, nematode disease of field crops..erials, ear cockle and yellow ear rot disease of wheat, molya disease of wheat and barley, maize cyst, nematodes disease, nematode disease of vegetables (root knot, reniform disease of tomato brinjal, potato, chilli, cucumber, fruits (root knot nematodes and reniform nematodes of papaya, banana etc). phytonematodes management in field/horticulture crop management, strategies with cultural, physical, chemical, biological breeding for management and integrated nematode etc. Practical: Diagnosis of economic important disease in state, survey and surveillance and collection of soil and plant samples in nematode infested fiels of various crops, extraction of nematode from soil and plant samples.preparation of semi permanent mount of suspension, identification of various strategies of semi-endo and endo parasitic</p>		

		nematodes of economic importance.;study of pathogenic level of phytonematodes in crops.study of apparatus/equipments use during chemical control strategies;calculation of recommended dose of nematodes/bioagents.		
	AGC 701	<p>Bio-control Agents and Bio-pesticides</p> <p>Theory: Definition, concept and principles of biological control. Attributes of an effective natural enemies. Types of natural enemies- Parasitoids and predators. Techniques of biological control. Microbial control- Pathogenicity, virulence and factors that enhance the use of microorganisms. Classification, mode of action and uses of microbial agents, factors influencing their effectiveness. Advantages and limitations of biological control in IPM. Role of biological control in IPM. Mass production and multiplication of biocontrol agents- viruses, bacteria, fungi and parasitoids and predators and their application techniques. Potential of plant products in IPM.</p> <p>Practical: Handling, maintenance and upkeep of equipments related to biological control. Identification of important biological agents. Mass rearing techniques of important host insects of parasitoids (one field and one storage Lepidopteran pest).Mass rearing techniques and inundative release of important parasitoids - <i>Trichogramma</i> sp./ <i>Campoletis chloridae</i>. Mass rearing technique of important predators- Lady bird beetle and green lacewing.Collection and preservation of bio-agents. Mass production of NPV, Bt and <i>Metarrhizium anisopliae</i>. Field visit to study the behavior of natural enemies and their collection. Visits of mass production and biological control centers of national repute. Preparation of neem seed kernel extract.</p>		
	AGC 702	<p>Vermi-composting and Organic Farming</p> <p>Theory: Vermicompost: Definition and objectives of vermitechnology. Importance of vermicomposting in utilization of Agriculture waste and organic recycling of nutrients. Classification of earthworm's. of vermicompost application for cereals,</p>		

	<p>vegetables, trees and pots. Role Method of preparation of vermicompost. Method and doses of vermicomposting in organic farming and soil fertility.</p> <p>Organic farming: concept, definition, objectives and scope of organic farming. Role of organic farming in improving soil health and quality. Biofertilizers: Definition, importance of biofertilizers in organic farming and sustainability of soil fertility and productivity. Types of microbiological inoculants and method of application and doses.</p> <p>Practical: Identification of earthworms. Preparation of vermicompost. Separation and procurement of vermiculture and vermicompost. Analysis for quality standards and fractionation of vermicompost. Drawing of flow-sheet chart and preparation of vermicompost project. Measurement of changes in bulk density, infiltration rate, water holding capacity and organic carbon content of soil with the application of vermicompost. Determination of organic carbon, N, P and K content of soils under organic farming. Visits of organic farming fields. Identification of different strains of biofertilizers and isolation of rhizobium from nodules.</p>		
AGC 703	<p>Tissue Culture and Micro Propagation Techniques</p> <p>Theory: Setting up of commercial micro propagation unit - Lab and hardening unit design, Equipment, lab wares and consumables, Energy requirement and use of alternate energy sources. Man power requirement, Biosafety measures and waste disposal, Legislative requirement and govt. incentive. Major techniques in micro propagation- Axillary enhancement, Automated somatic embryogenesis systems, Synthetic seeds, Hardening procedures, Sterilization procedure and clean air environment, Risk factor analysis, Handling of contamination, Packaging and transportation, Marketing and Supply chain management, Economics of micropropagation, Material procurement, Stores handling, Cost reduction during production and hardening. GMP and HACCP requirement. Visit to commercial production units and case studies.</p> <p>Practical:</p>		

		<p>Lab and hardening unit design. Familiarity with equipments, lab wares and consumables. Procedures of autoclaving, Media preparation Explant preparation, Surface sterilization, Axillary bud, nodal explant culture, experiments to induce somatic embryos. Preparation of synthetic seeds, Experiments for hardening of in vitro explants. Visit to commercial Production units and case studies.</p>		
	AGC 704	<p>Plasticulture in Agriculture Theory: Introduction of Plasticulture, Types and quality of plastics used in agriculture, Quality control measures, Present status and future prospective of plasticulture in India, Use of plastics in water management and in -situ moisture conservation, Plastic pipes for sub-surface drainage, Plastic film lining in canal, pond or water reservoir. Plastic mulch technique, Use of plastic in nursery raising, Plastics as cladding material for controlled environmental cultivation- poly houses, shade net houses, poly tunnels, low tunnels and crop covers. Plastic nets for crop protection - anti insect nets, bird protection nets. Plastic fencing. Innovative packaging solutions-leno bags, carets, vacuum packing .Plastic cap covers for storage of food gain in open. Use of plastics in farm equipments and machineries - sprayers, seed drill tubes and other spare parts of equipments and machineries. Plastic vermi-beds. Silage film technique for fodder preservation. Agencies involved in the promotion of plasticulture at national and state level.</p> <p>Practical: Study of sub- surface drainage system model, design of farm pond and estimation of plastic film, laying and flushing of drip laterals, plastic mulch laying, construction of low tunnels, use of leno bags, design, installation and cost estimate of cap cover, use of plastic in nursery under anti insect/ bird protection net, use of plastic vermi-bed, use of silage film for fodder preservation, visit to a nearby- PVC pipe manufacturing unit/dealer/ farmer' s field, sprinkler manufacturing unit/ dealer, poly house, shade net house.</p>		
	AGC 705	<p>Nursery Management of Horticultural Crops Theory:</p>		1. Not running in 2017-18

		<p>Present status and future scope of nurseries. Recent trends in planning and layout of nurseries and progeny orchard. Principles and methods of propagation by seed, specialized vegetative structures, cutting, layering, grafting, budding and in vitro propagation. Use of PGRs in plant propagation. Propagation structures Economics of raising nursery. Nursery regulation certification.</p> <p>Practical: Identification of propagation material and equipment. Layout of nurseries and management of progeny orchard. Use of protrays and root trainers in vegetable nursery. Raising and maintenance of root stock. Multiplication of plants by sexual methods. Raising of seedlings. Propagation by cuttings in Horticultural crops. Propagation by budding in Horticultural crops. Propagation by grafting in Horticultural crops. Use of plant growth regulators in propagation. Potting, repotting or lifting of saplings (packaging) for transportation. Use of propagation media. Tetrazolium salt test for determining germination. Visit of commercial nurseries. Project preparation for nursery. Procurement of inputs. Techniques of environment management for large scale production. Care of nursery plant and management of insect, pest and diseases. Visit to commercial orchard and diagnosis of maladies.</p>		
	<p>AGC 706</p>	<p>Commercial Vegetable Production</p> <p>Theory: Importance, scope and export potential of commercial vegetables in India. Importance , origin, history, area, distribution, taxonomy, recent trends of the commercial vegetables. F1-hybrids, commercial varieties, nutritional requirement, irrigation, inter-cultural operations, weed control, mulching, plant protection of important commercial vegetables, solanaceous, okra, bulb crops, cucurbits, cowpea, amaranthus and clusterbean. Off season cultivation of important commercial vegetables . Organic vegetable production..</p> <p>Practical: Identification and botanical description of important commercial vegetables, their varieties & seeds. Estimation of viability and germination percentage and real value of seeds. Practice of</p>		

		<p>emasculatation, selfing and crossing in various vegetable crops. Seed production in root crops, cauliflower, onion, tomato and cucurbits. Planting of roots of radish, carrot and turnip for seed production. Preparation of cropping scheme for commercial vegetable growers/farms. Preparation of nursery beds, seed treatment and sowing of seeds in beds. Sowing of seeds in polythene bags/ pro-trays. Seedling preparation in pro-trays and management in Net house. Transplanting of seedlings, sowing of cucurbits in field. Growing of vegetables with drip irrigation methods. Use of plastic mulch in vegetable production. Application of manures and fertilizers, liquid fertilizers and nutrient spray in vegetable crops. Inter-cultural operations in vegetable crops. Spray of pesticides, fungicides and use of PGRs. Study of physiological disorders in vegetables. Study of maturity standards and harvesting. Seed extraction techniques, pre cooling, washing, grading, packaging and storage of vegetable crops. Calculation of cost of production and B/C ratio. Identification of major pests, diseases and disorders. Study of storage techniques of vegetable crops.</p>		
	<p>AGC 707</p>	<p>Commercial Fruit Production Theory: Importance, present position and scope of fruit production. Classification, systematic study of fruits, Importance, origin, history, area, distribution and recent trends in the production technology of commercial fruit crops viz. Guava, Citrus, Mango, Beal, Ber, Aonla, Lehsua, Pomegranate, Papaya, Grapes and Date palm. Practical: Identification of important sub tropical and tropical fruits. Lay out of orchards. Different types of planting methods including high density planting and meadow orcharding. Preparation of soil mixture for nursery bed. Identification and uses of horticultural tools. Raising of rootstock. Practices on stratification and scarification of fruit seeds. Soil sterilization of nursery. Irrigation methods of fruits orchards with the emphasis on micro irrigation. Methods of fertilizer application of fruit crops and fertigation. Use of PGRs in fruit crops. Various methods of plant protection. Vegetative methods of propagation. Demonstration of different</p>		

		<p>training methods. Demonstration of different pruning methods. Methods of moisture conservation and weed control in various fruit crops. Study of physiological disorders of fruit crops. Study of nutrient deficiency symptoms of fruit crops. Study of maturity indices of fruit crops. Calculation of water or irrigation requirement of fruit crops based on CPE. Visit to different fruit orchards of local region. Cost of cultivation of ber, Aonla, mango, kinnow, papaya etc. Pollination in date palm.</p>		
	AGC 708	<p>Plant Growth Regulators in Agriculture Theory: Introduction and historical background of Plant growth regulators. Classification of plant hormones and their synthetic analogues. Surfactants – Physiology and performance. Plant hormones vis-à-vis control of flowering and sex expression. Role of plant hormone in seed, fruit and grain formation. Weed control and plant hormones. Economic and social aspects of PGRs applications</p> <p>Practical: Methods of application of synthetic plant hormones and precautions. Doses, responses and growth stages for the application of hormones. Plant hormones and propagation through cell, tissue, organ culture and differentiation. Plant hormones vis-à-vis seed and propagule storage. Abiotic and biotic stress management through plant hormones. Vist to orchards for demonstration of flower and fruit drop and their control measures.</p>		
	AG D701	<p>Marketing Management Theory: Marketing Management: Meaning, definitions, marketing, Mix, market segmentation, targeting & positioning, market information system, market orgaiation and control. 4P's of marketing, product life cycle. Marketing potential : Classification of products, new product development, product line, product mix, branding, packaging and labeling. Factors affecting on prices: Pricing policies, strategies and pricing methods. Types of distribution channels. Functions of channels, members and channel</p>		

		<p>management decisions.</p> <p>Practical : Performance analysis of regulated market and Marketing societies. Price spread and Marketing efficiency analysis.</p>		
	AG D702	<p>Project Formulation, Evaluation and Monitoring</p> <p>Theory: Introduction to project: Meaning and definition, purpose, characteristics of a project, type of agriculture projects. Project cycle: Identification, formulation, appraisal, implementation, monitoring and evaluation. Project feasibility: Market feasibility, technical feasibility, financial and economic feasibility. Project appraisal techniques: Discounted and undiscounted techniques, compounding, payback period, annual return on investment, proceeds per unit of outlay, NPW, B-C ratio, IPR, profitability index, sensitivity analysis. Project monitoring and evaluation: Ex-ante evaluation, mid course evaluation and ex-post evaluation.</p> <p>Practical: Numerical exercises on techniques of project appraisals</p>		
	AG D703	<p>Natural Resource Economics and Management</p> <p>Theory: Concept, Subject matter and importance of natural resource economics, Classifications of natural resources and basic terms and concepts of natural resource economics: ecology-ecosystem, biomass, biosphere, reserves, environment, pollution, etc. Natural resources management and conservation, issues in natural resources and management. Approaches to natural resource problems. Important issues in economics and management of land, water and forest resource and the environment. Factors mitigating natural resources scarcity. Natural resources administration and policy formulations. International environmental issues, climate change.</p> <p>Practical: Environmental impact assessment. Visit to pollution control board. Optimum harvest of forestry/fishery, exercise on pollution abatement.</p>		

AG D704	<p>Visuals & Graphic Communication Theory: Role of visuals & graphics in Communication. Characteristics of visuals & graphics. Functions of visuals and graphics. Classification and selection of visuals. Designing message for visuals and Graphics. Principles and production of low cost visuals like charts, posters, flash cards, exhibits, photographs slides and PC based visuals. Multimedia production. Preparation and presentation of multimedia slides. Pre-testing and evaluation of visuals. Scanning of visuals.</p> <p>Practical: Preparation of low cost projected and Non-Projected visuals. Designing and layout of charts, posters, flash cards etc. Power point presentations. Generating computer aided presentation graphics. Scanning and evaluation of visuals.</p>		
AG D705	<p>Government Policies and Programmes on Agriculture Theory: Indian situation of Agriculture at a glance. Issues and challenges in agricultural development in India. National Policy for Agricultural development since independence: Development programmes for agriculture with reference to year of start, objectives and salient features. Research, extension and teaching mechanism at national and state level with reference to agriculture, Public-Private Partnership.</p> <p>Practical: Preparation of interview schedule for conducting bench mark survey with special reference to demographic information of a nearby village. Visit of KVK / voluntary organization to study developmental activities related to agriculture. Field visit to a successful agriculture related enterprise. Study the functioning of State Department of Agriculture. Evaluation of any ongoing agricultural development programme. Social auditing of MNREGA.</p>		
AG D706	<p>Sampling Techniques Theory: Sampling unit. Sampling frame, Principles of sample survey. main steps in survey, types of sampling, advantages of sampling over census, limitations of sampling; Sources and</p>		

		<p>types of non-sampling errors, biases and variance error, non-sampling bias, non-coverage, incomplete frames and missing units; Simple random sampling with and without replacement. Stratified sampling. Systematic sampling; Cluster sampling, multi - stage sampling. Basic idea about ratio and regression estimators. NOTE : Mathematical derivations and proofs are excluded.</p> <p>Practical: Random sampling - use of random number tables. Determination of sample size, estimation of mean and variance of simple random sampling with and without replacement, stratified random sampling. Cluster sampling, two stage sampling, Ratio and Regression estimators, Efficiency of SRSWR over SRSWOR,. Estimation of gain in precision due to stratification. Relative efficiency of cluster sampling equal cluster over unequal cluster.</p>		
	AG D707	<p>Dairy Cattle Production Theory: Importance of dairying. Important milch breeds of cattle and buffalo. Selection, purchase and insurance of dairy animals. Scientific management of calves, heifers, bull calves, dry, pregnant and lactating dairy animals. Least cost ration formulation. Systems of breeding. Factors affecting productive and reproductive efficiency of dairy animals.</p> <p>Practical: Selection of site for dairy farm. Layout of dairy farm building. Computation and formulation of milk replacer, calf starter, concentrate mixture for lactating, pregnant and dry animals. Computation of balance ration for various categories of dairy animals. Physical and chemical treatment of low quality roughages. Plan for supplying green fodder throughout the year. Vaccination in various categories of dairy animals. Dehorning in dairy calves. Castration of male calves. Control of ecto and endo parasites. Colostrums and its utility. Weaning and rearing of dairy calves. Determination of age of animal. Care and management of dairy calves. Management of lactating, dry and pregnant cows. Dairy hygiene. Clean milk production and its marketing. Cleaning and sanitization of dairy equipments. Milking machine and its operation. Management of milch</p>		

		animals during adverse climatic conditions. Symptoms of estrus in dairy animals. Pregnancy diagnosis. Artificial insemination and its importance. Hay and silage making. Temperature, pulse and respiration rate in dairy animals.		
	AG D708	<p>Poultry Production and Management</p> <p>Poultry breeds of economic importance. Formation and laying of egg. Systems of poultry rearing. Feeding and management of different categories of poultry. Common nutritional disorders of birds. Vaccination and deworming. Selection and culling of different classes of poultry. Formulation of poultry farm plan.</p> <p>Practical: Familiarity with external body parts of chicken. Handling and restraining of poultry birds. Selection of site for poultry farm. Layout of poultry farm buildings. Brooding, debeaking and vaccination of chicks. Internal structure and composition of egg. Collection, recording, grading, marketing and preservation of chicken eggs. Management of broilers. Dressing of birds. Incubation of eggs. Common feed ingredients. Feed additives used in poultry. Formulation of chick starter, grower and layer feed. Formulation of broiler starter and finisher feed. Cleaning and disinfection of poultry houses. Management of poultry farm under adverse climatic conditions. Economics of poultry farm.</p>		

VIIIth Semester

1	AG 801		<p>Production Technology for Bio-agents and Bio-fertilizers</p> <p>History and concept of biopesticides. Importance, scope and potential of biopesticide. Definitions, concepts and classification of biopesticides viz. pathogen, botanical pesticides, and biorationales. Botanicals and their uses. Mass production technology of bio-pesticides. Isolation and purification of important biopesticides: <i>Trichoderma</i>, <i>Pseudomonas</i>, <i>Bacillus</i>, <i>Metarhizium</i> etc. and its production. Identification of important botanicals. Visit to biopesticide laboratory in nearby area. Field visit to explore naturally infected cadavers. Identification of entomopathogenic entities in field condition. Quality control of biopesticides. Isolation and purification of <i>Azospirillum</i>, <i>Azotobacter</i>, <i>Rhizobium</i>, P-solubilizers and cyanobacteria. Mass</p>	New course added
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			<p>multiplication and inoculums production of biofertilizers. Isolation of AM fungi -Wet sieving method and sucrose gradient method. Mass production of AM inoculants. Identification of major parasitoids and predators commonly being used in biological control. Insect orders bearing predators and parasitoids used in pest control and their mass multiplication techniques.</p>	
2	AG 802		<p>Seed Production & Technology</p> <p>Seed production in major cereals: Wheat, Rice, Maize, Sorghum and Bajra. Seed production in major pulses: Urd, Mung, Cowpea, Pigeonpea, Lentil, Gram, Fieldpea. Seed production in major oilseeds: Soybean, Rapeseed and Mustard, Groundnut. Seed production in vegetable crops & Seed spices.</p> <p>Seed sampling and testing: Physical purity, germination, viability, etc. Seed and seedling vigour test. Genetic purity test: Grow out test and electrophoresis. Seed certification: Procedure, Field inspection, Preparation of field inspection report. Visit to seed production farms, seed testing laboratories and seed processing plant.</p> <p>Maintenance of genetic purity during seed production, seed quality; Definition, Characters of good quality seed, different classes of seed.</p>	New course added
3	AG 803		<p>Mushroom Cultivation Technology</p> <p>Role of mushroom in economic growth, nutritional and medicinal values, Taxonomy of mushroom. Pure culture of fungus, preparation of spawn production Importance of mushroom cultivation, Cultivation procedure of paddy straw mushroom (outdoor/indoor), concepts, types, uses, food values, Acquaintance with edible, non-edible, medicinal and poisonous mushrooms. Reproduction in Fungi, Fungal growth factors, Nutrition of Mushroom. Cultivation procedure of oyster, Mushrooms, Cultivation procedure milk, Mushroom. Organic mushroom production technology. Demonstration on bag preparation of oyster and milk mushrooms. Opportunities and Constraints. Mushroom processing and preservation (drying/ dehydration, pickling and canning) Value addition in mushroom, preparation of value added products, skill development and marketing activities. Mushroom spawn: quality attributes storage and transport, Acquaintance with mushroom contaminants.</p>	New course added
4	AG 804		<p>Soil, Plant, Water and Seed Testing</p> <p>Determination of soil texture by Bouzoukis hydrometer method, capillary rise phenomenon of water in soil column. Laboratory Organization, Laboratory Safety, Quality Control and Standardization Procedures, Data Processing. Concept of seed processing, diversity in seed storage and viability issues, Methods of testing of seed viability. Behavior of seed germination and concept of speed of germination/seed vigor, design of experiments for</p>	New course added

			evaluation of seed related traits. Seed moisture test Germination test – types of germination, Germination test – different methods of germination Seed certification: Procedure. The concentration and composition of dissolved salts in any water determine its quality for irrigation. Mostly the concerns with irrigation water quality relate to possibility of high salt concentration, sodium hazard, carbonate and bicarbonate hazard, or toxic ions (e.g., B or Cl). The analyses required for determining water quality include EC, soluble anions and cations.	
5	AG 805		Commercial Beekeeping Importance of beneficial Insects, Honey bee species, castes of bees. Beekeeping and pollinators, bee biology, commercial methods of rearing, equipment used, seasonal management, bee enemies and disease. Bee pasturage, bee foraging and communication. Insect pests and diseases of honey bee. Role of pollinators in cross pollinated plants. Seasonal management for beekeeping. Adoption of beekeeping as entrepreneur. Important schemes of government to beekeeping.	New course added
6	AG 806		Poultry Production Technology Different types of feather and function and different type of comb and function (Demo). External body poultry. Respiratory, circulatory digestive and excretory system. Male and female reproductive system. Egg structure and its function. Nervous and endocrine system (Demo). Immune system. Identification method of poultry. Visit to IDF and IPF to study breeds of poultry and daily routine farm operations and farm records. Culling of poultry. Planning and layout of housing for poultry farm. Hatchery operations, incubation and hatch	New course added
7	AG 807		Commercial Horticulture Identification of garden tools. Identification of horticultural crops. Preparation of seed bed/nursery bed. Practice of sexual and asexual methods of propagation including micro-propagation. Layout and planting of orchard. Training and pruning of fruit trees. Preparation of potting mixture. Fertilizer application in different crops. Visits to commercial nurseries/orchard.	New course added
8	AG 808		Floriculture and landscaping Study of various features of an ornamental garden with suitable plants and identification of plants for each feature, formal gardens (Mughal, Persian, Italian and French gardens) with their different features, special type of gardens (Terrace garden and Rock garden, Commercial Flowers and their packaging, landscaping Highways, Railway stations, Bus terminus and Airports, landscaping factories, places of historic importance, places of worship, landscaping cities, towns, country side, canals and along the bank of rivers, Visit to nearby places of worship, places of	New course added

			historic importance, Airport and highways for study of landscape design	
9	AG 809		<p>Food Processing</p> <p>Comparison of conventional and microwave processing of food, Preservation of food by the process of freezing, Drying of food using Tray dryer/other dryers, Preservation of food by canning(Fruit/Vegetable/meat), Cut-out analysis of canned food, Osmotic dehydration, Minimal Processing, Testing of Packaging material.</p>	New course added
10	AG 810		<p>Agricultural Waste Management</p> <p>Composting- Solid waste suitable for composting – Methods of composting – vermicomposting – Mineralization process in composting – Biochemistry of composting – Factors involved - Infrastructure required – maturity parameters – value addition – application methods Biomass Briquetting– potential agro residues and their characteristics for briquetting – fundamental aspects and technologies involved in briquetting – economic analysis of briquetting – setting up of briquetting plant- appliances for biomass briquettes. Biogas and Bio Ethanol Production ,Screening of suitable lingo cellulosic substrate for biogas production -determination of bio- energy potential of agro-waste by estimating total solids – volatile solids – Calorific value- per cent total carbohydrates, moisture, lignin and cellulosic contents – preparation of feed stocks for anaerobic bi- digestion – types of digesters – factors affecting – nutrient value and utilization of biogas slurry. Ethanol production from lingo cellulosic wastes – Processing of Biomass to Ethanol -pre-treatment-fermentation-distillation.</p>	New course added
11	AG 811		<p>Organic Production Technology</p> <p>Visit of organic farms to study the various components and their utilization; Preparation of enrich compost, vermicompost, bio-fertilizers/bio-inoculants and their quality analysis; Indigenous technology knowledge (ITK) for nutrient, insect, pest disease and weed management; Cost of organic production system; Post harvest management; Quality aspect, grading, packaging and handling.</p>	New course added
12	AG 812		<p>Commercial Sericulture</p> <p>1. Sericulture maps:</p> <p>a) World maps and Silk Road</p> <p>b) Sericulture map of India and West Bengal</p> <p>2. Preparation of histograms and pie charts on:-</p> <p>a) Production of Textile fibres in India</p> <p>b) World Silk Production</p> <p>c) Pie chart on mulberry and non-mulberry silk production in India</p> <p>3. Organization set up in India :- (Demonstration & Exercise)</p> <p>a) Govt. of India, b) Five traditional</p>	New course added

			<p>states viz., Karnataka, Andhra Pradesh, Tamilnadu, West Bengal and Jammu & Kashmir</p> <p>4. Identification and study of Sericulture products:Cotton and Silk Yarn different types, Pupae, Silk Yarn, Noil Yarn</p> <p>5. Laboratory Note Book, Internal Assessment</p>	
13	AG 813		<p>AGRIBUSINESS MANAGEMENT</p> <p>Study of Agri - input markets. Seed, fertilizers, pesticides. Study of output markets: grains, fruits, vegetables, flowers. Study of product markets, retails trade commodity trading, and value added products. Study of financing institutions- Cooperative, Commercial banks, RRBs, Agribusiness Finance Limited, NABARD.Preparations of projects and Feasibility reports for agribusiness entrepreneur.Appraisal/evaluation techniques of identifying viable project- Non-discounting techniques.Case study of agro-based industries. Trend and growth rate of prices of agriculturalcommodities</p>	New course added
14	AG 814		<p>Agro-Advisory Services</p> <p>Overview of integrated Agro- Advisory services in India, variability in weather/climate impacting agriculture. Precipitation events.Needs of farmers - agro-climate & its variability Weather forecast Short & Medium Range Extended range Seasonal Scale Climate Prediction Pest/disease prognosis & control measures Advice on sowing/harvest, cultivar selection, farm input management & intercultural operations.Strategies to empower farmers- Generate information on Weather & Climate (Observations & Forecast) Impact of likely weather on crop Impact of likely weather on P&D Weather based input management Weather sensitivity of farm operations Develop decision making Tools: Data base Crop/Soil/P&D Modeling Remote Sensing & GIS Crop/Soil Monitoring, Drought Monitoring etc. Disseminate information Outreach, capacity building, Feedback. Operational Agro-Meteorology -TIER 1 Apex Policy Planning Body, Delhi Network of 130 Agromet Field Units TIER 2 National Agromet Service HQ Execution, Pune Network of AAS units in the country TIER 3 State Agromet Centres (28) Coordination/Monitoring TIER 4 Agromet Field Units Agroclimatic Zone Level (130) TIER 5 District Level Extension and Training Input Management as advisory~640 Service Goal: Locale & Crop specific Advisory & Farmer Level Outreach.</p>	New course added
15	AG 815		<p>Nursery Management</p> <p>Identification of propagation material and equipment.Layout of nurseries and management of progeny orchard. Use of protrays and root trainers in vegetable nursery.Raising and maintenance of root stock. Multiplication of plants by sexual methods.Raising of seedlings. Propagation by cuttings in Horticultural crops.Propagation by budding in Horticultural crops.Propagation by grafting in Horticultural crops.Use of plant growth regulators in</p>	New course added

			propagation. Potting, repotting or lifting of saplings (packaging) for transportation. Use of propagation media. Tetrazolium salt test for determining germination. Visit of commercial nurseries	