R.K.D.F. UNIVERSITY, BHOPAL

B.Sc. (HONS) AGRICULTURE

New Scheme Based On ICAR Flexible Curriculum

Semester – I

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Credit
B.Sc. (Hons) Agriculture	Fundamentals of Horticulture	BAG-5101	2-3 hours	2

Course Outcomes

CO1 To get the knowledge about diversity of Plants
CO2 Students will be able to identify plant vegetative
CO3 Information to solve horticultural problems.
CO4 Information about different types of irrigation on different plants.
CO5 To understand about fertilizers application methods.
CO6 Students will understands how to propagate plant, manage and harvest a variety of plant
CO7 To get the information about fruit quality.
CO8 Importance about medicinal plants and aromatic plants.

THEORY

UNIT I

Horticulture - Its definition and branches, importance and scope; horticultural and botanical classification; climate and soil for horticultural crops. Plant propagation-methods and propagating structures.

UNIT II

Seed dormancy, Seed germination, principles of orchard establishment; Principles and methods of training and pruning

UNIT III

Juvenility and flower bud differentiation; unfruitfulness; pollination, pollinizers and pollinators fertilization and parthenocarpy; medicinal and aromatic plants

UNIT IV

Importance of plant bio-regulators in horticulture

UNIT V

Irrigation – Methods, Fertilizer application in horticultural crops

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.

Reference Books:

1. Fundamentals of Horticulture – Jitendra singh (Kalyani Publications)
2. Handbook of Horticulture –ICAR

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Semester – I

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Credit
B.Sc. (Hons) Agriculture	Fundamentals of Plant Biochemistry and Biotechnology	BAG-5102	2-3 hours	3 (2+1)

Course Outcomes

CO1 To understand the importance of pH
CO2 Information about different nutrients and their importance.
CO3 Importance of DNA and RNA (Nucleic acids)
CO4 To understand the role of metabolism
CO5 Role of enzymes in food industry.
CO6 Synthesis pathways of biomolecules and regulations
CO7 Application of biotechnology in crop improvement.
CO8 To understand the importance of hybrid plants.
CO9 To understand the culture techniques better yield.

THEORY

UNIT I

Importance of Biochemistry.Properties of Water, pH and Buffer.Carbohydrate: Importance and classification.Structures of Monosaccharides, Reducing and oxidizing properties of Monosaccharides, Mutarotation; Structure of Disaccharides and Poly saccharides. Lipid: Importance and classification; Structures and properties of fatty acids; storage lipids and membrane lipids.

UNIT II

Proteins: Importance of proteins and classification; Structures, titration and zwitterions nature of amino acids; Structural organization of proteins. Enzymes: General properties; Classification; Mechanism of action; Michaelis & Menten and Line Weaver Burk equation & plots; Introduction to allosteric enzymes

UNIT III

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.

UNIT IV

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 and cybrids; Somaclonal variation and its use in crop improvement;

UNIT V

Cryo-preservation; 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.

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 finger printing.

Reference Books:

1. Fundamentals of Plant Biochemistry and Biotechnology: NK. Gupta Sunita Gupta, Kalyani Publishers.
2. Fundamentals of Biochemistry and Biotechnology: Omkar Singh, Rama Publishing House.
3. Fundamentals of Plant Biochemistry and Biotechnology: RajanKatoch, Kalyani Publishers.

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Semester – I

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Credit
B.Sc. (Hons) Agriculture	Fundamentals of Soil Science	BAG-5103	2-3 hours	3 (2+1)

Course Outcomes

CO1 Students will gain knowledge on concepts and principles of Soil Science
CO2 Relevant knowledge on rocks and minerals, their composition and the types of soils formed from different parent materials.
CO3 Understand the role of soil forming factors and processes in soil formation
CO4 Understand various soil physical, chemical and biological properties and their impact on plant growth.
CO5 The knowledge gained in this course will be useful in understanding the role of soils in crop production and management.
CO6 Study of rocks-igneous, sedimentary and metamorphic rocks
CO7 Study of a soil profile, Study of soil temperature, Study of soil texture-feel method, mechanical analysis, soil colour, soil moisture, constants-field capacity; water holding capacity.
CO8 Collection and processing of soil for analysis.
CO9 Study of infiltration rate of soil.

THEORY

UNIT I

Soil- Pedological and edaphalogical concepts. Soil Science-scope and branches of soil science. Earth spheres and composition of earth crust. Minerals-classification, formation and properties of silicate and non silicate minerals, Rocks-classification, formation and properties of igneous, sedimentary and metamorphic rocks.

UNIT II

Weathering-type, factors of weathering, products of weathering; Soil formation-soil forming factors and soil forming processes. Soil profile-master horizons, subordinate horizons.Soil physical properties-Soil texture-classification of soil separates, properties of soil separates, Particle size analysis- Stokes law-assumptions and limitations, textural classes.

UNIT III

Soil structure-classification, soil aggregates, evaluation of soil structure, significance. Pore space-types, factors affecting porosity, manipulation. Bulk density and particle density- relationships, factors, significance and manipulation.Soilcolour-factors, attributes and significance.Soil consistency-forms, factors, limits and significance.

UNIT IV

Soil crusting- factors and significance. Soil temperature-thermal properties of soils, flow of heat, soil temperature regimes, influence of soil temperature on plant growth. Soil air-composition, gaseous exchange, influence of soil air on plant growth.

UNIT V

Soil water-classification, potentials, soil moisture constants, movement of soil water, infiltration, percolation, hydraulic conductivity.Soil survey- types and methods.Soil classification-systems of classification.Soil taxonomy-advantages, structure, formative elements, diagnostic horizons, keys to soil orders.Soils of Karnataka and India.

PRACTICAL

Study of general properties of minerals.

Study of minerals-silicate and non-silicate minerals.

Reference Books:

1. Introductory soil sciences, Kalyani Publications , Dilip Kumar Das
2. Fundamentals of Soil Science , Shivanand Tolanur

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Semester – I

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Credit
B.Sc. (Hons) Agriculture	Introduction to Forestry	BAG-5104	2-3 hours	2(1+1)

Course Outcomes

CO1 Information about the provision of timber
CO2 To gets the knowledge about Fuel wood
CO3 To study about wildlife habitat
CO4 Natural water quality management
CO5 Recreation
CO6 Employment
CO7 Aesthetically appealing landscapes
CO8 Biodiversity management
CO9 Watershed management
CO10 Erosion control
CO11 Forest and wildlife preservation.

THEORY

UNIT I

Introduction – definitions of basic terms related to forestry, objectives of silviculture, forest classification, salient features of Indian Forest Policies.

UNIT II

Agroforestry – definitions, importance, criteria of selection of trees in agroforestry, 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.

UNIT III

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.

UNIT IV

Crown classification. Tending operations – weeding, cleaning, thinning – mechanical, ordinary,

crown and advance thinning.

UNIT V

Forest mensuration – objectives, diameter measurement, instruments used in diameter measurement; Non instrumental methods of height measurement - shadow and single pole method; 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.

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

Reference Books:

1. Fundamentals of Forestry (ICAR)
2. Introduction to Forestry (Kalyani Publications) SR Reddy, C Nagmani

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Semester – I

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Credit
B.Sc. (Hons) Agriculture	Comprehension & Communication Skills in English	BAG-5105	2-3 hours	2(1+1)

Course Outcomes

CO1 Demonstrate a significant increase in word knowledge.
CO2 Employ prereading, skimming, and prewriting techniques.
CO3 Identify main ideas in paragraphs and reading selections.
CO4 Locate important details.
CO5 Decipher paragraph patterns, writer techniques, and conclusions.

THEORY

UNIT I

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.

UNIT II

Reading Comprehension, Vocabulary- Antonym, Synonym, Homophones, Homonyms, often confused words. Exercises to Help the students in the enrichment of vocabulary based on TOEFL and other competitive examinations.

UNIT III

Functional grammar: Articles, Prepositions, Verb, Subject verb Agreement, Transformation, Synthesis, Direct and Indirect Narration.

UNIT IV

Written Skills: Paragraph writing, Precise writing, Report writing and Proposal writing. The Style: Importance of professional writing.

UNIT V

Preparation of Curriculum Vitae and Job applications. Synopsis Writing. Interviews: kinds, Importance and process.

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.

Reference Books:

English Communication Theory and Practice by Dr Manoj kumar Garg

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Semester – I

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Credit
B.Sc. (Hons) Agriculture	Fundamentals of Agronomy	BAG-5106	2-3 hours	4(3+1)

Course Outcomes

CO1 In modern terminology however the word has come to mean and denote a branch of science dealing with all aspects of crop cultivation and production.
CO2 A study of agronomy often involves a summoning of resources from related disciplines such as Botany, Soil Science, Irrigation, plant protection, Plant Genetics and Breeding, Agro-meteorology etc.
CO3 In a more fundamental sense it can be categorized as an applied Science, the object of which is crop cultivation and management for the purpose of producing food for humans, feed for animals as well as raw materials for the industry.
CO4 Knowledge about Indian Agriculture and importance, present status, scope and future prospect
CO5 Cropping seasons of India. Soil formation, classification, physical, chemical properties. Identification of important crops and crop seeds.

THEORY

UNIT I

Agronomy and its scope, seeds and sowing, tillage and tilth, crop density and geometry.

UNIT II

Crop nutrition, manures and fertilizers, nutrient use efficiency.

UNIT III

water resources, soil-plant-water relationship, crop water requirement, water use efficiency, irrigation- scheduling criteria and methods, quality of irrigation water, logging.

UNIT IV

Weeds- importance, classification, crop weed competition, concepts of weed management principles and methods, herbicides- classification, selectivity and resistance, allelopathy.

UNIT V

Growth and development of crops, factors affecting growth and development, plant ideotypes, crop rotation and its principles, adaptation and distribution of crops, crop management technologies in problematic areas, harvesting and threshing of crops.

PRACTICAL

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.

Reference Books:

1. Fundamentals of Agronomy , Kalyani Publications , SR Reddy
2. Fundamentals of Agronomy, Dr. KL Nandeha,Nirjharnee Nandeha

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Semester – I

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Credit
B.Sc. (Hons) Agriculture	Introductory Biology*/Elementary Mathematics*	BAG-5107	2-3 hours	2(1+1) /2(2+0)*

Course Outcomes

CO1 The student will be able to read, understand, and critically interpret the primary biological literature in his/her area of interest.

CO2 The student will be able to design, conduct, analyze, and communicate (in writing and orally) biological research.

CO3 The student will recognize and be able to apply basic ethical principles to basic and applied biological/biomedical practice and will understand the role of biological/biomedical science, scientists, and practitioners in society.

CO4 The student will be able to explain the process of organic evolution and its underlying principles and mechanisms.

CO5 The student will be able to explain the fundamental biological processes of metabolism, homeostasis, reproduction, development, and genetics, and the relationships between form and function of biological structures at the molecular, cellular, organismal, population, and ecosystem levels of the biological hierarchy. Co6. The student will be able to explain the importance of biodiversity at the genetic, organismal, community, and global scale.

INTRODUCTORY BIOLOGY (NEW) 2(1+1)

THEORY

UNIT I

Introduction to the living world, diversity and characteristics of life, origin of life.

UNIT II

Evolution and Eugenics.

UNIT III
Binomial nomenclature and classification Cell and cell division.

UNIT IV
Morphology of flowing plants.Seed and seed germination. Plant systematic- viz;

Brassicaceae, Fabaceae and Poaceae.

UNIT V
Role of animals in agriculture.

PRACTICAL
Morphology of flowering plants – root, stem and leaf and their modifications.Inflorence, 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.

ELEMENTARY MATHEMATICS (NEW) 2(2+0)

Course Outcome

CO1	Demonstrate competency in the areas that comprise the core of the mathematics major
CO2	Demonstrate the ability to understand and write mathematical proofs
CO3	Be able to use appropriate technologies to solve mathematical problems
CO4	Be able to construct appropriate mathematical models to solve a variety of practical problems
CO5	Obtain a full-time position in a related field or placement

THEORY
UNIT I
Straight lines : Distance formula, section formula (internal and external division), Change of axes (only origin changed), Equation of co-ordinate axes, Equation of lines parallel to axes, Slope-intercept form of equation of line, Slope-point form of equation of line, Two point for of equation of line, Intercept form of equation of line, Normal form of equation of line, General form of equation of line, Point of intersection of two st. lines, Angles between two st. lines, Parallel lines, Perpendicular lines, Angle of bisectors between two lines, Area of triangle and quadrilateral.

UNIT II

Circle: Equation of circle whose centre and radius is known, General equation of a circle, Equation of circle passing through three given points, Equation of circle whose diameters is line joining two points (x1, y1) & (x2,y2), Tangent and Normal to a given circle at given point (Simple problems), Condition of tangency of a line y = mx + c to the given circle x2 + y2 = a2.

UNIT III

Differential Calculus: Definition of function, limit and continuity, Simple problems on limit, Simple problems on continuity, Differentiation of xn , ex , sin x & cos x from first principle, Derivatives of sum, difference, product and quotient of two functions, Differentiation of functions of functions (Simple problem based on it), Logarithmic differentiation (Simple problem based on it),

Differentiation by substitution method and simple problems based on it, Differentiation of Inverse Trigonometric functions. Maxima and Minima of the functions of the form y=f (x) (Simple problems based on it).

UNIT IV

Integral Calculus : Integration of simple functions, Integration of Product of two functions, Integration by substitution method, Definite Integral (simple problems based on it), Area under simple well-known curves (simple problems based on it).

UNIT V

Matrices and Determinants: Definition of Matrices, Addition, Subtraction, Multiplication, Transpose and Inverse up to 3rd order, Properties of determinants up to 3rd order and their evaluation**.**

Reference books: NCERT

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Semester – I

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Credit
B.Sc. (Hons) Agriculture	Agricultural Heritage (New Course)*	BAG-5108	2-3 hours	1(1+0)*

Course Outcome

CO1 Demonstrate competency in the areas that comprise the core of the mathematics major

CO2 Demonstrate the ability to understand and write mathematical proofs

CO3 Be able to use appropriate technologies to solve mathematical problems

CO4 Be able to construct appropriate mathematical models to solve a variety of practical problems

CO5 Obtain a full-time position in a related field or placement

THEORY

UNIT I

Introduction of Indian agricultural heritage; Ancient agricultural practices, Relevance of heritage to present day agriculture; Past and present status of agriculture and farmers in society;

UNIT II

Journey of Indian agriculture and its development from past to modern era; Plant production and protection through indigenous traditional knowledge;

UNIT III

Crop voyage in India and world; Agriculture scope; Importance of agriculture and agricultural resources available in India;

UNIT IV

Crop significance and classifications; National agriculture setup in India;

UNIT V

Current scenario of Indian agriculture; Indian agricultural concerns and future prospects.

Reference Books:

1. Agricultural heritage by A. Zaman , Sagar MaitrI
2. Agricultural Heritage by SR Reddy, Kalyani Publications

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Semester – I

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Credit
B.Sc. (Hons) Agriculture	Rural Sociology & Educational Psychology	BAG-5109	2-3 hours	2(2+0)*

Course Outcomes

CO1 Understand concept of rural sociology, its importance in agricultural extension, characteristics of Indian rural society.

CO2 Understand social groups, social stratification, culture, social values, social control and attitudes, leadership and training.

CO3 Understand concept of educational psychology, intelligence, personality, perceptions, emotions, frustration, motivation, teaching and learning

CO4 Acquaint with characteristics of rural society, village institutions and social organizations. Select lay leaders and train them.

CO5 Assess personality types, leadership types and emotions of human beings iv. Create a training situation under village conditions

THEORY

UNIT I

Sociology and Rural sociology: Definition and scope, its significance in agriculture extension, Social Ecology.

UNIT II

Rural society, Social Groups, Social Stratification, Culture concept, Social Institution, Social Change & Development.

UNIT III

Educational psychology: Meaning & its importance in agriculture extension.

UNIT IV

Behavior: Cognitive, affective, psychomotor domain, Personality, Learning,

UNIT V

Motivation, Theories of Motivation, Intelligence.

Reference Books:

Text Book of Rural Sociology & Educational Psychology by Sagar Mondal , kalyani Publications

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Semester – I

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Credit
B.Sc. (Hons) Agriculture	Human Values & Ethics (Non- gradial)	BAG-5110	2-3 hours	1(0+1)

Course Outcomes

CO1 Understand the significance of value inputs in a classroom and start applying them in their life and profession.

CO2 Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.

CO3 Understand the value of harmonious relationship based on trust and respect in their life and profession.

CO4 Understand the role of a human being in ensuring harmony in society and nature.

CO5 Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

THEORY

UNIT I

Values and Ethics-An Introduction.

UNIT II

Goal and Mission of Life. Vision of Life. Principles and Philosophy.

UNIT III

Self-Exploration, Self-Awareness, Self-Satisfaction, Decision Making.

UNIT IV

Motivation, Sensitivity, Success, Selfless Service, Case Study of Ethical Lives, Positive Spirit.

UNIT V

Body, Mind and Soul, Attachment and Detachment. Spirituality Quotient, Examination.

Reference Books:

Human Values & Professional Ethics by Varinder Kumar

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Semester – I

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Credit
B.Sc. (Hons) Agriculture	NSS/NCC/Physical Education & Yoga Practices**	BAG-5111	2-3 hours	2(0+2)

Course outcomes

CO1 Learn to work in rural areas

CO2 Village adoption for development

CO3 Learn about education and health awareness programme

CO4 Learn Social Responsibility

CO5 NCC helps in Youth empowerment and helps in building of Nation

CO6 Yoga and Physical Education gives mental and Physical discipline helps in maintain peaceful and healthy body, increase flexibility of muscle strength

COURSE TITLE: NATIONAL SERVICE SCHEME I

Introduction and basic components of NSS:

Orientation: history, objectives, principles, symbol, badge; regular programs under NSS,113organizational structure of NSS, code of conduct for NSS volunteers, points to be considered by NSS volunteers awareness about health

NSS programs and activities

Concept of regular activities, special camping, day camps, basis of adoption of village/slums, conducting survey, analyzing guiding financial patterns of scheme, youth programme/ schemes of GOI, coordination with different agencies and maintenance of diary

Understanding youth

Definition, profile, categories, issues and challenges of youth; and opportunities for youth who is agent of the social change

Community mobilization

Mapping of community stakeholders, designing the message as per problems and their culture; identifying methods of mobilization involving youth-adult partnership

Social harmony and national integration

Indian history and culture, role of youth in nation building, conflict resolution and peacebuilding

Volunteerism and shramdan

Indian tradition of volunteerism, its need, importance, motivation and constraints; shramdan as part of volunteerism

Citizenship, constitution and human rights

Basic features of constitution of India, fundamental rights and duties, human rights, consumer awareness and rights and rights to information

Family and society

Concept of family, community (PRIs and other community based organizations) and society

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Semester – II

SYLLABUS

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.Sc. (Hons) Agriculture	Fundamentals of genetics	BAG-5201	2-3 hours	3

Course Outcome

CO1 Apply the knowledge gained on inheritance and variation
CO2 Study about structure and working of chromosomes
CO3 Relate mutation to evolution and heredity
CO4 Interpret the functions of genetic material.

THEORY

UNIT I

Pre and Post Mendelian concepts of heredity, Mendelian principles of heredity.

UNIT II

Architecture of chromosome; chromonemata, chromosome matrix, chromomeres, centromere, secondary constriction and telomere; special types of chromosomes. Chromosomal theory of inheritance, cell cycle and cell division- mitosis and meiosis. Probability and Chi-square. Dominance relationships, Epistatic interactions with example.

UNIT III

Multiple alleles, pleiotropism and pseudoalleles, Sex determination and sex 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,

UNIT IV

Mutation, classification, Methods of inducing mutations & CIB technique, mutagenic agents and induction of mutation, Qualitative & Quantitative traits

UNIT V

Polygenes and continuous variations, multiple factor hypothesis, Cytoplasmic inheritance, 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.

Reference books

1. B.D. Singh Fundamental of Genetics 4th edition
2. Phundan Singh Fundamental of Genetics

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Semester – II

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.Sc. (Hons.) Agriculture	Agricultural Microbiology	BAG-5202	2-3 hours	2

Course Outcome

CO1 Discriminate prokaryotic and eukaryotic microbes
CO2 Delineate the structure and growth of bacteria
CO3 Utilize microbes as models to study genetics
CO4 Use microbes in enriching specific plant nutrients
CO5 Analyze the ubiquitous nature of microbes inhabiting a wide range of ecological habitats
CO6 Practice bacterial isolation

THEORY

UNIT I

Introduction, Microbial world: Prokaryotic and eukaryotic microbes. Bacteria: cell structure, chemoautotrophy, photo autotrophy, growth

UNIT II

Bacterial genetics: Genetic recombination transformation, conjugation and transduction, plasmids, transposon. Role of microbes in soil fertility and crop production Carbon, Nitrogen, Phosphorus and Sulphur cycles.

UNIT III

Biological nitrogen fixation - symbiotic, associative and asymbiotic. Azolla, blue green algae and mycorrhiza. Rhizosphere and phyllosphere. Microbes in human welfare: silage production, biofertilizers, biopesticides, biofuel production and biodegradation of agro-waste.

Reference books

1. Rangaswami G Agriculture Microbiology
2. Vijyapal Babu Applied Microbiology B.
3. Mangesh Y. Dudhe Agriculture Microbiology

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Semester – II

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.Sc. (Hons.) Agriculture	Soil and Water Conservation Engineering	BAG-5203	2-3 hours	2

Course Outcome

CO1 Understand water and wind erosion and their mechanisms.
CO2 Know various agronomical and mechanical measures for controlling soil erosion and moisture conservation.
CO3 Develop analytical thinking and problem-solving skills in soil and water conservation engineering problems.
CO4 Measure and estimate soil loss and sedimentation using different techniques.
CO5 Design bunds, terraces, grassed waterways, wind breaks and shelter belts etc.

THEORY

UNIT I

Introduction to Soil and Water Conservation, causes of soil erosion. Definition and agents of soil erosion, water erosion: Forms of water erosion.

UNIT II

Gully classification and control measures. Soil loss estimation by universal Loss Soil Equation. Soil loss measurement techniques.

UNIT III

Principles of erosion control: Introduction to contouring, strip cropping. Contour bund. Graded bund and bench terracing.

UNIT IV

Grassed water ways and their design. Water harvesting and its techniques.

UNIT V

Wind erosion: mechanics of wind erosion, types of soil movement. Principles of wind erosion control and its control measures.

Reference book

1. Bimal Chandra Mal Introduction to Soil and Water Conservations
2. S.K. Gupta Fundamental of soil and water

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Semester – II

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.Sc. (Hons.) Agriculture	Fundamentals of Crop Physiology	BAG-5204	2-3 hours	2

Course Outcome

CO1 Define different physiological process at plant and cellular level
CO2 Summarize mechanisms of uptake, transport and translocation of water and nutrients
CO3 Distinguish carbon cycles in plants and define lipid metabolism
CO4 Relate the importance of growth regulators in plant growth
CO5 Explain nutrient deficiencies and physiological requirements of plants
CO6 Interpret and measure plant physiological data

THEORY

UNIT I

Introduction to crop physiology and its importance in Agriculture;

UNIT II

Plant cell: An Overview; Diffusion and osmosis; Absorption of water, transpiration and Stomatal Physiology; Mineral nutrition of Plants: Functions and deficiency symptoms of nutrients, nutrient uptake mechanisms.

UNIT III

Photosynthesis: Light and Dark reactions, C3, C4 and CAM plants; Respiration: Glycolysis, TCA cycle and electron transport chain.

UNIT IV

Fat Metabolism: Fatty acid synthesis and Breakdown; Plant growth regulators

UNIT V

Physiological roles and agricultural uses, Physiological aspects of growth and development of major crops: Growth analysis, Role of Physiological growth parameters in crop productivity.

Reference books

1. S. N. Pandey & B. K. Sinha Plant physiology 4th edition
2. V.K. Jain Fundamentals of Plant physiology

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Semester – II

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.Sc. (Hons.) Agriculture	Fundamentals of Agricultural Economics	BAG-5205	2-3 hours	2

Course Outcome

CO1 Apply the knowledge gained on the fundamentals of economics
CO2 Employ agricultural economic applications
CO3 Practice applying mathematical models to agro-economics
CO4 Interpret market structures responsible for creating national income
CO5 Analyse agro-economic growth and develop policies
CO6 Integrate agro-economic knowledge with real time application

THEORY

UNIT I

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 behaviour. Basic concepts: Goods and services, desire, want, demand, utility, cost and price, wealth, capital, income and welfare.

UNIT II

Agricultural economics: meaning, definition, characteristics of agriculture, importance and its role in 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 price elasticity, income elasticity and cross elasticity.

UNIT III

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.

UNIT IV

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. Distribution theory: meaning, factor market and pricing of factors of production. Concepts of rent, wage, interest and profit.

UNIT V

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 socio-economic 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. Banking: Role in modern economy, types of banks, functions of commercial and central bank, credit creation policy. Agricultural and public finance: meaning, micro v/s macro finance, need for agricultural finance, public revenue and public expenditure. Tax: meaning, direct and indirect taxes, agricultural taxation, VAT. Economic systems: Concepts of economy and its functions, important features of capitalistic, socialistic and mixed economies, elements of economic planning.

Reference books

S. Subba Reddy, P. Raghu Ram Agricultural Economics

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Semester – II

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.Sc. (Hons.) Agriculture	Fundamentals of Plant Pathology	BAG-5206	2-3 hours	4

Course Outcome

CO1 Recognize the importance and scope of plant pathology and analyze the causes and factors leading to pathogenesis
CO2 Classify pathogens taxonomically for designing effective disease management strategies
CO3 Differentiate plant pathogens based on morphology, vegetative, reproductive and resting structures.
CO4 Relate disease cycles, physiology of pathogens and plant defense
CO5 Describe epidemiology of plant diseases and strategies for disease management
CO6 Practice identifying and controlling pathogens

THEORY

UNIT I

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. 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.

UNIT II

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.

UNIT III

Bacteria and mollicutes: general morphological characters. Basic methods of classification andreproduction. Viruses: nature, structure, replication and transmission. Study of phanerogamic plant parasites.

UNIT IV

Nematodes: General morphology and reproduction, classification, symptoms and nature of damage caused by plant nematodes (Heterodera, Meloidogyne, Anguina, Radopholusetc.)

UNIT V

Growth and reproduction of plant pathogens. Liberation / dispersal and survival of plant pathogens. 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.

Reference books

1. R.S. Singh Introduction to Principle of Plant Pathology 5th edition
2. B.P. Pandey Plant Pathology
3. R.S. Mehrotra Plant Pathology

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Semester – II

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.Sc. (Hons.) Agriculture	Fundamentals of Entomology	BAG-5207	2-3 hours	4

Course Outcome

CO1 Express knowledge gained on the historic contributions of eminent scientists in the field of entomology and fascinating facts about insects
CO2 Describe insect's anatomy and morphology
CO3 Infer biochemical and physiological processes governing insect metabolism, growth, and form
CO4 Relate ecological relationships of insects with other life forms
CO5 Devise pest control measures
CO6 Identify insects based on their key taxonomic characters

THEORY

UNIT I

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 moulting.

UNIT II

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.

UNIT III

Metamorphosis and diapause in insects. Types of larvae and pupae. Structure and functions of digestive, circulatory, excretory, respiratory, nervous, secretary (Endocrine) and reproductive system, in insects. Types of reproduction in insects. Major sensory organs like simple and compound eyes, chemoreceptor. 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.

UNIT IV

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.

UNIT V

Systematics: Taxonomy –importance, history and development and binomial nomenclature. Definitions of Biotype, Sub-species, Species, Genus, Family and Order. Classification of class Insectaupto 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; Thysanoptera:Thripidae; Hemiptera: Pentatomidae, Coreidae, Cimicidae, Pyrrhocoridae, Lygaeidae, Cicadellidae, Delphacidae, Aphididae, Coccidae, Lophophidae, Aleurodidae, Pseudococcidae; Neuroptera: Chrysopidae; Lepidoptera: Pieridae, Papiloinidae, Noctuidae, Sphingidae, Pyralidae, Gelechiidae, Arctiidae, Saturnidae, Bombycidae; Coleoptera: Coccinellidae, Chrysomelidae, Cerambycidae, Curculionidae, Bruchidae, Scarabaeidae; Hymenoptera: Tenthridinidae, Apidae. Trichogrammatidae, lchneumonidae, Braconidae, Chalcididae; Diptera: Cecidomyiidae, Tachinidae, Agromyziidae, Culicidae,Muscidae, Tephritidae.

Reference books

1. D.S. Reddy Applied Entomology
2. K.N. Rangumoorthi Principle of Applied Entomolgy

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Semester – II

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.Sc. (Hons.) Agriculture	Fundamentals of Agricultural Extension Education	BAG-5208	2-3 hours	3

Course Outcome

CO1 Realize the necessity of agricultural extension for rural development
CO2 Acquire knowledge on extension systems in India
CO3 Devise plans for rural community development; plan and evaluate an extension programme
CO4 Transfer technology and innovations towards agricultural development
CO5 Develop interest in agricultural journalism
CO6 Disseminate information and technology through audio visual aids

THEORY

UNIT I

Education: Meaning, definition & Types; Extension Education- meaning, definition, scopeand process; objectives and principles of Extension Education; Extension Programme planning- Meaning, Process, Principles and Steps in Programme Development.

UNIT II

Extension systems in India: extension efforts in pre-independence era (Sriniketan, Marthandam, Firka Development Scheme, Gurgaon Experiment, etc.) and post-independence era (Etawah Pilot Project, Nilokheri Experiment, etc.); various extension/ agriculture development programmes launched by ICAR/ Govt. of India (IADP, IAAP, HYVP, KVK, IVLP, ORP, ND, NATP, NAIP, etc.).

UNIT III

New trends in agriculture extension: privatization extension, cyber extension/ e-extension, market-led extension, farmer-led extension, expert systems, etc. Rural Development: concept, meaning,

definition; various rural development programmes launched by Govt. of India. Community Dev.- meaning, definition, concept & principles, Philosophy of C.D.

UNIT IV

Rural Leadership: concept and definition, types of leaders in rural context; extension administration: meaning and concept, principles and functions. 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;

UNIT V

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.

Reference books

1. Sagar Mondal Fundamental of Agricultural Extension Education
2. Jitendra Chouhan Extension Education Communication System
3. G.L. Ray Extension Education Communication and Management

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Semester – II

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.Sc. (Hons.) Agriculture	Communication Skills and Personality Development	BAG-5209	2-3 hours	2

Course Outcome

CO1 To have knowledge of proper use of grammar
CO2 Knowledge of verbal and nonverbal way of expressing
CO3 Way to have better presentation knowledge in presenting an article or in an interview and in group discussions

THEORY

UNIT I
Communication Skills: Structural and functional grammar

UNIT II
Meaning and process of communication, verbal and nonverbal communication

UNIT III
Listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures.

UNIT IV
Reading and comprehension of general and technical articles, precise writing, summarizing, abstracting

UNIT V
Individual and group presentations, impromptu presentation, public speaking; Group

discussion, Organizing seminars and conferences.

Reference books

1. Jindagi kumari Communication skills
2. Nitin Bhatnagar, Mamta Bhatnagar Effective Communications
3. Manisha N. Jangale, Soni Shende Communication skills
4. S.S. Narula Personality Development and Communication Skills
5. P.C. Sharma Communication Skills and Personality Development

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Semester – III

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B. Sc. (Hons.) Agriculture	Crop Production Technology – I *(Kharif Crops)*	BAG-5301	2-3 hours	2

Course Outcomes

CO1	Identification of different Kharif crops.
CO2	Familiar with different kharif crop varieties.
CO3	Getting acquainted with Rice nursery preparations and precautions.
CO4	Getting knowledge of different sowing methods of kharif crops.
CO5	Getting acquainted with basic fertilizers application methods, organic manure and Bio-fertilizers.
CO6	Knowledge about different irrigation methods in field crops.
CO7	Practical acquisition of Maturity time and harvesting of kharif crops

THEORY

UNIT I

Origin, geographical distribution, economic importance, soil and rice, pigeonpea, soybean

UNIT II

Origin, geographical distribution, economic importance, soil and maize, mungbean and groundnut,
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UNIT III

Origin, geographical distribution, economic importance, soil and sorghum, urdbean, cowpea, cotton

UNIT IV

Origin, geographical distribution, economic importance, soil and pearl millet, forage crops-sorghum

UNIT V

Origin, geographical distribution, economic importance, soil and finger millet, cluster bean and Napier

Reference books:

1. Fundamentals of Agronomy – S.R Reddy
2. Modern Techniques of Raising field crops-Chhida Singh
3. Principles of Agronomy-T.Y Reddy

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Semester – III

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B. Sc. (Hons.) Agriculture	Fundamentals of Plant Breeding	BAG-5302	2-3 hours	3

Course Outcomes

CO1 Familiar with basics of Fundamentals of Plant breeding
CO2 Familiar with different Plant Breeders kit.
CO3 Getting acquainted with Emasculation & hybridization techniques.
CO4 Study about the breeding methods for segregating generations field.
CO5 Knowledge about Biotechnological tools.
CO6 Getting acquainted with farmers and breeders rights.

THEORY

UNIT I

Historical development, concept, nature, role, aim and objectives of plant breeding.
Major achievements and future prospects.
Domestication, Acclimatization and Introduction.
Centre of origin/diversity.
Modes of reproduction and apomixes and its genetic consequences.

UNIT II

Concepts of population genetics and Hardy-Weinberg Law.
Self-incompatibility and male-sterility.
Genetics in relation to plant breeding; Components of Genetic variation.
Heritability and genetic advance.

UNIT III

Genetic basis and breeding methods in self pollinated crops- mass selection and pure line selection, hybridization techniques and handling of segregating population. Multiline concept.

UNIT IV

Heterosis and inbreeding depression. Development of inbred lines and hybrids, composite and synthetic varieties. Genetic basis and methods of breeding for cross pollinated crops, modes of selection. Population improvement Schemes- Ear to row method, Modified Ear to Row method, Recurrent selection schemes.

UNIT V

Breeding methods in asexually propagated crops- clonal selection and hybridization. Wide hybridization and pre-breeding. Polyploidy in relation to plant breeding. Mutation breeding-methods and uses. Breeding for important biotic and abiotic stresses. Biotechnological tools-DNA markers and marker assisted selection. Participatory plant breeding; Intellectual Property Rights, Patenting, Plant Breeders and & Farmer's Rights. Maintenance of breeding records and data collection.

Reference books:

1. Essentials of Plant Breeding– Phundan Singh
2. Principles & Methods of Plant breeding- Dr.B.D Singh

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Semester – III

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B. Sc. (Hons.) Agriculture	Agricultural Finance and co-operation	BAG-5303	2-3 hours	3

Course Outcomes

CO1 Familiar with Basics of Agriculture Finance & importance of Credit in Agriculture

CO2 Acquainted with the knowledge concerning Sources of Agriculture Finance institutions as well as micro-finance schemes and about the functioning of higher financing institutions.

CO3 Acquainted with the Balance Sheet (Assests & Liabilities) and Income Statement (Profit & loss account)

CO4 Understanding the fundamentals of Techno-economic parameters for preparation of project report as well as SWOT analysis of an enterprise.

CO5 Understand the significance of cooperatives in Indian agriculture.

CO6 Exposure of commercial bank, cooperative bank and cooperative society to acquire first hand knowledge of their management, schemes and procedures.

THEORY

UNIT I

Agricultural Finance- meaning, scope and significance, credit needs and its role in Indian agriculture. Agricultural credit: meaning, definition, need, classification. Credit analysis: 4 R's, and 3C's of credits.

UNIT II

Sources of agricultural finance: institutional and non-institutional sources, commercial banks, social control and nationalization of commercial banks, 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, Insurance and Credit Guarantee Corporation of India. Cost of credit. Recent development in agricultural credit.

UNIT III

Preparation and analysis of financial statements – Balance Sheet and Income Statement. Basic guidelines for preparation of project reports- Bank norms – SWOT analysis.

UNIT IV

Agricultural Cooperation – Meaning, brief history of cooperative development in India, objectives, principles of cooperation, significance of cooperatives in Indian agriculture.

UNIT V

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.

Reference books:

1. Agricultural economics-S.Subba Reddy, P.Raghu Ram Oxford. Publish.
2. Handbook of Agriculture-ICAR

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Semester – III

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B. Sc. (Hons.) Agriculture	Agri-Informatics	BAG-5304	2-3 hours	2

Course Outcomes

CO1 Familiar with Computer basics.
CO2 Familiar with Internet & basic programming language.
CO3 Knowledge of Use of Information Computer Technology in Agriculture
CO4 Knowledge of IT application for Agri-input management
CO5 Knowledge about Geospatial technology for generating valuable agri-information.

THEORY

UNIT I
Introduction to Computers, Operating Systems, definition and types, Applications of MSOffice for document creation & Editing, Data presentation, interpretation and graph creation, statistical analysis, mathematical expressions,

UNIT II
Database, concepts and types, uses of DBMS in Agriculture, World Wide Web (WWW): Concepts and components. Introduction to computer programming languages, concepts and standard input/output operations.

UNIT III
e-Agriculture, concepts and applications, Use of ICT in Agriculture. Computer Models for understanding plant processes.

UNIT IV
IT application for computation of water and nutrient requirement of crops, Computer-controlled devices (automated systems) for Agri-input management, Smartphone Apps in Agriculture for farm advises, market price, postharvest management etc;

UNIT V

Geospatial technology for generating valuable agri-information.Decision support systems, concepts, components and applications in Agriculture, Agriculture Expert System, Soil Information Systems etc for supporting Farm decisions. Preparation of contingent crop-planning using IT tools.

References books:

Introductory Agri-Informatics-, Subrat K. Mahapatra, Subrata K. Mohanty, Jwel Bhuiya & Jayashankar Pradhan

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Semester – III

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.Sc.(Hons.) Agriculture	Farm Machinery and Power	BAG-5305	2-3 hours	2

Course Outcomes

CO1 Familiar with Farm power & sources of farm power in India.
CO2 Getting knowledge about Two Stroke and Four Stroke Engines, Working Principles, Applications- Types, Power and Efficiency
CO3 Getting Familiar with different systems of I.C. engines
CO4 Familiar with Power transmission systems
CO5 Familiar with Primary & Secondary tillage implements concerning with farm machinery.

THEORY

UNIT I
Status of Farm Power in India, Sources of Farm Power

UNIT II
I.C. engines, working principles of I C engines, comparison of two stroke and four stroke cycle engines, Study of different components of I.C. engine, I.C. engine terminology and solved problems

UNIT III
Familiarization with different systems of I.C. engines: Air cleaning, cooling, lubrication,fuel supply and hydraulic control system of a tractor

UNIT IV
Familiarization with Power transmission system: clutch, gear box, differential and final drive of a tractor, Tractor types, Cost analysis of tractor power and attached implement,

UNIT V

Familiarization with Primary and Secondary Tillage implement, Implement for hill agriculture, implement for intercultural operations, Familiarization with sowing and planting equipment, calibration of a seed drill and solved examples, Familiarization with Plant Protection equipment, Familiarization with harvesting and threshing equipment.

Reference books:

1. Farm Machinery –Jagdiswar Sahay
2. Handbook of Agricultural Engineering-ICAR
3. Radhey Lal & A.C Dutta-Agricultural Engineering.

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Semester – III

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.Sc.(Hons.) Agriculture	Production Technology for Vegetables and Spices	BAG-5306	2-3 hours	2

Course Outcomes

CO1 Capable to identify different vegetables & spice crops and their seeds. Become aware about Importance of vegetables & spices in human nutrition.
CO2 Getting knowledge about scientific production technology of different vegetables.
CO3 Knowledge of morphological characters of different vegetables & spices.
CO4 Getting acquainted with basic fertilizers application methods, organic manures and bio-fertilizers in Vegetables.
CO5 Practical Knowledge regarding Harvesting & preparation for market.
CO6 Knowledge about Economics of vegetables and spices cultivation.

THEORY

UNIT I

Importance of vegetables & spices in human nutrition and national economy, kitchen gardening. 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, physiological disorders, of important vegetable and spices: Tomato, Brinjal, Chilli, Capsicum.

UNIT II

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, physiological disorders :Cucumber, Melons, Gourds, Pumpkin,

UNIT III

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, physiological disorders : French bean, Peas;

UNIT IV

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, physiological disorder: Cole crops such as Cabbage, Cauliflower, Knol-khol

UNIT V

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, physiological disorder: Bulb crops such as Onion, Garlic; Root crops such as Carrot, Radish, Beetroot; Tuber crops such as Potato; 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, physiological disorder: Leafy vegetables such as Amaranth, Palak. Perennial vegetables.

Reference books:

1. Textbook of Vegetables, Tuber crops and Spices - Tech.Editors-S.Thamburaj & Narendra Singh Publ. by –ICAR New Delhi.
2. Handbook of Horticulture-ICAR

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Semester – III

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B. Sc. (Hons.) Agriculture	Environmental Studies and Disaster Management	BAG-5307	2-3 hours	3

Course Outcomes

CO1 Familiar with the concepts of natural resources like forest resource, water resource, food resources, mineral resources and land resource. Concept of Non Conventional energy resources, types and various applications of renewable resources and current potentials of energy resources. Role of an individual in conservation of natural resources.

CO2 Become aware for environmental pollution and its causes as well as become aware about environmental protection acts.

CO3 Aware about Ecosystem concept and different ecosystems. Ecosystem Links between environmental components and their role and types of ecosystems. As well as gain knowledge about the threats to biodiversity & its conservation principles.

CO4 Acquainted with the principles of natural resource management for sustainable development. Awareness with respect to social development and welfare issues.

CO5 Meaning and nature of natural disasters, their types and effects and management Aware for safer and disaster resilient approach, holistic, pro-active, technology driven and sustainable development strategy that involves all stakeholders and fosters a culture of prevention, preparedness and mitigation and disaster management protocols.

THEORY

UNIT I

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, water logging, salinity, case studies. e) Energy resources: Growing energy needs, renewable and nonrenewable energy sources, use of alternate energy sources. Case studies. 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 life styles.

UNIT II

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. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness.

UNIT III

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. Biodiversity at global, National and local levels, India as a mega-diversity nation. Hot-sports 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.

UNIT IV

Social Issues and the Environment: From Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management. Environmental ethics: Issues and possible solutions, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. dies. Wasteland reclamation. Consumerism and waste products. Human Population and the Environment: population growth, variation among nations, population explosion, Family Welfare Programme. Environment and human health: Human Rights, Value Education, HIV/AIDS. Women and Child Welfare. Role of Information Technology in Environment and human health.

UNIT V

Natural Disasters- Meaning and nature of natural disasters, their types and effects. Floods, drought, cyclone, earthquakes, landslides, avalanches, volcanic eruptions, Heat and cold waves, Climatic change: global warming, Sea level rise, ozone depletion. Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, air pollution, water pollution, deforestation, industrial waste water pollution, road accidents, rail accidents, air accidents,

sea accidents. Disaster Management- Effect to migrate natural disaster at national and global levels. International strategy for disaster reduction. Concept of disaster management, national disaster management framework; financial arrangements; role of NGOs, community –based organizations and media. Central, state, district and local administration; Armed forces in disaster response; Disaster response; Police and other organizations.

Reference books:

1. Perspectives in Environmental studies-Anubha Kaushik & C.P Kaushik (New Age Int.Publ.)

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Semester – III

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B. Sc. (Hons.) Agriculture	Statistical Methods	BAG-5308	2-3 hours	2

Course Outcomes

CO1 Acquaintance with some basic concepts of statistics & its Applications in Agriculture

CO2 Familiar with some elementary statistical methods like Probability , Binomial & Poisson Distributions

CO3 Acquiring knowledge of Correlation, Scatter Diagram. Karl Pearson's Coefficient of Correlation

CO4 Introduction to Test of Significance,

CO5 Analysis of data pertaining to attributes and to interpret the results.

THEORY

UNIT I

Introduction to Statistics and its Applications in Agriculture, Graphical Representation of Data, Measures of Central Tendency & Dispersion.

UNIT II

Definition of Probability, Addition and Multiplication Theorem (without proof). Simple Problems Based on Probability. Binomial & Poisson Distributions.

UNIT III

Definition of Correlation, Scatter Diagram. Karl Pearson's Coefficient of Correlation. Linear Regression Equations.

UNIT IV

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 V

Introductions to Analysis of Variance, Analysis of One Way Classification. 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.

Reference books:

Statistical methods for Agricultural workers-V.G Panse & Sukhatame

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Semester – III

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B. Sc. (Hons.) Agriculture	Livestock and Poultry Management	BAG-5309	2-3 hours	2

Course Outcomes

CO1 Knowledge about role of livestock in national economy, their housing and care management as well as management of calves, growing heifers and milch animals

CO2 Gain knowledge on different breeds of Livestocks , management of cattle's, buffalo, sheep , goat swine and poultry .Milking methods, Artificial insemination & their feed management

CO3 Knowledge about Prevention (including vaccination schedule) and control of important diseases of livestock and poultry

THEORY

UNIT I

Role of livestock in the national economy. Reproduction in farm animals and poultry. Housing principles, space requirements for different species of livestock and poultry. Management of calves, growing heifers and milch animals.

UNIT II

Management of sheep, goat and swine. Incubation, hatching and brooding. Management of growers and layers.

UNIT III

Important Indian and exotic breeds of cattle, buffalo, sheep, goat, swine and poultry. Improvement of farm animals and poultry.

UNIT IV

Digestion in livestock and poultry. Classification of feedstuffs. Proximate principles offeed.Nutrients and their functions. Feed ingredients for ration for livestock and poultry. Feed supplements and feed additives.

UNIT V

Feeding of livestock and poultry. Introduction of livestock and poultry diseases. Prevention (including vaccination schedule) and control of important diseases of livestock and poultry.

Reference books:

1. Animal Husbandary- Jagdish Prasad
2. A text book of Livestock production & Management-V.N Gautam, Sadhana Shrivastava

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Semester – IV

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.Sc. (Hons.) Agriculture	Crop Production Technology –II (Rabi Crops)	BAG-5401	2-3 hours	2(1+1)

Course outcome

CO1 Knowledge about different Rabi crops
CO2 Know various agronomical practices viz., crop variety, crop family, field preparation, seed treatment etc.
CO3 Know about different sowing methods
CO4 Identification of different growth stages of crops viz.,tillering,branching,flowering etc.
CO5 Knowledge about fertilizers and its application methods
CO6 Identification of different weeds in Rabi season and its control methods
CO7 Yield contributing characters of Rabi season crops viz.,no of ear head, pods/ branches, no of seeds per tiller/branch etc.

THEORY

UNIT I

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Rabi crops; wheat and chickpea, mustard, berseem.

UNIT II

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Barley, lentil, peas, sugarcane.

UNIT III

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Rapeseed, sunflower and oat.

UNIT IV

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of lucerne and Citronella

UNIT V

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Mentha and Lemon grass.

PRACTICAL

Sowing methods of wheat and sugarcane, identification of weeds in *rabi* season 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 rabi forage experiments, oil extraction of medicinal crops, visit to research stations of related crops.

References books:

1. Rabi crop production by O.P.Ahelawaht
2. Fundamentals of Agronomy by S Reddy

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Semester – IV

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.Sc. (Hons.) Agriculture	Production Technology for Ornamental Crops, MAPs and Landscaping	BAG-5402	2-3 hours	2(1+1)

Course outcome

CO1 dentification of ornamental crops and their varieties
CO2 Identification of medicinal and aromatic plants and their species
CO3 Knowledge about cut flowers like rose, gerbera, carnation, lilium etc.
CO4 Practice about bed preparation, seeds/ planting material treatments etc.
CO5 Planning and layout of garden
CO6 Knowledge about protected structure like low tunnel, shed net, polyhouse etc.
CO7 Knowledge about fertilizer application methods
CO8 Practices about different irrigation methods
CO9 Knowledge about harvesting time and interval

THEORY

UNIT I

Importance and scope of ornamental crops, medicinal and aromatic plants and landscaping. Principles of landscaping. Landscape uses of trees, shrubs and climbers.

UNIT II

Production technology of important cut flowers like rose, gerbera, carnation, lilium and orchids under protected conditions and gladiolus, tuberose, chrysanthemum under open conditions.

UNIT III

Package of practices for loose flowers like marigold and jasmine under open conditions.

UNIT IV

Production technology of important medicinal plants like ashwagandha, asparagus, aloe, costus, Cinnamomum, periwinkle, isabgoland aromatic plants like mint, lemongrass, citronella, palmarosa, ocimum, rose, geranium, vetiver.

UNIT V

Processing and value addition in ornamental crops and MAPs produce.

PRACTICAL

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.

Reference book

Hand book of Horticulture-by ICAR

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Semester – IV

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.Sc. (Hons.) Agriculture	Renewable Energy and Green Technology	BAG-5403	2-3 hours	2(1+1)

Course outcome

CO1 Understand the various forms of conventional energy resources.
CO2 Explain the concept of various forms of renewable energy
CO3 Identification of solar cooker, solar water heater, solar drying, solar pond, solar pump, solar light, solar distillation etc.
CO4 Compare Solar, Wind and bio energy systems, their prospects, Advantages and limitations.
CO5 Understand the concept of Biomass energy resources and their classification, types of biogas Plants- applications

THEORY

UNIT I

Classification of energy sources, contribution of these of sources in agricultural sector

UNIT II

Familiarization with biomass utilization for biofuel production and their application, Familiarization with types of biogas plants and gasifiers, biogas, bioalcohol, biodiesel and bio-oil production and their utilization as bioenergy resource

UNIT III

Introduction of solar energy, collection and their application

UNIT IV

Familiarization with solar energy gadgets: solar cooker, solar water heater, application of solar energy: solar drying, solar pond, solar distillation, solar photovoltaic system and their application,

UNIT V

Introduction of wind energy and their application.

PRACTICAL

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, and solar fencing. To study solar cooker, to study solar drying system. To study solar distillation and solar pond.

References books

1. Renewable Energy Resources, by Twidell, John.
2. Renewable Energy Sources and Emerging Technologies, by Kothari, D. P.

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Semester – IV

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.Sc. (Hons.) Agriculture	Problematic Soils and their Management	BAG-5404	2-3 hours	2(2+0)

Course outcome

CO1 The students get knowledge about different kind of problem soil in India and there characteristics.
CO2 The students will understand how to control or improve the soil fertility.
CO3 The students gain practical knowledge of laboratory to test the problem soil.
CO4 The students get knowledge about Irrigation water and it quality.

THEORY

UNIT I

Soil quality and health, Distribution of waste land and problem soils in India. Their categorization based on properties.

UNIT II

Irrigation water – quality and standards, utilization of saline water in agriculture.

UNIT III

Reclamation and management of saline and sodic soils, Acid soils, Acid Sulphate soils, Eroded and Compacted soils, Flooded soils, Polluted soils.

UNIT IV

Remote sensing and GIS in diagnosis and management of problem soils. Problematic soils under different Agro-ecosystems.

UNIT V

Multipurpose tree species, bio remediation through MPTs of soils, land capability and classification, land suitability classification.

References books

1. Fundamental of Soil science ICAR Publication
2. D.K. Das Kalyani publications

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Semester – IV

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.Sc. (Hons.) Agriculture	Production Technology for Fruit and Plantation Crops	BAG-5405	2-3 hours	2(1+1)

Course outcome

CO1 To impart knowledge on the principles of horticulture, propagation and production techniques of tropical, sub-tropical, temperate fruit and plantation crops.

CO2 Hands on training on various propagation methods and important cultural practices for major fruit and plantation crops will be provided.

THEORY

UNIT I

Importance and scope of fruit and plantation crop industry in India; Importance of rootstocks; Production technologies for the cultivation of major fruits-mango, banana,

UNIT II

Production technology for citrus, grape, guava, litchi, papaya.

UNIT III

Production technology for sapota, apple, pear, peach, walnut, almond.

UNIT IV

Production technology for minor fruits- date, ber, pineapple, pomegranate, jackfruit, strawberry,

UNIT V

Production technology for 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.

References books

1. Production Technology of Fruit Crops by Prasad S, Bhardwaj RL
2. Fundamentals and Production Technology of Fruit Crops in India by Prakash P. Deshmukh

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Semester – IV

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.Sc. (Hons.) Agriculture	Principles of Seed Technology	BAG-5406	2-3 hours	3(2+1)

Course outcome

CO1 The students will gain knowledge about the various techniques of quality seed production, processing and seed quality enhancement

CO2 Develop an understanding of seed development, germination, vigor, deterioration and the relationship between laboratory tests and field performance.

CO3 Understand seed increase systems, seed testing and the laws and regulations related to marketing high quality seed.

THEORY

UNIT I

Difference between seed and grain, Quality seed and its importance in Agriculture, Core Concept of seed quality, Seed technology; definitions, objectives and its role in increasing agricultural production. Seed improvement programmes in India and Madhya Pradesh. Generation system of seed production-Nucleus seed breeder seed, foundation seed, certified seed and truthfully levelled seed.

UNIT II

Reproduction process in crop plants; sexual and asexual reproduction, apomixes. Seed formation and development. Seed replacement and multiplication rates. Seed demand forecasting.

Principles of seed production. Maintenance of genetic purity causes of varietal deterioration and its control.

UNIT III

Male sterility- concepts and its use in hybrid seed production; inbred and non-inbred lines. Nucleus and Breeder seed production of newly released and established varieties of self pollinated crops like rice, wheat, soybean, chickpea, pigeon pea, rapeseed, mustard etc. Foundation and Certified seed production of maize hybrids, single and double cross hybrids. Hybrid seed production of rice, sunflower, sorghum and pearl millet using male sterility system. Latest released hybrids, their parentage and characteristics. Foundation and Certified seed production of wheat, rice, soybean, grams, sunflower, pigeon pea, groundnut, castor, cotton etc. Foundation and Certified seed production of some important vegetables like onion, brinjal, chillies, tomato, okra and gourds etc.

UNIT IV

Seed Certification- its concepts, role, goals and procedure. Seed certification agencies. Minimum certification standards for self and cross pollinated crops. Field and seed inspection, its objectives. Seed Act and Seed Rules; Seed Legislation and Seed Law Enforcement, Seed Control Orders, Seed Policies, Seed Bills, WTO, IPR, PBR in India and recent development in Indian Seed Industry.

UNIT V

Seed quality regulations; seed processing-cleaning, grading seed treatment methods, bagging and storage, factors affecting seed quality in storage, storage pests and disease control. Orthodox and recalcitrant seeds. Seed testing- principles and methods of sampling, purity analysis, seed moisture, germination, viability and vigor test. Cultivar purity testing- ODV, electrophoresis and grow-out tests for seed genetic purity, seed health etc. Seed dormancy; types, causes and breaking methods. Seed marketing, organizations, seed pricing, promotion of quality seeds and seed marketing strategies etc.

PRACTICAL

Study of reproductive systems in crop plants-floral biology, pollination and fertilization.**,** Classification of seeds based on their usage, preparation of seed album, Study of seed structure in monocots and dicots, Study of seed production in major crops- MS lines, pollen shedders, off-types, emasculation and pollination techniques.**,** Study of seed processing equipment- plan and layout, Study of seed testing equipment, seed testing methods- seed sampling, seed purity test, seed moisture, seed germination tests, seed viability and vigor, seed health tests etc., Seed dormancy breaking methods.**,** Visit to seed production plots**,** Visit to seed processing plants, public and private seed enterprises.

References books

1. Principles of Seed Science and Technology by Copeland, Lawrence O., McDonald, Miller
2. Principles of Seed Technology by P.K. Agrawal

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Semester – IV

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.Sc. (Hons.) Agriculture	Farming System & Sustainable Agriculture	BAG-5407	2-3 hours	1(1+0)

Course outcome

CO1 Students will know different cropping and farming system like integrated farming system (IFS).

CO2 To get knowledge on sustainable agricultural practices such as organic farming.

CO3 A solid understanding of the cross-cultural interactions and exchange that linked the world's people and facilitated agricultural development is also expected.

THEORY

UNIT I

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 II

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 III

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, Integrated farming system-historical background, objectives and characteristics, components of IFS and its advantages.

UNIT IV

Site specific development of IFS model for different agro-climatic zones, resource use efficiency and optimization techniques, Resource cycling and flow of energy in different farming system, farming system and environment.

UNIT V

Visit of IFS model in different agro-climatic zones of nearby states University/ institutes and farmers field.

References books

Cropping System and Sustainable Agriculture by Dr. S C Panda

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Semester – IV

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.Sc.(Hons.) Agriculture	Agricultural Marketing Trade & Prices	BAG-5408	2-3 hours	3(2+1)

Course outcome

CO1 To know about Agricultural Marketing: Concepts and definitions of market, marketing, agricultural marketing, market structure, marketing mix and market segmentation, classification and characteristics of agricultural markets

CO2 To study of Demand, supply and producer's surplus of agri-commodities

CO3 Know about Product life cycle (PLC) and competitive strategies: Meaning and stages in PLC; characteristics of PLC; strategies in different stages of PLC

CO4 To study Marketing process and functions: Marketing process concentration, dispersion and equalization; exchange functions – buying and selling

CO5 Meaning, definition and types of market integration; marketing efficiency; marketing costs, margins and price spread

CO6 Know more about Role of Govt. in agricultural marketing: Public sector institutions-CWC, SWC, FCI, CACP & DMI – their objectives and functions.

C07 Risk in marketing: Types of risk in marketing; speculation & hedging; an overview of futures trading; Agricultural prices and policy: Meaning and functions of price.

THEORY

UNIT I

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.

UNIT II

producer's 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:

UNIT III

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 labelling (Agmark); Market functionaries and marketing channels: Types and importance of agencies involved in agricultural marketing.

UNIT IV

Meaning and definition of marketing channel; number of channel levels; marketing channels for different farm products; 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:

UNIT V

Public sector institutions- CWC, SWC, FCI, CACP & DMI – their objectives and functions; cooperative marketing in India; 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.

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 and marketed surplus of important commodities; Study of price behaviour over time for some selected commodities; Construction of index numbers; Visit to a local market to study various marketing functions performed by different agencies, identification of marketing channels for selected commodity, collection of data regarding marketing costs, margins and price spread and presentation of report in the class; Visit to market institutions – NAFED, SWC,

CWC, cooperative marketing society, etc. to study their organization and functioning; Application of principles of comparative advantage of international trade.

References books

1. Agricultural Marketing in India – by S. S. Acharya and N. L. Agarwal. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi
2. Agricultural Price Analysis - by S. S. Acharya and N. L. Agarwal. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi

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Semester – IV

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.Sc. (Hons.) Agriculture	Introductory Agro-meteorology & Climate Change	BAG-5409	2-3 hours	2(1+1)

Course outcomes

CO1 To introduce agro meteorology (definitions, aims, scope and importance)
CO2 To understand roles of agro meteorology in agriculture and its relation to other areas of agriculture.
CO3 To learn different metrological parameters like rainfall, temperature, RH and other weather parameters.
CO4 Studies the characteristics, behaviour or phenomenon of the atmosphere.
CO5 Studies the changes of individual weather elements. (Such as temperature).

THEORY

UNIT I

Agricultural Meteorology- Introduction, definition of meteorology, scope and practical utility of Agricultural meteorology. Composition and structure of atmosphere and definition of weather and climate, aspects involved in weather and climate, atmospheric temperature, soil temperature, solar radiation, atmospheric pressure, atmospheric humidity, evaporation and transpiration, monsoons, rainfall, clouds, drought, weather disasters and their management atmospheric pollution and role of meteorology.

UNIT II

Basics of weather forecasting. Climate change-causes. Global warming-causes and remote sensing. Effect of climate change on horticulture Past and future changes in greenhouse gases within the atmosphere. Sources and sinks for greenhouse gases. Atmospheric chemistry. Plants sense and respond to changes in CO2 concentration.

UNIT III

Measurement of short-term effects and mechanisms underlying the observed responses in C3 and C4 species. plant development affected by growth in elevated CO2. Physiology of rising CO2 on nitrogen use and soil fertility, its implication for production. Methodology for studying effect of CO2. Change in secondary metabolites and pest disease reaction of plants.

UNIT IV

The mechanisms of ozone and UV damage and tolerance in plants. Increased temperature and plants in tropical/sub-tropical climates- effect on growing season, timing of flowering, duration of fruit development and impacts on crop yields and potential species ranges, interaction of temperature with other abiotic/biotic stress. Mitigation strategies and prospects for genetic manipulation of crops to maximize production in the future atmosphere.

UNIT V

Modifying Rubisco, acclimation, metabolism of oxidizing radicals, and sink capacity as potential strategies.

PRACTICAL

Site selection for Agromet observatory; Measurement of temperature; Measurement of rainfall; Measurement of evaporation (atmospheric/soil); Measurement of atmospheric pressure; Measurement of sunshine duration and solar radiation; Measurement of wind direction and speed and relative humidity; Study of weather forecasting and synoptic charts. Visit to Meteorological observatory, Visit to IMD meteorological observatory-Lay out plan of standard meteorological observatory. Recording of air and soil temperature. Measurement of radiation and components, Measurement of rainfall-different types of rain gauges, Measurement of wind speed and direction and atmospheric humidity, Recording of evaporation. Synoptic charts and weather reports, symbols, etc.

References Books

1. Agricultural Meteorology by Rao and Prasada
2. Textbook of Agricultural Meteorology by M C Varshneya
3. Agricultural Meteorology, the Effect of Weather on Crops by J W B 1863 Smith

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Semester – IV

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.Sc. (Hons.) Agriculture	Weed Management (Elective Course)	BAG-5410	2-3 hours	3(2+1)

Course outcomes

CO1 Discuss the place of weeds in agriculture.

CO2 Classify weeds based on different characteristics

CO3 Planning for their control, control options, surveillance, herbicide trials

CO4 Understand about control methods and use of herbicides

CO5 Approaches to weed management

CO6 Planning for weed management and weed management processes

THEORY

UNIT I

Introduction to weeds, characteristics of weeds their harmful and beneficial effects on ecosystem.

UNIT II

Classification, reproduction and dissemination of weeds. Herbicide classification, concept of

adjuvant, surfactant, herbicide formulation and their use. Introduction to mode of action of herbicides and selectivity.

UNIT III

Allelopathy and its application for weed management. Bio-herbicides and their application in agriculture.

UNIT IV

Concept of herbicide mixture and utility in agriculture. Herbicide compatibility with agro-chemicals and their application.

UNIT V

Integration of herbicides with nonchemical methods of weed management. Herbicide Resistance and its management.

PRACTICAL

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 equipment's. Calculations of herbicide doses and weed control efficiency and weed index.

Reference books

1. Weed Management Principles And Practices- 2011 by Gupta
2. Principles of Agronomy by Reddy G.H. Shankara Reddy T. Yallamanda

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Semester – V

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.Sc. (Hons.) Agriculture	Principles of Integrated Pest and Disease Management	BAG-5501	2-3 hours	3(2+1)

Course outcomes

CO1 To know Insect Vectors transmitting plant diseases.
CO2 Knowledge of Insect Control Methods.
CO3 To know about Plant Protection equipment's.

THEORY

UNIT I

Categories of insect pests and diseases, IPM: Introduction, history, importance, concepts, principles and tools of IPM.

UNIT II

Economic importance of insect pests, diseases and pest risk analysis. Methods of detection and diagnosis of insect pest and diseases. Calculation and dynamics of economic injury level and importance of Economic threshold level.

UNIT III

Methods of control: 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.

UNIT IV

Survey surveillance and forecasting of Insect pest and diseases. Development and validation of IPM module.

UNIT V

Implementation and impact of IPM (IPM module for Insect pest and disease. Safety issues in pesticide uses. Political, social and legal implication of IPM. Case histories of important IPM programmers.

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 (agro ecosystem) 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 farmers' fields.

Reference Books:

1. Dhaliwal, G.S. and Ramesh Arora 2001. Integrated pest management: Concepts and approaches, Kalyani Publishers, Ludhiana
2. Metcalf, R.L. and Luckman, W.H.1982. Introduction to insect pest management Wiley inter science publishing, New York.Larry P Pedigo 1991. Entomology and pest management, P
3. rentice Hall of India Pvt. Ltd., New Delhi

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Semester – V

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.Sc. (Hons.) Agriculture	Manures,Fertilizers and Soil Fertility Management	BAG-5502	2-3 hours	3(2+1)

Course outcomes

CO1 To impart knowledge on soil essential nutrients and nutrient transformations in Soil.To know the soil fertility management.

CO2 The knowledge gained by students through this course will be useful in making decisions on nutrient dose, choice of fertilizers/manures and method of application etc.

CO3 The students will also gain confidence in managing soil health for sustained productivity.

THEORY

UNIT I

Introduction and importance of organic manures, properties and methods of preparation of bulky and concentrated manures.Green/leaf manuring. Fertilizer recommendation approaches. Integrated nutrient management.

UNIT II

Chemical fertilizers: classification, composition and properties of major nitrogenous, phosphatic,

potassic fertilizers, secondary & micronutrient fertilizers, Complex fertilizers, nano fertilizers Soil amendments, Fertilizer Storage, Fertilizer Control Order.

UNIT III

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.

UNIT IV

Chemistry of soil nitrogen, phosphorus, potassium, calcium, magnesium, sulphur and micronutrients. Soil fertility evaluation, Soil testing. Critical levels of different nutrients in soil.

UNIT V

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.

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 insoils, Estimation of N in plants, Estimation of P in plants, Estimation of K in plants, Estimation of S in plants.

Reference books

1. Introductory Soil Science (2013) by D.K. Das, Kalyani Publishers, New Delhi.
2. Manures and Fertilizers (2009) by P. C. Das, Kalyani Publishers, New Delhi.

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Semester – V

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.Sc. (Hons.) Agriculture	Pests of Crops and Stored Grains and their Management	BAG-5503	2-3 hours	3(2+1)

Course outcomes

CO1 Students will know about pest of crops and stored grains like cereals, pulses, oilseeds and their management.
CO2 Comprehend grain store management.
CO3 Assess losses created due to insect pests in crops and recommend control measures

THEORY

UNIT I

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.

UNIT II

Management of major pests and scientific name, order, family, host range, distribution, nature of

damage and control practice other important arthropod pests of various field crop, vegetable crop.

UNIT III

Management of major pests and scientific name, order, family, host range, distribution, nature of damage and control practice other important arthropod pests of various fruit crop, plantation crops, ornamental crops, spices and condiments.

UNIT IV

Factors affecting losses ofstored grain and role of physical, biological, mechanical and chemical factors in deterioration of grain.

UNIT V

Insect pests, mites, rodents, birds and microorganisms associated with stored grain and their management. Storage structure and methods of grain storage and fundamental principles of grain store management.

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 god owns.

Reference books.

1. Crop Pests and Stored Grain Pests and Their Management by TNAU.
2. Pests of Stored Grains and Their Management by M. C. Bhargava, K. C. Kumawat

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B.Sc. (HONS) AGRICULTURE

New Scheme Based On ICAR Flexible Curriculum

Semester – V

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.Sc. (Hons.) Agriculture	Diseases of Field and Horticultural Crops and their Management -I	BAG-5504	2-3 hours	3(2+1)

Couse outcomes

CO1 Students will learn diseases of various Field crops and Horticultural crops and to know their management practices.

THEORY

UNIT I

Horticultural Crops: Guava: wilt, anthracnose; Banana: Panama wilt, bacterial wilt, Sigatoka and bunchy top , Papaya: foot rot, leafcurl and mosaic, Pomegranate: bacterial blight; Cruciferous vegetables: Alternaria leaf spot andblack rot; Brinjal: Phomopsis blight and fruit rot and Sclerotinia

blight; Tomato: damping off,wilt, early and late blight, buck eye rot and leaf curl and mosaic; Okra: Yellow Vein Mosaic

UNIT II

Beans:anthracnose and bacterial blight; Ginger: soft rot; Colocasia: Phytophthora blight; Coconut: wiltand bud rot; Tea: blister blight; Coffee: rust

UNIT III

Symptoms, etiology, disease cycle and management of major diseases of following crops: Field Crops: Rice: blast, brown spot, bacterial blight, sheath blight, false smut, khairaandtungro;Maize: stalk rots, downy mildew, leaf spots; Sorghum: smuts, grain mold and anthracnose,Bajra :downy mildew and ergot; Groundnut: early and late leaf spots, wilt

UNIT IV

Soybean: Rhizoctonia blight, bacterial spot, seed and seedling rot and mosaic; Pigeonpea:Phytophthora blight, wilt and sterility mosaic;

UNIT V

Finger millet: Blast and leaf spot; black &greengram: Cercospora leaf spot and anthracnose, web blight and yellow mosaic; Castor: Phytophthorablight;Tobacco: black shank, black root rot and mosaic.

PRACTICAL

Identification and histopathological studies of selected diseases of field and horticulturalcrops covered in theory. Field visit for the diagnosis of field problems. Collection and preservationof plant diseased specimens for Herbarium; Note: Students should submit 50 pressed and well-mounted specimens.

Reference books.

1. Diseases of Field and Horticultural Crops and their Management by Dhananjay Kathal
2. Diseases Of Field And Horticultural Crops by P. Chowdappa

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Semester – V

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.Sc. (Hons.) Agriculture	Crop Improvement-I (Kharif Crops)	BAG-5505	2-3 hours	2(1+1)

Course outcomes:

CO1 Students will deploy different methods of plant breeding like pure line selection, mass selection, pedigree method and other hybrid crop varieties production for special crop improvement.

CO2 Crop improvement may be for drought resistance, high yield, pest and disease resistance.

THEORY

UNIT I

Plant genetic resources; its utilization and conservation.Study of genetics of qualitative and quantitative characters.

UNIT II

Important concepts of breeding self pollinated, cross pollinated and vegetative propagated crops. Floral biology, emasculation, pollination, centers of origin, distribution of species, wild relatives of different cereals and pulses of *kharif* season.

UNIT III

Floral biology, emasculation, pollination, centers of origin, distribution of species, wild relatives of different oilseeds, fibres, fodders and cash crops, vegetable and horticultural crops of *kharif* season.

UNIT IV

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) of different *kharif* crops.

UNIT V

Hybrid seed production technology in rice, maize, sorghum, pearl millet and pigeon pea. Ideotype concept and climate resilient crop varieties for future.

PRACTICAL

Floral biology, emasculation and hybridization techniques in different crop species viz., Rice, Jute, Maize, Sorghum, Pearl millet, Ragi, Pigeonpea, Urdbean, Mungbean, Soybean, Groundnut, Seasame, Caster, Cotton, Cowpea, Tobacco, Brinjal, Okra and Cucurbitaceous crops., Maintenance breeding of different *kharif* crops., Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods., Study of field techniques for seed production and hybrid seeds production in *Kharif* 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.

Reference books.

1. Practical manual on crop improvement-I (Kharif) by S.K. Kataria and Sons.
2. Crop improvement –I (Kharif crops) by Dr. Omkar Singh

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Semester – V

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.Sc. (Hons.) Agriculture	Entrepreneurship Development and Business Communication	BAG-5506	2-3 hours	2(1+1)

THEORY

UNIT I

Concept of Entrepreneur, Entrepreneurship Development, Characteristics of entrepreneurs;

UNIT II

SWOT Analysis & achievement motivation, Government policy and programs and institutions for entrepreneurship development, Impact of economic reforms on Agribusiness/ Agrienterprises,

UNIT III

Entrepreneurial Development Process; Business Leadership Skills; Developing organizational skill (controlling, supervising, problem solving, monitoring & evaluation),

UNIT IV

Developing Managerial skills, Business Leadership Skills (Communication, direction and motivation Skills), Problem solving skill, Supply chain management and Total quality management,

UNIT V

Project Planning Formulation and report preparation; Financing of enterprise, Opportunities for agri entrepreneurship and rural enterprise.

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.

Reference books.

1. Entrepreneurship Development in Agriculture by Rashmi Singh
2. Entrepreneurship Development and Small Business Enterprises by Poornima M. Charantimath

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Semester – V

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.Sc. (Hons.) Agriculture	Geo-informatics and Nano-technology and Precision Farming	BAG-5507	2-3 hours	2(1+1)

Course outcomes

CO1 Students will know about applications of GIS in agriculture which will help them to forecast for precision farming.

THEORY

UNIT I

Precision agriculture: concepts and techniques; their issues and concerns for Indian agriculture, Geo-informatics- definition, concepts, tool and techniques; their use in Precision Agriculture.

UNIT II

Crop discrimination and Yield monitoring, soil mapping; fertilizer recommendation using geospatial technologies; Spatial data and their management in GIS;

UNIT III

Remote sensing concepts and application in agriculture; Image processing and interpretation; Global positioning system (GPS), components and its functions;

UNIT IV

Introduction to crop Simulation Models and their uses for optimization of Agricultural Inputs; STCR approach for precision agriculture;

UNIT V

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.

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.

Reference books.

A Textbook on Geoinformatics, Nanotechnology and Precision Farming by Tarun Kumar Upadhyay and Sushil Kumar Sharma

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Semester – V

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.Sc. (Hons.) Agriculture	Practical Crop Production-I *(Kharif Crops)*	BAG-5508	2-3 hours	2(0+2)

Course outcomes

CO1 Each student will be allotted a minimum land area of 10 cents and he will do all field operations in the allotted land from field preparation to harvest and processing.

CO2 Under exigencies like water scarcity to raise wetland rice of the crop production programme shall be with two irrigated dry crops, with an area of not less than five cents.

CO3 Irrigated puddled lowland rice will be cultivated.

PRACTICAL

UNIT I

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.

UNIT II

The emphasis will be given to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies.

UNIT III

Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of 8-10 students.

Reference books.

1. Practical manual on crop improvement-I (Kharif) by S.K. Kataria and Sons.
2. Agronomy of field crop by S.R. Reddy

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Semester – V

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.Sc. (Hons.) Agriculture	Intellectual Property Rights	BAG-5509	2-3 hours	1(1+0)

Couse outcomes

CO1 Students will be aware of Intellectual Property Rights for ensuring rights for their products.

THEORY

UNIT I

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 II

Types of Intellectual Property and legislations covering IPR in India:-Patents, Copyrights,Trademark, Industrial design, Geographical indications, Integrated circuits, Trade secrets.

UNIT III

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 IV

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 breeders rights, Registration of plant varieties under PPV&FR Act 2001, breeders, researcher and farmers rights.

UNIT V

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.

Reference books.

1. Intellectual Property Rights by Neeraj Pandey and Khushdeep Dharni.
2. Intellectual Property Rights-Infringement And Remedies by Ananth Padmanabhan

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Semester – V

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.Sc. (Hons.) Agriculture	Agrochemicals(Elective Course)	BAG-5510	2-3 hours	3(2+1)

Course outcomes:

CO1 Understanding the role of agrochemicals in agriculture and its effect on environment
CO2 Imparting knowledge on herbicides, fungicides, insecticides, fertilizers and its applications
CO3 Emphasising the use of right dose of agrochemicals for sustainable agriculture

THEORY

UNIT I

An introduction to agrochemicals, their type and role in agriculture, effect on environment, soil, human and animal health, merits and demerits of their uses in agriculture, management of agrochemicals for sustainable agriculture.

UNIT II

Herbicides-Major classes, properties and important herbicides.Fate of herbicides.Fertilizers and their importance. Nitrogenous fertilizers: Feedstocks and Manufacturing of ammonium sulphate, ammonium nitrate, ammonium chloride, urea. Slow release N-fertilizers.

UNIT III

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 useof Zineb and maneb.Systemic fungicides- Benomyl, carboxin, oxycarboxin, Metalaxyl, Carbendazim,characteristics and use.

UNIT IV

Introduction and classification of insecticides: inorganic andorganic insecticides Organochlorine, Organophosphates, Carbamates, Synthetic pyrethroidsNeonicotinoids, Biorationals, Insecticide Act

and rules, Insecticides banned, withdrawn andrestricted use, Fate of insecticides in soil & plant. IGRs Biopesticides, Reduced risk insecticides,Botanicals, plant and animal systemic insecticides their characteristics and uses.Plant bio-pesticides for ecological agriculture, Bio-insect repellent.

UNIT V

Phosphatic fertilizers: feedstock and manufacturing of single superphosphate. Preparationof bone meal and basic slag.Potassic fertilizers: Natural sources of potash, manufacturing ofpotassiumchloride, potassium sulphate and potassium nitrate.Mixed and complex fertilizers: Sources and compatibility–preparation of major, secondaryand micronutrient mixtures. Complex fertilizers: Manufacturing of ammonium phosphates,nitrophosphates and NPK complexes. Fertilizer control order. Fertilizer logistics and marketing.

PRACTICAL

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 kin market, Estimation of nitrogen in Urea, Estimation of water soluble P2O5 and citrate soluble P2O5 in single super phosphate, Estimation of potassium in Muraite 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

Reference books.

1. Soil fertility, fertilizer and agrochemical by Praveen Kumar Jaga and Bharat Singh.
2. Agrochemicals: Composition, Production, Toxicology, Applications by Franz Müller

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Semester – VI

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.Sc. (Hons.) Agriculture	Rainfed Agriculture and Watershed Management	BAG-5601	2-3 hours	2

Course Outcomes

CO1 Basic knowledge of rain fed agriculture and water shed management
CO2 Student can able to understand objective, principles and component of watershed management.
CO3 Student can able to understand about rainfed agriculture and its introduction, problem and prospects in India

THEORY

UNIT I

Rainfed agriculture: Introduction, types, History of rainfed agriculture and watershed in India; Problems and prospects of rainfed agriculture in India.

UNIT II

Soil and climatic conditions prevalent in rainfed areas; Soil and water conservation techniques, Drought: types, effect of water deficit on physio-morphological characteristics of the plants

UNIT III

Crop adaptation and mitigation to drought; Water harvesting: importance, its techniques

UNIT IV

Efficient utilization of water through soil and crop management practices, Management of crops in rainfed areas.

UNIT V

Contingent crop planning for aberrant weather conditions, Concept, objective, principles and components of watershed management, factors affecting watershed management

Reference books.

1. Rainfed Agriculture and Watershed Management- SR Reddy
2. Rainfed Agriculture and Watershed Management by Dr. Rayees Ahmad Shah,Kushal Publication 2017

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Semester – VI

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.Sc. (Hons.) Agriculture	Protected Cultivation and Secondary Agriculture	BAG-5602	2-3 hours	2

Course Outcomes

CO1 To study about Greenhouse technology
CO2 Student will able to understand Important of Protected Cultivation
CO3 Student will able to understand how to grow plant in protected condition

THEORY

UNIT-I

Green house technology: Introduction, Types of Green Houses; Plant response to Green house environment, Planning and design of greenhouses,

UNIT-II

Design criteria of green house for cooling and heating purposes. Green house equipments, materials of construction for traditional and low cost green houses.

UNIT-III

Irrigation systems used in greenhouses, typical applications, passive solar green house, hot air green house heating systems, green house drying. Cost estimation and economic analysis.

UNIT-IV

Important Engineering properties such as physical, thermal and aero & hydrodynamic properties of cereals, pulses and oilseed, their application in PHT equipment design and operation.

UNIT-V

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). Material handling equipment; conveyer and elevators, their principle, working and selection.

Reference books:

1. Singh Brrahma and Balraj Singh. 2014. Advances in Protected Cultivation, New India Publishing Company
2. RadhaManohar, K. and Igathinathene.C. greenhouse Technology and Management, 2nd edition, BS publications.

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Semester – VI

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.Sc. (Hons.) Agriculture	Diseases of Field and Horticultural Crops and their Management-II	BAG-5603	2-3 hours	3

Course Outcomes

CO1 Acquainted with the knowledge about different type of pathogens occurs in horticultural crops & Field crops.

CO2 Student acquires the knowledge about etiology and symptoms of the diseases which helps in the diagnosis of the diseases of the field and horticultural crops.

CO3 By knowing means of dispersal of these diseases suitable management methods can be applied.

THEORY

UNIT I

Symptoms, etiology, disease cycle and management of following diseases: Horticultural Crops:Mango: anthracnose, malformation, bacterial blight and powdery mildew; Citrus: canker and gummosis; Symptoms, etiology, disease cycle and management of following diseases: Horticultural Crops:Grape vine: downy mildew, Powdery mildew and anthracnose; Apple: scab, powdery mildew, fire blight and crown gall; Peach: leaf curl.

UNIT II

Symptoms, etiology, disease cycle and management of following diseases: Horticultural Crops:Strawberry: leaf spot Potato: early and late blight, black scurf, leaf roll, and mosaic;

UNIT III

Symptoms, etiology, disease cycle and management of following diseases: Horticultural Crops:Cucurbits: downy mildew, powdery mildew, wilt; Onion and garlic: purple blotch, andStemphyliumblight; Chilies: 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.

UNIT IV

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 PokkahBoeng;

UNIT V

Symptoms, etiology, disease cycle and management of following diseases: Field Crops:Sunflower: 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.

Reference books.

1. Plant Diseases and their management – Sushil kumar , Adesh kumar , Kalyani publ.
2. Hand book of horticulture - ICAR

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Semester – VI

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.Sc. (Hons.) Agriculture	Post-harvest Management and Value Addition of Fruits and Vegetables	BAG-5604	2-3 hours	2

Course Outcomes

CO1 To study about importance of post harvest management
CO2 Student will able to understand methods and process of preservation
CO3 Student will able to understand how to manage fruits and vegetables after harvesting

THEORY

UNIT I

Importance of post-harvest processing of fruits and vegetables, extent and possible causes of post harvest losses; Pre-harvest factors affecting postharvest quality, maturity, ripening and changes occurring during ripening; Respiration and factors affecting respiration rate.

UNIT II

Harvesting and field handling; Storage (ZECC, cold storage, CA, MA, and hypobaric); Value addition concept; Principles and methods of preservation.

UNIT III

Intermediate moisture food- Jam, jelly, marmalade, preserve, candy – Concepts and Standards; Fermented and non-fermented beverages.

UNIT IV

Tomato products- Concepts and Standards; Drying/ Dehydration of fruits and vegetables – Concept and methods, osmotic drying.

UNIT V

Canning - Concepts and Standards, packaging of products

Reference books

1. Rathore, N.S., Mathur, G.K., Chasta, S.s. 2012. Post-harvest Management and Processing of Fruits and Vegetables. ICAR, New Delhi
2. Srivastava, R.P. and Sanjeev Kumar, 2002. Fruit and vegetable Preservation: Principles and Practices. International Book Distributio Company, Lucknow

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Semester – VI

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.Sc. (Hons.) Agriculture	Management of Beneficial Insects	BAG-5605	2-3 hours	2

Course Outcomes

CO1 To study the beneficial insects with respect to its commercial use in agriculture.

CO2 Student should know the rearing of beneficial insects commercially along with its use in pest control.

THEORY

UNIT I

Importance of beneficial Insects, Beekeeping and pollinators, bee biology, commercial methods of rearing, equipment used, seasonal management, bee enemies and disease.

UNIT II

Bee pasturage, bee foraging and communication.Insect pests and diseases of honey bee. Role of pollinators in cross pollinated plants.

UNIT III

Types of silkworm, voltinism and biology of silkworm.Mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves. Rearing, mounting and harvesting of cocoons. Pest and diseases of silkworm, management, rearing appliances of mulberry silkworm and methods of disinfection.

UNIT IV

Species of lac insect, morphology, biology, host plant, lac production – seed lac, button lac, shellac, lac- products.

UNIT V

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. Important species of pollinator, weed killers and scavengers with their importance.

Reference books

1. Vasantharaj David, B.,and V.V.Ramanamurthy, 2003. Elements of Economic Entomology. Popular Book Depot, Coimbatore.
2. Ganga, G. and Sulochana Chetty, J 1997 (2nd edt). An introduction to Sericulture .Oxford and IBH Publishing Co. Pvt Ltd., New Delhi
3. Mishra R C 1995. Honey bees and their management in India .ICAR, New Delhi

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Semester – VI

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.Sc. (Hons.) Agriculture	Crop Improvement – II (*Rabi*)	BAG-5606	2-3 hours	2

Course Outcomes

CO1 Basic knowledge of rabi crops and it`s crop improvement approach
CO2 Student will able to understand major plant breeding approach of rabi crops
CO3 Student will able to understand hybrid seed production technology of rabi crops

THEORY

UNIT I

Plant genetic resources, its utilization and conservation.Study of genetics of qualitative and quantitative characters.

UNIT II

Floral biology, emasculation, pollination, centers of origin, distribution of species, wild relatives in different cereals and pulses of *Rabi* season.

UNIT III

Floral biology, emasculation, pollination, centers of origin, distribution of species, wild relatives in different oilseeds, fodder crops and cash crops, vegetable and horticultural crops of *Rabi* season.

UNIT IV

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) of different *Rabi* crops.

UNIT V

Hybrid seed production technology of *rabi* crops.Ideotype concept and climate resilient crop varieties for future.

Reference books

1. Textbook of field crops production, Prasad. R. ,IARI Publisher
2. Text Book of field crops by Mukund Joshi

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Semester – VI

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.Sc. (Hons.) Agriculture	Practical Crop Production –II (Rabi crops)	BAG-5607	2-3 hours	2

Course Outcomes:

CO1 To study about package and practices of Rabi crops
CO2 Student will able to understand the preparation field for rising crop
CO3 Student will able to understand the package and practices of Rabi crops

THEORY

UNIT I

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.

UNIT II

The emphasis will be given to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies.

Reference books

1. Jain L. K. manual on fundamentals of agronomy
2. Das, N R practical manual on basic agronomy with theory 2 nd Ed

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Semester – VI

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.Sc. (Hons.) Agriculture	Principles of Organic Farming	BAG-5608	2-3 hours	2

Course Outcomes

CO1 To study about how to produce organic product
CO2 Student will able to understand the importance and principles of organic farming
CO3 Student will able to understand Certification process and standards of organic farming

THEORY

UNIT I

Organic farming, principles and its scope in India; Initiatives taken by Government (central/ state), NGOs and other organizations for promotion of organic agriculture; Organic ecosystem and their concepts

UNIT II

Organic nutrient resources and its fortification; Restrictions to nutrient use in organic farming.

UNIT III

Choice of crops and varieties in organic farming; Fundamentals of insect, pest, disease and weed management under organic mode of production.

UNIT IV

Operational structure of NPOP; Certification process and standards of organic farming.

UNIT V

Processing, leveling, economic considerations and viability, marketing and export potential of organic products.

Reference books.

1. Rajendra Prasad: organic farming
2. Reddy, SR principles of organic farming
3. Palaniappan SP: organic farming – theory and practice

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Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.Sc. (Hons.) Agriculture	Farm Management, Production & Resource Economics	BAG-5609	2-3 hours	2

Course Outcomes

CO1 To impart basic knowledge of principles applied Farm Management dealing with the analysis of limited farm resources to students.

CO2 Students will be able to understand different types of farms and economic principles applied to manage farms

CO3 Students will be able to prepare budgeting of farms as well as different enterprises of farms.

CO4 Students will be able to understand resource management strategy to achieve economic and sustainable production of farms.

THEORY

UNIT I

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 relationship, law of equi-marginal/or principles of opportunity cost and law of comparative advantage.

UNIT II

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.

UNIT III

Farm business analysis: meaning and concept of farm income and profitability, technical and economic efficiency measures in crop and livestock enterprises. 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.

UNIT IV

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. 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.

UNIT V

Concepts of resource economics, differences between NRE and agricultural economics, unique properties of natural resources. 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.

References books:

1. Johl and Kapoor (2005). Farm Business Management.
2. Panda SC(2007). Farm Management & Agricultural Marketing. Kalyani Publications.
3. Sankhayan, P.L. (1988), Introduction to the Economics of Agricultural Production, Prentice Hall of India Private Limited, New Delhi-110 001.

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New Scheme Based On ICAR Flexible Curriculum

Semester – VI

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.Sc. (Hons.) Agriculture	Principles of Food Science and Nutrition	BAG-5610	2-3 hours	2

Course Outcomes

CO1 Students will be able to understand differencing redients of food and their chemistry
CO2 Students will be able to understand principles and methods of preservation and processing of food
CO3 Students will be able to understand roles of different microbes in food items.
CO4 Students will be able to understand correlation between food, nutrition and manner to overcome malnutrition problems.

THEORY

UNIT I

Concepts of Food Science (definitions, measurements, density, phase change, pH, osmosis,surface tension, colloidal systems etc.)

UNIT II

Food composition and chemistry (water, carbohydrates,proteins, fats, vitamins, minerals, flavours, colours, miscellaneous bioactives, important reactions);

UNIT III

Food microbiology (bacteria, yeast, moulds, spoilage of fresh & processed foods, Production offermented foods);

UNIT IV

Principles and methods of food processing and preservation (use of heat, lowtemperature, chemicals, radiation, drying etc.);

UNIT V

Food and nutrition, Malnutrition (over and undernutrition), nutritional disorders; Energy metabolism (carbohydrate, fat, proteins); Balanced/modified diets, Menu planning, New trends in food science and nutrition.

References books:

1. Food Science and Nutrition (2018). SunetraRoday, Oxford Publication.
2. Food Science. B. Laxmi, New Age International Publisher
3. Text Book of Food Science and Technology (2017). Sharma A., CBS Publishers and Distributers Pvt. Ltd

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Semester – VI

Course Content

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credits
B.Sc. (Hons.) Agriculture	Bio pesticides&Bio fertilizers (Elective Course)	BAG-5611	2-3 hours	2

Course Outcomes

CO1 Students will be given knowledge about bio-pesticides and bio fertilizers its uses and utility in crop husbandry.

CO2 Students will have awareness of bio-pesticides and bio fertilizers. Methods of preparation and application.

CO3 Students will have awareness about the importance of bio pesticides and bio fertilizers over commercial chemical pesticides and fertilizers.

THEORY

UNIT I

History and concept of biopesticides.Importance, scope and potential of biopesticide.Definitions, concepts and classification of biopesticides viz. pathogen, botanical pesticides, andbiorationales.Botanicals and their uses.

UNIT II

Biofertilizers - Introduction, status and scope. Structure and characteristic features of bacterial biofertilizers- *Azospirillum, Azotobacter, Bacillus, Pseudomonas, Rhizobium* and *Frankia*; Cynobacterialbiofertilizers- *Anabaena*, *Nostoc*, Hapalosiphon and fungal biofertilizers- AM mycorrhiza and ectomycorhiza.

UNIT III

Mass production technology of bio-pesticides.Virulence, pathogenicity and symptoms of entomopathogenic pathogens and nematodes.Methods of application of biopesticides.Methods of quality control and Techniques of biopesticides.Impediments and limitation in production and use of biopesticide.

UNIT IV

Nitrogen fixation -Free living and symbiotic nitrogen fixation.Mechanism of phosphate solubilization and phosphate mobilization, K solubilization. Production technology: Strain selection, sterilization, growth and fermentation, mass production of carrier based and liquid biofertiizers.

UNIT V

FCO specifications and quality control of biofertilizers. Application technology for seeds, seedlings, tubers, sets etc. Biofertilizers -Storage, shelf life, quality control and marketing. Factors influencing the efficacy of biofertilizers.

Reference books

1. Biofertilizers and Biocontrol Agents for Organic Farming, Dr. ReetaKhosla
2. Biofertilizers and Biopesticides, by Krishnendu Acharya (Author), SurjitSen (Author), ManjulaRai (Author).
3. Biofertilizers and Biopesticides (English, Hardcover, Channabasava A., H. C. Lakshman)
4. Biofertilizers and Biopesticides, Dr. ShaliniSuri

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Semester – VII

Course Content

SEMESTER-VII			
S.NO.	**RURAL AGRICULTURAL WORK EXPERIENCE AND AGRO-INDUSTRIAL ATTACHMENT (RAWE &AIA)**		
	ACTIVITIES	**NO. OF WEEKS**	**CREDIT HOURS**
1.	General orientation & On campus training by different faculties	1	14
2.	Village attachment	8	
	Unit attachment in Univ./ College. KVK/ Research Station Attachment	5	
3.	Plant clinic	2	02
	Agro-Industrial Attachment	3	04
4.	Project Report Preparation, Presentation and Evaluation	1	
Total weeks for RAWE & AIA		20	20

- **Agro- Industrial Attachment:** The students would be attached with the agro-industries for period of 3 weeks to get an experience of the industrial environment and working.
- Educational tour will be conducted in break between IV & V Semester or VI & VII Semester

RAWE Component-I

Village Attachment Training Programme

S.NO.	ACTIVITY	DURATION
1.	Orientation and Survey of Village	1 week

2.	Agronomical Interventions	1 week
3.	Plant Protection Interventions	1 week
4.	Soil Improvement Interventions (Soil sampling and testing)	1 week
5.	Fruit and Vegetable production interventions	1 week
6.	Food Processing and Storage interventions	1 week
7.	Animal Production Interventions	1 week
8.	Extension and Transfer of Technology activities	1 week

RAWE Component –II

Agro Industrial Attachment

- Students shall be placed in Agro-and Cottage industries and Commodities Boards for 03 weeks.
- Industries include Seed/Sapling production, Pesticides-insecticides, Post harvest-processing value addition, Agri-finance institutions, etc.

Activities and Tasks during Agro-Industrial Attachment Programme

- Acquaintance with industry and staff
- Study of structure, functioning, objective and mandates of the industry
- Study of various processing units and hands-on trainings under supervision of industry staff
- Ethics of industry
- Employment generated by the industry
- Contribution of the industry promoting environment
- Learning business network including outlets of the industry
- Skill development in all crucial tasks of the industry
- Documentation of the activities and task performed by the students
- Performance evaluation, appraisal and ranking of students

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Semester – VIII

Course Content

Modules for Skill Development and Entrepreneurship: A student has to register 20 credits opting for two modules of (0+10) credits each (total 20 credits) from the package of modules in the **VIII semester.**

SEMESTER-VIII		
S. NO.	**TITLE OF THE MODULE**	**CREDITS**
1.	Production Technology for Bioagents and Biofertilizer	0+10
2.	Seed Production and Technology	0+10
3.	Mushroom Cultivation Technology	0+10
4.	Soil, Plant, Water and Seed Testing	0+10
5.	Commercial Beekeeping	0+10
6.	Poultry Production Technology	0+10
7.	Commercial Horticulture	0+10
8.	Floriculture and Landscaping	0+10
9.	Food Processing	0+10
10.	Agriculture Waste Management	0+10
11.	Organic Production Technology	0+10
12.	Commercial Sericulture	0+10