B.Sc.(Hons) Agriculture

Semester-I

S.No.	Subject	Credit	Examination Marks Detail				
			External Exam	Internal Exam		Practical	Total
				Internal Exam	Assignments		
1	Fundamentals of Horticulture	2 (1+1)	50	20	15	15	100
2	Fundamentals of Plant Biochemistry and Biotechnology	3(2+1)	50	20	15	15	100
3	Fundamentals of Soil Science	3(2+1)	50	20	15	15	100
4	Introduction to Forestry	2 (1+1)	50	20	15	15	100
5	Comprehension & Communication Skills in English	2 (1+1)	50	20	15	15	100
6	Fundamentals of Agronomy	4(3+1)	50	20	15	15	100
7	Elementary Mathematics	2(2+0)	50	30	20	-	100
8	Rural Sociology & Educational Psychology	2 (2+0)	50	30	20	-	100
9	NSS/NCC/Physical Education & Yoga Practices	-	-	-	-	-	-
10	Computer Fundamental	-	-	-	-	-	-
	Total	**20 (14+6)**					**800**

Fundamentals of Horticulture 2(1+1)

Theory

- Horticulture - Its definition and branches, importance;
- Horticultural Zones of India And Classification of Horticultural Plants
- Plant propagation-methods and vegetative propagation;
- Seed dormancy, Seed germination;
- Principles of orchard establishment; Principles of training and pruning
- Unfruitfulness, its causes and measures to overcome it;
- Brief studies of pollination, pollinizers and pollinators;
- Brief studies of fertilization, Polyembryony, and parthenocarpy;
- Irrigation – Systems of irrigation and
- Fertilizer application in horticultural crops.

Practical

- Identification of garden tools.
- Identification of horticultural crops.
- Preparation of seed bed/ nursery bed.
- Layout and planting of orchard.
- Training and pruning of fruit trees.
- Practice of sexual and asexual methods of propagation including micro-propagation.
- Preparation of potting

Fundamentals of Agronomy 4 (3+1)

Theory

- Agronomy – definition and its scope.
- Seeds and Sowing - Sowing methods
- Tillage and tilth – Definition – types of tillage - modern concepts of tillage
- Crops - Classification – Economic and agricultural importance in India
- Manures and Fertilizers - Role of manures and fertilizers in crop production
- Irrigation - methods - techniques of irrigation - quality of irrigation water - logging
- Weeds: importance, classification and concepts of weed management. Crop weed competition;
- Herbicides- classification and its important; Plant ideotypes
- Crop rotation and its principles ; Factors affecting crop production
- Harvesting and Threshing of crops

Practical

- Study of Identification of crops and seeds,
- Study of fertilizers and pesticides,
- Identification of weeds in crops,
- Methods of herbicide and fertilizer application,
- Seed germination test,
- Numerical exercises on fertilizer requirement,
- Plant population, herbicides and water requirement

Introduction to Forestry (New) 2(1+1)

Theory

- **Introduction** to Forestry –
  - branches of forestry
  - Definitions of basic terms related to forestry,
  - Objectives of Silviculture,
  - forest classification, function of forests
  - Salient features of Indian Forest Policies.
- **Forest regeneration**-
  - Definition of Forest regeneration, Method of regeneration
  - **Natural regeneration** - natural regeneration from seed and vegetative parts, coppicing, pollarding, root suckers;
  - **Artificial regeneration** – objectives, choice between natural and artificial regeneration,
  - Vegetative Regeneration method
- **Tending operations in Siliviculture** – weeding, cleaning, and thinning.
- **Forest mensuration** –
  - Definition and scope of Forest mensuration,
  - Objectives of Forest mensuration
  - Common formula used in measurement,
  - 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;
  - Forest mensuration formulas,Tree stem form, form factor, form quotient, measurement of volume of felled and standing trees, age determination of trees.
- **Afforestation:** Definition and importance of afforestation
- **Agroforestry** Definitions and importance
  - Objective of agroforestry
  - Classification of agroforestry
  - Benefits and limitation of agroforestry
- **Taungya system:** Importance Advantages and Disadvantages

Practical

- To study Identification of forest tree species.
- To study Botanical name, Common name and uses of important Forest plants
- Diameter measurements using calipers and tape
- Height measurement of standing trees by shadow method
- Volume measurement of logs using various formulae.
- To study Nursery lay out and vegetative propagation techniques.
- Study of Forest plantations and their management.
- Visits of nearby forest based industries.

Fundamentals of Plant Biochemistry and Biotechnology 3(2+1)

Theory

Plant Biochemistry

- **Carbohydrate:**Definition and classification. Structures formula of the following-
    - Monosaccharide- D Glucose, D Fructose, D Galactose
    - Disaccharides – Sucrose , Maltose, Lactose
    - Polysaccharides- Starch, cellulose, Inulin
- **Proteins:** definition, classification, composition, important functions, Structural organization of proteins, Biological significance of proteins.
- **Amino acid-** Classification, Essenrial and non-essential amino acid,nutrinalsignificanceof amino acid
- **Lipid:** Importance and classification
- **Enzymes:** General properties; Classification and mechanism
- **Nucleic acids:** Importance and classification; Structure of Nucleotides, Watson and crick modal of DNA.

Plant Biotechnology:

- Definition, scope and application of biotechnology;
- **Micro-propagation methods;**definition, explant used in micropropagation, stages in micropropagation, advantages and disadvantages of micropropagation
- **Genetic engineering or recombinant DNA technology-** definition, application, Genetic engineering through *Agrobactriumtumefaciens*
- Somaclonal variation and Cryopreservation
- Transgenic plant and their application, Genetically modified crop (GM Crop)

Practical

- Qualitative tests of carbohydrates
- Qualitative tests of 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,
- Study of Sterilization techniques.
- Study of Composition of various tissue culture media and preparation of stock solutions for MS nutrient medium.
- Study of Micropropagation, hardening and acclimatization.

Fundamentals of Soil Science 3(2+1)

Theory

- Soil as a natural body, Pedological and edaphological concepts of soil;
- **Soil genesis**: soil forming rocks and minerals; weathering, processes and factors of soil formation;
- **Soil Profile**, components of soil;
- **Soil physical properties:** soil-texture, structure, density and porosity, soil colour, consistence and plasticity;
- **Soil taxonomy;** Elementary knowledge of soil taxonomy classification and soils of India;
- **Soil colloids** - inorganic and organic; silicate clays: constitution and properties; sources of charge; ion exchange, cation exchange capacity, base saturation;
- **Soil organic matter:** composition, properties and its influence on soil properties; humic substances - nature and properties;
- **Manure and fertilizers**
- **Soil pollution** - behaviour of pesticides and inorganic contaminants, prevention and mitigation of soil pollution.

Practical

- Study of soil profile in field.
- Study of Soil physical properties
- Study of soil forming rocks and minerals.
- Studies of Soil taxonomy
- Studies of composition and properties soil organic matter
- Calculation of organic matter content of soil.

Rural Sociology & Educational Psychology 2(2+0)

Theory

Sociology and Rural sociology: Definition and scope, its significance in agriculture extension, Social Ecology, Rural society, Social Groups, Social Stratification, Culture concept, Social Change & Development.

Educational psychology: Meaning & its importance in agriculture extension. Behavior: Cognitive, affective, psychomotor domain, Personality, Learning, Motivation, Theories of Motivation, Intelligence, Leadership concept.

Fundamentals of Soil Science 3(2+1)

Theory

- Soil as a natural body, Pedological and edaphological concepts of soil;
- **Soil genesis**: soil forming rocks and minerals; weathering, processes and factors of soil formation;
- **Soil Profile**, components of soil;
- **Soil physical properties:** soil-texture, structure, density and porosity, soil colour, consistence and plasticity;
- **Soil taxonomy;** Elementary knowledge of soil taxonomy classification and soils of India;
- **Soil reaction**-pH, soil acidity and alkalinity, buffering, effect of pH on nutrient availability
- **Soil colloids** - inorganic and organic; silicate clays: constitution and properties; sources of charge; ion exchange, cation exchange capacity, base saturation;
- **Soil organic matter:** composition, properties and its influence on soil properties; humic substances - nature and properties;
- **Manure and fertilizers**
- **Soil pollution** - behaviour of pesticides and inorganic contaminants, prevention and mitigation of soil pollution.

Practical

- Study of soil profile in field.
- Study of Soil physical properties
- Study of soil forming rocks and minerals.
- Studies of Soil taxonomy
- Determination of soil pH
- Studies of composition and properties soil organic matter
- Calculation of organic matter content of soil.

Comprehension and Communication Skills in English 2(1+1)

Theory

- Reading Comprehension, Vocabulary- Antonym, Synonym, Homophones, Homonyms, often confused words.
- Functional grammar: Articles, Prepositions, Verb, Subject verb Agreement, Transformation, Synthesis, Direct and Indirect Narration.
- Written Skills: Paragraph writing, Precise writing, Report writing and Proposal writing. The Style: Importance of professional writing. Preparation of Curriculum Vitae and Job applications. Synopsis Writing. Interviews: kinds, Importance and process.

Practical

- Listening Comprehension: Listening to short talk's 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.

Elementary Mathematics (New) 2(2+0)

Theory

Straight lines: Distance formula, section formula (internal and external division), 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 form 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 straight lines, Angles between two straight. lines, Parallel lines, Perpendicular lines, Angle of bisectors between two lines, Area of triangle. Circle: Equation of circle whose centre and radius is known.

Differential Calculus: Definition of function, limit and continuity, Simple problems on limit, Simple problems on continuity, Differentiation of x^n, e^x, sin x & cos x from first principle, Derivatives of sum, difference, product and quotient of two functions,

Integral Calculus: Integration of simple functions, Integration of Product of two functions, Integration by substitution method, Definite Integral (simple problems based on it).

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.

B.Sc.(Hons) Agriculture
Semester - II

S. No	Subject Code	Subject	Credit	Examination Marks Detail				
				External Exam	Internal Exam		Practical	Total
					Internal Exam	Assignments		
1	GPBR-201	Fundamentals of Genetics	3(2+1)	50	20	15	15	100
2	AMBE-201	Agricultural Microbiology	2(1+1)	50	20	15	15	100
3	SWCE-201	Soil and Water Conservation Engineering	2(1+1)	50	20	15	15	100
4	CPHY-201	Fundamentals of Crop Physiology	2(1+1)	50	20	15	15	100
5	PATH-201	Fundamentals of Plant Pathology	4(3+1)	50	20	15	15	100
6	ENTO-201	Fundamentals of Entomology	4(3+1)	50	20	15	15	100
7	AEXT-201	Fundamentals of Agricultural Extension Education	3(2+1)	50	20	15	15	100
8	CSPD-201	Communication Skills and Personality Development	2(1+1)	50	20	15	15	100
9	AECO-201	Fundamentals of Agricultural Economics	2(2+0)	50	30	20	-	100
		Total	**24 (16+8)**					**900**

Fundamentals of Genetics (GPBR-201) 3(2+1)

Theory

- Pre and Post Mendelian concepts of heredity; Mendelian principles of heredity and exceptions to the laws.
- Monohybrid, Dihybrid, Trihybrid, Multiple alleles, Pleiotropism and Pseudoalleles.
- Architecture of chromosome; Centromere/ Primary constriction, Chromatids, Secondary constriction & Satellite, Telomere, Chromomere, Chromonema, Matrix and special types of chromosomes
- Chromosomal theory of inheritance.
- Cell division: meiosis and mitosis.
- Linkage and crossing over - types and significance
- Nucleic acid as genetic material - structure, replication, genetic code, transcription and translation (Protein synthesis)
- Mutation; Definition & Classification
- Blood group genetics
- Sex chromosomes and Autosome and Genetic disorders

Practical

- Study of Microscope
- Study of Plant cell structure with Diagram.
- Study of Cell division (Mitosis and Meiosis) with Diagram.
- Calculation regarding Monohybrid, Dihybrid, Trihybrid and Polyhybrid
- Study of models on DNA and RNA structures.
- Determination of linkage and cross-over analysis
- Study of genetic disease problem.

Agricultural Microbiology (AMBE-201) 2(1+1)

Theory

- **Introduction.** Microbial world: Prokaryotic and Eukaryotic microbes.
- **Bacteria:** cell structure, chemoautotrophy, photoautotrophy, growth curve of bacteria.
- **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.
- **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.

Practical

- Study of cell structure of Bacteria.
- Study of Microscope- parts, principles of microscopy, resolving power and numerical aperture.
- Study of different Methods of sterilization and Nutritional media and their preparations.
- Isolation of Rhizobium from legume root nodule /Isolation of BGA.
- Study of Grams Staining.

Soil and Water Conservation Engineering (SWCE-201) 3(2+1)

Theory

- **Soil erosion** - Introduction, causes and types - geological and accelerated erosion, agents, factors affecting and effects of erosion.
- **Water erosion** - Mechanics and forms; Gullies - Classification, stages of development.
- **Soil loss estimation** – Universal soil loss equation (USLE) and modified USLE. Rainfall Erosivity - estimation by KE>25 and EI_{30} methods. Soil Erodibility and other management factors.
- **Water erosion control measures** - agronomical measures - contour farming, strip cropping, conservation tillage and mulching; Engineering measures– Bunds and terraces.
- **Bunds -** contour and graded bunds - design and **Terraces** - level and graded broad base terraces, bench terraces - planning, design and layout procedure.
- **Gully and ravine reclamation** - principles of gully control – vegetative measures, temporary structures and diversion drains. Grassed waterways and design.
- **Wind erosion**- Factors affecting, mechanics, soil loss estimation and control measures - vegetative, mechanical measures.
- **Design of** wind breaks and shelter belts and stabilization of sand dunes.

Practical

- To Study of Soil erosion and its causes & types
- To Study of Water erosion and its causes & types
- To study Computation of soil Erodibility index in soil loss estimation.
- To .Study Design and layout of contour bunds/graded bunds.
- To study Design and layout of broad base terraces/bench terraces.
- To study Design of vegetative waterways.
- To study of Computation of soil loss by wind erosion.
- To Study of Wind erosion and its causes & types
- To study Design of wind breaks for wind erosion control.
- Visit to soil Erosion sites.

Fundamentals of Crop Physiology (CPHY-201) 2(1+1)

Theory

- **Introduction to crop physiology** and its importance in Agriculture
- **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;
- **Photosynthesis**: Light and Dark reactions, C3, C4 and CAM plants;
- **Respiration**: Glycolysis, TCA cycle and electron transport chain;
- **Plant growth regulators**: type and importance
- **Photoperiodism and Vernalization**.

Practical

- To study Microscope
- To Study structure of plant cells
- To study imbibition's, osmosis, plasmolysis,
- To study rate of transpiration,
- To study Separation of photosynthetic pigments through paper chromatography,
- To study estimation of relative water content.

Fundamentals of Plant Pathology (PATH-201) 4(3+1)

Theory:

- **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. 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.
- **Fungi**: general characters, definition of fungus, somatic structures, types of fungal thalli, fungal tissues, reproduction (asexual and sexual). classification of fungi.
- **Bacteria and mollicutes**: general morphological characters. Basic methods of classification and reproduction.
- **Viruses**: nature, structure, replication and transmission.
- **Nematodes**: General morphological characters. Basic methods of classification and reproduction. Nature of damage caused by plant nematodes (*Heterodera / Meloidogyne*)
- **Growth and reproduction of plant pathogens.** Types of parasitism and variability in plant pathogens. Pathogenesis.
- **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.

Practical

- Acquaintance with various laboratory equipment's and microscopy.
- Collection and preservation of disease specimen.
- General study of different classification of fungi.
- Study of symptoms of various plant diseases.
- General study of plant viruses.
- Study of phanerogamic plant parasites.
- Study of morphological features and identification of plant parasitic nematodes.

Fundamentals of Agricultural Economics (AECO-201) 2 (2+0)

Theory

- **Economics**: Meaning, scope and subject matter, definitions, micro and macro economics
- **Basic concepts:** Goods and services, desire, want, demand, utility, cost and price, wealth, capital, income and welfare.
- **Agricultural economics**: meaning, definition, characteristics of agriculture, importance and its role in economic development
- **Demand:** meaning, law of demand, demand schedule and demand curve, determinants, utility theory; law of diminishing marginal utility, equi-marginal utility principle.
- **Elasticity of demand:** concept and measurement of price elasticity, income elasticity and cross elasticity.
- **Production**: process, factors of production
- **Cost:** Cost concepts, short run and long run cost curves.
- **Supply:** Stock v/s supply, law of supply, elasticity of supply
- **Market structure:** meaning and types of market, basic features of perfectly competitive and imperfect markets.
- **National income:** Meaning and importance, circular flow, concepts of national income accounting and approaches to measurement
- **Population:** Importance, Malthusian and Optimum population theories, natural and socio-economic determinants,
- **Money:** Barter system of exchange and its problems, evolution, meaning and functions of money,
- **Banking**: Role in modern economy, types of banks, functions of commercial and central bank
- **Agricultural and public finance:** meaning, micro v/s macro finance, need for agricultural finance
- **Tax:** meaning, VAT.
- **Economic systems:** Concepts of economy and its functions, important features of capitalistic, socialistic and mixed economies, elements of economic planning.

Fundamentals of Entomology (ENTO-201) 4(3+1)

Theory

- History of **Entomology** in India. Major points related to dominance of Insecta in Animal kingdom. Classification of phylum Arthropoda upto classes. Relationship of class Insecta with other classes of Arthropoda.
- Morphology: Structure and functions of **insect cuticle** and molting. Body segmentation. Structure of Head, thorax and abdomen. Structure and modifications of insect antennae, mouth parts, legs, Wing venation, modifications and wing coupling apparatus. Structure of male and female genital organ.
- **Metamorphosis** and diapause in insects. Types of larvae and pupae.
- Structure and functions of digestive, circulatory, excretory, respiratory, nervous, 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.
- **Systematics:** Taxonomy –importance and development and binomial nomenclature.
- Definitions of **Biotype**, Sub-species, Species, Genus, Family and Order. Classification of class Insecta upto Orders, basic groups of present day insects with special emphasis to orders and families of Agricultural importance like Orthoptera, Odonata, Isoptera, Thysanoptera: Hemiptera, Lepidoptera, Coleoptera, Diptera.

Practical

- Method of collection and preservation of insects including immature stages;
- To study external features of Grasshopper/Blister beetle;
- To study types of insect antennae, mouthparts and legs; Wing venation, types of wings.
- To study types of insect larvae and pupae;
- To Study of characters of orders Orthoptera, Dictyoptera, Odonata, Hemiptera, Lepidoptera, Coleoptera, Hymenoptera, Diptera and their families of agricultural importance.

Fundamentals of Agricultural Extension Education (AEXT-201) 3(2+1)

Theory

- **Introduction**: **Extension Education**- meaning, definition, scope and process; objectives and principles of Extension Education;
- **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.).
- **New trends in agriculture extension:** privatization extension, cyber extension/ 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.
- **Rural Leadership:** concept and definition, types of leaders in rural context;
- **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.

Practical

- Group discussion- exercise; handling and use of audio visual equipments and digital camera and LCD projector; preparation and use of AV aids,
- Presentation skills exercise; micro teaching exercise;
- A visit to village to understand the problems being encountered by the villagers/ farmers;
- to study organization and functioning of DRDA and other development departments at district level;
- visit to NGO and learning from their experience in rural development;
- visit to community radio and television studio for understanding the process of programme production;
- script writing, writing for print and electronic media, developing script for radio and television

Communication skills and Personality Development (CSPD-201) 2(1+1)

Theory

- Communication Skills: Structural and functional grammar;
- Meaning and process ofcommunication, verbal and nonverbal communication;
- Listening and note taking, writing skills, oral presentation skills;
- Field diary and lab record; indexing, footnote and bibliographic procedures.
- Reading and comprehension of general and technical articles, precise writing, summarizing, abstracting; individual and group presentations, impromptu presentation, public speaking;
- Group discussion. Organizing seminars and conferences.

Practical

- Listening and note taking, writing skills, oral presentation skills;
- Field diary and lab record; indexing, footnote and bibliographic procedures.
- Reading and comprehension of general and technical articles, precise writing, summarizing, abstracting;
- Individual and group presentations.

B.Sc.(Hons.) Agriculture

Semester-III

S. No.	Subject Code	Subject	Credit Hours	Examination Marks Detail				
				External Exam	Internal Exam		Practical	Total
					Internal Exam	Assignments		
1	AGRO-301	Crop Production Technology – I *(Kharif Crops)*	2 (1+1)	50	20	15	15	100
2	GPBR-301	Fundamentals of Plant Breeding	3 (2+1)	50	20	15	15	100
3	AGFC-301	Agricultural Finance and Cooperation	3 (2+1)	50	20	15	15	100
4	AGIF-301	Agri- Informatics	2 (1+1)	50	20	15	15	100
5	AFMP-301	Farm Machinery and Power	2 (1+1)	50	20	15	15	100
6	HORT-301	Production Technology for Vegetables and Spices	2 (1+1)	50	20	15	15	100
7	ESDM-301	Environmental Studies and Disaster Management	3 (2+1)	50	20	15	15	100
8	AGSM-301	Statistical Methods	2 (1+1)	50	20	15	15	100
9	LSPM-301	Livestock and Poultry Management	4 (3+1)	50	20	15	15	100
		Total	**23** (14+9)	-	-	-	-	**900**

Crop Production Technology-I (Kharif Crops)

Subject Code: AGRO-301 **Credit Hours: 2(1+1)**

Theory

- Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Kharif crops.
    - Cereals –rice, maize, sorghum, pearl millet and finger millet,
    - Pulses-pigeonpea & mungbean;
    - Oilseeds- groundnut, and soybean;
    - Fibre crops- cotton & jute;
    - Forage crops-sorghum and cowpea.

Practical

- Rice nursery preparation, transplanting of rice,
- Sowing of pigeonpea and maize,
- Seed germination of kharif season crops,
- Effect of sowing depth on germination of kharif crops,
- Identification of weeds in kharif season crops,
- Top dressing ,
- Study of crop varieties.

Fundamentals of Plant Breeding

Subject Code: GPBR-301 **Credit Hours: 3 (2+1)**

Theory

- Plant Breeding- objectives and scope.
- Mode of reproduction in crop plants in relation to breeding techniques.
- Hybridization and its type and importance; Emasculation
- Modes of Pollination, genetic consequences of self and cross pollinated crops.
- Plant Introduction; Merits and Demerits Plant Introduction
- Genetic basis and breeding methods in self pollinated crops - mass and pure line selection and hybridization techniques.
- Concepts of population genetics and Hardy-Weinberg Law
- Genetic basis and methods of breeding cross-pollinated crops, modes of selection
- Inbreeding Depression and Heterosis
- Male sterility and its importance.
- Hybrids, Composite and Synthetic varieties
- Breeding of asexually propagated crops, Clonal selection and apomixes.
- Polyploidy and mutation breeding-methods and uses.
- Intellectual Property Rights, Patenting, Plant Breeders and & Farmer's Rights.

Practical

- Study of breeding kit.
- Study of self-pollinated and cross pollinated crops.
- Study of Germplasm of various crops.
- Study of Emasculation and hybridization techniques in self &cross pollinated crops.
- Study of Polyploidy
- Skeleton of different breeding procedures.
- Practical record,Viva-voce.

Agricultural Finance and Co-Operation

Subject Code: AGFC-301 **Credit Hours: 3 (2+1)**

Theory

- **Definition of agricultural Finance –** nature-scope- meaning-significance - micro & macro finance.
- **Agricultural credit:** meaning, definition, need, classification. Credit analysis: 4 R's, and 3C's of credits.
- **Sources of agricultural finance:** institutional and non-institutional sources, commercial banks, social control and nationalization of commercial banks, 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.
- **Agricultural Cooperation –** Meaning, brief history of cooperative development in India,

  objectives, principles of cooperation, significance of cooperatives in Indian agriculture.
- **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.

Practicals

- Analysis of progress and performance of cooperatives using published data.
- Analysis of progress and performance of commercial banks and RRBs using published data.
- Visit to a commercial bank, cooperative bank and cooperative society to acquire firsthand knowledge of their management.
- Techno-economic parameters for preparation of projects.
- Seminar on selected topics.
- Practical report

Agri-Informatics

Subject Code: AGIF-301 **Credit Hours: 2(1+1)**

Theory

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, Database, concepts and types, World Wide Web (WWW): Concepts and components. Introduction to computer programming languages, concepts and standard input/output operations.

Practical

Study of Computer Components, accessories, practice of important DOS Commands. Introduction of different operating systems such as windows, Unix/ Linux, Creating, Files & Folders, File Management. Use of MS-WORD and MS Power-point for creating, editing and presenting a scientific Document. MS-EXCEL - Creating a spreadsheet, use of statistical tools, writing expressions, creating graphs, analysis of scientific data. MS-ACCESS: Creating Database, preparing queries and reports. Introduction to World Wide Web (WWW). Introduction of programming languages.

Farm Machinery and Power

Subject Code: AFMP-301 **Credit Hours: 2(1+1)**

Theory

- **Status of Farm Power in India**, Sources of Farm Power , I.C. engines, working principles of I C engines, comparison of two stroke and four stroke cycle engines , Study of different components of I.C. engine, I.C. engine terminology and solved problems,
- **Familiarization with different systems of I.C. engines:** Air cleaning, cooling, lubrication ,fuel supply and hydraulic control system of a tractor,
- **Familiarization with Power transmission system**: clutch, gear box, differential and final drive of a tractor, Tractor types.
- **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
- **Familiarization with Plant Protection equipment**, Familiarization with harvesting and threshing equipment.

Practical:

- To study of different components of I.C. engine.
- To study air cleaning and cooling system of engine.
- To study Familiarization with clutch, transmission, differential
- To study about tractor, different type of tractor and final drive of a tractor.
- Familiarization with lubrication and fuel supply system of engine,
- Familiarization with different types of primary and secondary tillage implements: mould plough, disc plough and disc harrow.
- Familiarization with different types of sprayers and dusters
- Familiarization with harvesting and threshing machinery.

Production Technology for Vegetable and Spices

Subject Code: HORT-301 **Credit Hours: 2(1+1)**

Theory:

- Importance of vegetables & spices in human nutrition and national economy
- Brief about origin, area, climate, soil, improved varieties and cultivation practices such as time of sowing, planting distance, fertilizer requirements, irrigation, weed management, harvesting and yield, physiological disorders, of important
    - ❖ Vegetable and spices (Tomato, Brinjal, Capsicum)
    - ❖ Cole crops such as Cabbage, Cauliflower ;
    - ❖ Bulb crops such as Onion, Garlic;
    - ❖ Root crops such as Carrot, Raddish;
    - ❖ Tuber crops such as Potato;
    - ❖ Leafy vegetables such as Palak.

Practical

- Study of Identification of vegetables & spice crops and their seeds.
- Study of Nursery raising.
- Study of Direct seed sowing.
- Study of morphological characters of different vegetables & spices.
- Study of Fertilizers applications.
- Study of Harvesting & preparation for market.
- Study of Economics of vegetables and spices cultivation.

Environmental Studies and Disaster Management

Subject Code: ESDM-301 **Credit Hours: 3(2+1)**

Theory

- Multidisciplinary nature of environmental studies Definition, scope and importance.
- **Natural Resources**: Renewable and non-renewable resources, Natural resources and associated problems. a) Forest resources, b) Water resources, c) Mineral resources, d)Food resources, e) Energy resources f) Land resources. Role of an individual in conservation of natural resources.
- **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. Characteristic features and function of the following ecosystem: a. Forest ecosystem , b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems
- **Biodiversity:** - Introduction- definition, genetic, species and ecosystem. Importance of Biodiversity. Biogeographical classification of India. India as a mega-diversity nation. Hot-sports of biodiversity. Threats to biodiversity, Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.
- **Environmental Pollution**: definition, sources, effects and control measures of a). Air pollution, b) Water pollution c) Soil pollution d) Marine pollution and e) Noise pollution
- **Environmental ethics**: Issues and possible solutions, climate change, global warming, acid rain and ozone layer depletion. Environment Protection Act.
- **Human Population and the Environment:** population growth, population explosion, Family Welfare Programme. Role of Information Technology in Environment and human health.

Disaster Management

- **Natural Disasters**- Meaning and nature of natural disasters, their types and effects. flood, Earthquake, cyclone, Tsunami and Landslides management.
- **Man Made Disasters** Meaning and nature of natural disasters, their types and effects. Nuclear disaster, chemical disasters and biological disasters management

Practical

- Pollution case studies.
- Study about Biogeographical classification of India
- Case Studies- Field work: Visit to a local area to document environmental assets river/ forest/ grassland/ hill/ mountain
- Visit to a local polluted site-Urban/Rural/Industrial/ Agricultural
- Study of common plants, insects, birds
- Study of simple ecosystems-pond, river, hill slopes, etc.
- Study of Disaster management

Statistical Methods

Subject Code: AGSM-301 **Credit Hours: 2(1+1)**

Theory

- Introduction to Statistics and its Applications in Agriculture,
- Graphical Representation of Data, Measures of Central Tendency & Dispersion,
- Definition of Probability, Simple Problems Based on Probability.
- Definition of Correlation, Karl Pearson's Coefficient of Correlation.
- Linear Regression Equations.
- 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.
- Introduction to Analysis of Variance
- Introduction to Sampling Methods, Sampling versus Complete Enumeration

Practical

- Graphical Representation of Data.
- Measures of Central Tendency
- Measures of Dispersion
- Application of One Sample t-test.
- Chi-Square test of Goodness of Fit.
- Analysis of Variance One Way Classification.

Livestock & Poultry Management

Subject Code: LSPM-301 **Credit Hours: 4 (3+1)**

Theory:

- Role of livestock in the national economy. Reproduction in farm animals and poultry.
- Management of calves,growing heifers and milch animals.Management of sheep, goat and swine. Incubation, hatchingand brooding.
- Important Indian and exotic breeds of cattle, buffalo, sheep, goat, swine and poultry.Improvement of farm animals and poultry.
- Digestion in livestock and poultry. Classification of feedstuffs. Proximate principles offeed.
- Nutrients and their functions.Feed ingredients for ration for livestock and poultry. Feeding of livestock and poultry.
- Introduction of livestock and poultry diseases. Prevention (including vaccination schedule) and control of important diseases of livestock and poultry.

Practical

- Study of External body parts of cattle, buffalo, sheep, goat, swine and poultry.
- Study of Identification methods of farm animals and poultry.
- Visit and exposure of breeds of livestock and poultry
- Study of Judging of cattle, buffalo and poultry. Culling of livestock and poultry.
- Study of Planning and layout of housing for different types of livestock.
- Study of Clean milk production, milking methods.
- Study of management of chicks, growers and layers.
- Study of economics of cattle, buffalo, sheep, goat, swine and poultry production.

B.Sc.(Hons) Agriculture
Semester - IV

S. No	Subject Code	Subject	Credit	Examination Marks Detail				
				External Exam	Internal Exam		Practical	Total
					Internal Exam	Assignments		
1	AGRO-401	Crop Production Technology – II (Rabi Crops)	2(1+1)	50	20	15	15	100
2	HORT-401	Production Technology for Ornamental Crops, MAP and Landscaping	2(1+1)	50	20	15	15	100
3	HORT-402	Production Technology for Fruit and Plantation Crops	2(1+1)	50	20	15	15	100
4	REGT-401	Renewable Energy and Green Technology	2(1+1)	50	20	15	15	100
5	APST-401	Principles of Seed Technology	3(1+2)	50	20	15	15	100
6	AMTP-401	Agricultural Marketing Trade & Prices	3(2+1)	50	20	15	15	100
7	AMCC-401	Introductory Agro-meteorology & Climate Change	2(1+1)	50	20	15	15	100
8	ELCT-401	Elective Course: Micro propagation Technologies	3(1+2)	50	20	15	15	100
9	FSSA-401	Farming System & Sustainable Agriculture	1(1+0)	50	30	20	-	100
10	PBSM-401	Problematic Soils and their Management	2(2+0)	50	30	20	-	100
		Total	**22(12+10)**					**1000**

Crop Production Technology –II (Rabi Crops) 2(1+1)

Theory

- Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Rabi crops;
    - **Cereals** –wheat and barley,
    - **Pulses**- chickpea, lentil, peas,
    - **Oilseeds**-rapeseed, mustard;
    - **Sugar crops**-sugarcane;
    - **Forage crops**-berseem and oat.

Practical

- To study of morphological characteristics of two rabi crops
- To Study Sowing methods of wheat.
- To study of identification of weeds in rabi season crops,
- To study of morphological characteristics of two rabi crops
- To study of important agronomic experiments of rabi crops at experimental farms.
- Visit to research stations of related crops.

Production Technology for Ornamental Crops, MAP and Landscaping 2 (1+1)

Theory

- **Ornamental crops:** Importance and scope of ornamental crops
- **Medicinal and aromatic plants (MAP)** Importance and scope of Medicinal and aromatic plants.
- **Landscaping**: Principles of landscaping. Landscape uses of trees, shrubs and climbers.
- Production technology of important cut flowers like rose, gerbera under protected conditions and gladiolus, tuberose, chrysanthemum under open conditions.
- **Production technology** of important medicinal plants like ashwagandha, aloe, Cinnamomum etc. and aromatic plants like mint, lemongrass, citronella, ocimum, rose.
- Study of training and pruning of plants.

Practical

- To study Identification of Ornamental plants.
- To study Identification of Medicinal and Aromatic Plants.
- To study Nursery bed preparation and seed sowing.
- To study Planning and layout of garden.
- To study Bed preparation and planting of MAP.
- Visit to commercial flower/MAP unit.

Renewable Energy and Green Technology 2(1+1)

Theory

- **Energy Sources**: Classification of different energy sources, contribution of these of sources in agricultural sector
- **Biofuel** : definition and importance and their application
- **Familiarization with types of biogas plants** and gasifiers, biogas, bioalcohol, biodiesel and biooil production and their utilization as bioenergy resource,
- **Introduction of solar energy** and their application.
- **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,
- **Introduction of wind energy** and their application.

Practical

- Familiarization with renewable energy gadgets.
- To study biogas plants,
- To study the production process of biodiesel,
- To study the production process of bio-fuels.
- Familiarization with different solar energy gadgets.
- To study solar cooker,
- To study solar drying system.
- To study solar distillation and solar pond.

Problematic Soils and their Management (New) 2(2+0)

Theory

- **Problematic Soils;** Definition, Types of Problematic Soils
- **Water Logging:** Definition, Cause of water logging, prevention of water logging
- **Soil management;** Definition, Properties, importance and kind of soil
- **Problem soil management** : Problem soil, Characterization of problem soil
- Reclamation and management of Saline and sodic soils, Acid soils and Polluted soils.
- **Irrigation water** – quality and standards, utilization of saline water in agriculture.
- **Remote sensing** and GIS in diagnosis and management of problem soils.
- Problematic soils under different Agroecosystems.

Production Technology for Fruit and Plantation Crops 2(1+1)

Theory

- Importance and scope of fruit and plantation crop industry in India;
- **Rootstocks**: Importance of rootstocks;
- Production technologies for the cultivation of
    - Major fruits-mango, citrus, guava, papaya
    - Minor fruits- jackfruit, pomegranate, pineapple,
    - Plantation crops-coconut, tea & coffee.
- **Growth regulator:** definition, type and use of growth regulator in fruit production

Practical

- To study Seed propagation
- To study Scarification and stratification of seeds.
- To study Propagation methods for fruit and plantation crops.
- To study about description and identification of fruit.
- To study different plant Regulator
- Visit to commercial orchards.

Principles of Seed Technology 3(1+2)

Theory

- **Seed and Seed Technology**: Introduction and importance of seed technology.
- **Seed quality;** Definition, characteristics of quality seeds and different classes of seed. Differences between seed and grain.
- **Seed Production:** Principles of seed production- cereals, pulses, oilseeds, and Commercial crops.
- **Seed certification,** phases of certification, procedure for seed certification. Seed Act and
  Seed Act enforcement.
- **Genetically modified crops**, Transgene contamination in non-GM crops, Principles of GM crop and organic seed production.
- **Seed resting-** importance, procedures, purity, viability and germination.
- **Seed drying-** processing and their steps, seed testing for quality assessment, seed treatment, its importance, method of application and seed packing.
- **Seed storage;** general principles, stages and factors affecting seed longevity during storage.
- **Seed marketing:** Factors affecting seed marketing, Role of WTO and OECD in seed marketing.

Practical

- To study Seed and Grain and their differences
- To study Seed production in cereals: Wheat, Rice and Maize.
- To study Seed production in pulses: Mung, Gram. Pigenpea.
- To study Seed production in oilseeds: Soybean, and Mustard,
- To study Seed production in important vegetable crops
- To study about maintenance of seed purity in the field.
- Visit to seed production farms, seed testing laboratories and seed processing plant.

Farming System and Sustainable Agriculture 1(1+0)

Theory

- **Farming systems** – Farming systems – Definition, types and methods of farming.
- **Sustainable agriculture-** Definition, scope and advantages of sustainable agriculture.
- Modern agriculture in relation to sustainable agriculture.
- **Cropping systems**: Important cropping systems for sustainable agriculture.

Agricultural Marketing, Trade and Prices 3(2+1)

Theory

- **Agricultural Marketing**: Market, Meaning, scope and classification of markets.
    - Definition of agricultural marketing, demand, supply and price.
    - Marketable surplus, marketed surplus. Integrated marketing.
    - General theory of markets and marketing.
    - Demand for agricultural products.
    - Production and market supply.
  - **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;
  - **Market functionaries and marketing channels**: Types and importance of agencies involved in agricultural marketing;
  - **Meaning and definition of marketing channel**; number of channel levels; marketing channels for different farm products; Integration, efficiency, costs and price spread: Meaning, definition and types of market integration; marketing efficiency; marketing costs, margins and price spread; factors affecting cost of marketing; reasons for higher marketing costs of farm commodities; ways of reducing marketing costs;
  - **Role of Govt. in agricultural marketing:** Public sector institutions-CWC, SWC, FCI, CACP & DMI – their objectives and functions; cooperative marketing in India;
  - **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

- To Survey of a market (mandi) both primary and secondary (at least one each).
- To Study of relationship between market arrivals and prices of some selected commodities; To 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 and Visit to market institutions – NAFED, SWC, CWC etc.
- To study their organization and functioning; Application of principles of comparative advantage of international trade.

Elective course:

Micropropagation Technologies 3(2+1)

Theory

- **Plant tissue culture** (definition , history, explant, steps, application); Types of cultures;
- **Micropropagation**- introduction, history, advantages and limitations, stages of micropropagation, method of micropropagation-
    - Axillary bud proliferation (Shoot tip and meristem culture, bud culture),
    - Organogenesis - formation of shoots and roots,
    - Meristem and shoot-tip culture (production of virus free plants),
    - Somatic embryogenesis,
- **Somaclonal variation**;
- **Secondary metabolite**
- **Plant growth hormone**; types and application
- **Artificial Seeds**- introduction and application
- **Cryopreservation**: introduction and application

Practical

- To study different equipment in tissue culture Laboratory
- Identification and use of equipments in tissue culture Laboratory,
- To study about Nutrition media composition,
- To study sterilization techniques for media, containers and small instruments,
- To study sterilization techniques for explants,
- To study stages of micropropagation
- To study method of micropropagation
    - Shoot tip and meristem culture,
    - Organogenesis
    - Somatic embryogenesis

.

Introductory Agrometeorology & Climate Change 2(1+1)

Theory

- Meaning and scope of agricultural meteorology;
- Earth atmosphere- its composition, extent and structure;
- Atmospheric weather variables; Atmospheric pressure, its variation with height; Wind, types of wind, daily and seasonal variation of wind speed, cyclone, anticyclone, land breeze and sea breeze;
- Nature and properties of solar radiation, solar constant, depletion of solar radiation, short wave, longwave and thermal radiation, net radiation, albedo;
- Atmospheric temperature, temperature inversion, lapse rate, daily and seasonal variations of temperature, vertical profile of temperature, Energy balance of earth; Atmospheric humidity, concept of saturation, vapor pressure, process of condensation, formation of dew, fog, mist, frost, cloud;
- Precipitation, process of precipitation, types of precipitation such as rain, snow, sleet, and hail, cloud formation and classification;
- Artificial rainmaking. Monsoon mechanism and importance in Indian agriculture, Weather hazards - drought, floods, frost, tropical cyclones and extreme weather conditions such as heat-wave and cold-wave. Agriculture and weather relations; Modifications of crop microclimate, climatic normals for crop and livestock production. Weather forecasting- types of weather forecast and their uses. Climate change, climatic variability, global warming, causes of climate change and its impact on regional and national Agriculture.

Practical

- Visit of Agrometeorological Observatory, site selection of observatory, exposure of instruments and weather data recording.
- Measurement of total, shortwave and longwave sunshine duration, computation of Radiation Intensity using BSS.
- Measurement of maximum and minimum air temperatures, its tabulation, trend and variation analysis.
- Measurement of soil temperature and computation of soil heat flux.
- Determination of vapor pressure and relative humidity.
- Determination of dew point temperature. Measurement of atmospheric pressure and analysis of atmospheric conditions.
- Measurement of wind speed and wind direction, preparation of windrose.
- Measurement, tabulation and analysis of rain.

B.Sc.(Hons.) Agriculture
Semester - V

S. No	Subject Code	Subject	Credit	Examination Marks Detail				
				External Exam	Internal Exam		Practical	Total
					Internal Exam	Assignments		
1	IPDM-501	Principles of Integrated Pest and Disease Management	3 (2+1)	50	20	15	15	100
2	MFSM-501	Manures, Fertilizers and Soil Fertility Management	3 (2+1)	50	20	15	15	100
3	PCSM-501	Pests of Crops and Stored Grain and their Management	3 (2+1)	50	20	15	15	100
4	DHCM-501	Diseases of Field and Horticultural Crops and their Management -I	3 (2+1)	50	20	15	15	100
5	CIKC-501	Crop Improvement-I (Kharif Crops)	2 (1+1)	50	20	15	15	100
6	EDBC-501	Entrepreneurship Development and Business Communication	2 (1+1)	50	20	15	15	100
7	GNPF-501	Geoinformatics and Nano-technology and Precision Farming	2 (1+1)	50	20	15	15	100
8	ELCT-501	Elective Course: Biopesticides & Biofertilizers	3(2+1)	50	30	15	15	100
9	AIPR-501	Intellectual Property Rights	1(1+0)	50	30	20	-	100
10	PCPK-501P	Practical Crop Production – I (Kharif crops)	2 (0+2)	-	-	-	100	100
		Total	**24(14+10)**					**1000**

Principles of Integrated Pest and Disease Management 3(2+1)

Theory

- Categories of insect pests and diseases,
- IPM: Introduction, importance, concepts, principles and tools of IPM.
- Economic importance of insect pests.
- Dynamics of economic injury level and importance of Economic threshold level.
- Methods of control: Host plant resistance, cultural, mechanical, physical, legislative, biological and chemical control.
- Safety issues in pesticide uses.

Practical

- Methods of diagnosis and detection of various insect pests, and plant diseases,
- Identification of biocontrol agents, different predators and natural enemies.
- Identification and nature of damage of important insect pests and diseases and their management.

Manures, Fertilizers and Soil Fertility Management 3(2+1)

Theory

- 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.
- **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.
- **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.
- Soil fertility evaluation, Soil testing. Critical levels of different nutrients in soil. Forms of nutrients in soil, plant analysis, rapid plant tissue tests. Indicator plants.
- **Methods of fertilizer recommendations to crops**. Factor influencing nutrient use efficiency (NUE), methods of application under rainfed and irrigated conditions.

Practical

- To study about Colorimetry and flame photometry.
- To study Green/leaf manuring
- To study about different fertilizers
- To Estimation of soil organic carbon
- To Estimation of N, P,K & S in plants.

Diseases of Field & Horticultural Crops & their Management-I 3 (2+1)

Theory:

- Symptom, etiology, disease cycle and management of major diseases of following crops:
  - **Field Crops: Rice**: blast, brown spot, bacterial blight, false smut, khaira and tungro; **Maize**: downy mildew, leaf spots; **Sorghum**: smuts; **Bajra** : downy mildew; **Groundnut**: early and late leaf spots; **Pigeonpea**: Phytophthora blight; **Finger millet**: Blast and leaf spot; **Castor**: Phytophthora blight; **Tobacco**: mosaic.
  - **Horticultural Crops: Guava:** wilt and anthracnose; **Banana:** Panama wilt, **Papaya**: foot rot, leaf curl, **Pomegranate**: bacterial blight; **Cruciferous vegetables**: Alternaria leaf spot, **Tomato**: early and late blight, buck eye rot; **Colocasia:** Phytophthora blight; **Coconut:** wilt; **Tea:** blister blight; **Coffee**: rust

Practical's

1. Identification and histop athological studies of selected diseases of field and horticultural crops covered in theory.
2. Field visit for the diagnosis of field problems.
3. Collection and preservation of plant diseased specimens for Herbarium;

Elective Course:

Biopesticides & Biofertilizers 3(2+1)

Theory

Biopesticides

- Definition, types of biopesticides; Microbial pesticides, Plant-incorporated-protectants (PIPs), Biochemical pesticides, Botanical pesticides, Biotic agents (parasitoids and predators) and commerce of biopesticide, advantage of biopesticides.
- *Bacillus thuringiensis*, insect viruses and entomo-pathogenic fungi – its characteristics, physiology, mechanism of action and application.

Biofertilizers

- Definition, type of biofertilizer; nitrogen biofertilizers, Compost biofertilizers, & Phosphorous biofertilizers, Importance of biofertilizers, Advantages and disadvantages of biofertilizer. Mass production of biofertilizer.
- Structure and characteristic features of
    - bacterial biofertilizers- *Azospirillum, Azotobacter, Bacillus, Pseudomonas, Rhizobium* and *Frankia*;
    - Cynobacterial biofertilizers- *Anabaena*, *Nostoc*,
    - Hapalosiphon and fungal biofertilizers- Mycorrhiza - VAM association, Types of mycorrhiza

Practical

- To study important biopesticides: *Trichoderma Pseudomonas*, *Bacillus.*
- Visit to biopesticide laboratory in nearby area.
- Field visit to explore naturally infected cadavers.
- To study important bio fertilizers *Rhizobium*, *Azospirillum* , *Azotobacter*, P-solubilizers and cyanobacteria.
- To study Mass multiplication and inoculums production of biofertilizers.
- To study Isolation of VAM fungi

Pests of Crops and Stored Grains and their Management 3(2+1)

Theory

- General account of the nature and type of damage by different arthropods pest:
- Scientific name of three major pests, order, family, host range & nature of damage.
- Nature and control practice of vegetable crops, fruit crops, ornamental crops and spices
- Factor affecting losses of stored grains & role of physical, mechanical, biological and chemical factor in deterioration of grains.
- Insect, rodents, birds, pests and microorganism associated with stored grain and their management.
- Fundamental principal of grain store management.

Practical

- To study identification of different type of damage in three crops
- To study identification type of damage in three fruits.
- To study fumigation of grain store/ godown
- To study identification of rodents & rodent control program in godowns.
- Visit to nearest FCI/nutritional industrial godowns

Geoinformatics, Nano-technology and Precision Farming 2(1+1)

Theory

- **Precision agriculture**: concepts and techniques; their issues and concerns for Indian agriculture;
- **Geo-informatics**- definition, concepts, tool and techniques; their use in Precision Agriculture.
- **Remote sensing concepts** and application in agriculture;
- **Global positioning system(GPS),** components and its functions;
- Introduction to crop Simulation Models and their uses for optimization of Agricultural Inputs;
- **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

- To study about Geo-informatics
- To study about Global positioning system(GPS), components and its functions
- To study fertilizers recommendations based of VRT and STCR techniques.
- To study Crop stress (biotic/abiotic) monitoring using geospatial technology.
- To study Use of GPS for agricultural survey.
- To study about Nanotechnology and applications of nanoparticles in agriculture.
- Projects formulation and execution related to precision farming.

Intellectual Property Rights 1(1+0)

Theory

- Introduction and meaning of intellectual property, brief introduction to GATT, WTO, TRIPs and WIPO.
- Types of Intellectual Property and legislations covering IPR in India:-Patents, Copyrights, Trademark, Industrial design, Geographical indications, Integrated circuits, Trade secrets.
- Patents Act 1970 and Patent system in India, patentability, process and product patent, filing of patent.
- Origin and history including a brief introduction to UPOV for protection of plant varieties, Plant breeders rights
- Registration of plant varieties under PPV&FR Act 2001, breeders, researcher and farmers rights. Traditional knowledge-meaning and rights of TK holders.
- Convention on Biological Diversity, International treaty on plant genetic resources for food and agriculture (ITPGRFA). Indian Biological Diversity Act, 2002 and its salient features.

Crop Improvement – I (*Kharif*) 2(1+1)

Theory

- Centers of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fibres; fodders and cash crops; vegetable and horticultural crops;
- Plant genetic resources, its utilization and conservation, study of genetics of qualitative and quantitative characters;
- Important concepts of breeding self pollinated, cross pollinated and vegetatively propagated crops;
- Hybrid seed production technology in Maize, Rice, Sorghum, Pearl millet and Pigeonpea, etc.
- Ideotype concept and climate resilient crop varieties for future.

Practical

- Floral biology, emasculation and hybridization techniques in different crop species;
- 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.

Practical Crop Production-I *(Kharif Crops)* 2(0+2)

Practical

Crop planning, raising field crops in multiple cropping systems: Field preparation, seed, treatment, nursery raising, sowing, nutrient, water and weed management and management of insect-pests diseases of crops, harvesting, threshing, drying winnowing, storage and marketing of produce. The emphasis will be given to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies. Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of 8-10 students.

Entrepreneurship Development and Business Communication

2 (1+1)

Theory

Concept of Entrepreneur, Entrepreneurship Development, Characteristics of entrepreneurs; SWOT Analysis & achievement motivation, Government policy and programs and institutions for entrepreneurship development, Impact of economic reforms on Agribusiness/ Agrienterprises, Entrepreneurial Development Process; Business Leadership Skills; Developing organizational skill (controlling, supervising, problem solving, monitoring & evaluation), Developing Managerial skills, Business Leadership Skills (Communication, direction and motivation Skills), Problem solving skill, Supply chain management and Total quality management, Project Planning Formulation and report preparation; Financing of enterprise, Opportunities for agrientrepreneurship 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.

B.Sc.(Hons.) Agriculture
Semester - VI

S. No	Subject Code	Subject	Credit	Examination Marks Detail				
				External Exam	Internal Exam		Practical	Total
					Internal Exam	Assignments		
1	RAWM-601	Rainfed Agriculture & Watershed Management	2 (1+1)	50	20	15	15	100
2	PCSA-601	Protected Cultivation and Secondary Agriculture	2 (1+1)	50	20	15	15	100
3	DHCM-601	Diseases of Field and Horticultural Crops and their Management-II	3 (2+1)	50	20	15	15	100
4	PHMV-601	Post-harvest Management and Value Addition of Fruits and Vegetables	2 (1+1)	50	20	15	15	100
5	AMBI-601	Management of Beneficial Insects	2 (1+1)	50	20	15	15	100
6	CIRC-601	Crop Improvement-II (Rabi crops)	2 (1+1)	50	20	15	15	100
7	APOF-601	Principles of Organic Farming	2 (1+1)	50	20	15	15	100
8	FMRE-601	Farm Management, Production & Resource Economics	2 (1+1)	50	20	15	15	100
9	ELCT-601	Elective Course : Agribusiness Management	3(2+1)	50	20	15	15	100
10	PFSN-601	Principles of Food Science and Nutrition	2(2+0)	50	30	20	-	100
11	PCPR-601P	Practical Crop Production –II (Rabi crops)	2 (0+2)	-	-	-	100	100
		Total	**24(13+11)**					**1100**

Rainfed Agriculture and Watershed Management: 2(1+1)

Theory

- Rainfed agriculture: Introduction, types, History of rainfed agriculture and watershed in India; Problems and prospects of rainfed agriculture in India.
- 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, Crop adaptation and mitigation to drought;
- Water harvesting: importance, its techniques, Efficient utilization of water through soil and crop management practices, Management of crops in rainfed areas
- Watershed management: Concept, objective, principles and components of watershed management, factor
-
- s affecting watershed management.

Practical

- Studies on climate classification, studies on rainfall pattern in rainfed areas of the country and pattern of onset and withdrawal of monsoons.
- Field demonstration on soil & moisture conservation measures.
- Field demonstration on construction of water harvesting structures.
- Visit to rainfed research station/watershed

Protected Cultivation and Secondary Agriculture 2(1+1)

Theory

- Green house technology: Introduction, Types of Green Houses;
    - Plant response to Green house environment,
    - Planning and design of greenhouses,
    - Design criteria of green house for cooling and heating purposes.
    - Green house equipments, materials of construction for traditional and low cost green houses.
    - Irrigation systems used in greenhouses, typical applications, passive solar green house, hot air green house heating systems, green house drying.
- Threshing –threshers for different crops, parts, terminology, care and maintenance
- Drying – Grain Drying, types of drying, types of dryers, Importance of drying.
- Storage- Grain Storage – Types of storage structures.
- Evaporation – Principles, Types of evaporators.

Practical

- Study of different type of green houses based on shape
- Determination of drying rate of agricultural products inside green house.
- Study of green house equipments.
- Visit to various Post Harvest Laboratories.
- Field visit to seed processing plant.

Diseases of Field & Horticultural Crops & their Management-II 3(2+1)

Theory

- Symptoms, etiology, disease cycle and management of following diseases:
  - Field Crops:
    - Wheat: rusts, loose smut, karnal bunt
    - Sugarcane: red rot, smut
    - Sunflower: Alternaria blight
    - Mustard: Alternaria blight, white rust, downy mildew
    - Gram: wilt
    - Cotton: anthracnose
    - Pea: powdery mildew
  - Horticultural Crops:
    - Mango: anthracnose
    - Citrus: canker
    - Grape vine: downy mildew
    - Apple: scab
    - Strawberry: leaf spot Potato
    - Cucurbits: downy mildew,
    - Onion purple blotch
    - Chillies: anthracnose
    - Marigold: Alternaria blight;
    - Rose: black leaf spot.

Practical

- Identification and histopathological studies of selected diseases of field and horticultural
  crops covered in theory.
- Field visit for the diagnosis of field problems.
- Collection and preservation of plant diseased specimens for herbarium.

Management of Beneficial Insects 2(1+1)

Theory

- Beneficial Insects: Definition and Importance of beneficial Insects,
- Beekeeping and pollinators, bee biology, commercial methods of rearing, equipment used, seasonal management, bee enemies and disease. Bee pasturage, bee foraging and communication. Insect pests and diseases of honey bee.
- Role of pollinators in cross pollinated plants. Types of silkworm, voltinism and biology of silkworm. Mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves. Rearing, mounting and harvesting of cocoons. Pest and diseases of silkworm, management, rearing appliances of mulberry silkworm and methods of disinfection.
- Species of lac insect, morphology, biology, host plant, lac production − seed lac, button lac, shellac, lac- products.

Practical

- To study of different Beneficial Insects
- To study to honey bee species, castes of bees. Beekeeping appliances and seasonal management, bee enemies and disease. Bee pasturage, bee foraging and communication.
- To study of types of silkworm, voltinism and biology of silkworm. Mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves.
- Species of lac insect, host plant identification.
- Visit to research and training institutions devoted to beekeeping, sericulture, lac culture and natural enemies.

Post-harvest Management and Value Addition of Fruits and Vegetables 2(1+1)

Theory:

- 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;
- Harvesting and field handling; Storage (ZECC, cold storage, CA, MA, and hypobaric); Value addition concept;
- Principles and methods of preservation; Intermediate moisture food- Jam, jelly, marmalade, preserve, candy – Concepts and Standards; Fermented and non-fermented beverages.
- Tomato products- Concepts and Standards; Drying/ Dehydration of fruits and vegetables – Concept and methods, osmotic drying. Canning -– Concepts and Standards, packaging of products.

Practical

- Study of importance of post-harvest processing of fruits
- Application of different types of packaging, containers for shelf life extension.
- Demonstration of chilling and freezing injury in vegetables and fruits.
- Extraction and preservation of pulps and juices.
- Preparation of jam, jelly, RTS, nectar, squash, osmotically dried products, fruit bar and candy and tomato products, canned products.
- Visit to processing unit/ industry.

Crop Improvement – II (*Rabi*) 2(1+1)

Theory

- Centers of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fodder crops and cash crops; vegetable and horticultural crops;
- Plant genetic resources, its utilization and conservation; study of genetics of qualitative and quantitative characters;
- Major breeding objectives and procedures for development of hybrids and varieties for yield, adaptability, stability, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional);
- Hybrid seed production technology of *rabi* crops. Ideotype concept and climate resilient crop varieties for future.

Practical

- Floral biology, emasculation and hybridization techniques in different crop species namely
    - Wheat
    - Field pea
    - Rapeseed Mustard
    - Sunflower
    - Sugarcane
    - Chilli
- Study of field techniques for seed production and hybrid seeds production in *Rabi* crops
- Layout of field experiments
- Visit to seed production plots
- Visit to AICRP plots of different field crop

Practical Crop Production-II *(Rabi Crops)* 2(0+2)

Practical

Crop planning, raising field crops in multiple cropping systems: Field preparation, seed, treatment, nursery raising, sowing, nutrient, water and weed management and management of insect-pests diseases of crops, harvesting, threshing, drying winnowing, storage and marketing of produce.

Principles of Organic Farming 2(1+1)

Theory

- 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; Organic nutrient resources and its fortification;
- Choice of crops and varieties in organic farming;
- Fundamentals of insect, pest, disease and weed management under organic mode of production;
- Operational structure of NPOP; Certification process and standards of organic farming;

Practical

- Visit of organic farms to study the various components and their utilization;
- Preparation of enrich compost, vermicompost, bio-fertilizers/bio-inoculants and their quality analysis;

Farm Management, Production and Resource Economics 2(1+1)

Theory

- **Farm management**- Meaning and concept of farm management, objectives and relationship with other sciences. Meaning and definition of farms, its types and characteristics, factor determining types and size of farms.
- **Principles of farm management**: concept of production function and its type, use of production function in decision-making on a farm, factor-product, factor-factor and product-product relationship, law of equi-marginal/or principles of opportunity cost and law of comparative advantage.
- **Meaning and concept of cost**, types of costs and their interrelationship, importance of cost in managing farm business.
- **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.

Practical

- Preparation of farm layout.
- Determination of cost of fencing of a farm.
- Preparation of farm plan and budget, farm records and accounts.
- Collection and analysis of data on various resources in India.

Elective Course :

Agribusiness Management 3(2+1)

Theory

- Transformation of agriculture into agribusiness, various stakeholders and components of agribusiness systems. Importance of agribusiness in the Indian economy and New Agricultural Policy.
- Distinctive features of Agribusiness Management: Importance and needs of agro-based industries, Classification of industries and types of agro based industries.
- Institutional arrangement, procedures to set up agro based industries. Constraints in establishing agro-based industries.
- Agri-value chain: Understanding primary and support activities and their linkages. Business environment: PEST & SWOT analysis.
- Management functions: Roles & activities, Organization culture. Planning, meaning, definition, types of plans. Purpose or mission, goals or objectives, Strategies, polices procedures, rules, programs and budget.
- Components of a business plan, Steps in planning and implementation.
- Organization staffing, directing and motivation. Ordering, leading, supervision, communications, control.
- Sales & Distribution Management. Pricing policy, various pricing methods.

Practical

- Study of agri-input markets: Seed, fertilizers, pesticides.
- Study of financing institutions- Cooperative, Commercial banks, RRBs, Agribusiness Finance Limited, NABARD.
- Preparations of projects and Feasibility reports for agribusiness entrepreneur.

Principles of Food Science and Nutrition 2(2+0)

Theory

- Concepts of Food Science; Food composition and chemistry.
- Food microbiology (definition, predominate microorganismsin food- bacteria, yeast, moulds, food spoilage, Production of fermented foods, Probiotics).
- Principles and methods of food processing and preservation (use of heat, low temperature, chemicals, radiation, drying etc.).
- Food and nutrition, Malnutrition (over and under nutrition), nutritional disorders.
- Food Guides & Food groups, Balanced/modified diets, Menu planning.

B.Sc. Agriculture

Syllabus

Semester- VII

Rural Awareness Works Experience (RAWE) and Agro-Industrial Attachment (AIA)

It will consist of general orientation training by different faculties followed by village attachment/unit attachment in University/College/KVK or a Research station. The students will be attached with the agro-industries to get an experience of the industrial environment and working. Weightage in terms of credit hours/ Marks will be given depending upon the duration of stay of students in villages/agro-industries. At the end of RAWE/AIA, the students will be given one week for project report preparation, presentation and evaluation. The students would be required to record their observations and will prepare their project report based on these observations.

B.Sc.(Hons.) Agriculture
Semester - VI

Subject Code	Subject	Credit	Examination Marks Detail				
			External Exam	Internal Exam		Practical	Total
				Internal Exam	Assignments		
RAWE & AIA	General orientation training by different faculties	20				400	400
	Village attachment/Unit attachment in Univ./ College. KVK/ Research Station Attachment					400	400
	Agro-Industrial Attachment						
	Project Report Preparation, Presentation						
	Evaluation & Viva Voce					200	200
	Total	20				1000	1000

B.Sc.(Hons.) Agriculture
Semester - VIII

Subject Code	Subject	Credit	Examination Marks Detail				
			External Exam	Internal Exam		Practical	Total
				Internal	Assignments		
AELP	**Experiential Learning Programme (AELP-801-812)**	10 (0+10)	-	-	-	400	400
	Viva Voice of ELP-1		-	-	-	100	100
	Experiential Learning Programme (AELP-801-812)	10 (0+10)	-	-	-	400	400
	Viva Voice of ELP-2		-	-	-	100	100
	Total	**20**	**-**	**-**	**-**	**1000**	**1000**

Experiential Learning Programme (ELP)

This programmer will be undertaken by the students preferably during the VIII semester with a weightage of 0+20 credit hours. The students will register for **any of two modules (of 0+10 credit each) listed below**:

Subject Code	Topic	Credits
AELP-801	Production Technology for Bio-agents and Bio-fertilizers	10
AELP-802	Seed Production and Technology	10
AELP-803	Mushroom Cultivation Technology	10
AELP-804	Soil, Plant, Water and Seed Testing	10
AELP-805	Poultry Production Technology	10
AELP-806	Hybrid Seed Production Technologies	10
AELP-807	Floriculture and Landscaping	10
AELP-808	Food Processing	10
AELP-809	Commercial Horticulture	10
AELP-810	Agriculture Waste Management	10
AELP-811	Organic Production Technology	10
AELP-812	Commercial Sericulture	10