

**Distribution of Courses, Syllabii and Credits for B.Sc. (Hons.) Agriculture**

**5<sup>th</sup> Semester**

<b>Sl. No.</b>	<b>Course No.</b>	<b>Title of Course</b>	<b>Credit(s)</b>
1	AGR 301	Crop Production Technology IV ( <i>Kharif</i> crops)	2(1+1)
2	AGR 302	Rainfed Agriculture and Watershed Management	2(1+1)
3	GPB 303	Crop Improvement II ( <i>Kharif</i> crops)	2(1+1)
4	ABT 304	Principles and Practices of Agricultural Bio-technology	2(1+1)
5	ACSS 305	Problematic Soils and their Management	2(1+1)
6	AEPP 306	Principles of Integrated Pest and Disease Management	3(2+1)
7	AEC 307	Farm Management, Production and Resource Economics	2(1+1)
8	AEX 308	Entrepreneurship Development and Business Communication	2(1+1)
9	HORT 309	Production Technology of Ornamental Crops, MAP and Landscaping	2(1+1)
10	AEMP 310	Protected Cultivation and Secondary Agriculture	2(1+1)
11	EC 311-318	Elective Course	3(2+1)
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**AGR 301      Crop production Technology IV (*Kharif* Crops)**

**2(1+1)**

**Theory**

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of fibre crops; commercial crops, medicinal and aromatic crops:

Fibre crops: Jute, Cotton and Sunnhemp

Commercial crops: Sugarcane and Sugarbeet

Medicinal and Aromatic: Mentha, Citronella, Lemon grass, Palmarosa, Isabgul and Poppy

### **Practical**

Field preparation, sowing of fibre, commercial, medicinal and aromatic crops, and inter / mix cropping; Calculations of seed rate and fertilizers; Effect of seed size and sowing depth on germination and seeding vigour of fibre, commercial, medicinal and aromatic crops; Top dressing and foliar feeding of nutrients; Identification of weeds and their control measures, important intercultural operations and water management; Study of varieties, yield contributing characters, yield estimation of important fibre, commercial, medicinal and aromatic crops; Cost of cultivation; Crop distribution in West Bengal and its ecological regions; Study of crop varieties and important agronomic experiments at experimental farms; Visit to research stations for related *kharif* crops and multiple cropping.

**AGR 302      Rainfed Agriculture and Watershed Management**

**2(1+1)**

**Theory:**

Rainfed agriculture: history, introduction and types; Soil and climatic conditions prevalent in rainfed areas; Drought: types, effect of water deficit on physio-morphological characteristics of the plants; Crop adaptation and mitigation to drought; Efficient utilization of water through soil and crop management practices, management of crops in rainfed areas; Contingent crop planning for aberrant weather conditions; Soil and water conservation techniques; Water harvesting: importance and its techniques; Watershed management: history, concept, objectives, principles, components, influential factors, choice of crops and cropping system

### **Practical**

Study on rainfall pattern in rainfed areas of the country; Study on cropping pattern of different rainfed areas; Rainfall analysis: Frequency, intensity, duration and probability; Interpretation of meteorological data and scheduling of supplemental irrigation on the basis of evapo-transpiration demand of crops; Study on cultural practices for mitigating moisture stress; Field demonstration on soil and moisture conservation measures; Characterization and delineation of model watershed; Field demonstration on construction of water harvesting structures; Analysis of case studies of some identified watersheds and their management in different agro-climatic conditions; Visit to rainfed research station / watershed.

**GPB 303      Crop Improvement II (*Kharif* Crops)**

**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; 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); 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; viz., Rice, Jute, Maize, Sorghum, Pearl millet, Ragi, Pigeonpea, Urdbean, Mungbean, Soybean, Groundnut, Sesame, 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.

Concepts and scope of plant biotechnology; Introduction to plant tissue culture- culture media and aseptic manipulation; Types of culture- organ culture, embryo culture, cell suspension culture, callus culture, anther culture, pollen culture and ovule culture and their applications; Organogenesis and embryogenesis; Micro-propagation methods; Synthetic seeds and their significance; Embryo rescue and its significance; Somatic hybridization and cybrids; Somaclonal variation and its use in crop improvement; cryo-preservation.

Introduction to rDNA technology and gene cloning, 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; Biotechnology regulations.

### **Practical**

Sterilization techniques, Preparation of MS medium, Fresh culture and Sub-culture, Micro-propagation- hardening and acclimatization, Synthetic seed development, Demonstration on isolation of DNA, Demonstration on PCR amplification, Demonstration of gel electrophoresis techniques and DNA finger printing.

**ACSS 305      Problematic Soils and their Management**

**2(1+1)**

**Theory**

Soil quality and health, Distribution of Waste land and problem soils in India. Their categorization based on properties. Reclamation and management of Saline and sodic soils, Acid soils, Acid Sulphate soils, Eroded and Compacted soils, Flooded soils, Polluted soils. Irrigation water – quality and standards, utilization of saline water in agriculture. Remote sensing and GIS in diagnosis and management of problem soils. Multipurpose tree species, bio remediation through MPTs of soils, land capability and classification, land suitability classification. Problematic soils under different Agro eco systems.

### **Practical**

pH, EC & ESP of the saturation extract of the saline soil. SAR & Gypsum requirement of sodic soils. Lime requirement and Gypsum requirement of problem soils. Parameters of quality of irrigation water. Determination of lime requirement of acid soils

Categories of insect pests and diseases, IPM: Introduction, history, importance, concepts, principles and tools of IPM. Economic importance of insect pests, diseases and pest risk analysis. Methods of detection and diagnosis of insect pest and diseases. Calculation and dynamics of economic injury level and importance of Economic threshold level. Methods of control: Host plant resistance, cultural, mechanical, physical, legislative, biological and chemical control. Ecological management of crop environment. Different aspects of plant bio-security, bio-safety and preventive measures. Introduction to conventional pesticides for the insect pests and disease management. Survey surveillance and forecasting of Insect pest and diseases. Development and validation of IPM module. 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 programmes. Case histories of important IPM programmes.

### **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 . Performance study of hot water treatments of fruits and vegetables.

Components of IPM- Physical, mechanical, biological, chemical and legislative methods. Biotechnological approaches in IPM. Pest surveillance and sampling. Ecological backlash and its management, resistance of population to pest management tactics, pest population resurgence and replacement. Problems and constraints in the implementation of IPM. IPM on rice, sugarcane, mustard, brinjal, cabbage, pulse crops, jute, major fruit trees.

IDM progress, Central idea of IDM, Phases of IDM, Strategies adopted for IDM, Plant disease management : Management of host, pathogen and environment; Principles of plant disease management : Avoidance, Eradication, Protection, Host resistance and therapy: Procedures of plant disease management. Different methods of cultural, Biological and Chemical control. Integrated disease management practices, IDM on rice, potato, groundnut, jute, mustard, wheat, vegetable crops, pulses, major fruit trees.

### **Practical**

Sampling techniques of different pests, estimation of population of different pests and crop loss, studies of different types of traps, assessment of different natural enemies, study of chemical pesticides and calculation of doses, study of physical, mechanical and biological methods of control, study on IPM practices in rice, mustard, cucurbits, jute, vegetables and fruit crops.

Acquaintance with different types of chemicals; seed treatment; soil treatment foliar application of chemicals, assessment of disease incidence and severity, yield loss assessment, quantification of pesticides for application, preservation of disease samples, cost: benefit ratio calculation.

Categories of insect pests and diseases, IPM: Introduction, history, importance, concepts, principles and tools of IPM. Economic importance of insect pests, diseases and pest risk analysis. Methods of detection and diagnosis of insect pest and diseases. Calculation and dynamics of economic injury level and importance of Economic threshold level. Methods of control: Host plant resistance, cultural, mechanical, physical, legislative, biological and chemical control. Ecological management of crop environment. Introduction to conventional pesticides for the insect pests and disease management. Survey surveillance and forecasting of Insect pest and



diseases. Development and validation of IPM module. 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 programmes. Case histories of important IPM programmes.

### **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.

## **AEPP 306 Principles of Integrated Disease Management**

**1(1+0)**

### **Theory**

IDM progress, Central Idea of IDM, Phases of IDM, Strategies adopted for IDM, Plant disease management : Management of Host, pathogen and environment.; Principles of plant disease management : Avoidance, Eradication, Protection, Host resistance and therapy,: Procedures of plant disease Management. Different methods of cultural, Biological and Chemical Control. Integrated disease management practices, IDM on Rice, Potato, Groundnut, Jute, Mustard, Wheat, Vegetable crops, Pulses, Major fruit trees.

### **Practical**

Acquaintance with different types of chemicals; seed treatment; soil treatment; foliar application of chemicals, Assessment of disease incidence and severity, yield loss assessment, quantification of pesticides for application, preservation of disease samples.

## **AEC 307 Farm Management, Production and Resource Economics**

**2(1+1)**

## **Theory**

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 and estimation of gross farm income, net farm income, family labor income and farm business income. Farm business analysis: meaning and concept of farm income and profitability, technical and economic efficiency measures in crop and livestock enterprises. Importance of farm records and accounts in managing a farm, various types of farm records needed to maintain on farm, farm inventory, balance sheet, profit and loss accounts. Meaning and importance of farm planning and budgeting, partial and complete budgeting, steps in farm planning and budgeting-linear programming, appraisal of farm resources, selection of crops and livestock's enterprises. Concept of risk and uncertainty occurs in agriculture production, nature and sources of risks and its management strategies, Crop/livestock/machinery insurance – weather based crop insurance, features, determinants of compensation. Concepts of resource economics, differences between NRE and agricultural economics, unique properties of natural resources. 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. Computation of depreciation cost of farm assets. Application of equi-marginal returns/opportunity cost principle in allocation of farm resources. Determination of most profitable level of inputs use in a farm production process. Determination of least cost combination of inputs. Selection of most profitable enterprise combination. Application of cost principles including CACP concepts in the estimation of cost of crop and livestock enterprises. Preparation of farm plan and budget, farm records and accounts and profit & loss accounts. Collection and analysis of data on various resources in India.

## **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: Communication, direction and motivation skills, Problem solving skill. Supply chain management and Total quality management. Project Planning, Formulation and Evaluation. Opportunities for agri-entrepreneurship and rural enterprise. Financing of enterprise.

## **Practical**

Methods for Assessing entrepreneurial traits. Techniques of Managerial skills and achievement motivation. Creativity Exercise. Identification and selection of business idea, preparation of business plan and proposal writing, visit to entrepreneurship development institute and entrepreneurs. Methods for problem solving skills. Project formulation in terms of Time, Cost, resource and Management. SWOT analysis & Exercise.

## **Theory**

Importance and scope of ornamental crops, medicinal and aromatic plants and landscaping. Principles of landscaping. Landscape uses of trees, shrubs and climbers. Production technology of important cut flowers like rose, gerbera, carnation, liliun and orchids under protected conditions and gladiolus, tuberose, chrysanthemum under open conditions. Package of practices for loose flowers like marigold and jasmine under open conditions. Production technology of important medicinal plants like ashwagandha, asparagus, aloe, costus, Cinnamomum, periwinkle, isabgol and aromatic plants like mint, lemongrass, citronella, palmarosa, ocimum, rose, geranium, vetiver. 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.

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. Cost estimation and economic analysis.

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

### **Practical**

Study of different type of green houses based on shape. Determine the rate of air exchange in an active summer winter cooling system. Determination of drying rate of agricultural products inside green house. Study of green house equipments. Visit to various Post Harvest Laboratories. Determination of Moisture content of various grains by oven drying & infrared moisture methods. Determination of engineering properties (shape and size, bulk density and porosity of biomaterials). Determination of Moisture content of various grains by moisture meter. Field visit to seed processing plant.