



**B. Sc. (Hons.) Agriculture**  
**SEMESTER-VI**  
**Syllabus: Rainfed Agriculture & Watershed Management**  
**Paper Code: AG335**  
**w.e.f. Session 2020-21**

**Theory**

**2 (1+1)**

**Uini-1**

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

**Uini-II**

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

**Uini-III**

Water harvesting: importance, its techniques, Efficient utilization of water through soil and crop management practices, Management of crops in rainfed areas,

**Uini-IV**

Contingent crop planning for aberrant weather conditions, Concept, objective, principles and components of watershed management, factors 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. Studies on cropping pattern of different rainfed areas in the country and demarcation of rainfed area on map of India. Interpretation of meteorological data and scheduling of supplemental irrigation on the basis of evapo-transpiration demand of crops. Critical analysis of rainfall and possible drought period in the country, effective rainfall and its calculation. Studies on cultural practices for mitigating moisture stress. Characterization and delineation of model watershed. Field demonstration on soil & moisture conservation measures. Field demonstration on construction of water harvesting structures. Visit to rainfed research station/watershed.

**Suggesting Readings:**

Johan Rockström, K. L. Sahrawat, and Suhas Pralhad Wani (2011) Integrated Watershed Management in Rainfed Agriculture.

Suraj Nagar (2011), Integrated Watershed Management in Rainfed Agriculture.

R.K.Nanwal (2019) Rainfed Agriculture and Watershed Management.

Suhas Pralhad Wani (2009) Rainfed Agriculture: Unlocking the Potential

**B. Sc. (Hons.) Agriculture**  
**SEMESTER-VI**  
**Syllabus: Farming System & Sustainable Agriculture**  
**Paper Code: AG336**  
**w.e.f. Session 2020-21**

**Theory**

**1(1+0)**

**Unit I**

Farming System-scope, importance, and concept, Types and systems of farming system and factors affecting types of farming, Farming system components and their maintenance, Cropping system and pattern, multiple cropping system, Efficient cropping system and their evaluation

**Unit II**

Allied enterprises and their importance, Tools for determining production and efficiencies in cropping and farming system; Sustainable agriculture-problems and its impact on agriculture, indicators of sustainability, adaptation and mitigation, conservation agriculture strategies in agriculture, HEIA, LEIA and LEISA and its techniques for sustainability

**Unit III**

Integrated farming system-historical background, objectives and characteristics, components of IFS and its advantages, Site specific development of IFS model for different agro-climatic zones, resource use efficiency and optimization techniques

**Unit IV**

Resource cycling and flow of energy in different farming system, farming system and environment, Visit of IFS model in different agro-climatic zones of nearby states University/ institutes and farmers field.

**Suggesting Readings:**

- William L Donn. 1965. Meteorology. McGraw-Hill Book Co. New York.
- A.K.Dahama. 2007. *Organic farming for sustainable agriculture*. Agrobios (India), Jodhpur
- Arnon L. 1972. Crop Production in Dry Regions. Leonard Hill Publishing Co. London.
- Yawalkar K S and Agarwal J P. 1977. Manures and Fertilizers. Agricultural Horticultural Publishing House, Nagpur
- Gupta O P. 1984. Scientific Weed Management in the Tropics and Sub- Tropics. Today and Tomorrow's Printers and Publishers. New Delhi.
- Reddy Yellamanda T and Shankar Reddy G H. 1995. Principles of Agronomy. Kalyani Publishers Ludhiana.

**B. Sc. (Hons.) Agriculture**  
**SEMESTER-VI**  
**Syllabus: Protected Cultivation and Secondary Agriculture**  
**Paper Code: HT327**  
**w.e.f. Session 2020-21**

**Theory**

**2 (1+1)**

**Unit I**

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

**Unit II**

Design criteria of green house for cooling and heating purposes, Irrigation systems used in greenhouses, typical applications, passive solar green house, hot air green house heating systems, green house drying,

**Unit III**

Green house equipment's, materials of construction for traditional and low cost green houses, 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.

**Unit IV**

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.

**Suggesting Readings:**

- Protected cultivation of Horticultural Crops by Dinesh Kumar Singh and K V Peter, NIPA Publishers
- Advances in Protected Cultivation by Bhrama Singh, by NIPA Publishers
- Hydroponics and Protected Cultivation by Lynette Morgan by CABI Publishers
- Balraj Singh. 2006. *Protected cultivation of vegetable crops*. Kalyani Publishers, Ludhiana
- Jitendra Singh, 2015. *Precision Farming in Horticulture*. New India Publishing Agency. New Delhi.

## **B. Sc. (Hons.) Agriculture**

### **SEMESTER-VI**

#### **Syllabus: Diseases of Field and Horticultural Crops and their Management-II**

**Paper Code: AG339**

**w.e.f. Session 2020-21**

#### **Theory**

**3 (2+1)**

##### **Unit I**

Symptoms, etiology, disease cycle and management of Field Crops: Wheat: rusts, loose smut, karnal bunt, powdery mildew, alternaria blight, and ear cockle; Lentil: rust and wilt; Pea: downy mildew, powdery mildew and rust; Gram: wilt, grey mould and Ascochyta blight;

##### **Unit II**

Symptoms, etiology, disease cycle and management of Field Crops: Sunflower: Sclerotinia stem rot and Alternaria blight; Mustard: Alternaria blight, white rust, downy mildew and Sclerotinia stem rot; Cotton: anthracnose, vascular wilt, and black arm; Sugarcane: red rot, smut, wilt, grassy shoot, ratoon stunting and Pokkah Boeng

##### **Unit III**

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

##### **Unit IV**

Symptoms, etiology, disease cycle and management of Horticultural Crops: Peach: leaf curl. Strawberry: leaf spot Potato: early and late blight, black scurf, leaf roll, and mosaic; Cucurbits: downy mildew, powdery mildew, wilt; Onion and garlic: purple blotch, and Stemphylium blight; Chillies: anthracnose and fruit rot, wilt and leaf curl; Turmeric: leaf spot Coriander: stem gall Marigold: Botrytis blight; Rose: dieback, powdery mildew and black leaf spot

##### **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.

#### **Suggested Readings:**

- Joshi LM, Singh DV & Srivastava KD. 1984. Problems and Progress of Wheat Pathology in South Asia. Malhotra Publ. House, New Delhi.
- Rangaswami G. 1999. Diseases of Crop Plants in India. 4th Ed.. Prentice Hall of India, New Delhi.
- Ricanel C, Egan BT, Gillaspie Jr AG & Hughes CG. 1989. Diseases of Sugarcane, Major Diseases. Academic Press, New York.
- Singh RS. 1998. Plant Diseases. 7th Ed. Oxford & IBH, New Delhi.
- Singh US, Mukhopadhyay AN, Kumar J & Chaube HS. 1992. Plant Diseases of International Importance. Vol. I. Diseases of Cereals and Pulses. Prentice Hall, Englewood Cliffs, New Jersey

**B. Sc. (Hons.) Agriculture  
SEMESTER-VI**

**Syllabus: Post-harvest Management and Value Addition of Fruits and Vegetables**

**Paper Code: HT328**

**w.e.f. Session 2020-21**

**Theory**

**2 (1+1)**

**Unit-I**

Importance of post-harvest processing of fruits and vegetables, extent and possible causes of post harvest losses.

**Unit-II**

Pre-harvest factors affecting postharvest quality, maturity, ripening and changes occurring during ripening; Respiration and factors affecting respiration rate; Harvesting and field handling; Storage (ZECC, cold storage, CA, MA, and hypobaric); Value addition concept.

**Unit-III**

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.

**Unit-IV**

Drying/ Dehydration of fruits and vegetables – Concept and methods, osmotic drying. Canning – Concepts and Standards, packaging of products.

**Practical**

Applications of different types of packaging, containers for shelf life extension. Effect of temperature on shelf life and quality of produce. Demonstration of chilling and freezing injury in vegetables and fruits. Extraction and preservation of pulps and juices. Preparation of jam, jelly, RTS, nectar, squash, osmotically dried products, fruit bar and candy and tomato products, canned products. Quality evaluation of products -- physico-chemical and sensory. Visit to processing unit/ industry.

**Suggested Readings:**

- Ahmad, M.S. & Siddiqui, M.W. 2015. Post Harvest Quality Assurance of Fruits. Springer International Publishing AG Switzerland
- Nanda, V. & Sharma, S. 2017. Novel Food Processing Technologies. New India Publishing Agency.
- Bhutani RC. 2003. Fruit and Vegetable Preservation. Biotech Books.
- Chadha KL & Pareek OP. (Eds.). 1996 Advances in Horticulture. Vol. IV. Malhotra Publ. House.
- Haid NF & Salunkhe SK. 1997. Post Harvest Physiology and Handling of Fruits and Vegetables. Grenada Publ.
- Mitra SK. 1997. Post Harvest Physiology and Storage of Tropical and Sub-tropical Fruits. CABI.
- Ranganna S. 1997. Hand Book of Analysis and Quality Control for Fruit and Vegetable Products. Tata McGraw-Hill.

**B. Sc. (Hons.) Agriculture**  
**SEMESTER-VI**  
**Syllabus: Management of Beneficial Insects**  
**Paper Code: AG340**  
**w.e.f. Session 2020-21**

**Theory**

**2 (1+1)**

**Unit I**

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.

**Unit II**

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

**Unit III**

Species of lac insect, morphology, biology, host plant, lac production – seed lac, button lac, shellac, lac- products. Identification of major parasitoids and predators commonly being used in biological control.

**Unit IV**

Insect orders bearing predators and parasitoids used in pest control and their mass multiplication techniques. Important species of pollinator, weed killers and scavengers with their importance.

**Practical**

Honey bee species, castes of bees. Beekeeping appliances and seasonal management, bee enemies and disease. Bee pasturage, bee foraging and communication. Types of silkworm, voltinism and biology of silkworm. Mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves. Species of lac insect, host plant identification. Identification of other important pollinators, weed killers and scavengers. Visit to research and training institutions devoted to beekeeping, sericulture, lac culture and natural enemies. Identification and techniques for mass multiplication of natural enemies.

**Suggested Readings:**

- Handbook of Entomology by T V Prasad 2016. Kindle Edition.
- Elements of Economic Entomology 8th Edition (English, Paperback, BV David, VV Ramamurthy)
- Get latest entomology books online through:<https://www.questia.com/library/science-and-technology/life-sciences-and-agriculture/entomology>
- Get the course outlook at <http://www.jnkvv.org/PDF/0304202020410434200120.pdf>

**B. Sc. (Hons.) Agriculture**  
**SEMESTER-VI**  
**Syllabus: Crop Improvement-II (*Rabi crops*)**  
**Paper Code: AG341**  
**w.e.f. Session 2020-21**

**Theory**

**2 (1+1)**

**Unit I**

Centers of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fodder crops and cash crops; vegetable and horticultural crops

**Unit II**

Plant genetic resources, its utilization and conservation; study of genetics of qualitative and quantitative characters

**Unit III**

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)

**Unit IV**

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, Oat, Barley, Chickpea, Lentil, Field pea, Rajma, Horse gram, Rapeseed Mustard, Sunflower, Safflower, Potato, Berseem. Sugarcane, Tomato, Chilli, Onion; 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 *Rabi* crops; Estimation of heterosis, inbreeding depression and heritability; Layout of field experiments; Study of quality characters, study of donor parents for different characters; Visit to seed production plots; Visit to AICRP plots of different field crops

**Suggested Readings:**

- Plant Breeding, Principles and Methods by B D Singh, Kalyani Publication.
- Vegetable Breeding, Principles and Practices by Hari Har Ram, Kalyani Publication.
- Essentials of Plant Breeding, by Phundan Singh, Kalyani Publication.
- Modern Techniques of Raising Field Crops by Chhidda Singh, Prem Singh and Rajbir Singh, Oxford and IBH Publishing Co Pvt Ltd.



**B. Sc. (Hons.) Agriculture**  
**SEMESTER-VI**  
**Syllabus: Practical Crop Production –II (*Rabi* crops)**  
**Paper Code: AG342**  
**w.e.f. Session 2020-21**

**Practical**

**2 (0+2)**

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.

**B. Sc. (Hons.) Agriculture**  
**SEMESTER-VI**  
**Syllabus: Principles of Organic Farming**  
**Paper Code: AG343**  
**w.e.f. Session 2020-21**

**Theory**

**2 (1+1)**

**Unit I**

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

**Unit II**

Organic ecosystem and their concepts; Organic nutrient resources and its fortification; Restrictions to nutrient use in organic farming; Choice of crops and varieties in organic farming

**Unit III**

Fundamentals of insect, pest, disease and weed management under organic mode of production; Operational structure of NPOP

**Unit IV**

Certification process and standards of organic farming; Processing, leveling, economic considerations and viability, marketing and export potential of organic products.

**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; Indigenous technology knowledge (ITK) for nutrient, insect, pest disease and weed management; Cost of organic production system; Post harvest management; Quality aspect, grading, packaging and handling.

**Suggested Readings:**

- Principles of Organic Farming by P L Maliwa
- Principles of Organic Farming, by S R Reddy, Kalyami Publications, New Delhi
- Basics of Organic Farming by Bansal M
- Jaivik Kheti (Organic Farming) by Chandra Prakash Shukl, Pointer Publishers

**B. Sc. (Hons.) Agriculture**  
**SEMESTER-VI**  
**Syllabus: Farm Management, Production & Resource Economics**  
**Paper Code: AG344**  
**w.e.f. Session 2020-21**

**Theory**

**2 (1+1)**

**Unit I**

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

**Unit II**

Meaning and concept of cost, types of costs and their interrelationship, importance of cost in managing farm business and estimation of gross farm income, net farm income, family labour income and farm business income. Farm business analysis: meaning and concept of farm income and profitability, technical and economic efficiency measures in crop and livestock enterprises.

**Unit II**

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.

**Unit II**

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.

**Suggested Readings:**

- Tandan R.K. and Dhondiyal, S.P. "Principles and Methods of Farm Management".
- Johl, S.S. and Kapoor, T.R. "Fundamental of Farm Business Management, KalyaniPublishers,Ludhiana and New Delhi.
- Sankhayan, P.L. "Introduction to the Economics of Agricultural Production".
- Karam, A.S. and Karan Singh "Economics of Farm Management in India".

**B. Sc. (Hons.) Agriculture**  
**SEMESTER-VI**  
**Syllabus: Principles of Food Science and Nutrition**  
**Paper Code: AG345**  
**w.e.f. Session 2020-21**

**Theory**

**2 (2+0)**

**Unit I**

Concepts of Food Science (definitions, measurements, density, phase change, pH, osmosis, surface tension, colloidal systems etc.); Food composition and chemistry (water, carbohydrates, proteins, fats, vitamins, minerals, flavours, colours, miscellaneous bioactives, important reactions).

**Unit II**

Food microbiology (bacteria, yeast, moulds, spoilage of fresh & processed foods, Production of fermented foods); Principles and methods of food processing and preservation (use of heat, low temperature, chemicals, radiation, drying etc.).

**Unit III**

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

**Suggested Readings**

- Swaminathan MS Food Science, Chemistry and Experimental Foods, Bangalore Print & Publishing Company.
- Manay SN and Shadaksharaswamy M (2008): Foods: facts and principles, 3rd Ed. New Age International (P) Ltd
- Sohi D. A Comprehensive Textbook of Nutrition & Therapeutic Diets, New Delhi: Jaypee Brothers Medical Publishers
- Hughes O and Bennion, M (1970): Introductory Foods, 5th Ed. Macmillan & Co., New York
- Frazier WC and Westhoff D C and Vanitha NM (2017): Food Microbiology, 5th Ed. McGraw Hill Education.
- Jay JM (2005): Modern Food Microbiology, 3rd Ed. CBS Publishers & Distributors.