B.Sc. Agriculture VI- Semester

Management of Beneficial Insects	**Credit hours: 2(1+1)**

Theory:

Importance of beneficial Insects, Beekeeping, pollinating plant and their cycle, 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.

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. Identification of major parasitoids and predators commonly being used in biological control.

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

Practicals:

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.

References:

- Metcalf, R.L and Luckman W.H. (1982). Introduction to Insect Pest Management. Wiley Inter Science publishing, New York.
- G.S.Dhaliwal and Ramesh Arora. (2001). Integrated Pest Management. Concepts and Approaches. Kalyani publishers, New Delhi.

- Yazdani G.S. and Agarwal M.L. (1979). Elements of Insect Ecology. Naroji publishing house, New Delhi.
- David, B.V. 2003. Elements of Economic Entomology, Popular Book Depot, Chennai.

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

Theory :

Symptoms, etiology, disease cycle and management of following diseases:

Field Crops:

Wheat: rusts, loose smut, karnal bunt, powdery mildew, alternaria blight, and ear cockle;

Sugarcane: red rot, smut, wilt, grassy shoot, ratoon stunting and PokkahBoeng;

Sunflower: Sclerotinia stem rot and Alternaria blight; Mustard: Alternaria blight, white rust, downy mildew and Sclerotinia stem rot; Gram: wilt, grey mould and Ascochyta blight; Lentil: rust and wilt; Cotton: anthracnose, vascular wilt, and black arm; Pea: downy mildew, powdery mildew and rust 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; 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.

Note: Students should submit 50 pressed and well-mounted specimens.

References:

- Gupta, S.K. and Thind, T.S. (2006). Disease problems in vegetable production. Scientific Publishers, Jodhpur.

- Mehrotra, R.S. and Aggarwal, A. (2007).Plant Pathology (2nd.ed.) Tata McGraw-Hill Publishing Co Ltd., New Delhi.
- Pathak, V.N. (1980). Diseases of fruit crops. Oxford and IBH Publishing Co. Pvt. Ltd, New Delhi.
- Singh, R.S. 2006. Diseases of fruit crops. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.
- Singh, R.S. (1994). Diseases of vegetable crops. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.
- Gupta V K and Paul Y S (eds) (2002). Diseases of field crops. Indus Publishing Co. ND.
- Mehrotra R S and Aggarwal A. (2007). Plant Pathology (2nd.ed.). Tata Mc Graw-Hill Publishing Co Ltd. ND.
- Rangaswamy,G and Mahadevan, A. (2001). Diseases of crop plants in India. Prentice hall of India Pvt Ltd ND.

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

Theory:

Importance of fruits and vegetables, extent and possible causes of post harvest losses; Pre-harvest factors affecting postharvest quality, maturity, ripening and changes occurring during ripening; Respiration and factors affecting respiration rate; Role of ethylene; Post harvest disease and disorders; Heat, chilling and freezing injury; 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.

Practicals:

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.

References:

- Srivastava, R.P. and Kumar, S. (2007). Fruits and Vegetable Preservation. Principle and Practices. International Book Distributing Comp., Lucknow.
- Lal, G., Siddapa, G.S. and Tandon, G.L. (1967). Fruit and vegetable Preservation in India. ICAR, New Delhi.
- Nair, S.S. And Sharma, H.C. (2006). Phal Tarkari Parikshan Praydhogiki. Rajasthan Hindi Granth Academy, Jaipur.

Geoinformatics and Nano-technology for Precision Farming **Credit hours: 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. Crop discrimination and Yield monitoring, soil mapping; fertilizer recommendation using geospatial technologies; Spatial data and their management in GIS; Geodesy and its basic principles; Remote sensing concepts and application in agriculture; Image processing and interpretation; Global positioning system (GPS), components and its functions; System Simulation- Concepts and principles, Introduction to crop Simulation Models and their uses for optimization of Agricultural Inputs; STCR approach for precision agriculture; Nanotechnology, definition, concepts and techniques, brief introduction about nanoscale effects, nano-particles, nano-pesticides, nano-fertilizers, nano-sensors, Use of nanotechnology in tillage, seed, water, fertilizer, plant protection for scaling-up farm productivity.

Practical :

Introduction to GIS software, spatial data creation and editing.Introduction to image processing software.Visual and digital interpretation of remote sensing images.Generation of spectral profiles of different objects.Supervised and unsupervised classification and acreage estimation.Multispectral remote sensing for soil mapping.Creation of thematic layers of soil fertility based on GIS.Creation of productivity and management zones. Fertilizers recommendations based of VRT and STCR techniques.

Crop stress (biotic/abiotic) monitoring using geospatial technology.Use of GPS for agricultural survey.Formulation, characterization and applications of nanoparticles in agriculture. Projects formulation and execution related to precision farming.

Crop Improvement – II (Rabi)	**Credit hours: 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; Floral biology, 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); Seed production technology in self pollinated, cross pollinated and vegetatively propagated crops. Hybrid seed production technology of rabi crops. Ideotype concept and climate resilient crop varieties for future.

Practicals:

Emasculation and hybridization techniques in different crop species namely Wheat, Oat, Barley, Chickpea, Lentil, Field pea, Rapeseed Mustard, Sunflower, Potato, Berseem. Sugarcane, Cowpea; Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed 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.

References:

- Singh, Chhidda; Singh P. and Singh, R. (2003). Modern Techniques of Raising Field Crops, Oxford & IBH,Publishing Co., New Delhi.
- Singh, S.S. (1998), Crop Management: Under irrigated and rainfed conditions.
- Singh, S.S. (1993), Principles and Practices of Agronomy, Kalyani Publishers, New Delhi.

- Reddy,T.Y. and Reddi, G.H.S. (1993). Principles of Agronomy, Kalyani Publishers, New Delhi.

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

Practicals:

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.

References:

- Yawalkar K.S., Agarwal, J.P. and Bokde, S. (1992). Manures and Fertilizers. Agri-Horticultural Pub. House, Nagpur- India.
- Balasubramaniyan, P. and Pallaniappan, S.P. (2001). Principles and Practices of Agronomy, Agrobios (India) , Jodhpur.
- Reddy,S.R. (2002). Principles of Agronomy. Kalyani Publishers, New-Delhi.
- Singh, S.S. (1993). Principles and Practices of Agronomy, Kalyani Publishers, New-Delhi.

Principles of Organic Farming	**Credit hours: 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; Restrictions to nutrient use in organic farming; 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; Processing, leveling, economic considerations and viability, marketing and export potential of organic products.

Practicals:

Visit of organic farms to study the various components and their utilization; Preparation of enrich compost, vermin-compost, 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.

References:

- Sharma, Arun K. (2002). A Handbook of Organic Farming, Agrobios (India) Ltd., Jodhpur.
- Balasubramaniyan, P. and Palaniappan, S.P. (2004). Principles and Practices of Agronomy, Agrobios, (India),Jodhpur.
- Shukla, Rajeev K. (2004). Sustainable Agriculture, Surbhee Publications, Jaipur.
- Palaniappan, SP. (1985). Cropping Systgems in the Tro;ics : Principles and Management, Wiley Easter,Ltd. And TNAU, Ciombatore.
- Reddy, S.R. (2004). Principles of Agronomy, Kalyani Publishers, Ludhiana.
- Palaniappan, S.P. and Sivraman, K. (1996). Cropping system in Tropics, International Pvt. New-Delhi.
- Dahama, A.K. (1999). Organic Farming, Agro Botanic, Bikaner.
- Sharma, Arun K. (2002). A Handbook of Organic Farming, Agrobios (India) , Jodhpur.
  Palaniappan, S.P. and Anandurai, K. (1999).Organic Farming- Theory and Practice, Scientific Pub.Jodhpur.

Farm Management, Production and Resource Economics Credit hours: 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.

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.

References:

- Mittal, S.K. and Sethi, C.P. "Linear Programming."
- Tandan R.K. and Dhondiyal, S.P. "Principles and Methods of Farm Management".
- Heady, E.O. and Candler, W. "Linear Programming Methods".
- Johl, S.S. and Kapoor, T.R. "Fundamental of Farm Business Management, Kalyani Publishers,Ludhiana and New Delhi.
- Sankhayan, P.L. "Introduction to the Economics of Agricutural Production".
- Singh, I.J. "Elements of Farm Management".
- Dorfman, R. and Samuelson and Solow, R. "Linear Programming and Economic Analysis".
- Heady, E.O. and Dillors, J.L. "Agricultural Production Function".

- Karam, A.S. and Karan Singh "Economics of Farm Management in India".

Agricultural Marketing, Trade and Prices	**Credit hours: 3(2+1)**

Theory :

Agricultural Marketing: Concepts and definitions of market, marketing, agricultural marketing, market structure, marketing mix and market segmentation, classification and characteristics of agricultural markets; demand, supply and producer's surplus of agri-commodities: nature and determinants of demand and supply of farm products, producer's surplus – meaning and its types, marketable and marketed surplus, factors affecting marketable surplus of agri-commodities; product life cycle (PLC) and competitive strategies: Meaning and stages in PLC; characteristics of PLC; strategies in different stages of PLC; pricing and promotion strategies: pricing considerations and approaches – cost based and competition based pricing; market promotion – advertising, personal selling, sales promotion and publicity – their meaning and merits & demerits; marketing process and functions: Marketing process-concentration, dispersion and equalization; exchange functions – buying and selling; physical functions – storage, transport and processing; facilitating functions – packaging, branding, grading, quality control and labeling (Agmark); Market functionaries and marketing channels: Types and importance of agencies involved in agricultural marketing; meaning and definition of marketing channel; number of channel levels; marketing channels for different farm products; 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 :

Plotting and study of demand and supply curves and calculation of elasticities; Study of relationship between market arrivals and prices of some selected commodities; Computation of marketable and marketed surplus of important commodities; Study of price behaviour over time for some selected commodities; Construction of index numbers; Visit to a local market to study various marketing

functions performed by different agencies, identification of marketing channels for selected commodity, collection of data regarding marketing costs, margins and price spread and presentation of report in the class; Visit to market institutions – NAFED, SWC, CWC, cooperative marketing society, etc. to study their organization and functioning; Application of principles of comparative advantage of international trade.

References

- S.S. Acharya and N.L. Agarwal (1987) Agricultural Marketing in India, Oxfgord&IBH, New Delhi
- J.R. Moore, S.S. Johl and A.M. Khusro (1973) Indian Food Grain Marketing, Printice Hall, New
- Delhi
- A.S. Kahlon& D.S. Tyagi (1983) Agricultural Price Policy in India, Allied Publishers, New Delhi
- V.K. Bhall and S. Shiva Ramu (1996) International Business-Environment and Management, Anmol,Publications (P) Limited, New Delhi