B.Sc. Agriculture III- Semester

Fundamentals of Entomology	**Credit hours 4(3+1)**

Theory:

Introduction to phylum arthropoda. Importance of class Insecta. Insect dominance. History and importance of binomial nomenclature Definition, division and scope of entomology. Comparative account of external morphology-types of mouth parts, antennae, legs, wings and genetalia. Structure, function of cuticle & moulting and body segmentation, Anatomy of digestive, Circulatory, Sensory, respiratory, Endocrine, excretory, nervous and reproductive systems. Types of reproduction. Postembryonic development-eclosion. Matamorphosis. Types of larvae and pupa. Classification of insects upto orders and families of economic importance and their distinguished characters. Plant mites – morphological features, important families with examples.

Practical:

Insect collection and preservation. Identification of important insects. General body organization of insects. Study on morphology of grasshopper. Preparation of permanent mounts of mouth parts, antennae, legs and wings. Dissection of grasshopper and caterpillar for study of internal morphology. Observations on metamorphosis of larvae and pupae. Dissection of cockroaches.

Referencess:

- Atwal, A.S. and Dhaliwal, G.S. 2002. Agricultural Pests of South Asia and Their Management, Kalyani Publishers, New Delhi.
- David B.V. 2003. Elements of Economic Entomology, Popular Book Depot, Chennai
- Pradhan, S. 1968. Insect Pests of Crops, National Book Trust, New Delhi
- Nayar, M.R.G.K. 1986. Insects and Mites of Crops in India, ICAR, New Delhi.
- Srivastava, K.P. 2004. A Text Book of Entomology, Vol.II, Kalyani Publishers, New Delhi.
- Khare, B.P. 1994. Stored Grain Pests and Their Management, Kalyani Publishers, New Delhi.

Crop Production Technology-I (*Kharif* Crops)	**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 and urdbean; oilseeds- groundnut, sesame and soybean; fibre crops- cotton & Jute; forage crops-sorghum, cowpea, cluster bean and napier grass.

Practical :

Rice nursery preparation, transplanting of Rice, study of sowing of field crops, effect of seed size on germination and seedling vigour of kharif season crops, effect of sowing depth on germination of kharif crops, identification of weeds in kharif season crops, top dressing and foliar feeding of nutrients, visit to research centres of related 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.
- Maiti, S., Hedge,M.R. and Chhattopadhyay, S.B. 1988. Handbook of Annual Oil Seed Crops. Oxford & IBH Publishing Co., New Delhi.
- Jaiswami, L.H. and Baldeo, B. 1990. Advances in Puulse Production Technology, ICAR, New Delhi. Thakur, C. 1979. Crop Production, Vol. I & II. Metropolitan Book Pvt. Ltd., New Delhi.
- Ahlawat, I.P.S., Sharma, O.P. & Saini., G.S. 1998. Scientific Crop Production in India. Aman Publishing House, Madhu Market, Budhana gate, Meerut.
- Rathore, P.S. 1999-2000. Techniques and Management of Field Crop Production. Agrobios (India), Jodhpur. Rathore, P.S. and Sharma, S.K. 2003. Scientific Pulse Production. Yash Publishing House, Bikaner.
- Sharma, Kalicharan. 1990. Bharat ki promokh faslea. G.B. Pant Agricultural & Technology University, Nanital. Reddy, S.R. 2004. Agronomy of Field Crops. Kalyani Publishers, New Delhi.

Fundamentals of Plant Breeding	**Credit hours: 3(2+1)**

Theory

Historical development, concept, nature and role of plant breeding, major achievements and future prospects; Genetics in relation to plant breeding, modes of reproduction and apomixes, self – incompatibility and male sterility- genetic consequences, cultivar options. Domestication, Acclimatization, introduction; Centre of origin/diversity, component of Genetic variation; Heritability and genetic advance; Genetic basis and breeding methods in self- pollinated crops-mass and pure line selection, hybridization techniques and handling of segregating population; Multiline concept. Concepts of population genetics and Hardy-Weinberg Law, Genetic basis and methods of breeding cross pollinated crops, modes of selection; Heterosis and inbreeding depression, development of inbred lines and hybrids, composite and synthetic varieties; Breeding methods in asexually propagated crops, clonal selection and hybridization; Wide hybridization and pre-breeding; Polyploidy in relation to plant breeding, mutation breeding-methods and uses; Breeding for important biotic and abiotic stresses; Biotechnological tools-DNA markers and marker assisted selection. Participatory plant breeding; Intellectual Property Rights, Patenting, Plant Breeders and & Farmer's Rights.

Practical

Plant Breeder's kit, Study of germplasm of various crops. Study of floral structure of self-pollinated and cross pollinated crops. Emasculation and hybridization techniques in self & cross pollinated crops. Consequences of inbreeding on genetic structure of resulting populations. Study of male sterility system. Handing of segregation populations. Methods of calculating mean, range, variance, standard deviation, heritability. Designs used in plant breeding experiment, analysis of Randomized Block Design. To work out the mode of pollination in a given crop and extent of natural out crossing. Prediction of performance of double cross hybrids.

References:

- Alard, R.W. 2000.Principles of Plant Breeding. John Willey & Sons, New York.
- Singh, B.D. 2005. Plant Breeding. Kalyani Publishing House, New Delhi.
- Singh, P. 2001.Essentials of Plant Breeding-Principles and Methods. KalyaniPublishing House, New Delhi.

Fundamentals of Crop Physiology	**Credit hour: 3(2+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; Fat Metabolism: Fatty acid synthesis and Breakdown; Plant growth regulators: Physiological roles and agricultural uses, Physiological aspects of growth and development of major crops: Growth analysis, Role of Physiological growth parameters in crop productivity.

Practical

Study of plant cells, structure and distribution of stomata, imbibitions, osmosis, plasmolysis, measurement of root pressure, rate of transpiration, Separation of photosynthetic pigments through paper chromatography, Rate of transpiration, photosynthesis, respiration, tissue test for mineral nutrients, estimation of relative water content, Measurement of photosynthetic CO_2 assimilation by Infra Red Gas Analyser (IRGA).

References:

- N.K. Gupta & Sunita Gupta, 2004. Plant Physiology. Oxford & IBH Publication, New Delhi.
- R.L. Agarwal, 1995. Seed Technology, Oxford & IBH Publication, New Delhi.
- G.R. Noggle and G.J. Fritz, 1986. Plant Physiology, Prentic Hall of India Pvt. Ltd.
- J.B. Salisbury and C.W. Ross (1992). Plant Physiology, Wadswar Publishing Company, Belmont,California.
- S.N. Pandey & B.K. Sinha (1995). Vikas Publishing House Pvt. Ltd., New Delhi.

Fundamentals of Plant Pathology **Credit hours: 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. Cause and classification of plant diseases. Important plant pathogenic organisms, different groups: fungi, bacteria, fastidious vesicular bacteria, phytoplasmas, spiroplasmas, viruses, viroids, algae, protozoa, phanerogamic parasites and nematodes with examples of diseases caused by them. Diseases and symptoms due to abiotic causes.

Fungi:general characters, definition of fungus, somatic structures, types of fungal thalli, fungal tissues, modifications of thallus, reproduction (asexual and sexual). Nomenclature, Binomial system of nomenclature, rules of nomenclature, classification of fungi. Key to divisions,sub-divisions, orders and classes.

Bacteria and mollicutes: general morphological characters. Basic methods of classification and reproduction.

Viruses: nature, architecture, multiplication and transmission.Study of phanerogamic plant parasites.

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

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 equipments and microscopy. Preparation of media, isolation and Koch's postulates. General study of different structures of fungi. Study of symptoms of various plant diseases. Study of representative fungal genera. Staining and identification of plant pathogenic bacteria. Transmission of plant viruses. Study of phanerogamic plant parasites.

Study of morphological features and identification of plant parasitic nematodes. Extraction of nematodes from soil.

References:

- Agrios, G.N. 1996. Plant Pathology, Academic Press, New Delhi.
- Alexopolus, C.J., Mims, C.W. and Blackwell, M. 1996. Introductory Mycology, John Wiley Estern Private Limited, New York.
- Mehrotra, R.S. and Aggarawal, A. 2007. Plant Pathology. Tata McGraw Hill Publishing Co. Ltd., New Delhi.
- Singh, R.S. 1996. An Introduction to Principles of Plant Pathology. Oxford & IBH, New Delhi.
- Nene Y.L. and Thapliyal, P.N. 1993. Fungicides in Plant Diseases Control. 3rd Edn. Oxford & IBH published Co. Pvt. Ltd., New Delhi.

Rural Sociology & Educational Psychology **Credit hours: 2(2+0)**

Theory

Sociology and Rural sociology: Definition and scope, its significance in agriculture extension, Rural society, Social Groups, Social Stratification, Culture concept, Social Institution, Social Change & Development. Educational psychology: Meaning & its importance in agriculture extension. Behavior: Cognitive, affective, psychomotor domain, Personality, Learning, Motivation, Theories of Motivation, Intelligence.

References:

- Bhatia, H.R. 1965. A Text Book of Educational Psychology, Asia Publishing House, New Delhi.
- Chitamber, J.B., 1990. Introductory Rural Sociology: Willey Easter Ltd. New Delhi.
- Dhama, O.P. & Bhatnagar, O.P.,1985. Education & Communication for Development, Oxford and IBHPublishing Company, New Delhi.
- Desai, A.R. 1953. Rural Sociology in India, Vora & Co. Publisher Pvt. Ltd., Bombay.
- Pujari, D. 2002 Educational Psychology in Agriculture, Agrotech Publishing Academy, Udaipur (Raj.).

Communication Skills and Personality Development **Credit hours: 2(1+1)**

Theory

Communication Skills: Structural and functional grammar; meaning and process of communication, 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.

References:

- Thomson and Martinet (1997) "A Practical English Grammar, Exercise Books Vol. I & II" OUP Publication.
- Michal Swan(1995) "A Practical English Grammar" OUP Publication.
- David Green (1990) "Contemporary English Grammar Structure Composition" McMillan.
- A.S. Hornby (1997) "Advance Learner's Dictionary" OUP Publication.
- S. Allen (1997) "Living English Structure" Orient Longman.
- Daniel Jones (1997) "Drills and Tests in English Sounds" ELBS.
- Krishnamohan " Speaking English Effectively" McMillan.
- Work Book of Indira Gandhi National Open University, Delhi. (Course No. Feg.1,Feg.2 and Feg.3). Audiovisual tapes prepared by British Council, New Delhi and CIEFL, Hyderabad.

Principles of Seed Technology	**Credit hours: 2(1+1)**

Theory:

Seed and seed technology: introduction, definition and importance. Deterioration causes of crop varieties and their control; Maintenance of genetic purity during seed production, seed quality; Definition, Characters of good quality seed, different classes of seed. Foundation and certified seed production of important cereals, pulses, oilseeds, fodder and vegetables. Seed certification, phases of certification, procedure for seed certification, field inspection. Seed Act and Seed Act enforcement. Duty and powers of seed inspector, offences and penalties. Seeds Control Order 1983, Varietal Identification through Grow Out Test and Electrophoresis, Molecular and Biochemical test. Detection of genetically modified crops, Transgene contamination in non-GM crops, GM crops and organic seed production.

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. Measures for pest and disease control during storage. Seed marketing: structure and organization, sales generation activities, promotional media. Factors affecting seed marketing, Role of WTO and OECD in seed marketing.

Practical :

Seed production in major cereals: Wheat, Rice, Maize, Sorghum and Bajra. Seed production in major pulses: Urd, Mung, Pigeonpea, Lentil, Gram, Fieldpea. Seed production in major oilseeds: Soybean, Rapeseed and Mustard. Seed production in vegetable crops. Seed sampling and testing: Physical purity, germination, viability, etc. Seed and seedling vigour test. Genetic purity test: Grow out test and electrophoresis. Seed certification: Procedure, Field inspection, Preparation of field inspection report. Visit to seed production farms, seed testing laboratories and seed processing plant.

References:

- Agarwal, R.L.1991.Seed Technology, Oxford & IBH Publishing Co. Delhi.
- Agarwal, P.K. 1999. Seed Technology, ICAR, New Delhi.
- Subir Sen and Nabinanda Ghosh.1999. Seed Science and Technology, Kalyani Publishers. NewDelhi.
- Dhirenra Khare and Mohan S. Bhale.2000. Seed Technology. ScientificPublishers(India),Jodhpur.
- Maloo,S.R., Intodia, S.K. and Pratap Singh.2008. Beej Pradyogiki.Agrotech Publishing Academy.
- A.K. Joshi and B.D. Singh.2005.Seed Technology. Kalyani Publishers, New Delhi.

Manures, Fertilizers and Soil Fertility Management Credit Hours: 2(1+1)

Theory :

Introduction and importance of organic manures, properties and methods of preparation of bulky and concentrated manures. Green/leaf manuring. 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. Chemistry of soil nitrogen, phosphorus, potassium, calcium, magnesium, sulphur and micronutrients. 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 :

Introduction of analytical instruments and their principles, calibration and applications, Colorimetry and flame photometry. Estimation of available N in soils. Estimation of available P in soils. Estimation of available K. Estimation of available S in soils. Estimation of available Ca and Mg in soils. Estimation of available Zn in soils. Estimation of N in plants. Estimation of P in plants. Estimation of K in plants. Estimation of S in plants.

References:

- Yawalkar, K.S. and Agarwal. J.P. (1992). Manure and fertilizers. Agriculture- Horticulture Publishing House,Nagpur.
- Tisdale, S.L. and Nelson, W.L. (1990). Soil Fertility and fertilizers, McMillan Pub. Co. N.Y. pp.754.
- Sanchalli, V.K. (1960). Chemistry and Technology of Fertilizers. Reinhebl publishing corporation, New, York,USA.
- Chopra, S.L. and Kanwar, J.S. (1991). Analytical Agriculture, Chemistry, Kalyani Publishers, New Delhi.
- Tandon, H.L.S. (1989). Soil water and fertilizers analysis, Fertilizer Development and Consultant organization,New Delhi
- FAI. (1999). Fertilizer (Control) Order, 1985 and the essential commodities Act, 1995. FAI, New Delhi, pp. 203.
- Kanwar, J.S. (1976). Soil Fertility: theory and practice. (ed) ICAR, New Delhi pp. 583.
- McVicker, M.H. (1952). Using commercial fertilizers, Interstate Danvilk, US.
- Tisdale, W.L. Nelson and J.D. Beaton, 1990. Soil Fertility and Fertilizers Macmillan Publishing Company, New York
- Tisdale, S.L. Nelson, W.L. Beaton, J.D. and Havlin, J.L. (1991) Soil fertility and fertilizers (5th ed.).Prentice Hall of India, Pvt.Ltd, New Delhi.