

**NIILM  
UNIVERSITY  
KAITHAL  
B.SC.  
AGRICULTURE  
4 YEAR DEGREE  
PROGRAMME  
SYLLABUS**

<b>SEMESTER I</b>		
<b>COURSE CODE</b>	<b>COURSE NAME</b>	<b>CREDITS</b>
<b>ENT 101</b>	<b>Insect Morphology and Systematic</b>	<b>4(3+1)</b>
<b>AGRO 101</b>	<b>Introduction to Agriculture</b>	<b>1 (1+0)</b>
<b>COMP 101</b>	<b>Introduction to Computer Applications</b>	<b>2 (1+1)</b>
<b>ENG 101</b>	<b>Comprehension and Communication Skills in English</b>	<b>2 (1+1)</b>
<b>MATH 101</b>	<b>Mathematical Methods in Agriculture</b>	<b>3 (3+0)</b>
<b>SOIL 101</b>	<b>Introduction to Soil Science</b>	<b>3 (2+1)</b>
<b>BOT 101</b>	<b>Elementary Botany</b>	<b>2 (1+1)</b>
<b>BIOCHEM101</b>	<b>Biochemistry</b>	<b>3 (2+1)</b>
<b>SOC 101</b>	<b>Fundamentals of Rural Sociology and Educational Psychology</b>	<b>2 (2+0)</b>
<b>SST 101</b>	<b>Principles of seed Technology</b>	<b>3 (2+1)</b>
<b>NSS</b>	<b>National Service Scheme</b>	<b>1 (0+1)</b>
	<b>Total credits</b>	<b>26 (18+8)</b>

## **INSECT MORPHOLOGY AND SYSTEMATICS (ENT 101)**

### **Theory**

History of entomology in India; factors for insect abundance; classification of phylum arthropoda up to classes; relationship of class insecta with other classes.

Morphology: structure and functions of insect cuticle and moulting; body segmentation; structure and modifications of insect antennae, mouth parts and legs; wing venation, modifications and wing coupling apparatus; sensory organs; metamorphosis and diapause in insects; types of larvae and pupae; structure and functions of digestive, circulatory, excretory, respiratory, nervous and reproductive systems in insects; types of reproduction in insects.

Systematics: taxonomy - importance, history and development and binomial nomenclature; definitions of biotype, sub-species, species, genus, family and order; classification of class insecta up to orders; important orders and their families: *Orthoptera* (*Acrididae*, *Tettigoniidae*, *Gryllidae*, *Gryllotalpidae*, *Schizodactylidae*); *Dictyoptera* (*Mantidae*, *Blattidae*); *Odonata*; *Isoptera* (*Termitidae*); *Thysanoptera* (*Thripidae*); *Hemiptera* (*Delphacidae*, *Aphididae*, *Coccidae*, *Aleurodidae*, *Pseudococcidae*, *Lophopidae*, *Lacciferidae*); *Neuroptera* (*Chrysopidae*); *Lepidoptera* (*Noctuidae*, *Sphingidae*, *Pyralidae*, *Gelechiidae*, *Arctiidae*, *Pieridae*, *Danaiidae*, *Papilionidae*, *Yponomeutidae* (*Plutellidae*), *Hesperiidae*, *Sphingidae*, *Bombycidae*); *Coleoptera* (*Coccinellidae*, *Chrysomelidae*, *Cerambycidae*, *Curculionidae*, *Bruchidae*, *Scarabaeidae*, *Dermestidae*, *Tenebrionidae*, *Meloidae*, *Bostrychidae*, *Lampyridae*); *Hymenoptera* (*Tenthredinidae*, *Apidae*, *Trichogrammatidae*, *Ichneumonidae*, *Braconidae*, *Encyrtidae*, *Aphelinidae*, *Eulophidae*); *Diptera* (*Cecidomyiidae*, *Trypetidae*, *Tachinidae*, *Agromyzidae*, *Tephritidae*, *Syrphidae*, *Muscidae*, *Glossinidae*, *Asilidae*, *Tabanidae*).

### **Practical**

Methods of collection and preservation of insects including immature stages; external features of grasshopper/blister beetle; types of insect antennae, mouthparts and legs; wing venation, types of wings and wing coupling apparatus; types of insect larvae and pupae; dissection of digestive system in insects; dissection of male and female reproductive systems in insects; study of characters of orders *Orthoptera*, *Dictyoptera*, *Odonata*, *Isoptera*, *Thysanoptera*, *Hemiptera*, *Lepidoptera*, *Neuroptera*, *Coleoptera*, *Hymenoptera*, *Diptera* and their families.

## **COURSE: INTRODUCTION TO AGRICULTURE (AGRO 101)**

### **Theory**

Art, science and business of crop production; basic elements of crop production; factors affecting crop production; history of agricultural development; ancient India agriculture in civilization era; chronological agricultural technology development in India; Indian agriculture: balance sheet, liabilities, assets and contrasting trends(DAT);agricultural growth, contrasting food chain, diversity in physiography, soil groups, marine, livestock and water;liabilities:soilfactors,weatherfactors,economicceology,dry and irrigated agriculture, farming system approach, value addition, requirements in new technology; women in agriculture: multifaceted roles and tasks, work stress factors, nutritional and rural lifestandards,roleofhouseholddesignmaking,drudgeryreductionforfarmwomen, women friendly agricultural technology; empowerment of women: group dynamics for farm women, rural women; the nucleus of agricultural extension and training. Visit to NAS Museum, New Delhi.

## **COURSE: INTRODUCTION TO COMPUTER APPLICATIONS (COMP 101)**

### **Theory**

Introduction to computers, anatomy of computers, input and output devices, units of memory, hardware, software and classification of computers, personal computers, types of processors, booting of computer, warm and cold booting, computer viruses, worms and vaccines; operating system :DOS and WINDOWS, disk operating system (DOS);Some fundamental DOS commands, FORMAT, DIR, COPY, PATH, LABEL,VOL,MD,CD and DELTREE, rules for naming files in DOS;WINDOWS;GUI, Desktop and its elements, WINDOWS Explorer, working with files and folders; setting starting and shutting down of WINDOWS; anatomy of a WINDOW, title bar, minimum, maximum and close buttons, scrollbars, menus and toolbars; applications– MS Word: word, processing and units of document, features of word-processing packages; creating, editing, formatting and saving a document in MS Word; MS Excel; electronic spreadsheets, concept, packages, creating, editing and saving a spreadsheet with MS Excel; use of in-built statistical and other functions and writing expressions; use of dataanalysistools,correlationandregression,t-testfortwosamplesandANOVAwith one-way classification; creating graphs, MS Power Point; features of power point package; principles of programming; flow charts and algorithms, illustration through examples; internet: world wide web (WWW), concepts, web browsing and electronic mail.

## **Practical**

Study of computer components; booting of computer and its shut down; practice of some fundamental DOS commands, TIME, DATE, DIR, COPY, FORMAT, VOL, LABEL, PATH; Practicing WINDOWS Operating System, use of mouse, Title Bar, Minimum, Maximum and Close Buttons, Scroll Bars, Menus and Tool Bars; WINDOWS Explorer, Creating Folders, COPY and PASTE functions; MS Word: Creating a Document, Saving and Editing; MS Word, Use of options from Tool Bards, Format, Insert and Tools (Spelling and Grammar) Alignment of text; MS Word, Creating a Table, Merging of Cells, Column and Row width; MS Excel: Creating a Spreads heet, Alignment of rows, columns and cells using Format Toolbar; MS Excel: Entering Expressions through the formula tool bar and use of in built functions, SUM, AVERAGE, STDEV; MS-Excel: Data Analysis using in built Tool Packs, Correlation & Regression; MS Excel: Creating Graphs and Saving with and without data; MS Power Point: Preparation of slides on PowerPoint; Transforming the data of Word, Excel and Access to other formats; Internet Browsing; Browsing a Web Page and Creating of E-Mail.

## **COURSE: COMPREHENSION AND COMMUNICATION SKILLS IN ENGLISH (ENG 101)**

### **Theory**

Text for comprehension entitled (i) The Pointed Vision edited by Usha Bande and Krishan Gopal, Oxford University Press (ii) Current English for Colleges by N. Krishna swamy and T. Sriraman, Macmillan India Ltd. Madras, 1995. (a) reading comprehension (b) vocabulary-synonyms, antonyms, words often confused (c) exercises to help the students in the enrichment of vocabulary based on TOEFL and GRE and other competitive examinations; language study: functional grammar, agreement of verb with subject; writing skills: mechanics of good letter writing, effective business correspondence, personal correspondence; preparation of curriculum vitae and job applications; the style an importance of professional writing: choice of words and phrases, precision, conciseness, clichés, redundancy, jargon, foreign words; precise writing and synopsis writing; interviews: types of interviews, purpose, different settings as interviewer and interviewee, physical makeup and manners, appearance, poise, speech, self-reliance, evaluation process review or feedback.

## **Practical**

Listening comprehension: listening to short talks, lectures, speeches (scientific, commercial and general in nature); listening to at least two tape recorded conversations aimed at testing listening comprehension of students; communication: spoken English, oral communication, importance of stress and intonation; spoken English practice by using audio-visual aids, the essentials of good conversation, oral exercises in conversation practice (at the doctor, at the restaurant, at the market yard) ;using dictionary: introduction of phonetic symbols and transcription; reading skills: rapid reading, intensive reading, improving reading skills; meetings: purpose, procedure of participation, chairmanship, physical arrangements, recording minutes of meeting etc

## **COURSE: MATHEMATICAL METHOD IN AGRICULTURE (MATH 101)**

### **Theory**

Algebra: arithmetic and geometric series; permutation and combination; binomial theorem; determinants; matrices and their properties, inverse of a matrix; solution of linear equations; co ordinate geometry –distance between two points, section-formulae; straight line, slope of a line, various forms of the equation of a line, angle between two lines, distance of a point from a line; trigonometry: trigonometric ratios of five standard angles; allied angles, addition and subtraction formulae, sum and product formulae; t-ratios of multiple and sub-function; maxima and minima of function of single variable; Rolle's theorem and mean value theorem; integral calculus-elementary integration, integration by substitution and by parts; definite integrals, evaluation of definite integrals; properties of definite integrals; area under simple curves; function of two variables, evaluation of partial derivatives; differential equations; vector algebra- basic concept, types of vectors, multiplication of a vector by a scalar; cross and dot product of two vectors

## **COURSE: ELEMENTARY BOTANY (BOT 101)**

### **Theory**

Morphological features of angiosperms; pollination, fertilization, seed and fruit development; tissue: structure and functions, internal structure of dicot and monocot stem, root and leaf; plant systematics and its utility, binomial nomenclature, general classification; concept of water potential with respect to plant cell, absorption and translocation of water/sap; basic concepts of plant growth and development, respiration and photosynthesis.

### **Practical**

Morphology of various vegetative and reproductive parts in plants, study of slides and specimen pertaining to above topics; demonstration, experiments of diffusion, imbibitions, osmosis, ascent of sap; extraction of plant pigments; measurement of plant growth.

## **COURSE: BIOCHEMISTRY (BIOCHEM 101)**

### **Theory**

Biochemistry: introduction and importance to agriculture, plant cell, biomolecules; carbohydrates: definition, functions and classification, biologically important monosaccharide's, chiral carbon, stereoisomerism, optical activity, mutarotation, reactions of monosaccharide's, structure and functions of important oligosaccharides and polysaccharides, brief aspects of glycolysis, TCA cycle, oxidative phosphorylation, HMP, glyoxalate pathway and gluconeogenesis; lipids: saponifiable and non-saponifiable lipids, structure

and properties of saturated, unsaturated and OH-fatty acids, triacylglycerol, characterization of fats, rancidity, waxes, phospholipids, glycolipids, reactions of  $\beta$ -oxidation; proteins: general functions, classification, structure and functions of amino acids, peptide bond, structural organization of proteins, general reactions of amino acid degradation, urea cycle; enzymes: classification, factors affecting enzyme activity, coenzymes, prosthetic group, energy of activation, enzyme specificity; nucleic acids: structure and functions of bases, nucleosides, nucleotides, RNA and DNA. Preliminary aspects of replication, transcription, translation, photosynthesis, photorespiration,  $\text{NO}_3^-$  and ammonia assimilation and symbiotic  $\text{N}_2$  fixation; plant hormones and secondary metabolites - their role.

### **Practical**

Preparation of solutions and buffers, use of pH meter, colour reactions of carbohydrates, proteins, amino acids and lipids, quantitative determination of sugars and proteins; qualitative separation of sugars and amino acids by paper chromatography; separation of lipids and photosynthesis pigments by TLC, protein denaturation by heat and pH; simple enzyme assays.

## **COURSE: FUNDAMENTALS OF RURAL SOCIOLOGY AND EDUCATIONAL PSYCHOLOGY (SOC 101)**

### **Theory**

Sociology and rural sociology: meaning, definition, scope, importance of rural sociology in agricultural extension; differences and relationship between rural and urban communities; social groups: meaning, definition, classification; role of social groups in agricultural extension; social stratification: meaning, definition, forms, characteristics and differences between class and caste system; types and role of social values; social institutions: meaning, definition, major institutions in rural society, functions and their role in agricultural extension; social control: meaning, definition, need and means; social change: meaning, definition, nature, factors of social change ;psychology and educational psychology: origin, meaning, nature and scope of psychology and educational psychology in agricultural extension; intelligence: meaning, definition, types and factors affecting intelligence; personality: meaning and nature of personality, factors affecting personality development, role of personality in agricultural extension; leadership: meaning, definition, classification, role of a leader agricultural extension; attitude: meaning and definition; learning: meaning and nature of learning, factors responsible for learning, importance of learning in educational process, principles of learning and their implications; teaching- learning process: meaning and definition and its role in agricultural extension



## **COURSE NAME: PRINCIPLES OF SEED TECHNOLOGY (SST: 101)**

### **Theory**

Introduction to seed production; deterioration of crop varieties; maintenance of genetic purity during seed production; seed quality; different classes of seed, seed production of field and vegetable crops; seed certification, phases of certification, procedure for seed certification, field inspection and field counts etc.; seed act, central seed committee, central seed certification board, state seed certification agency, central and state seed testing laboratories; duties and powers of seed inspectors, offences and penalties; seed control order: introduction to WTO; varietal identification through grow-out test and electrophoresis; seed drying; seed processing plant; establishing a seed testing laboratory, seed testing procedures for quality assessment, seed treatment, importance of seed treatment, types of seed treatment, seed packing and seed storage, stages of seed storage, factors affecting seed longevity during storage and conditions required for good storage, general principles of seed storage, measures for pest and disease control, temperature control, seed marketing, factors affecting seed marketing.

### **Practical**

Seed sampling principles and procedures; physical purity analysis of field crops; germination analysis of field crops; moisture tests of field crops; viability test of field crops; seed health test of field crops; seed dormancy and breaking methods; grow out tests for varietal identification; visit to seed production plots; visit to seed processing plants; visit to seed testing laboratories; planting ratios, isolation distance and rouging, etc.

## **COURSE: INTRODUCTION TO SOIL SCIENCE (SOIL 101)**

### **Theory**

Concept of land, soil and soil science; origin of the earth, earth crust and its composition; soil forming rock sand minerals; weathering; soil formation: factor sand processes; composition of soil; soil profile; soil color; taxonomic classification of soils; soils of Haryana and India; soil texture; particle size analysis; soil structure and aggregation- classification and significance; soil consistency; bulk density, particle density and porosity of soils; soil crusting; soil compaction; soil water- retention and potential; soil moisture constants; movement of soil water; soil temperature and thermal properties; soil air and gaseous exchange; influence of soil temperature and air on plant growth; soil colloids and their significance; layered silicate clays - genesis, charges; adsorption of ions, ion exchange and its significance; soil reaction; soil organic matter-composition, decomposition, mineralization and humus and its fractionation; soil organisms and their significance.

**Practical**

Identification of rocks and minerals; study and description of a soil profile; determination of bulk density and particle density; soil strength; soil moisture determination; determination of field capacity, infiltration rate, water holding capacity; mechanical analysis of soil; soil temperature; collection and processing of soil samples; determination of organic carbon, pH and electrical conductivity

**COURSE: NATIONAL SERVICE SCHEME****Practical**

NSS: Orientation of students in national problems, study of philosophy of NSS, fundamentals rights, directive principles of state policy, socio-economic structure of Indian society, population problems, brief of five year plan. Functional literacy, non-formal education of rural youth, eradication of social evils, awareness programs, consumer awareness, highlights of consumer act. Environment enrichment and conservation, health, family welfare and nutrition.

<b>Semester II</b>		
<b>COURSE CODE</b>	<b>COURSE NAME</b>	<b>CREDITS</b>
<b>AG ECON 101</b>	<b>Principles of Agricultural Economics</b>	<b>2 (1+1)</b>
<b>AGRO 102</b>	<b>Principles of Agronomy</b>	<b>3 (2+1)</b>
<b>STAT 101</b>	<b>Introduction to Statistical Methods</b>	<b>2 (1+1)</b>
<b>AGM 101</b>	<b>Principles of agricultural Meteorology</b>	<b>3(2+1)</b>
<b>GP 101</b>	<b>Fundamentals of Genetics</b>	<b>3 (2+1)</b>
<b>LPM 101</b>	<b>Livestock Production and Management</b>	<b>3 (2+1)</b>
<b>MICRO 101</b>	<b>Elementary Microbiology</b>	<b>3 (2+1)</b>
<b>SOIL 102</b>	<b>Soil Fertility, Soil Chemistry and Nutrient Management</b>	<b>3 (2+1)</b>
	<b>Total Credits</b>	<b>22 (14+8)</b>

## **COURSE: PRINCIPLES OF AGRICULTURE ECONOMICS (AG ECON 101)**

### **Theory**

Economics and agricultural economics: meaning, definition, subject matter, division, importance and relationship with others sciences; law of diminishing marginal utility: meaning, definition, assumptions, limitations, importance; consumer's surplus: meaning, definition, importance; demand: meaning, definition, kinds of demand, demand schedule, demand curve, law of demand, extension and contraction vs increase and decrease in demand; elasticity of demand: types of elasticity of demand, degrees of price elasticity of demand, methods of measuring elasticity, factors influencing elasticity of demand, importance of elasticity of demand; supply: meaning, definition, law of supply, elasticity of supply; national income: concepts, measurement ;inflation :meaning, definition, kinds of inflation and effect of inflation; basic concepts of economic growth and development

### **Practical**

To study the factors affecting demand and supply and measuring their responsiveness to changes in prices, income and expenditure etc.; equilibrium concept and price determination; extension and contraction vs increase and decrease in demand and supply; measurement of elasticity of demand through different methods; application of law of diminishing marginal utility and its limitations, concept of consumer's surplus and its application; different concepts of national income, their relationship and measurement.

## **COURSE: PRINCIPLES OF AGRONOMY (AGRO 102)**

### **Theory**

Meaning and scope of agriculture; development of agriculture in India in general and Haryana in particular; national and international agricultural research institutes in India; agronomy: definition, history and its relation with other sciences; classification of crops: agronomic, seasonal, life span, botanical, seed size, root depth and water requirement etc; characteristics of good seed, types of seed and seed multiplication; crop growth, yield and factors affecting them; agronomic principles involved in crop production; tillage and its objectives, soil tilth and its optimum requirement for important crops; soil fertility, productivity and their maintenance; time and method of application of manures and fertilizers, cropping pattern(s), cropping systems and farming systems.

## **Practical**

Study of tillage implements; practice of ploughing; practice of puddling; study of seeding equipments; different methods of sowing; study of inter cultivation implement and practice; participation in ongoing field operations; identification of crops, weed and their seeds; seed testing for purity, germination and moisture of various crop seeds; calculation of seed rate of different crops; preparation of seed arium; practice of methods of fertilizer applications; identification of fertilizers and manures, nutrient content of different fertilizers and manures; computing fertilizer and manorial requirement of various field crops; estimation of yield of different field crops.

## **COURSE: INTRODUCTION TO STATISTICAL METHODS (STAT 101)**

### **Theory**

Statistics: introduction, definition and its use and limitations; frequency distribution and frequency curves; measures of central tendency; characteristics of ideal average, arithmetic mean; median, mode, merits and demerits of arithmetic mean; measures of dispersions; standard deviation, variance and coefficient of variation; probability; definition and concept of probability; normal distribution and its properties; introduction to sampling; random sampling; the concept of standard error; tests of significance :types of errors, null hypothesis, level of significance and degrees of freedom, steps involved in testing of hypothesis; large sample test-SND test for means, single sample and two samples (all types); small sample test for means, student's t-test for single sample; two samples and paired t-test, F test; Ch-Square test in 2X 2 contingency table, Yates correction for continuity; correlation; types of correlation and identification through scatter diagram, computation of correlation coefficient 'r' and its testing; linear regression of Y on X and X on y; inter- relation between 'r' and the regression coefficients, fitting of regression equations; experimental designs: basic designs, completely random sized design (CRD), layout and analysis with equal and unequal number of observations, randomized block design (RBD), layout and analysis, latin square design (LSD), layout and analysis.

### **Practical**

Construction of frequency distribution tables and frequency curves; computation of arithmetic mean, median mode, standard deviation ,variance and coefficient of variation for un-grouped and grouped data; SND test for means, single sample; SND test for means two samples; student's t-test for single sample; student's t-test for two samples; paired t- test and F test; Chi-Square Test in 2 x 2 contingency table, Yates' correction for continuity; computation

of correlation coefficient 'r' and its testing; fitting of regression equations-Y on X and X on Y; analysis of completely randomized design (CRD): analysis of randomized block design (RBD); analysis of Latin square design (LSD).

### **COURSE: PRINCIPLES OF AGRICULTURAL METEOROLOGY (AGM 101)**

#### **Theory**

Definition, aim and scope of agricultural meteorology; the atmosphere and its structure; brief description of weather elements: radiation, temperature, air pressure, wind, humidity, condensation, precipitation, evaporation and evapotranspiration; impact of weather elements on crop and livestock production; agro climatic requirements of crops (rice, bajra, cotton, wheat, gram, sugarcane and mustard); crop microclimate and its modification; weather forecasting and its application in agriculture; climate of Haryana and India; agro climatic zones of Haryana and India; concept of climate change and air pollution; introduction to remote sensing and GIS.

#### **Practical**

Use of meteorological instruments for recording weather data in agro met observatory; computation of daily, weekly, monthly and annual weather data; preparation of weather charts and diagrams; computation of agro meteorological indices; study of synoptic charts for weather forecasting.

### **COURSE: FUNDAMENTALS OF GENETICS (GP 101)**

#### **Theory**

Ultra-structure of cell and cell organelles and their functions: mitosis and meiosis, their significance and differences between them; Mendel's laws of inheritance and exceptions to the laws; types of gene interaction, multiple alleles, pleiotropism, penetrance and expressivity; law of population equilibrium, quantitative traits, qualitative traits and differences between them; multiple factor hypothesis; cytoplasmic inheritance, its characteristic features and difference between chromosomal and cytoplasmic inheritance; mutation and its characteristic features; methods of inducing mutations and C / B technique; linkage, types of linkage and estimation of linkage; crossing over and factors affecting it; mechanism of crossing over and cytological proof of crossing over; DNA and its structure, function, types, modes of replication and repair; RNA and its structure, function and types; transcription, translation, genetic code and outline of protein synthesis; gene expression and differential gene activation; lac operon and fine structure of gene; numerical chromosomal aberrations (polyploidy) and evolution of

different crop species like cotton, wheat, tobacco, triticale and brassicas; structural chromosomal aberrations.

### **Practical**

Preparation of micro slides and identification of various stages of mitosis; preparation of micro slides and identification of various stages of meiosis; monohybrid ratio and its modifications; di- hybrid ratio and its modifications; tri-hybrid ratio; chi-square analysis and interaction of factors; epistatic factors, supplementary factors and duplicate factors; complementary factors, additive factors and inhibitory factors; linkage – two point test cross; linkage – three point testcross; Hardy Wein Berg law of population equilibrium

### **COURSE: LIVESTOCK PRODUCTION AND MANAGEMENT (LPM 101)**

#### **Theory**

Importance of livestock in the national economy; present status and future prospects of various livestock development programmes in India; important breeds of cattle, buffalo, sheep, goat and swine; factors effecting, reproduction in farm animals; selection and breeding of livestock for higher milk and meat production; milk secretion, milking of animals and factors affecting milk yield and composition; feeding and management of calves, growing, heifers and milch animals etc.; housing and rearing systems for different species of livestock; disease control, health management and animal farm waste management practices; animal farm records; cost of milk production and economics of viable units of cattle, buffalo, sheep, goat and swine; classification of poultry and characteristics of important breeds; methods of rearing, breeding, feeding and management, incubation and hatching, brooding, vaccination and prevention of diseases, preservation of egg and meat, cost of production etc.

#### **Practical**

Visit to livestock farms; identification, handling and restraining of animals; selection, judging and culling of dairy animals; feeding techniques and ration formulation; disease control, housing and feeding practices; economics of livestock production; incubation hatching, housing and management of poultry.

### **COURSE: ELEMENTARY MICROBIOLOGY (MICRO 101)**

#### **Theory**

History of microbiology: spontaneous generation theory, role of microbes in agriculture and fermentation, germ theory of disease, protection against infections; applied areas of microbiology; metabolism in bacteria: ATP generation, chemoautotrophy, photoautotrophy, respiration and fermentation; classification of prokaryotes criteria used for classification of

prokaryotes, general properties of different divisions of prokaryotes: gracilicutes, firmicutes, tenericutes and mendosicutes; bacteriophages: structure and properties of bacterial viruses—lytic and lysogenic cycles, viroids and prions; soil microbiology: microbial groups in soil, microbial transformations of carbon, nitrogen, phosphorus and sulphur; biodegradation of cellulose, hemicellulose and lignin; biological nitrogen fixation, mycorrhiza; microflora of rhizosphere and phyllosphere; microbes in composting; role of microorganisms in industry; microbiology of food: microbial food spoilage and principles of food preservation; microbiology of water and water purification; beneficial microorganisms in agriculture: biofertilizer (bacterial cyanobacterial and fungal), microbial insecticides, microbial agents for control of plant diseases, biodegradation of pesticides, biogas production, biodegradable plastics; plant- microbe interactions and use of genetically modified organisms for crop improvement.

### **Practical**

General instructions: familiarization with instruments, materials and glass wares used in a microbiology laboratory; study of components of microscope; microscopic examination of algae and fungi by use of low and medium power objectives in compound microscope; microscopic examination of bacteria and actinomycetes using oil immersion objective; examination of bacteria by simple and differential staining: gram staining, spore staining, negative staining and capsule staining of bacteria; methods for preparation of microbiological media: nutrient agar medium, nutrient broth and slants; sterilization of medium and glass ware using different techniques of sterilization such as moist heat (autoclave), hot air oven and filtration sterilization; plating methods for isolation and purification of bacteria: pour plate method and streak plate technique; isolation of spore- forming bacteria by enrichment culture technique; isolation of *rhizobium* from legume nodules by streak plate method; preparation of bio fertilizers inoculant (demonstration) and seed inoculation with bio fertilizers; isolation of microorganisms from air: ubiquitous presence of microbes; demonstration of waste utilization: composting and biogas production

## **COURSE: SOIL FERTILITY, SOIL CHEMISTRY & NUTRIENT MANAGEMENT**

### **(SOIL 102)**

#### **Theory**

Soil fertility and productivity; essential and beneficial nutrient elements, criteria of essentiality, available forms, mechanism of nutrient transport to plants, functions and deficiency symptoms in plants, factors affecting nutrients availability, remediation/amelioration of deficiencies and toxicities; microbiological transformations of C, N and S in soils; problem soils: acid, salt



affected and calcareous and their characteristics, nutrients availability and reclamation (mechanical, chemical and biological); irrigation water: quality and its appraisal, use of brackish water in agriculture; soil fertility evaluation and soil testing; critical levels of nutrients in soils and plants; plant analysis techniques; indicator plants; biological methods of soil fertility evaluation; introduction to manures and fertilizers; soil test based fertilizer recommendations to crops; integrated nutrient management; factors influencing nutrient use efficiency in respect of N, P, K, S and Zn fertilizers; sources, methods and scheduling of nutrients for different soils and crops grown under rain fed and irrigated conditions.

### **Practical**

Principles of spectrophotometer, flame photometer and atomic absorption spectrophotometer; principles of extraction of available nutrients from soil and digestion of plant material for analysis; estimation of available N, P, K, S in soils; determination of  $\text{CaCO}_3$ ; determination of pH, EC,  $\text{CO}_3^{--}$ ,  $\text{HCO}_3^-$ ,  $\text{Ca}^{++}$  and  $\text{Mg}^{++}$  in irrigation water; lime and gypsum requirement of problem soils; estimation of N, P, K, Zn, Fe, Cu and Mn in plants.

<b>SEMESTER III</b>		
<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>CREDITS</b>
<b>AG ECON 201</b>	<b>Agricultural Finance and Co-Operation</b>	<b>2 (1+1)</b>
<b>AGRO 201</b>	<b>Irrigation Water Management</b>	<b>3 (2+1)</b>
<b>AGRO 202</b>	<b>Field Crops - I (Kharif Crops)</b>	<b>3 (2+1)</b>
<b>GP 201</b>	<b>Principles of Plant Breeding</b>	<b>3 (2+1)</b>
<b>HORT 201</b>	<b>Production Technology of Fruit Crops</b>	<b>3 (2+1)</b>
<b>PL PATH 201</b>	<b>Plant Pathogens and Principles of Plant Pathology</b>	<b>4 (3+1)</b>
<b>SOIL 201</b>	<b>Manures, Fertilizers and Agro-Chemicals</b>	<b>3 (2+1)</b>
<b>VSC 201</b>	<b>Production Technology Of Vegetable Crops</b>	<b>3 (2+1)</b>
<b>NSS</b>	<b>National Service Scheme</b>	<b>2(0+2)</b>
	<b>Total Credits</b>	<b>26 (16+10)</b>

## **COURSE: AGRICULTURAL FINANCE AND CO-OPERATION (AG ECON 201)**

### **Theory**

Agricultural finance: nature and scope; time value of money: compounding and discounting agricultural credit: meaning, definition, need, classification and micro finance; credit analysis: 4R's, 5C's and 7P's of credit, repayment plans; history of financing agriculture in India; commercial banks: nationalization of commercial banks, lead bank scheme, regional rural banks, scale of finance; higher financing agencies-RBI, NABARD, AFC, Asian Development Bank, World Bank, Insurance and Credit Guarantee Corporation of India; assessment of crop losses: determination of compensation, crop insurance, advantages and limitations in application, estimation of crop yields; agricultural cooperation: philosophy and principles, history of Indian cooperative movement, pre-independence and post independence periods, cooperative credit structure-PACS, DCCB, SCB.

### **Practical**

Factors governing use of capital and identification of credit needs, time value of money-compounding and discounting; tools of financial management: balance sheet, income statement and cash flow analysis; estimations of credit needs and determining unit costs (7 types), preparations and analysis of loan proposals (4R's) and types of repayment loans.

## **COURSE: IRRIGATION WATER MANAGEMENT (AGRO 201)**

### **Theory**

Importance and role of water in crop production; irrigation: definition, source of irrigation, water resources and irrigation development in India and Haryana; forms of soil moisture and their importance in crop production; soil plant water relationship; energy concept of plant water relations; components of water potentials; method of soil moisture estimation, evapotranspiration, crop water requirement and effective rainfall; scheduling and methods of irrigation; irrigation efficiency and water use efficiency and factors affecting them; conjunctive use of water; irrigation water quality and its management; water management of various field crops; drainage and methods of drainage, prevention of water losses and adverse effect of water logging; water stress and its effect on crop growth; irrigation strategies under limited water conditions; micro/pressure irrigation: sprinkler, mini- sprinklers, micro-sprinkler, drip irrigation and rain gun.

## **Practical**

Determination of bulk density by field method; determination of soil moisture content by gravimetric method, tension meter, electrical resistance block and neutron moisture meter; soil moisture meter; determination of field capacity by field method; determination of permanent wilting point; measurement of irrigation water through flumes, weirs and flow meters; calculation of irrigation water requirement; determination of infiltration rate; demonstration and calculation of irrigation efficiencies of various methods of irrigation (flooding, boarder, furrow, check basin FIRBS, various types of drip and sprinkler systems etc); visit to farmers' fields, cost estimation and working of drip irrigation system and various types of sprinkler system

## **COURSE: FIELD CROPS - I (KHARIF CROPS) (AGRO 202)**

### **Theory**

Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, manuring, water management, important limiting factors and constraints in crop production and cultivation of kharif crops; cereals: rice, maize, sorghum, pearl millet; pulses: pigeon pea, green gram and black gram, urd bean; oilseeds: groundnut, sesamum, soybean; fibre crops: cotton; and forage crops: sorghum, cowpea and napier.

### **Practical**

Identification of different kharif crops and their seeds; morphological characters of major kharif crops; seed bed preparation and sowing of kharif crops; calculation of seed rate and the effect of seed size on germination and seedling vigour of kharif crops; preparation of kharif plant herbarium; effect of sowing depth on germination, manurial requirement and methods of fertilizer application; study of yield attributing characters, yield calculations, harvesting and yield estimation of kharif crops; study of crops, varieties and important agronomic experiments; visit to research stations.

## **COURSE: PRINCIPLES OF PLANT BREEDING (GP 201)**

### **Theory**

Floral biology, emasculation and pollination techniques in cereals, millets, pulses, oil seeds, fibers, plantation crops etc; aims and objectives of plant breeding; modes of reproduction, sexual, asexual, apomixis and their classification; significance in plant breeding; modes of pollination, genetic consequences, differences between self and cross pollinated crops; methods

of breeding: introduction and acclimatization; selection, mass selection, johannson's pure line theory, genetic basis, pure line selection; hybridization, aims and objectives, types of hybridization; methods of handling of segregating generations, pedigree method, bulk method, back cross method and various modified methods; incompatibility and male sterility and their utilization in crop improvement; heterosis, inbreeding depression, various theories of heterosis, exploitation of hybrid vigour development of inbred lines, single cross and double cross hybrids; population improvement programmes, recurrent selection, synthetics and composites; methods of breeding for vegetatively propagated crops; clonal selection; mutation breeding; ploidy breeding; wide hybridization, significance in crop improvement.

### **Practical**

Floral biology; study of megasporogenesis and microsporogenesis; fertilization and life cycle of an angiospermic plant; plant breeder's kit; emasculation and hybridization techniques and precautions to be taken; floral morphology, selfing, emasculation and crossing techniques; study of male sterility and incompatibility in field plots e.g., rice, sorghum, maize, wheat, bajra, sugarcane, groundnut, castor, sesamum, redgram, bengalgram, greengram, soybean, blackgram, chillies, brinjal, tomato; bhendi, onion, bottle gourd, ridge gourd, cotton, mesta, jute, sunhemp.

### **COURSE: PRODUCTION TECHNOLOGY OF FRUIT CROPS (HORT 201)**

#### **Theory**

Horticulture: importance and status; fruit zones; classification of fruits based on their edible parts; dormancy, chilling requirement, heat units, juvenility; physiology of flowering and fruit-bud-differentiation; parthenocarpy, C/N ratio, problems of unfruitfulness, fruit development and maturity; protection from frost, chilling injury, cold hardiness, drought and high temperature resistance; modern propagation structures and greenhouses; selection of location and site for planting an orchard, preparation of land and layout; orchard management practices, viz. training, pruning, fertilizer application, irrigation, plant protection; cultivation of temperate, sub-tropical and tropical fruits, viz. apple, pear, peach, plum, almond, loquat, mango, citrus, grapes, guava, sapota, litchi, ber, phalsa, pomegranate, aonla, jamun, date-palm, papaya, banana and pineapple.

#### **Practical**

Identification and description of fruits and their cultivars; plant propagation with seeds, cuttings, layering and grafting; orchard layout and planting systems; methods of pruning and training of fruit trees; methods of irrigation and fertilizer application in fruit crops; preparation

of solution of growth regulators for propagation; application of growth regulators for improving fruit set, fruit size, quality, delaying/hastening ripening; visit to local commercial orchards.

**COURSE: PLANT PATHOGENS AND PRINCIPLES OF PLANT PATHOLOGY (PL PATH 201)**

**Theory**

Plant pathogens: introduction, important plant pathogenic organisms, different groups- fungi, bacteria, fastidious vesicular bacteria, phytoplasmas, spiroplasmas, viruses, viroids, algae, protozoa and phanerogamic parasites with examples of diseases caused by them; prokaryotes: classification of prokaryotes according to Bergey's manual of systematic bacteriology; general characters of fungi, definition of fungus, somatic structures, types of fungal thalli, fungal tissues, modifications of thallus, reproduction in fungi (asexual and sexual); nomenclature, binomial system of nomenclature, rules of nomenclature, classification of fungi; key to divisions and sub-divisions; introduction, definition and objectives of plant pathology; history of plant pathology; terms and concepts in plant pathology; survival and dispersal of plant pathogens; phenomenon of infection: pre- penetration, penetration and post penetration; pathogenesis: role of enzymes, toxins, growth regulators and polysaccharides; defense mechanism in plants: structural and bio-chemical (pre and post infection); plant disease epidemiology; plant disease forecasting and remote sensing, general principles of plant diseases management: importance, general principles – avoidance, exclusion, protection – plant quarantine and inspection – quarantine rules and regulations; cultural methods: rouging, eradication of alternate and collateral hosts, crop rotation, manure and fertilizer management, mixed cropping, sanitation, hot weather ploughing, soil amendments, time of sowing, seed rate and plant density, irrigation and drainage; role and mechanisms of biological control and PGPR; physical and chemical methods, methods of application of fungicides; host plant resistance, application of biotechnology in plant disease management, development of disease resistant transgenic plants through gene cloning; integrated plant disease management (IDM): concept, advantages and importance

**Practical**

Acquaintance to plant pathology laboratory and equipments; preparation of culture media for fungi and bacteria; isolation techniques, preservation of disease samples; study the species of genera *Pythium*, *Phytophthora*, *Albugo*; *Sclerospora*, *Peronosclerospora*, *Pseudoperonospora*, *Peronospora*, *Plasmopara* and *Bremia*; study the sp. of genera *Mucor* *Rhizopus*, *Aspergillus*, *Penicillium*, *Oidium*, *Oidiopsis*, *Ovulariopsis*, *Erysiphe*, *Phyllactinia*, *Uncinula* and

Podospaera; study the sp. of genera Puccinia (different stages), Uromyces, Hemilia; Sphacelotheca, Ustilago, Tolyposporium Agaricus, Pleurotus and Ganoderma; study the species of genera Septoria, Colletotrichum, Pestalotiopsis, Pyricularia; Trichoderma, Fusarium; Helminthosporium, Drechslera, Alternaria, Stemphyllium, Cercospora, Phaeoisariopsis, Rhizoctonia and Sclerotium; demonstration of Koch's postulates; study of different groups of fungicides and antibiotics; preparation of fungicides: bordeaux mixture, bordeaux paste, chestnut compound; methods of application of fungicides: seed, soil and foliar; bio-assay of fungicides – poisoned food technique, inhibition zone technique and slide germination technique; bio-control of plant pathogens: dual culture technique, seed treatment; visit to quarantine station and remote sensing laboratory.

### **COURSE: MANURES, FERTILIZERS AND AGRO-CHEMICALS (SOIL 201)**

#### **Theory**

Manures: bulky and concentrated, FYM; methods of composting, suitable plants/plant residues for composting, vermicompost, green manure, oil cakes; sewage and sludge: biogas plant slurry, plant and animal refuges; fertilizers: classifications, manufacturing processes and properties of major nitrogenous, phosphatic, potassic and complex fertilizers, their fate and reactions in the soil; secondary and micronutrient fertilizers; amendments; fertilizer control order; fertilizer storage; biofertilizers; organic chemistry as prelude to agro chemicals; diverse types of agro-chemicals; botanical insecticides (Neem); pyrethrum; synthetic pyrethroids; synthetic organic insecticides- major classes, properties and uses of some important insecticides under each class; herbicides: major classes, properties and uses of 2,4-D, atrazine, glyphosate, butachor, benthocarb; fungicides: major classes, properties and uses of carbendazin, carboxin, captan, tridemorph, copper oxychloride; insecticides Act; plant growth regulator; adsorption and persistence of different agro-chemicals in soils.

#### **Practical**

Determination of total nitrogen and phosphorus in manures/composts; vermin-composting; COD in organic wastes; ammonical and nitrate nitrogen, water soluble phosphorus, potassium, calcium, sulphur and zinc content of fertilizers; adulteration in fertilizers; argentimetric and iodometric titrations- their use in the analysis of lindane, metasystox, endosulfan, malathion, copper and sulphur fungicides; compactability of fertilizers with pesticides.

## **COURSE TECHNOLOGY OF NAME: PRODUCTION VEGETABLE CROPS**

### **(VSC 201)**

#### **Theory**

Scope and importance of olericulture; role of vegetables in human nutrition; classification of vegetable crops; fundamentals of vegetable production; types of vegetable gardening; origin, area, production, varieties, sowing time, seed rate, cultural practices, plant protection measures and harvesting of potato, tomato, brinjal, chilli, cauliflower, cabbage, peas, cowpea, cluster bean, onion, garlic, carrot, radish, turnip, okra, sweet potato, watermelon, muskmelon, bottle gourd, beet leaf and fenugreek.

#### **Practical**

Identification of vegetable seeds, plants and varieties; planning and layout of a kitchen garden; preparation of nursery beds, seedbeds; seed treatment before sowing; raising of vegetable nursery in different seasons; hardening of seedlings and other treatments; transplanting of seedlings and aftercare; critical stages and methods of irrigation in vegetables; manures and fertilizers application; cultural operations and weed control in vegetable crops; visit to a commercial vegetable farm/kitchen garden.

## **COURSE: NATIONAL SERVICE SCHEME**

#### **Practical**

NSS: Orientation of students in national problems, study of philosophy of NSS, fundamentals rights, directive principles of state policy, socio-economic structure of Indian society, population problems, brief of five year plan. Functional literacy, non-formal education of rural youth, eradication of social evils, awareness programs, consumer awareness, highlights of consumer act. Environment enrichment and conservation, health, family welfare and nutrition.



<b>SEMESTER IV</b>		
<b>COURSE CODE</b>	<b>COURSE NAME</b>	<b>CREDITS</b>
<b>AG ECON 202</b>	<b>Agricultural Marketing, Trade and Prices</b>	<b>2 (1+1)</b>
<b>AGRO 203</b>	<b>Field Crops - II (<i>Rabi</i> Crops)</b>	<b>3 (2+1)</b>
<b>AGRO 204</b>	<b>Weed Management</b>	<b>2 (1+1)</b>
<b>ENT 201</b>	<b>Insect Ecology and Integrated Pest Management Including Beneficial Insects</b>	<b>3 (2+1)</b>
<b>EXT 201</b>	<b>Dimensions of Agricultural Extension</b>	<b>3 (2+1)</b>
<b>GP 202</b>	<b>Breeding of Field Crops</b>	<b>3 (2+1)</b>
<b>HORT 202</b>	<b>Production Technology of Spices, Medicinal, Aromatic and Plantation Crops</b>	<b>2 (1+1)</b>
<b>PL PATH 202</b>	<b>Diseases of Field Crops and Their Management</b>	<b>3 (2+1)</b>
	<b>Total Credits</b>	<b>21 (13+8)</b>

## **COURSE NAME: AGRICULTURAL MARKETING, TRADE AND PRICES**

### **(AG ECON 202)**

#### **Theory**

Agricultural marketing: concepts and definition, scope and subject matter; market and marketing: meaning, definitions, dimensions and components of a market classification; market structure: conduct, performance, marketing functions, market functionaries or agencies; producer's surplus: meaning, types of producers' surplus, marketable surplus; marketed surplus: importance, factors effecting marketable surplus; marketing channels: meaning, definition, channels for different products; market integration: meaning, definition, types of market integration; marketing efficiency: meaning, definition, marketing costs, margins and price spread, factors affecting the cost of marketing; international trade: GATT, WTO, implications of AOA, market access; cooperative marketing: meaning and types; quality control: agricultural products, AGMARK, characteristics of agricultural products; agricultural prices: meaning, role and types, need for agricultural price policy; risk in marketing: meaning and importance, types of risk in marketing; speculations and hedging.

#### **Practical**

Identification of marketing channels, study of Rythu Bazars /Apani Mandi, regulated markets and unregulated markets; estimation of marketed and marketable surplus and factors affecting it; price spread analysis and estimation of marketing efficiency through different methods; time series analysis: indices, forecasting etc; visit to marketing institutions: NAFED, APEDA, study of SWC, CWC and STC; analysis of information on daily prices and arrivals of selected commodities.

## **COURSE: FIELD CROPS - II (RABI CROPS) (AGRO 203)**

#### **Theory**

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices, manuring, water management, important limiting factors and constraints in production and cultivation of *rabi* crops; cereals: wheat, barley; pulses: chickpea, lentil, peas, frenchbean; oilseeds: rapeseed and mustard, and sunflower; sugar crops: sugarcane; commercial crops: tobacco; forage crops: berseem, lucerne and oat.

#### **Practical**

Seed bed preparation and sowing of different rabi season crops; preparation of rabi crops herbarium; calculations on seed rate, methods of fertilizer application; identification of *rabi*

season crops and their seeds; morphological characteristics of wheat, barley, mustard, *rabi* pulses; yield contributing characters of *rabi* crops; visit to research stations.

### **COURSE NAME: WEED MANAGEMENT (AGRO 204)**

#### **THEORY**

Weeds: introduction, harmful and beneficial effects, classification, propagation and dissemination; weed biology and ecology; crop weed association; crop weed competition and allelopathy; concepts of weed prevention, control and eradication; methods of weed control: physical, cultural, chemical and biological; integrated weed management; herbicides: advantages and limitations of herbicides uses in India; herbicide classification, formulations, method of application; introduction to adjuvants and their uses in herbicides; introduction to selectivity of herbicides; compatibility of herbicides with other agro-chemicals; weed management in major field and horticultural crops; shift of weed flora in cropping systems, aquatic and problematic weeds and their control.

#### **Practical**

Identification of weeds; survey of weeds in crop fields and their habitats; preparation of list of commonly available herbicides; preparation of weed herbarium; calculations on weed control efficiency and weed index; herbicide label information; computation of herbicide doses; study of herbicide application equipments and calibrations; demonstration of method of herbicide application; study of phytotoxicity symptoms of herbicides in different crops; biology of nutsedge, bermudagrass *Echinochloa* spp., *Phalaris minor*, *Parthenium* and *Trianthema*; economics of weed control practices; visits to problem areas.

### **COURSE NAME: INSECT ECOLOGY AND INTEGRATED PEST MANAGEMENT INCLUDING BENEFICIAL INSECTS (ENT 201)**

#### **Theory**

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; concepts of balance of life in nature, biotic potential and environmental resistance and causes for outbreak of pests in agro-ecosystem; pest surveillance and pest forecasting; categories of pests.

Integrated Pest Management (IPM): introduction, importance, concepts and tools of IPM - host plant resistance, cultural, mechanical, physical, legislative, biological (parasites, predators and pathogens such as bacteria, fungi and viruses) methods of control; chemical control:

importance, hazards and limitations; classification of insecticides, toxicity of insecticides and formulations of insecticides; study of important insecticides; recent methods of pest control: repellents, antifeedants, hormones, attractants, gamma radiation and genetic control; scope and limitations of IPM; insecticide Act 1968: important provisions; application techniques of spray fluids; phytotoxicity of insecticides; symptoms of poisoning, first aid and antidotes; beneficial insects parasites and predators used in pest control and their mass multiplication techniques; important groups of microorganisms: bacteria, viruses and fungi used in pest control and their mass multiplication techniques; important species of pollinators, weed killers and scavengers: their importance; non-insect pests: mites, nematodes, rodents and birds; silk worms, honey bees and lac insects

### **Practical**

Visit to meteorological observatory/automatic weather reporting station; study of terrestrial and pond ecosystems of insects; studies on behaviour of insects and orientation (repellency, stimulation, deterancy); study of distribution patterns of insects, sampling techniques for the estimation of insect population and damage; pest surveillance through light traps, pheromone traps and field incidence; practicable IPM practices: mechanical and physical methods, cultural and biological methods; chemical control: insecticides and their formulations; calculation of doses/concentrations of insecticides; compatibility of pesticides and phytotoxicity of insecticides; IPM case studies; identification and mass multiplication of important natural enemies; identification and management of honeybees; identification of rodents and bird pests and their damage; other beneficial insects: pollinators, weed killers and scavengers.

## **COURSE NAME: DIMENSIONS OF AGRICULTURAL EXTENSION (EXT 201)**

### **THEORY**

Education: meaning, definition, types-formal and non-formal education and their characteristics; extension education and agricultural extension: meaning, definition; concepts, objectives and principles; rural development: meaning, definition, concepts, objectives, importance and problems in rural development; developmental programmes of pre-independence era: Shriniketan, Marthandam, Gurgaon experiment and Gandhian constructive programme; development programmes of post independence era, Firka development, Etawah pilot project and Nilokheri experiment; community development programme: meaning, definition, concepts, philosophy, principles, objectives, differences between community development and extension education; national extension service; panchayat raj system: meaning of democratic-decentralization and panchayat raj, three tiers of panchayat raj system, powers, functions and organizational setup; agricultural development programmes with

reference to year of start, objectives and salient features: Intensive Agricultural District Programme (IADP), High Yielding Varieties Programme (HYVP), Institution Village Linkage Programme (IVLP), Watershed Development Programme (WDP), National Agricultural Technology Project (NATP), ATMA, ATIC; social justice and poverty alleviation programmes: Integrated Tribal Development Agency (ITDA), Integrated Rural Development Programme (IRDP), Swarna Jayanthi Gram Swarajgar Yojana (SGSY), Prime Minister Employment Yojana (PMEY); new trends in extension, privatization in extension; women development programmes: Development of Women and Children in Rural Areas (DWCRA), Rashtriya Mahila Kosh (RMK), Integrated Child Development Scheme (ICDS) and Mahila Samridhi Yojana (MSY), reorganized extension system (T and V System): salient features, fortnight meetings, monthly workshops, linkages, merits and demerits, emergence of broad based extension.

### **Practical**

Visits to a village and kisan mandal to study the ongoing development programmes; visits to Panchayat Raj Institutions to study the functioning of Gram Panchayat (GP) and Zila Parishad (ZP); visit and study the District Rural Development Agency (DRDA); participation in monthly workshops of Training and Visit (T and V) system; visit to watershed development project area; visit to a village to study the Self Help Groups (SHGs) of DWCRA; visit to a voluntary organization to study the developmental activities; organizing PRA techniques in a village to identify the agricultural problems; visit to villages.

### **COURSE NAME: BREEDING OF FIELD CROPS (GP 202)**

#### **THEORY**

Breeding objectives and important concepts of breeding self pollinated, cross pollinated and vegetatively propagated crops; Hardy-Weinberg law; study of origin, distribution of species, wild relatives and forms, cereals, (rice, wheat, maize, millets, sorghum, bajra); pulses (redgram, greengram, blackgram, soybean); oilseeds (groundnut, sesame, sunflower, castor, mustard) etc. fibers (cotton) etc. vegetables (tomato, bhindi, chilli, cucumbers); flowers crops (chrysanthemum, rose, galardia, gerbera and marigold); fruit crops (aonla, guava, mango, custard apple, banana, papaya); major breeding procedures for development of hybrids / varieties of various crops; plant genetic resources their conservation and utilization in crop improvement; ideotype concept in crop improvement (with examples of wheat, rice, maize, sunflower etc.); breeding for resistance to biotic and abiotic stresses; variability in pathogens and pests; mechanisms of resistance in plant to pathogens and pest; genetic basis of adaptability to unfavourable environments; definition and concept of biometrics- assessment of variability i.e. additive, dominance and epistasis and their differentiation; genotype x

environment interaction and influence on yield/performance; introduction to IPR and its related issues.

### **Practical**

Emasculation and hybridization techniques; handling of segregating generations, pedigree methods; handling of segregating generations, bulk methods; handling of segregating generations, back cross methods; field lay out of experiments; field trials, maintenance of records and registers; estimation of heterosis and inbreeding depression; estimation of heritability, GCA and SCA; estimation of variability parameters; parentage of released varieties/hybrids; problems on hardy-weinberg law; study of quality characters; sources of donors for different characters; visit to seed production and certification plots; visit to AICRP trials and programmes; visit to grow out test plots; visit to various research stations; visit to other institutions

### **COURSE: PRODUCTION TECHNOLOGY OF SPICES, MEDICINAL, AROMATIC AND PLANTATION CROPS (HORT 202)**

#### **Theory**

Importance and cultivation technology of spices: ginger, turmeric, pepper, cardamom, coriander, cumin and fenugreek; medicinal plants: diascoria, rauwolfia, opium, ocimum, periwinkle, aloe, guggal, belladonna, nux-vomica, Solanum khasiamum, aonla, senna, plantago, stevia, coleus and acorus; aromatic plants: lemon grass, citronella, palmarose, vetiver, geranium, dawana; plantation crops-coconut, arecanut, betel vine, cashew, cocoa, coffee, oil palm.

**Practical** Botanical description and identification of crops and varieties in spices, medicinal, aromatic and plantation crops; propagation techniques in spices, medicinal, aromatic and plantation crops; planting methods in ginger and turmeric; harvesting procedures in spices, medicinal, aromatic and plantation crops; curing and processing of spices, products and byproducts of spices, medicinal, aromatic and plantation crops; visit to local commercial plantation gardens

### **COURSE NAME: DISEASES OF FIELD CROPS AND THEIR MANAGEMENT (PL PATH 202)**

#### **Theory**

Economic importance, symptoms, cause, epidemiology and disease cycle and integrated management of diseases of rice, sorghum, bajra, maize, wheat, sugarcane, tobacco, groundnut, sesamum, sunflower, cotton, redgram, bengalgram, blackgram, greengram, soybean.

## **Practical**

Study of symptoms, etiology, host-parasite relationship and specific control measures of the following crop diseases; presentation of disease samples survey and collection of diseases of rice, sorghum; diseases of wheat, bajra and maize; diseases of sugarcane, turmeric and tobacco; diseases of groundnut, castor and sunflower; diseases of sesamum and cotton; diseases of redgram, greengram, blackgram, bengalgram and beans; field visits at appropriate time during the semester.

Note: Students should submit 50 pressed, well mounted different diseased specimens related to different crops in practical examination during the end of semester.





