

Semester wise distribution of courses at the UG Degree Programme (B.Sc. (Hons.) Agriculture) of Faculty of Agriculture, UBKV w. e. f. 2016-2017 academic session as per the ICAR-V Deans' Committee Recommendations:

I Semester

Sl. No.	Course Name	Credit Hr.	Offering Department
1.	Fundamentals of Horticulture	2 (1+1)	PPHT
2.	Fundamentals of Genetics	3(2+1)	GPB
3.	Fundamentals of Soil Science-I	3(2+1)	SSAC
4.	Introduction to Forestry	2 (1+1)	FOR
5.	Communication Skills and Personality Development	2 (1+1)	EXT
6.	Fundamentals of Agronomy-I	2(1+1)	AGR
7.	Fundamentals of Crop Physiology	2(1+1)	SST
8. ¥	Fundamentals of Agricultural Economics	2(2+0)	ECO
9.	Elementary Mathematics*	2(2+0)*	STAT
10.	Rural Sociology & Educational Psychology	2 (2+0)	EXT
11.	Human Values & Ethics (non gradial)	1(1+0)**	EXT
12.	NSS/NCC/Physical Education & Yoga Practices**	2 (0+2)**	EXT
13.	Comprehension and Communication Skill in English	2(1+1)	EXT
TOTAL		27(17+10)	

*R: Remedial course; **NC: Non-gradial courses, ¥ : This course will be offered in 2nd Semester for 2016-17 academic session only.

II Semester

Sl. No.	Course Name	Credit Hr.	Offering Department
1.	Fundamentals of Plant Breeding	3(2+1)	GPB
2.	Agricultural Microbiology	2(1+1)	SSAC
3.	Soil and Water Conservation Engineering	2(1+1)	F/Tech.
4.	Fundamentals of Plant Pathology-I	3(2+1)	PPA
5.	Fundamentals of Entomology	4(3+1)	ENT
6.	Fundamentals of Agricultural Extension Education	3(2+1)	EXT
7.	Fundamentals of Plant Biochemistry	3(2+1)	BCH
8.	Fundamentals of Agronomy-II	2(1+1)	AGR
Total		22(14+8)	

III Semester

Sl. No.	Course Name	Credit Hr.	Offering Department
1.	Crop Production Technology – I (<i>Kharif Crops</i>)	3 (2+1)	AGR
2.	Fundamentals of Plant Biotechnology	3 (2+1)	GPB
3.	Agricultural Finance and Cooperation	3 (2+1)	ECO
4.	Agri- Informatics and Computer Application	2(1+1)	STAT
5.	Farm Machinery and Power	2 (1+1)	F/Tech.
6.	Production Technology for Vegetables and Spices	2 (1+1)	VSC
7.	Environmental Studies and Disaster Management	3(2+1)	FOR
8.	Fundamentals of Statistical Methods	3(2+1)	STAT
9.	Livestock and Poultry Management-I	2 (1+1)	AGR
10.	Fundamentals of Plant Pathology-II	1(1+0)	PPA
Total		24(15+9)	

IV Semester

Sl. No.	Course Name	Credit Hr.	Offering Department
1.	Crop Production Technology –II (<i>Rabi Crops</i>)	3(2+1)	AGR
2.	Production Technology for Ornamental Crops, MAP and Landscaping	2(1+1)	FMAP
3.	Renewable Energy and Green Technology	2(1+1)	F/Tech.
4.	Problematic Soils and their Management	3(2+1)	SSAC
5.	Production Technology for Fruit and Plantation Crops	2(1+1)	PPHT
6.	Principles of Seed Technology	3(2+1)	SST
7.	Farming System & Sustainable Agriculture	1(1+0)	AGR
8.	Agricultural Marketing Trade & Prices	3(2+1)	ECO
9.	Introductory Agro-meteorology & Climate Change	2(1+1)	AGR
10.	Elective Course	3(2+1)	
Total		24(15+9)	

V Semester

Sl. No.	Course Name	Credit Hr.	Offering Department
1.	Livestock and Poultry Management-II	2 (1+1)	AGR
2.	Soil Fertility and Nutrient Management	3 (2+1)	SSAC
3.	Pests of Crops and Stored Grain and their Management	3 (2+1)	ENT
4.	Diseases of Field and Horticultural Crops and their Management -I	3 (2+1)	PPA
5.	Crop Improvement-I (<i>Kharif Crops</i>)	2 (1+1)	GPB
6.	Entrepreneurship Development and Business Communication	2 (1+1)	EXT
7.	Geoinformatics and Nano-technology and Precision Farming	2 (1+1)	AGR
8.	Practical Crop Production – I (<i>Kharifcrops</i>)	1 (0+1)	AGR
9.	Intellectual Property Rights	1(1+0)	ECO
10.	Principles of Organic Farming	2(1+1)	
11.	Elective Course	3(2+1)	
Total		24(14+10)	

VI Semester

Sl. No.	Course Name	Credit Hr.	Offering Department
1.	Rainfed Agriculture & Watershed Management	2 (1+1)	AGR
2.	Protected Cultivation and Secondary Agriculture	2 (1+1)	F/Tech.
3.	Diseases of Field and Horticultural Crops and their Management-II	3 (2+1)	PPA
4.	Post-harvest Management and Value Addition of Fruits and Vegetables	2 (1+1)	PPHT
5.	Management of Beneficial Insects	2 (1+1)	ENT
6.	Crop Improvement-II (<i>Rabi crops</i>)	2 (1+1)	GPB
7.	Practical Crop Production –II (<i>Rabi crops</i>)	1 (0+1)	AGR
8.	Farm Management, Production & Resource Economics	3 (2+1)	ECO
9.	Principles of Food Science and Nutrition	2(2+0)	PPHT
10.	Principles of Integrated Pest and Disease Management	3(2+1)	PPA
11.	Elective Course	3(2+1)	
Total		25(15+10)	
Grand Total		142(91+51)	

Distribution of credits in different semester

Semester	Total Credits
1 st semester	27(17+10)
2 nd semester	22(14+8)
3 rd semester	24(15+9)
4 th semester	24(15+9)
5 th semester	24(14+10)
6 th semester	25(15+10)
Up to 6 th semester	146(90+56)
7 th semester (Student READY Prog.)	20 (0+20)
8 th semester (Student READY Prog.)	20 (0+20)
Grand Total	186(90+96)

Details of Courses

B.Sc.(Hons.) Agriculture First Term

Fundamentals of Agronomy-I

2(1+1)

Theory

Agronomy and its scope, seeds and sowing, tillage and tilth, crop density and geometry, Intercultural operations, concept of yield and yield components, Crop nutrition, manures and fertilizers, nutrient use efficiency .Classification of crops.Agroclimatic zones of West Bengal.

Growth and development of crops, factors affecting growth and development, plant ideotypes, crop rotation and its principles, adaptation and distribution of crops, crop management technologies in problematic areas, harvesting and threshing of crops, principles of storage

Practical

Identification of crops, seeds, fertilizers, pesticides and tillage implements, Effect of sowing depth on germination and seedling vigour, Methods of fertilizer application, Study of yield contributing characters and yield estimation, Seed germination and viability test, Numerical exercises on fertilizer requirement, plant population, Use of tillage implements-reversible plough, one way plough, harrow, leveler, seed drill

Fundamentals of Soil Science -I

3(2+1)

Theory

Pedological and Edaphological concept: Definition of Pedology and Edaphology, Difference between Pedology and Edaphology, Definition of Soil, soil as a natural body, components of soil, concept of pedon, polypedon etc. Rocks and minerals-classification and composition: Definition of rocks and minerals, Rock formation- factors, Classification of rocks – igneous, sedimentary and metamorphic rocks and Definition of minerals, Secondary and primary minerals: description with examples. Weathering of rocks and minerals- definition, types of weathering- physical, chemical & biological weathering with examples. Soil formation-factors and processes: Soil formation: soil forming factors: passive & active factors, age of soil, Fundamental processes of soil formation, Different process of soil formation like podzolization, laterization etc. Elementary knowledge of soil taxonomy, classification and soils of India; Soil profile-definition of soil profile, horizon, different types of horizon with characters. Soil Texture – Definition, methods of textural analysis, stock's law, assumptions, limitation, textural classes, use of textural triangle and relationship between texture and other soil properties. Soil Structure – Definition and classification of soil structure, difference between soil texture and soil structure, genesis of soil structure and aggregate formation. Important/agricultural significance of soil structure, management of soil structure. Soil Densities – Bulk density - Definition and factors affecting bulk density; Particle Density – .Definition and factors affecting particle density, difference between bulk density and particle density; Pore space – Definition and factors affecting porosity of soil, relation between bulk density, particle density of soil, and total pore space of a soil, size of pores, factors affecting size of pores Soil consistency and plasticity- concept and factors influencing, Atterberg's constants. Soil colour - Definition, description, causes, importance/significance of soil colour, determination and interpretation of soil colour. Soil Water: Properties and related behaviour; Soil water classification – Physical classification along with the factors affecting various kinds of physical classification and biological classification, Available water - definition, concept and factors affecting available water. Brief ideas about soil water potential, soil moisture constants and factors affecting soil moisture constants. Measurement of soil water content-concepts and methods (introductory). Soil water movement- saturated and unsaturated flow, Darcy's law and brief concept of water infiltration. Soil Air – Composition of soil air, idea on soil aeration and gaseous exchange between soil and atmosphere, Importance of various components of soil air. Soil Temperature: Thermal properties of soil – Thermal concepts - heat, temperatures, modes of transmission of heat. Importance of soil temperature – processes affected by heat and its

management. Factors influencing the soil temperature. Soil colloids, properties, nature, type and significance. Layer silicate clays, their genesis and sources of charges. Structure of layer silicate clays (1:1, 2:1, 2:2 type), comparative properties of silicate clay minerals, genesis and sources of negative charges on silicate clay, organic soil colloids. B

Absorption of ions, concept of ion exchange phenomena, CEC, ECEC, AEC, factors affecting ion exchange, milliequivalent concept, percentage base saturation, Importance of cation exchange in plant nutrition, contact exchange, root CEC, complementary ion effect, pH and buffering, buffering capacity of soil, relation between pH-dependent and permanent charge. Soil reaction-pH, soil acidity and alkalinity and effect on nutrient availability.

Practical

Study of soil profile in field. Study of soil sampling tools, collection of representative soil sample, its processing and storage. Study of soil forming rocks and minerals. Determination of soil density, moisture content and porosity. Determination of soil texture by feel and Bouyoucos Methods. Studies of capillary rise phenomenon of water in soil column and water movement in soil. Determination of soil pH and electrical conductivity. Study of soil map. Determination of soil colour. Estimation of organic matter content of soil.

Fundamental of Soil Science-II (Horticulture)

(2+1)

Theory

Pedological and Edaphological concept: Definition of Pedology and Edaphology, Difference between Pedology and Edaphology, Definition of Soil, soil as a natural body, components of soil, concept of pedon, polypedon etc. Rocks and minerals-classification and composition: Definition of rocks and minerals, Rock formation- factors, Classification of rocks – igneous, sedimentary and metamorphic rocks and Definition of minerals, Secondary and primary minerals: description with examples. Weathering of rocks and minerals- definition, types of weathering- physical, chemical & biological weathering with examples. Soil formation-factors and processes: Soil formation: soil forming factors: passive & active factors, age of soil, Fundamental processes of soil formation, Different process of soil formation like podzolization, laterization etc. Elementary knowledge of soil taxonomy, classification and soils of India; Soil profile-definition of soil profile, horizon, different types of horizon with characters. Soil Texture – Definition, methods of textural analysis, Stokes' law, assumptions, limitation, textural classes, use of textural triangle and relationship between texture and other soil properties. Soil Structure – Definition and classification of soil structure, difference between soil texture and soil structure, genesis of soil structure and aggregate formation. Important/agricultural significance of soil structure, management of soil structure. Soil Densities – Bulk density - Definition and factors affecting bulk density; Particle Density – Definition and factors affecting particle density, difference between bulk density and particle density; Pore space – Definition and factors affecting porosity of soil, relation between bulk density, particle density of soil, and total pore space of a soil, size of pores, factors affecting size of pores. Soil consistency and plasticity- concept and factors influencing, Atterberg's constants. Soil colour - Definition, description, causes, importance/significance of soil colour, determination and interpretation of soil colour. Soil Water: Properties and related behaviour; Soil water classification – Physical classification along with the factors affecting various kinds of physical classification and biological classification, Available water - definition, concept and factors affecting available water. Brief ideas about soil water potential, soil moisture constants and factors affecting soil moisture constants. Measurement of soil water content-concepts and methods (introductory). Soil water movement- saturated and unsaturated flow, Darcy's law and brief concept of water infiltration. Soil Air – Composition of soil air, idea on soil aeration and gaseous exchange between soil and atmosphere, Importance of various components of soil air. Soil Temperature: Thermal properties of soil – Thermal concepts - heat, temperatures, modes of transmission of heat. Importance of soil temperature – processes affected by heat and its management. Factors influencing the soil temperature. Soil colloids, properties, nature, type and

significance .Layer silicate clays, their genesis and sources of charges. Structure of layer silicate clays(1: 1, 2:1,2:2 type),comparative properties of silicate clay minerals,genesis and sources of negative charges on silicate clay, organic soil colloids. Absorption of ions, concept of ion exchange phenomena, CEC,ECEC,AEC,factors affecting ion exchange,milliequivalent concept, percentage base saturation, Importance of cation exchange in plant nutrition, contact exchange, root CEC, complementary ion effect, pH and buffering, buffering capacity of soil,relation between pH-dependent and permanent charge.Soil reaction-pH, soil acidity and alkalinity and effect on nutrient availability.Remote sensing application in soil and plant Studies, Soil degradation.

Practical:

Collection and processing of soils, Study of soil profile,Determination of soil pH by pH meter, Determination of ECs of the given soil, Determination of B.D. and P.D.Soil moisture determination, Determination of Maximum water holding capacity,Determination of soil texture by feel method and Hydrometer method, Determination of Soil temperature,Identification of rocks and minerals. Determination of soil organic matter, Estimation of infiltration rate in soil.

Principles of Soil Science (Ag.Engineering)

3(2+1)

Theory

Nature and origin of soils; soil forming rocks and minerals, their classification and composition, Soil forming processes, classifications of soils – soil taxonomy orders, Important soil physical properties and their importance; soil particle distribution

Soil inorganic colloids-their composition, properties and origin of charge ,Ion exchange in soil and nutrient availability, Soil organic matter-its composition and decomposition, effect on soil fertility, Soil reaction-acidic, saline and sodic soils, Quality of irrigation water; Essential plant nutrients-their functions and deficiency symptoms in plants, Important inorganic fertilizers and their reactions in soils, Use of saline and sodic water for crop production; gypsum requirement for reclamation of sodic soils and neutralizing RSC, Liquid fertilizer and their solubility and compatibility.

Practical

Identification of rocks and minerals; Examination of soil profile in the field; Collection of Soil Sample; Determination of bulk density; particle density and porosity of soil; Determination of organic carbon of soil; Determination of Nitrogen, Determination of Phosphorus and Determination of Potassium; Identification of nutrient deficiency symptoms of crops in the field; Determination of gypsum requirement of sodic soils; Determination of water quality parameters.

Elementary Mathematics (For Agriculture and Horticulture Faculty)

(2+0)

Theory

Straight lines : Distance formula, section formula (internal and external division), Change of axes (only origin changed), Equation of co-ordinate axes, Equation of lines parallel to axes, Slope-intercept form of equation of line, Slope-point form of equation of line, Two point form of equation of line, Intercept form of equation of line, Normal form of equation of line, General form of equation of line, Point of intersection of two st. lines, Angles between two st. lines, Parallel lines, Perpendicular lines, Angle of bisectors between two lines, Area of triangle and quadrilateral.Circle: Equation of circle whose centre and radius is known, General equation of a circle, Equation of circle passing through three given points, Equation of circle whose diameters is line joining two points (x_1, y_1) & (x_2, y_2) , Tangent and Normal to a given circle at given point (Simple problems), Condition of tangency of a line $y = mx + c$ to the given circle $x^2 + y^2 = a^2$.Differential Calculus : Definition of function, limit and continuity, Simple problems on limit, Simple problems on continuity, Differentiation of x^n , e^x , $\sin x$

and $\cos x$ from first principle, Derivatives of sum, difference, product and quotient of two functions, Differentiation of functions of functions (Simple problems based on it), Logarithmic differentiation (Simple problems based on it), Differentiation by substitution method and simple problems based on it, Differentiation of Inverse Trigonometric functions. Maxima and Minima of the functions of the form $y=f(x)$ (Simple problems based on it).

Integral Calculus : Integration of simple functions, Integration of Product of two functions, Integration by substitution method, Definite Integral (simple problems based on it), Area under simple well-known curves (simple problems based on it).

Matrices and Determinants: Definition of Matrices, Addition, Subtraction, Multiplication, Transpose and Inverse up to 3rd order, Properties of determinants up to 3rd order and their evaluate.

Elementary Statistics (Horticulture)

2(1+1)

Theory:

Basic Concept: Introduction to statistics, Limitations of statistics, variable, statistic, parameter, types and sources of data, construction of frequency distribution tables, graphical representation of data, Measures of location and dispersion for raw and grouped data.

Probability and Distributions: Theory of Probability: Definitions (Classical, Empirical, Axiomatic) of Probability; Theorem on Total and Compound Probability (For two events only without proof), Random variable: Probability Mass Function and Probability Density Function; Mathematical Expectation and Variance; Theoretical Distributions: Binomial Distribution, Poisson distribution – Derivation of their mean and variance only.

Correlation and Regression: Simple Correlation and Regression.

Sampling: Basic concept of sampling, Advantages of Sample Survey over Census Survey; Simple Random Sampling (SRS), SRSWR and SRSWOR; Estimators of Population Mean, Total and their Variances (formulae only) for SRS; Concepts of Sampling Errors and Non-sampling Errors.

Test of Significance: Concept of Statistical Hypotheses, Critical Region, Acceptance Region, Level of Significance; Type I Error, Type II Error, Power of a Test and Test of Significance, Application of τ , chi-square and F Statistics.

Experimental Designs: Basic concepts, Completely Randomized Design, Randomized Block Design and Latin Square design.

Practical:

Construction of Frequency Distribution from Ungrouped and Grouped Data; Calculation of different measures of Location and Dispersion from Ungrouped and Grouped frequency distributions. Calculation of simple correlation coefficient; Fitting of Linear Regression Equations. Application of t, chi-square and F Statistics for Test of Significance in different statistical problems. Analysis of data from experiments laid out in CRD, RBD and LSD.

Rural Sociology and Educational Psychology

2 (2+0)

Theory

Sociology and Rural Sociology-Meaning, Definition, Scope, its significance in Agricultural Extension, Indian Rural Society-Important characteristics, Differences and Relationship between Rural and Urban societies; Social Groups – Meaning, Definition, Classification, Factors considered in formation and organization of groups, Motivation in group formation and Role of Social groups in Agricultural Extension; Social Stratification – Meaning, Definition, Functions, Basis for stratification, Forms of Social stratification – Characteristics and – Differences between Class & Caste System;

Cultural concepts – Culture, Customs, Folkways, Mores, Taboos, Rituals and Traditions – Meaning, Definition and their Role in Agricultural Extension; Social Institutions – Meaning, Definition, Major institutions in Rural society, Functions and their Role in Agricultural Extension; Social change – Meaning, Definition, Nature of Social change, Dimensions of social change and factors of social change.

Psychology and Educational Psychology – Meaning, Definition, Scope and Importance of Educational Psychology in Agricultural Extension; Behaviour: Cognitive, affective and psychomotor domain, Intelligence – Meaning, Definition, Types, Factors affecting intelligence and Importance of intelligence in Agricultural Extension; Personality – Meaning, Definition, Types, Factors influencing the Personality and Role of personality in Agricultural Extension; Motivation – Meaning, Definition, Motivation cycle, Types, Classification of Motives, Theories of motivation, Techniques of motivation and Role of Motivation in Agricultural Extension; Teaching – Learning process – Meaning and Definition of Teaching, Learning, Learning experience and Learning situation, Elements of learning situation and its characteristics; Principles of learning.

Communication Skills and Personality Development

2 (1+1)

Theory

Communication: Meaning and process of communication, verbal and nonverbal communication, individual and group presentations, impromptu presentation, public speaking; Group discussion. Organizing seminars and conferences, oral presentation skills, visual communication, body language, Interviews: kinds, Importance and process

Structural and functional Grammar: Introduction of Word Classes; Structure of Verb in English; Uses of Tenses; Study of Voice; Study of Conjunctions and Prepositions; Sentence Patterns in English.

Spoken English: Conversations of different situations in everyday life, the concept of stress, stress shift in words and sentences, silent letters in words and pronunciation of words with silent letters, the basic intonation patterns.

Comprehension skill: Reading and comprehension of general and technical articles.

Writing skill: Paragraph writing, précis writing, report writing, synopsis writing and proposal writing, summarizing, abstracting, field diary and lab record, indexing, footnote and bibliographic procedures, preparation of Curriculum Vitae and Job applications.

Practical

Structural Grammar: Exercises in word classes, identification and study of verbs in sentences, application of tenses and voice, exercises in conjunctions and prepositions, other structural grammar exercises, report writing, letter writing (different types of letters).

Spoken English: Conversations of everyday life, the concept of stress, stress shift. Silent letters in words, basic intonation patterns, preparing and address.

Listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures, précis writing, summarizing, abstracting, synopsis writing and proposal writing, CV writing, group discussions.

Comprehension and Communication Skills in English

2(1+1)

Theory

War Minus Shooting- The sporting Spirit. A Dilemma- A layman looks at science Raymond B. Fosdick. You and Your English – Spoken English and broken English G.B. Shaw. Reading

Comprehension, Vocabulary- Antonym, Synonym, Homophones, Homonyms, often confused words. Exercises to Help the students in the enrichment of vocabulary based on TOEFL and other competitive examinations. Functional grammar: Articles, Prepositions, Verb, Subject verb Agreement, Transformation, Synthesis, Direct and Indirect Narration. Written Skills: Paragraph writing, Precise writing, Report writing and Proposal writing. The Style: Importance of professional writing. Preparation of Curriculum Vitae and Job applications. Synopsis Writing. Interviews: kinds, Importance and process.

Practical

Listening Comprehension: Listening to short talks lectures, speeches (scientific, commercial and general in nature). Oral Communication: Phonetics, stress and intonation, Conversation practice. Conversation: rate of speech, clarity of voice, speaking and Listening, politeness & Reading skills: reading dialogues, rapid reading, intensive reading, improving reading skills. Mock Interviews: testing initiative, team spirit, leadership, intellectual ability. Group Discussions.

Human Values and Ethics (Non gradial)

1(1+0)

Theory

Values and Ethics-An Introduction., Goal and Mission of Life. Vision of Life.Principles and Philosophy.Self Exploration.Self Awareness.Self Satisfaction.Decision Making.Motivation.Sensitivity.Success.Selfless Service.Case Study of Ethical Lives.Positive Spirit.Body, Mind and Soul.Attachment and Detachment.Spirituality Quotient. Examination.

National Service Scheme, Physical Education and Yoga practices (Non gradial course) 2 (0+2)

Introduction and basic components of NSS:

Orientation: history, objectives, principles, symbol, badge; regular programmes under NSS, organizational structure of NSS, code of conduct for NSS volunteers, points to be considered by NSS volunteers awareness about health

NSS programmes and activities

Concept of regular activities, special camping, day camps, basis of adoption of village/slums, conducting survey, analysing guiding financial patterns of scheme, youth programme/ schemes of GOI, coordination with different agencies and maintenance of diary

Understanding youth

Definition, profile, profile, categories, issues and challenges of youth; and opportunities for youth who is agent of the social change

Community mobilisation

Mapping of community stakeholders, designing the message as per problems and their culture; identifying methods of mobilisation involving youth-adult partnership

Social harmony and national integration

Indian history and culture, role of youth in nation building, conflict resolution and peace-building

Volunteerism and shramdan

Indian tradition of volunteerism, its need, importance, motivation and constraints; shramdan as part of volunteerism

Citizenship, constitution and human rights

Basic features of constitution of India, fundamental rights and duties, human rights, consumer awareness and rights and rights to information

Family and society

Concept of family, community (PRIs and other community based organisations) and society

Physical Education and Yoga

Introduction to physical education. Posture, exercise for good posture, physical fitness exercises for agility, strength, coordination, endurance and speed. Rules are regulations of important games, skill development in any one of the games – football, hockey, cricket, volleyball, ball badminton, throw ball, tennikoit. Participation in one of the indoor games – shuttle badminton, chess and table tennis. Rules and regulations of athletic events, participation in any one of the athletic events – broad jump, high jump, triple jump, javelin throw, discus throw, shot put, short and long distance running, Safety education, movement education, effective way of doing day-to-day activities. First-aid training, coaching for major games and indoor games. Asanas and indigenous ways for physical fitness and curative exercises. Exercises and games for leisure time, use and experience.

Yoga practices

Note: Warming up and conditioning exercises are compulsory before the commencement of each class.

Fundamentals of Genetics

3(2+1)

Theory

Pre Mendelian concepts of heredity. Mendelian principles of heredity and Post Mendelian concepts. Cell division – mitosis, meiosis, Probability and Chi-square. Dominance relationships, gene interaction; pleiotropism and pseudoalleles. Epistatic interactions with examples. Multiple alleles. Blood group genetics. Sex determination and sex linkage; sex limited and sex influenced traits. Linkage and its estimation, crossing over mechanisms and chromosome mapping. Structural and numerical changes in chromosome, Mutation, classification. Methods of inducing mutation & CIB technique; mutagenic agents and induction of mutation. Qualitative & Quantitative traits, Polygenes and continuous variations; multiple factor hypothesis, Cytoplasmic inheritance and maternal effect. Genetic disorders. Nature, structure and replication of genetic material. Transcription and translational mechanism of genetic material. Protein synthesis. Gene concept: Gene structure, function and regulation; Lac operon and Trp operon.

Practical

Study of microscope. Experiments on monohybrid, dihybrid, trihybrid, test cross and back cross. Experiments on epistatic interactions. Study on mitotic and meiotic cell divisions. Study on probability and Chi-square test. Determination of linkage and cross over analysis (through two point test cross and three point test cross data). Study of models on DNA and RNA structure.

Fundamentals of Economics and Marketing (Horticulture) 3 (2+1)

Theory:

Nature and scope of economics, definition and concepts, divisions of economics, economic systems, approaches to the study of economics. Consumption – theory of consumer behaviour, laws of consumption, classification of goods. Wants – their characteristics and classification, utility and its measurement, cardinal and ordinal, law of diminishing marginal utility, law of equi-marginal utility, indifference curve and its properties. Theory of demand, demand schedule and curve, market demand. Price, income and cross elasticities, Engel's law of family expenditure – consumer's surplus. Theory of firm, factors of production – land and its characteristics, labour and division of labour, theories of population. Capital and its characteristics – classification and capital formation. Enterprises – forms of business organization – merits and demerits. Laws of return – law of diminishing marginal return, Law of supply – supply schedule and curve elasticities. Market equilibrium, Marketing- definition – Marketing Process – Need for marketing – Role of marketing — Marketing functions – Classification of markets – Marketing channels – Price spread – Marketing Efficiency – Integration – Constraints in marketing of agricultural produce. Market intelligence, Concept of future market

Practical:

Preparation of Bankable projects for various agricultural products and its value added products. Identification of marketing channel– Calculation of Price Spread – Identification of Market Structure – Visit to different Markets.

Introductory Crop Physiology (Horticulture)

2(1+1)

Theory

Water Relations in Plants: Role of water in plant metabolism, osmosis inhibition, diffusion, water potential and its components, measurement of water potential in plants, absorption of water, mechanism of absorption and ascent of sap. Stomata: Structure, distribution, classification, mechanism of opening and closing of stomata. Osmotic pressure, guttation, stem bleeding; transpiration methods and mechanism and factors affecting transpiration. Drought: Different types of stresses; water, heat and cold tolerance; mechanism of tolerance. Plant Nutrition: Essentiality, mechanism of absorption and its role in plant metabolism. Biological Nitrogen Fixation Photosynthesis, structure and function of chloroplast, dark and light reactions, cyclic and non-cyclic electron transfer, CO₂ fixation – C₃, C₄ and C₄ metabolism, advantages of C₄ pathway. Photorespiration and its implications, factors affecting photosynthesis. Mode of herbicide action, Secondary metabolites and plant defense.

Practical

Measurement of water potential, osmosis, root pressure, structure of the stomata, distribution, opening and closing of the stomata, measurement, transpiration and calculation of transpirational pull demonstration. Importance of light and chlorophyll in photosynthesis, pigment identification in horticultural crops and studying the enzyme activity of catalase, estimation of phenols, studying plant movements, root initiation in cuttings.

Fundamentals of Agronomy II

2(1+1)

Theory

Water resources, soil plant water relationship, crop water requirement, water use efficiency, irrigation-scheduling criteria and methods, quality of irrigation water, water logging.

Weeds- importance, classification, crop weed competition, concepts of weed management-principles and methods, herbicides- classification, selectivity and resistance, allelopathy

Practical

Identification of weeds in crops, Methods of herbicide application, Numerical exercises on herbicide requirement, Study of soil moisture measuring devices, Measurement of field capacity, bulk density and infiltration rate, Measurement of irrigation water

Agriculture Microbiology

2(1+1)

Theory

Introduction. Microbial world: Prokaryotic and eukaryotic microbes. Bacteria: cell structure, chemoautotrophy, photo autotrophy, growth. Bacterial genetics: Genetic recombination- transformation, conjugation and transduction, plasmids, transposon.

Role of microbes in soil fertility and crop production: Carbon, Nitrogen, Phosphorus and Sulphur cycles. Biological nitrogen fixation- symbiotic, associative and asymbiotic. Azolla, blue green algae and mycorrhiza. Rhizosphere and phyllosphere. Microbes in human welfare: silage production, biofertilizers, biopesticides, biofuel production and biodegradation of agro-waste.

Practical

Introduction to microbiology laboratory and its equipments; Microscope- parts, principles of microscopy, resolving power and numerical aperture. Methods of sterilization. Nutritional media and their preparations. Enumeration of microbial population in soil- bacteria, fungi, actinomycetes. Methods of isolation and purification of microbial cultures. Isolation of *Rhizobium* from legume root nodule. Isolation of *Azotobacter* from soil. Isolation of *Azospirillum* from roots. Isolation of BGA. Staining and microscopic examination of microbes.

Introductory Microbiology (Horticulture)

2(1+1)

Theory

History and Scope of Microbiology: The discovery of micro-organism, spontaneous generation conflict, germ theory of diseases, microbial effect on organic and inorganic matter. Development of microbiology in India and composition of microbial world. Microscopy and Specimen Preparation: The bright field microscope, fixation, dyes and simple staining, differential staining. Difference between prokaryotic and eukaryotic cells. Prokaryotic cell structure and functions. Types of culture media and pre-culture techniques. Microbial growth in models of bacterial, yeast and mycelia growth curve. Measurement of bacterial growth. General properties of viruses and brief description of bacteriophages. DNA as genetic material. Antibiosis, symbiosis, intra-microbial and extra-microbial association. Sterilization methods – Physical and chemical, Isolation of pure cultures and preservation of cultures, Plant growth promoting microorganisms and mushrooms – Economical importance, Industrially important microorganisms in large scale production and common microbial fermentations. Mushrooms- edible and poisonous types, nutritive values, Culturing and production techniques.

Practical

Examination of natural infusion and living bacteria; examination of stained cells by simple staining and Gram staining. Methods for sterilization and nutrient agar preparation. Broth culture, agar slopes, streak plates and pour plates, turbid metric estimation of microbial growth, mushroom culture- Spawn production, Culture and production techniques, harvesting, packing and storage.

Soil Fertility and Nutrient Management (Horticulture)

2 (1+1)

Theory

Introduction to soil fertility and productivity- factors affecting. Essential plant nutrient elements- functions, deficiency systems, transformations and availability. Acid, calcareous and salt affected soils – characteristics and management. Soil organic matter, Importance of C:N ratio and pH in plant nutrition, soil buffering capacity. Integrated plant nutrient management. Soil fertility evaluation methods, critical limits of plant nutrient elements and hunger signs. NPK fertilizers: composition and application methodology, luxury consumption, nutrient interactions, deficiency symptoms, visual diagnosis. Plant nutrient toxicity symptoms and remedies measures. Soil test crop response and targeted yield concept. Biofertilizer. Nutrient use efficiency and management. Secondary and micronutrient fertilizer. Fertilizer control order. Manures and fertilizers classification and manufacturing process. Nutrient based subsidy and customised fertilizers. Properties and fate of major and micronutrient in soils. Fertilizer use efficiency and management.

Practical

Analysis of soil for organic matter, available N,P,K and Micronutrients and interpretations. Gypsum requirement of saline and alkali soils. Lime requirement of acid soils. Estimation of organic carbon content in soil. Determination of Boron and chlorine content In soil. Determination of Calcium, Magnesium and Sulphur in soil. Sampling of organic manure and fertilizer for chemical analysis. Physical properties of organic manure and fertilizers. Total nitrogen in urea and farmyard manure. Estimation of ammonical nitrogen and nitrate nitrogen in ammonical fertilizer. Estimation of water soluble P_2O_5 , Ca and S in SSP, Lime and Gypsum. Estimation of Potassium in MOP/SOP and Zinc in zinc sulphate. Visiting of fertilizer testing laboratory.

Soil, Water and Plant Analysis (Horticulture)

2(1+1)

Theory

Methods of soil and plant sampling and processing for analysis. Characterization of hydraulic mobility – diffusion and mass flow. Renewal of gases in soil and their abundance. Methods of estimation of oxygen diffusion rate and redox potential. Use of radio tracer techniques in soil fertility evaluation. Soil micro-organisms and their importance. Saline, alkali, acid, waterlogged and sandy soils, their appraisal and management. Chemical and mineral composition of horticultural crops. Leaf analysis standards, index tissue, interpretation of leaf analysis values Quality of irrigation water. Radio tracer technology application in plant nutrient studies. Rapid tissue tests for soil and plant. Management of poor quality irrigation water in crop management. Soil and Water pollution.

Practical

Introduction to analytical chemistry, Collection and preparation of soil, water and plant samples for analysis. Use of soil and water testing kit. Determination of pH, electrical conductivity, sodium adsorption ratio and exchangeable sodium percentage of soils. Estimation of available macro and micronutrient elements in soils and their contents in plants. Irrigation water quality analysis. Determination of pH and EC in irrigation water samples, Determination of Carbonates and bicarbonates in soil and irrigation water, Determination of Calcium and Magnesium in soil and

irrigation water. Determination of N, P, K, Ca, Mg, Sand micronutrients in plant samples. Determination of Sodium, Potassium, Chlorine and Boron in irrigation water.

Fundamentals of Plant Pathology -I

(2+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. Causes / factors affecting disease development: disease triangle and tetrahedron 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, structure, replication and transmission. Study of phanerogamic plant parasites.

Practical

Acquaintance with various laboratory equipments and microscopy. Collection and preservation of disease specimen. 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 fungicides and their formulations. Methods of pesticide application and their safe use. Calculation of fungicide sprays concentrations.

Fundamentals of Agricultural Extension Education

3(2+1)

Theory

Education: Meaning, definition & Types; Extension Education- meaning, definition, scope and process; objectives and principles of Extension Education; Extension Programme planning- Meaning, Process, Principles and Steps in Programme Development. Extension systems in India: extension efforts in pre-independence era (Sriniketan, Marthandam, Firka Development Scheme, Gurgaon Experiment, etc.) and post-independence era (Etawah Pilot Project, Nilokheri Experiment, etc.); various extension/ agriculture development programmes launched by ICAR/ Govt. of India (IADP, IAAP, HYVP, KVK, IVLP, ORP, ND, NATP, NAIP, etc.). New trends in agriculture extension: privatization extension, cyber extension/ e-extension, market-led extension, farmer-led extension, expert systems, etc.

Rural Development: concept, meaning, definition; various rural development programmes launched by Govt. of India. *Community Dev.*-meaning, definition, concept & principles, *Physiology of C.D.* *Rural Leadership:* concept and definition, types of leaders in rural context; extension administration: meaning and concept, principles and functions. *Monitoring and evaluation:* concept and definition, monitoring and evaluation of extension programmes; *transfer of technology:* concept and models, capacity building of extension personnel; *extension teaching methods:* meaning, classification, individual, group and mass contact methods, media mix strategies; *communication:* meaning and definition; models and barriers to communication. *Agriculture journalism;* diffusion and adoption of innovation: concept and meaning, process and stages of adoption, adopter categories.

Practical

To get acquainted with university extension system.

Group discussion- exercise; handling and use of audio visual equipments and digital camera and LCD projector; preparation and use of AV aids, Preparation of extension literature – leaflet, booklet, folder, pamphlet news stories and success stories;

Presentation skills exercise; micro teaching exercise;

A visit to village to understand the problems being encountered by the villagers/ farmers;

To study organization and functioning of DRDA and other development departments at district level;

Visit to NGO and learning from their experience in rural development;

Understanding PRA techniques and their application in village development planning;

Exposure to mass media: visit to community radio and television studio for understanding the process of programme production;

Script writing, writing for print and electronic media, developing script for radio and television.

Fundamentals of Plant Breeding

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. Mode of pollination; self – incompatibility and male sterility- genetic consequences. Domestication, Acclimatization, introduction; Centre of origin/diversity. Components 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 generations. Pedigree method, Bulk method, Backcross Method and their modifications. Multiline concept. Concepts of population genetics and Hardy-Weinberg Law, Genetic basis and methods of breeding cross pollinated crops, modes of selection and population improvement; 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; Major achievements. Participatory plant breeding.

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 and cross pollinated crops. Consequences of inbreeding on genetic structure of resulting populations. Handling of segregation populations. Methods of calculating mean, range, variance, standard deviation, heritability. Designs used in plant breeding experiment and their analysis- Randomized Block Design, Split Plot Design and Augmented 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.

Theory:

Importance of Biochemistry. Properties of Water, pH and Buffer.

Carbohydrate: Importance and classification. Overview of optical isomerism; Structures of Monosaccharides, Reducing and oxidizing properties of Monosaccharides, Mutarotation; Structure of Disaccharides and Polysaccharides.

Lipid: Importance and classification; Structures and properties of fatty acids; storage lipids and membrane lipids.

Proteins: Importance of proteins and classification; Structures, titration and zwitterions nature of amino acids; Structural organization of proteins.

Enzymes: General properties; Classification; Mechanism of action; Michaelis&Menten and Line Weaver Burk equation & plots; Introduction to allosteric enzymes.

Nucleic acids: Importance and classification; Structure of Nucleotides; A, B & Z DNA; Watson-Crick model of DNA double helix; RNA: Types and Secondary & Tertiary structure.

Metabolism of carbohydrates: Glycolysis, TCA cycle, Glyoxylate cycle, Electron transport chain and oxidative phosphorylation.

Metabolism of lipids: Beta oxidation, Biosynthesis of fatty acids.

Practical:

Preparation of standard solution, pH & buffers; Qualitative tests of carbohydrates and amino acids. Quantitative estimation of glucose/ proteins. Titration methods for estimation of amino acids/lipids, Effect of pH, temperature and substrate concentration on enzyme action, Estimation of Acid value, Saponification number and Iodine number of fats and oils; Paper chromatography/ TLC demonstration for separation of amino acids/ monosaccharides.

Fundamentals of Entomology**4(3+1)****Part – I:**

History of Entomology in India. Major points related to dominance of Insecta in Animal kingdom. Classification of phylum Arthropoda upto classes. Relationship of class Insecta with other classes of Arthropoda. Morphology: Structure and functions of insect cuticle and molting. Body segmentation. Structure of Head, thorax and abdomen. Structure and modifications of insect antennae, mouth parts, legs, Wing venation, modifications and wing coupling apparatus. Structure of male and female genital organ. Metamorphosis and diapause in insects. Types of larvae and pupae. Structure and functions of digestive, circulatory, excretory, respiratory, nervous, secretary (Endocrine) and reproductive system, in insects. Types of reproduction in insects. Major sensory organs like simple and compound eyes, chemoreceptor.

Part-II:

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.

Part -III:

Categories of pests. Concept of IPM, Practices, scope and limitations of IPM. Classification of insecticides, toxicity of insecticides and formulations of insecticides. Chemical control—importance, hazards and limitations. Recent methods of pest control, repellents, antifeedants, hormones, attractants, gamma radiation. Insecticides Act 1968—Important provisions. Application techniques of spray fluids. Symptoms of poisoning, first aid and antidotes.

Part – IV:

Systematics: Taxonomy –importance, history and development and binomial nomenclature. Definitions of Biotype, Sub-species, Species, Genus, Family and Order. Classification of class Insecta upto Orders, basic groups of present day insects with special emphasis to orders and families of Agricultural importance like Orthoptera: Acrididae, Tettigonidae, Gryllidae, Gryllotalpidae; Dictyoptera: Mantidae, Blattidae; Odonata; Isoptera: Termitidae; Thysanoptera: Thripidae; Hemiptera: Pentatomidae, Coreidae, Cimicidae, Pyrrhocoridae, Lygaeidae, Cicadellidae, Delphacidae, Aphididae, Coccidae, Lophophidae, Aleurodidae, Pseudococcidae; Neuroptera: Chrysopidae; Lepidoptera: Pieridae, Papilionidae, Noctuidae, Sphingidae, Pyralidae, Gelechiidae, Arctiidae, Saturnidae, Bombycidae; Coleoptera: Coccinellidae, Chrysomelidae, Cerambycidae, Curculionidae, Bruchidae, Scarabaeidae; Hymenoptera: Tenthredinidae, Apidae. Trichogrammatidae, Ichneumonidae, Braconidae, Chalcididae; Diptera: Cecidomyiidae, Tachinidae, Agromyziidae, Culicidae, Muscidae, Tephritidae.

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 (Grasshopper); Dissection of male and female reproductive systems in insects (Grasshopper); Study of characters of orders Orthoptera, Dictyoptera, Odonata, Isoptera, Thysanoptera, Hemiptera, Lepidoptera, Neuroptera, Coleoptera, Hymenoptera, Diptera and their families of agricultural importance. Insecticides and their formulations. Pesticide appliances and their maintenance. Sampling techniques for estimation of insect population and damage.

Fundamentals of Agricultural Economics

2(2+0)

Theory

Economics: Meaning, scope and subject matter, definitions, activities, approaches to economic analysis; micro and macro economics, positive and normative analysis. Basic concepts: Goods and services, desire, want, demand, utility, cost and price, wealth, capital, income and welfare. Agricultural economics: meaning, definition, characteristics, importance and its role in economic development. Agricultural planning and development in the country. *Demand*: meaning, law of demand, demand schedule and demand curve, determinants, utility theory; law of diminishing marginal utility, equi-marginal utility principle. Consumer's equilibrium and derivation of demand curve, concept of consumer surplus. Elasticity of demand: concept and measurement of price elasticity, income elasticity and cross elasticity. Production: factors of production, concept of rent, wage, interest and profit, Law of variable proportions and law of returns to scale. *Cost*: Cost concepts, short run and long run cost curves. Supply: Stock v/s supply, law of supply, supply schedule, supply curve, determinants of supply, elasticity of supply. Market structure: meaning and types of market, basic features of perfectly competitive and imperfect markets. Price determination under perfect competition; short run and long run equilibrium of firm and industry, shut down and break even points. Concepts of rent, wage, interest and profit. *National income*: Meaning and importance, circular flow, concepts of national income accounting and approaches to measurement, difficulties in measurement. Population: Importance, Malthusian and Optimum population theories, natural and socio-economic determinants, current policies and programmes on population control. Money: Barter system of exchange and its problems, functions of money, classification of money, general price index, inflation and deflation. public finance: meaning, public revenue and public expenditure. *Tax*: meaning, direct and indirect taxes, agricultural taxation, VAT. *Economic systems*: Concepts of economy and its functions, important features of capitalistic, socialistic and mixed economies, elements of economic planning.

Fundamentals of Agri-business Management and Trade (Technology) 2(1+1)

Theory

Entrepreneurship, management – Management functions – planning- Organizing -Directing – motivation – ordering – leading – supervision-Communication and control– Financial management – importance of financial statements – balance sheet – profit and loss statement, Analysis of financial statements – liquidity ratios – leverage ratios, Coverage ratios – turnover ratios – profitability ratios, Agro-based industries – Project – project cycle – Project appraisal and evaluation techniques – undiscounted measures – payback period – proceeds per rupee of outlay, Discounted measures – Net Present Value (NPV) – Benefit-Cost Ratio (BCR) – Internal Rate of Return (IRR) – Net benefit investment ratio (N / K ratio) – sensitivity analysis-Importance of agribusiness in Indian economy International trade-WTO agreements – Provisions related to agreements in agricultural and food commodities. Agreements on agriculture (AOA) – Domestic support, market access, export subsidies agreements on sanitary and phyto-sanitary (SPS) measures, Trade related intellectual property rights (TRIPS).

Practical

Preparation of business – Strengths Weaknesses Opportunities and Threats (SWOT) analysis, Analysis of financial statements (Balance Sheet, Profit loss statement). Compounding and discounting, Break-even analysis Visit to agro-based industries – I, Visit to agro-based industries – II Study of Agro-industries Development Corporation , Ratio analysis – I, Ratio analysis – II, Application of project appraisal technique – I(Undiscounted measures), Application of project appraisal technique – II(Discounted Measures), Formulation of project feasibility reports – Farm Machinery Project proposals as entrepreneur – individual and group - Presentation of project proposals in the class

Fundamentals of Crop Physiology 2(1+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 CO₂ assimilation by Infra Red Gas Analyser (IRGA).

Crop Production Technology-I (Kharif Crops)

3(2+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, mesta and sunhemp; forage crops-sorghum, cowpea, cluster bean and napier. diananath grass and paragrass

Practical

Rice nursery preparation, transplanting of Rice, sowing of soybean, pigeonpea and mungbean. maize, groundnut and cotton, 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, study of yield contributing characters and yield calculation of kharif season crops, study of crop varieties and important agronomic experiments at experimental farm. study of forage experiments, morphological description of kharif season crops, visit to research centres of related crops.

Livestock and Poultry Management-I

2 (1+1)

Theory

Role of livestock in the national economy. Reproduction in farm animals and poultry. Housing principles, space requirements for different species of livestock and poultry. Management of calves, growing heifers and milch animals. Management of sheep, goat and swine. Incubation, hatching and brooding. Management of growers and layers.

Important Indian and exotic breeds of cattle, buffalo, sheep, goat, swine and poultry. Improvement of farm animals and poultry.

Practical

External body parts of cattle, buffalo, sheep, goat, swine and poultry. Handling and restraining of livestock. Identification methods of farm animals and poultry. Visit to IDF and IPF to study breeds of livestock and poultry and daily routine farm operations and farm records. Judging of cattle, buffalo and poultry. Culling of livestock and poultry. Planning and layout of housing for different types of livestock.

Fundamentals of Statistical Methods

3(2+1)

Theory:

Basic Concept: Concept of Statistics, Frequency Distribution of Ungrouped and Grouped data, Measures of Central Tendency: AM, GM, HM, Median, Mode, Quartiles, Deciles, Percentiles; Measures of Dispersion.

Correlation and Regression: Simple Correlation and Regression.

Probability and Distributions: Theory of Probability: Definitions (Classical, Empirical, Axiomatic) of Probability; Theorem on Total and Compound Probability (For two events only without proof), Pair-wise and Mutual Independence of Events, Random variable: Probability Mass Function and Probability Density Function; Mathematical Expectation and Variance; Theoretical Distributions: Binomial Distribution, Poisson Distribution and Normal Distribution; Central Limit Theorem (Statement only).

Sampling: Basic concept of sampling, Advantages of Sample Survey over Census Survey; Simple Random Sampling (SRS), SRSWR and SRSWOR; Estimators of Population Mean, Total and their Variances (formulae only) for SRS; Concepts of Sampling Errors and Non-sampling Errors.

Test of Significance: Concept of Statistical Hypotheses, Critical Region, Acceptance Region, Level of Significance; Type I Error, Type II Error, Power of a Test and Test of Significance; Application of τ , t , chi-square and F Statistics.

Experimental Design: Basic concept, Completely Randomized Design, Randomized Block Design and Latin Square design.

Practical

Construction of Frequency Distribution from Ungrouped and Grouped Data; Calculation of different measures of Location and Dispersion from Ungrouped and Grouped frequency distributions.

Calculation of simple correlation coefficient; Method of Prediction through Fitting of Linear Regression Equations.

Problems relating to Binomial Distribution, Poisson distribution and Normal Distribution respectively. Drawing of Random Samples using SRSWR and SRSWOR and Estimation of population mean, Total and their Standard Errors and Confidence Intervals.

Application of t , chi-square and F Statistics for Test of Significance in different statistical problems.

Analysis of data from experiments laid out in CRD, RBD and LSD.

Agri-informatics & Computer Applications (For Agriculture and Horticulture Faculty): 2(1+1)

Theory

IT and its importance. IT tools, IT-enabled services and their impact on society; computer fundamentals; Definition and Characteristics of computers; Organization of computers; Computer Generations; Classifications of Computers; Data representation in Computer, Word and character representation; Hardware and software; Computer memory and permanent storage devices, Input and output devices; Logic gates, Adder circuit, Binary addition and subtraction; Introduction to programming languages, features of machine language, assembly language, high-level language and their advantages and disadvantages; Principles of programming- algorithms and flowcharts; BASIC language, concepts, basic and programming techniques; Operating systems (OS) - definition, basic concepts and types; Internet and World Wide Web (WWW), Concepts and components, HTML and IP.

Practical

Introduction to WINDOWS Operating Systems; MS Word; MS Excel; MS Power Point; MS Word- Features of word processing, creating document and tables and printing of document, MS Excel- Concept of electronic spreadsheet, creating, editing and saving of spreadsheet, inbuilt statistical functions and formula bar, Analysis of data using MS Excel. MS Power point-preparation, presentation of slides and slide show. Internet applications: Web Browsing, Creation and operation of Email account.

Fundamentals of Plant Pathology –II

(1+0)

Growth and reproduction of plant pathogens. Liberation / dispersal and survival of plant pathogens. Types of parasitism and variability in plant pathogens. Pathogenesis. Role of enzymes, toxins and growth regulators in disease development. Defense mechanisms in plants. Epidemiology: Factors affecting disease development. Principles and methods of plant disease management. Resistance, Exclusion, Eradication, Protection, Avoidance, Therapy. Nature, chemical combination, classification, mode of action and formulations of fungicides and antibiotics.

Fundamentals of Plant Biotechnology Credit hours

3(2+1)

Theory

Concepts and applications of plant biotechnology. Biotechnological tools-Introduction to recombinant DNA methods: physical, chemical and Agrobacterium mediated gene transfer methods; Transgenics and its importance in crop improvement; PCR techniques and its applications; DNA markers and their application - RFLP, RAPD, AFLP, CAPS, SSR etc. Marker Assisted Breeding in crop improvement; Biotechnology regulations. Plant Cell and Tissue Culture - organ culture, embryo culture, cell suspension culture, callus culture, anther culture, pollen culture, ovule culture and their applications; Micro-propagation methods; organogenesis and embryogenesis, Synthetic seeds and their significance; Embryo rescue and its significance. Somatic hybridization and cybrids. Somaclonal variation and its use in crop improvement. Cryo-preservation. Application of in-vitro techniques.

Practical

Preparation of solution, pH and buffers. Sterilization techniques. Composition of various tissue culture media and preparation of stock solutions for MS nutrient medium. Callus induction from various explants and plant regeneration. Micro-propagation, hardening and acclimatization. Demonstration on isolation of DNA and PCR technique. Demonstration of gel electrophoresis techniques and DNA finger printing.

Nematode Pests of Horticultural Crops and their Management (Horticulture)

(1+1)

Theory

History and development of nematology - definition, economic importance. General characters of plant parasitic nematodes, their morphology, taxonomy, classification, biology, symptomatology and control of important plant parasitic nematodes of fruits – (tropical, sub-tropical and temperate) vegetables, tuber, ornamental, spice and plantation crops. Role of nematodes in plant disease complex. Integrated nematode management.

Practical

Methods of sampling and extraction of nematodes from soil and plant parts, killing, fixing and preparation of temporary and permanent nematode mounts. Nematicides and their use. Collection and preservation of 20 plant species/parts damaged by plant parasitic nematodes.

Fundamentals of Entomology (Horticulture)

(2+1)

Theory

Introduction to phylum arthropoda. Importance of class Insecta. Insect dominance. History of entomology in India, Importance of entomology in different fields. Definition, division and scope of entomology. Comparative account of external morphonology-types of mouth parts, antennae, legs, wings and genitalia. Structure, function of cuticle & moulting and body segmentation, Anatomy of digestive, Circulatory, Sensory, respiratory, glandular, excretory, nervous and reproductive systems.

Types of reproduction. Postembryonic development-eclosion. Matamorphosis. Types of egg larvae and pupa. Classification of insects upto orders, sub-order 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 or cockroach. 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.

Agricultural Finance and Co-Operation

3(2+1)

Theory

Agricultural Finance- meaning, scope and significance, credit needs and its role in Indian agriculture. Agricultural credit: meaning, definition, need, classification. Credit analysis: 4 R's, and 5C's and 7Ps of credits. Sources of agricultural finance: institutional and non-institutional sources, commercial banks, social control and nationalization of commercial banks, Micro financing including KCC. Lead bank scheme, RRBs, Scale of finance and unit cost. An introduction to higher financing institutions – RBI, NABARD, ADB, IMF, world bank, Insurance and Credit Guarantee Corporation of India. Crop Loan, Cost of credit. Recent development in agricultural credit. Preparation and analysis of financial statements – Balance Sheet and Income Statement. Basic guidelines for preparation of project reports- Bank norms – SWOT analysis.

Agricultural Cooperation – Meaning, brief history of cooperative development in India, objectives, principles of cooperation, significance of cooperatives in Indian agriculture. Agricultural Cooperation in India- credit, marketing, consumer and multi-purpose cooperatives, farmers' service cooperative societies, processing cooperatives, farming cooperatives, cooperative warehousing; role of ICA, NCUI, NCDC, NAFED.

Practical

Determination of most profitable level of capital use. Optimum allocation of limited amount of capital among different enterprise. Analysis of progress and performance of cooperatives using published data. Analysis of progress and performance of commercial banks and RRBs using published data. Visit to a commercial bank, cooperative bank and cooperative society to acquire firsthand knowledge of their management, schemes and procedures. Estimation of credit requirement of farm business – A case study. Preparation and analysis of balance sheet – A case study. Preparation and analysis of income statement – A case study. Appraisal of a loan proposal – A case study. Techno-economic parameters for preparation of projects. Preparation of Bankable projects for various agricultural products and its value added products. Seminar on selected topics.

Crop Production Technology-II (Rabi crops)

3(2+1)

Theory

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Rabi* crops; cereals –wheat and barley, pulses-chickpea, lentil, peas, French bean ,lathyrus oilseeds-rapeseed, mustard , sunflower and safflower, linseed; sugar crops- sugarcane and sugarbeet; other crops- potato, tobacco Forage crops-berseem, lucerne and oat.

Practical

Sowing methods of wheat and sugarcane, identification of weeds in rabi season crops, study of morphological characteristics of rabi crops, study of yield contributing characters of rabi season crops, yield and juice quality analysis of sugarcane, study of important agronomic experiments of *rabi* crops at experimental farms. Study of *rabi* forage experiments, oil extraction of medicinal crops, visit to research stations of related crops.

Introductory Agrometeorology & Climate Change

2(1+1)

Theory

Earth atmosphere- its composition, extent and structure; Atmospheric weather variables; Atmospheric pressure, its variation with height; Wind, types of wind, daily and seasonal variation of wind speed, cyclone, anticyclone, land breeze and sea breeze; Nature and properties of solar radiation, solar constant, depletion of solar radiation, short wave, longwave and thermal radiation, net radiation, albedo; Atmospheric temperature, temperature inversion, lapse rate, daily and seasonal variations of temperature, vertical profile of temperature, Energy balance of earth; Atmospheric humidity, concept of saturation, vapor pressure, process of condensation, formation of dew, fog, mist, frost, cloud; Precipitation, process of precipitation, types of precipitation such as rain, snow, sleet, and hail, cloud formation and classification; Artificial rainmaking. Monsoon- mechanism and importance in Indian agriculture, Weather hazards - drought, floods, frost, tropical cyclones and extreme weather conditions such as heat-wave and cold-wave. Agriculture and weather relations; Modifications of crop microclimate, climatic normals for crop and livestock production. Weather forecasting- types of weather forecast and their uses. Climate change, climatic variability, global warming, causes of climate change and its impact on regional and national Agriculture.

Practical:

Visit of Agrometeorological Observatory, site selection of observatory, exposure of instruments and weather data recording. Measurement of total, shortwave and longwave radiation, and its estimation using Planck's intensity law. Measurement of albedo and sunshine duration, computation of Radiation Intensity using BSS. Measurement of maximum and minimum air temperatures, its tabulation, trend and variation analysis. Measurement of soil temperature and computation of soil heat flux. Determination of vapor pressure and relative humidity. Determination of dew point temperature. Measurement of atmospheric pressure and analysis of atmospheric conditions. Measurement of wind speed and wind direction, preparation of windrose. Measurement, tabulation and analysis of rain. Measurement of open pan evaporation and evapotranspiration. Computation of PET and AET.

Farming System and Sustainable Agriculture

2(1+1)

Theory :

Farming System-scope, importance, and concept, Types and systems of farming system and factors affecting types of farming, Farming system components and their maintenance, Cropping system and pattern, multiple cropping system, Efficient cropping system and their evaluation, Allied enterprises and their importance, Tools for determining production and efficiencies in cropping and farming

system; Sustainable agriculture-problems and its impact on agriculture, indicators of sustainability, adaptation and mitigation, conservation agriculture strategies in agriculture, HEIA, LEIA and LEISA and its techniques for sustainability, Integrated farming system-historical background, objectives and characteristics, components of IFS and its advantages, Site specific development of IFS model for different agro-climatic zones, resource use efficiency and optimization techniques, Resource cycling and flow of energy in different farming system, farming system and environment, Visit of IFS model in different agro-climatic zones of nearby states University/ institutes and farmers field.

Problematic Soils and their Management

3(2+1)

Theory

Soil structure and aggregation-factors influencing the structure and aggregation, stability and degradation of structure and aggregation; restoration and management of soil structure and aggregation. Water stable aggregates .Evaluation of soil structure. Soil crusting-concept, types and management of crusting; Soil compaction- concept, factors influencing and management of soil compaction. Water infiltration in soil- concept, factors and redistribution of water. Soil acidity-concept, types, factors, chemistry, management and reclamation; Acid sulphate soils Saline and sodic soils- characteristics, factors, chemistry, management and reclamation; Quality of irrigation water; Flooded and submerged soils- characteristics and its management; Degraded soils and its management Soil pollution - Cause, effect and mitigation Soil classification-definition, purpose, evolution of soil genetic system of classification, diagnostic horizons, soil moisture and temperature regime, Soil taxonomical structures: definition, examples, land capability and classification, land suitability classification. Soil survey: definition, classification, map unit, map scales etc. Problematic soils under different Agro-ecosystems. Soil quality and health- concept and evaluation. Remote sensing and GIS in diagnosis and management of problem soils.

Practical

Study of aggregate stability; Soil infiltration study; Determination of lime requirement, Determination of lime potential, Determination of gypsum requirement, Physical and chemical test for monitoring soil quality; Preparation of a soil health score card. RS and GIS software in problem soils. Soil survey in problem soils.

Pests of Crops and Stored Grains and their Management

3(2+1)

Theory:

General account on nature and type of damage by different arthropods pests. Scientific name, order, family, host range, distribution, biology and bionomics, nature of damage, and management of major pests and scientific name, order, family, host range, distribution, nature of damage and control practice other important arthropod pests of various field crop, vegetable crop, fruit crop, plantation crops, ornamental crops, spices and condiments. Factors affecting losses of stored grain and role of physical, biological, mechanical and chemical factors in deterioration of grain. Insect pests, mites, rodents, birds and microorganisms associated with stored grain and their management. Storage structure and methods of grain storage and fundamental principles of grain store management.

Practical:

Identification of different types of damage. Identification and study of life cycle and seasonal history of various insect pests attacking crops and their produce: (a) Field Crops; (b) Vegetable Crops; (c) Fruit Crops; (d) Plantation, gardens, Narcotics, spices & condiments. Identification of insect pests and Mites associated with stored grain. Determination of insect infestation by different methods. Assessment of losses due to insects. Calculations on the doses of insecticides application technique. Fumigation of grain store / godown. Identification of rodents and rodent control operations in godowns. Identification of birds and bird control operations in godowns. Determination of moisture

content of grain. Methods of grain sampling under storage condition. Visit to Indian Storage Management and Research Institute, Hapur and Quality Laboratory, Department of Food., Delhi. Visit to nearest FCI godowns.

Insect Pests of Fruit, Plantation, Medicinal and Aromatic Crops (Horticulture) (2+1)

Theory

General – economic classification of insects; Bio-ecology and insect-pest management with reference to fruit, plantation, medicinal and aromatic crops; pest surveillance. Distribution, host range, bio-ecology, injury, integrated management of important insect pests affecting tropical, sub-tropical and temperate fruits, plantation, medicinal and aromatic crops like coconut, areca nut, oil palm, cashew, cacao, tea, coffee, cinchona, rubber, betel vine senna, neem, belladonna, pyrethrum, costus, crotalaria, datura, dioscorea, mint, opium, *Solanum khasianum* and. Storage insects – distribution, host range, bio-ecology, injury, integrated management of important insect pests attacking stored fruits, plantation, medicinal and aromatic crops and their processed products. Insecticide residue problems in fruit, plantation, medicinal and aromatic crops and their maximum residue limits (MRLs).

Practical

Study of symptoms of damage, collection, identification, preservation, assessment of damage and population of important insect – pests affecting fruits, plantation, medicinal and aromatic crops in field and storage.

Agricultural Marketing, Trade and Prices 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.

Practical Crop Production-I (Kharif Crops)**1(0+1)****Practical**

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.

Principles of Organic Farming**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.

Practical

Visit of organic farms to study the various components and their utilization; Preparation of enrich compost, vermicompost, bio-fertilizers/bio-inoculants and their quality analysis; Indigenous technology knowledge (ITK) for nutrient, insect, pest disease and weed management; Cost of organic production system; Post harvest management; Quality aspect, grading, packaging and handling.

Geoinformatics and Nano-technology for Precision Farming**2(1+1)****Theory**

Precision agriculture: concepts and techniques; their issues and concerns for Indian agriculture; Geoinformatics- 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.

Livestock and Poultry Management II

2 (1+1)

Theory

Digestion in livestock and poultry. Classification of feedstuffs. Proximate principles of feed. Nutrients and their functions. Feed ingredients for ration for livestock and poultry. Feed supplements and feed additives. Feeding of livestock and poultry.

Introduction of livestock and poultry diseases. Prevention (including vaccination schedule) and control of important diseases of livestock and poultry.

Practical

Computation of rations for livestock. Formulation of concentrate mixtures. Clean milk production, milking methods. Hatchery operations, incubation and hatching equipments. Management of chicks, growers and layers. Debeaking, dusting and vaccination. Economics of cattle, buffalo, sheep, goat, swine and poultry production.

Soil Fertility and Nutrient management

3 (2+1)

Theory

Introduction and importance of organic manures, properties and methods of preparation of bulky and concentrated manures. Green/leaf manuring. Fertilizer recommendation approaches. Integrated nutrient management.

Chemical fertilizers: classification, composition and properties of major nitrogenous, phosphatic, potassic fertilizers, secondary & micronutrient fertilizers, Complex fertilizers, nano fertilizers, customized fertilizers, nutrient based subsidy (NBS). 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 organic matter: composition, properties and its influence on soil properties; humic substances - nature and properties; 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. Use efficiency of nutrients. Factor influencing nutrient use efficiency (NUE), methods of application of fertilizers under rainfed and irrigated conditions.

Practical

Introduction of analytical instruments and their principles, calibration and applications, Colorimetry and flame photometry. Estimation of soil organic carbon, Estimation of alkaline hydrolysable N in soils. Estimation of soil extractable P in soils. Estimation of exchangeable K; Ca and Mg in soils. Estimation of soil extractable S in soils. Estimation of DTPA extractable Zn in soils. Estimation of N in plants. Estimation of P in plants. Estimation of K in plants. Estimation of S in plants.

Diseases of Field & Horticultural Crops & their Management-I

3 (2+1)

Symptoms, etiology, disease cycle, epidemiology and management of major diseases of following crops:

Field Crops:

Rice: blast, brown spot, bacterial blight, sheath blight, false smut, khaira and tungro; **Maize:** stalk rots, downy mildew, leaf spots, blights; **Sorghum:** smuts, grain mold, **Bajra:** downy mildew and ergot; **Mustard:** club root, white rust, Alternaria leaf spot, Sclerotinia stem rot; **Groundnut:** early and late leaf spots, rust; **Soybean:** bacterial spot, seed and seedling rot and mosaic; **Pigeonpea:** wilt

and sterility mosaic; **Black & green gram**: Cercospora leaf spot and anthracnose, web blight and yellow mosaic; **Tobacco**: black shank, black root rot and mosaic.

Horticultural Crops:

Guava: wilt and anthracnose; **Banana**: Panama wilt, bacterial wilt, Sigatoka and bunchy top; **Papaya**: foot rot, leaf curl and mosaic; **Cruciferous vegetables**: Damping off, Club root, Alternaria leaf spot and black rot; downy mildew, powdery mildew **Potato**: early and late blight, bacterial wilt, black scurf, scab, mosaic, leaf roll; **Brinjal**: Damping off, bacterial wilt, Phomopsis blight and fruit rot and Sclerotinia blight, little leaf; **Tomato**: damping off, bacterial wilt, early and late blight, buck eye rot and leaf curl; **Okra**: Yellow Vein Mosaic; Cercospora leaf spot; **Beans**: anthracnose and bacterial blight; **Ginger**: soft rot; Colocasia: Phytophthora blight; **Coconut**: wilt and bud rot; **Tea**: blister blight; **Coffee**: rust.

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.

Entrepreneurship Development and Business Communication

2 (1+1)

Theory

Concept of Entrepreneur, Entrepreneurship Development, Characteristics of entrepreneurs; SWOT Analysis & achievement motivation, Government policy and programs and institutions for entrepreneurship development, Impact of economic reforms on Agribusiness/ Agrienterprises, Entrepreneurial Development Process; Business Leadership Skills; Developing organizational skill (controlling, supervising, problem solving, monitoring & evaluation), Developing Managerial skills, Business Leadership Skills (Communication, direction and motivation Skills), Problem solving skill, Supply chain management and Total quality management, Project Planning Formulation and report preparation; Financing of enterprise, Opportunities for agri-entrepreneurship and rural enterprise.

Practical

Assessing entrepreneurial traits, problem solving skills, managerial skills and achievement motivation, exercise in creativity, time audit through planning, monitoring and supervision, identification and selection of business idea, preparation of business plan and proposal writing, visit to entrepreneurship development institute and entrepreneurs.

Crop Improvement – I (*Kharif*)

2(1+1)

Theory

Centers of origin, distribution of species, wild relatives in different cereals, pulses, oilseeds, fibres, fodders and cash crops; vegetable and horticultural crops – Rice, Maize, Mungbean, Urdbean, Sesame, Cowpea, Jute, Pigeonpea, Brinjal, Tobacco and underutilized crops; study of genetics of qualitative and quantitative characters. Important concepts of breeding self-pollinated, cross pollinated and vegetatively propagated crops (*kharif*). 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) in *kharif* crops. Plant genetic resources, their utilization and conservation. Ideotype concept and climate resilient crop varieties for future.

Practical

Emasculation and hybridization techniques in different crop species; viz., Rice, Maize, Pigeonpea, Urdbean, Mungbean, Sesame, Cowpea, Brinjal and Tobacco. Maintenance breeding of different kharif crops. Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods. Estimation of heterosis, inbreeding depression and heritability; Layout of field experiments; Study of quality characters, donor parents for different characters. Visit to AICRP plots of different field crops.

Agri-business Management

3(2+1)

Theory

Transformation of agriculture into agribusiness, various stakeholders and components of agribusiness systems. Importance of agribusiness in the Indian economy and New Agricultural Policy. Distinctive features of Agribusiness Management: Importance and needs of agro-based industries, Classification of industries and types of agro based industries. Institutional arrangement, procedures to set up agro based industries. Constraints in establishing agro-based industries. Agri-value chain: Understanding primary and support activities and their linkages. Business environment: PEST & SWOT analysis. Management functions: Roles & activities, Organization culture. Planning, meaning, definition, types of plans. Purpose or mission, goals or objectives, Strategies, policies procedures, rules, programs and budget. Components of a business plan, Steps in planning and implementation. Organization staffing, directing and motivation. Ordering, leading, supervision, communications, control. Capital Management and Financial management of Agribusiness. Financial statements and their importance. Marketing Management: Segmentation, targeting & positioning. Marketing mix and marketing strategies. Consumer behavior analysis, Product Life Cycle (PLC). Sales & Distribution Management. Pricing policy, various pricing methods. Project Management definition, project cycle, identification, formulation, appraisal, implementation, monitoring and evaluation. Project Appraisal and evaluation techniques.

Practical

Study of agri-input markets: Seed, fertilizers, pesticides. Study of output markets: grains, fruits, vegetables, flowers. Study of product markets, retails trade commodity trading, and value added products. Study of financing institutions- Cooperative, Commercial banks, RRBs, Agribusiness Finance Limited, NABARD. Preparations of projects and Feasibility reports for agribusiness entrepreneur. Appraisal/evaluation techniques of identifying viable project- Non-discounting techniques. Case study of agro-based industries. Trend and growth rate of prices of agricultural commodities. Net present worth technique for selection of viable project. Internal rate of return.

Intellectual Property Rights

1(1+0)

Theory

Introduction and meaning of Intellectual property, brief introduction to GATT, WTO, TRIPs and WIPO, Treaties for IPR protection: Madrid protocol, Berne Convention, Budapest treaty, etc. Types of Intellectual Property and legislations covering IPR in India:- Patents, Copyrights, Trademark, Industrial design, Geographical indications, Integrated circuits, Trade secrets. Patents Act 1970 and Patent system in India, patentability, process and product patent, filing of patent, patent specification, patent claims, Patent opposition and revocation, infringement, Compulsory licensing, Patent Cooperation Treaty, Patent search and patent database.

Origin and history including a brief introduction to UPOV for protection of plant varieties, Protection of plant varieties under UPOV and PPV&FR Act of India, Plant breeders rights, Registration of plant varieties under PPV&FR Act 2001, breeders, researcher and farmers rights. Traditional knowledge-meaning and rights of TK holders.

Convention on Biological Diversity, International treaty on plant genetic resources for food and agriculture (ITPGRFA). Indian Biological Diversity Act, 2002 and its salient features, access and benefit sharing.

Principles of Seed Technology

3(1+2)

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.

Theory

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.

Practical Crop Production-II (*Rabi Crops*)

1(0+1)

Practical

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.

Rainfed Agriculture and Watershed Management – (New)

2(1+1)

Theory

Rainfed agriculture: Introduction, types, History of rainfed agriculture & watershed in India; Problems and prospects of rainfed agriculture in India ; Soil and climatic conditions prevalent in rainfed areas; Drought: types, effect of water deficit on physio- morphological characteristics of the plants, Mechanism of crop adaptation under moisture deficit condition; Water harvesting: importance, its techniques, Efficient utilization of water through soil and crop management practices, Management of crops in rainfed areas, Contingent crop planning for aberrant weather conditions, Concept, objective, principles and components of watershed management, factors affecting watershed management.

Practical

Studies on climate classification, studies on rainfall pattern in rainfed areas of the country and pattern of onset and withdrawal of monsoons. Studies on cropping pattern of different dry land areas in the country and demarcation of dry land area on map of India. Interpretation of meteorological data and scheduling of supplemental irrigation on the basis of evapo-transpiration demand of crops. Critical analysis of rainfall and possible drought period in the country, effective rainfall and its calculation. Studies on cultural practices viz; mulching, plant density, depth of sowing, thinning and leaf removal for mitigating moisture stress. Characterization and delineation of model watershed. Field demonstration on soil & moisture conservation measures. Field demonstration on construction of water harvesting structures. Visit to rainfed research station/watershed.

Diseases of Field & Horticultural Crops & their Management-II

3(2+1)

Theory

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

Field Crops:

Wheat: rusts, loose smut, karnal bunt, alternaria blight, spot blotch, blast and ear cockle; **Sugarcane:** red rot, smut, wilt, grassy shoot, ratoon stunting and PokkahBoeng; **Sunflower:** Sclerotinia stem rot and Alternaria blight; **Gram:** wilt, grey mould and Ascochyta blight; **Lentil:** rust and wilt; **Jute:** Macrophomina disease complex, **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, tristeza, citrus decline; **Grape vine:** downy mildew, Powdery mildew and anthracnose; **Apple:** scab, powdery mildew, fire blight and crown gall; **Jackfruit:** Rhizopus rot; **Pineapple:** Head rot, **Betel vine:** leaf spots, foot rot; **Cucurbits:** damping off, downy mildew, powdery mildew, wilt, ; **Onion and garlic:** purple blotch, and Stemphylium blight; **Chilli:** anthracnose and fruit rot, leaf spot,

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.

Principles of Integrated Pest and Disease Management

3(2+1)

Theory:

Categories of insect pests and diseases, IPM: Introduction, history, importance, concepts, principles and tools of IPM. Economic importance of insect pests, diseases and pest risk analysis. Methods of detection and diagnosis of insect pest and diseases. Calculation and dynamics of economic injury level and importance of Economic threshold level. Ecological management of crop environment. Introduction to conventional pesticides for the insect pests and disease management. Survey surveillance and forecasting of Insect pest and diseases. Development and validation of IPM module. Implementation and impact of IPM (IPM module for Insect pest and disease. Safety issues in pesticide uses. Political, social and legal implication of IPM. Case histories of important IPM programmes. Case histories of important IPM programmes.

Practical

Methods of diagnosis and detection of various insect pests, and plant diseases, Methods of insect pests and plant disease measurement, Assessment of crop yield losses, calculations based on economics of IPM, Identification of biocontrol agents, different predators and natural enemies. Mass multiplication of *Trichoderma*, *Pseudomonas*, *Trichogramma*, NPV etc. Identification and nature of damage of important insect pests and diseases and their management. Crop (agro-ecosystem) dynamics of a selected insect pest and diseases. Plan & assess preventive strategies (IPM module) and decision making. crop monitoring attacked by insect, pest and diseases. Awareness campaign at farmers fields.

Crop Improvement – II (Rabi)

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 - Wheat, Oat, Barley, Chickpea, Lentil, Field pea, Lathyrus, Rapeseed, Mustard, Sunflower, Potato, Cowpea, Brinjal and Tomato; study of genetics of qualitative and quantitative characters. Important concepts of breeding self pollinated, cross pollinated and vegetatively propagated crops (rabi). 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) in rabi crops. Ideotype concept and climate resilient crop varieties for future.

Practical

Emasculation and hybridization techniques in different crop species namely Wheat, Oat, Barley, Chickpea, Lentil, Field pea, Rapeseed, Mustard, Sunflower, Potato, Cowpea, Brinjal and Tomato. Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods. Estimation of heterosis, inbreeding depression and heritability; Layout of field experiments; Study of quality characters, study of donor parents for different characters. Visit to AICRP plots of different field crops.

ENT-351: Management of Beneficial Insects

2 (1+1)

Theory:

Importance of beneficial Insects, Beekeeping and pollinators, bee biology, commercial methods of rearing, equipment used, seasonal management, bee enemies and disease. Bee pasturage, bee foraging and communication. Insect pests and diseases of honey bee. Role of pollinators in cross pollinated plants.

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.

Practical:

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

Apiculture, Sericulture and Lac culture (Horticulture)

(1+1)

Theory:

Introduction to beneficial insects. Importance and History of apiculture. Species of honey bees, Rock bee, Littlebee, Indian bee, European bee, Italian bee and Dammar bee, lifecycle and caste determination. Bee colony maintenance, bee colony activities, starting of new colony, location site, transferring colony, replacement of queen, combining colonies, swarm prevention, colony management in different seasons, Equipment for apiary, types of bee hives and their description. Bee pasturage. Honey extraction, honey composition and value, bee wax and tissues. Importance, History and development in India, silkworms kinds and their hosts, systematic position, distribution, lifecycles in brief, Silk glands. Mulberry silkworm-morphological features, races, rearing house and equipments, disinfection and hygiene. Grainage acid treatment, packing and transportation of eggs, Incubation, black boxing, hatching of eggs. Silkworm rearing young age /chawki rearing and old age rearing of silkworms. Feeding, spacing, environmental conditions and sanitation. Cocoon characters colour, shape, hardness and shell ratio. Defective cocoons and stifling of cocoons. Uses of silk and by-products. Economics of silk production. Moriculture-Mulberry varieties, package of practices, Pests and diseases and their management. Lac growing areas in India, Lac insects, biology, behaviour, lac cultivation, food plants, pruning, inoculation, cropping, kinds of lac. Enemies of lac-insects.

Practical:

Honey bee colony, different bee hives and apiculture equipment. Summer and Winter management of colony. Honey extraction and bottling. Study of pests and diseases of honeybees. Establishment of mulberry garden. Preparation of mulberry cuttings, planting methods under irrigated and

rainfed conditions. Maintenance of mulberry garden-pruning, fertilization, irrigation and leaf harvest. Mulberry pests and diseases and their management and nutritional disorders. Study of different kinds of silkworms and mulberry silkworm morphology, silk glands. Sericulture equipments for silkworm rearing. Mulberry silkworm rearing room requirements. Rearing of silkworms-chalky rearing. Rearing of silkworms late age silkworm rearing and study of moutages. Study of silkworm pests and their management. Study of silkworm diseases and its management. Lac insects-biology, behaviour, lac cultivation, food plants, pruning, inoculation, cropping, kinds of lac. Enemies of lac insects.

Insect Pests of Vegetable, Ornamental and Spice Crop (Horticulture) (2+1)

Theory:

Economic importance of insects in vegetable, ornamental and spice crops -ecology and pest management with reference to these crops. Pest surveillance in important vegetable, ornamental and spice crops. Distribution, host range, bio-ecology, injury, integrated management of important insect-pests affecting vegetable, ornamental and spice crops. Important storage insect-pests of vegetable, ornamental and spice crops, their host range, bio-ecology, injury and integrated management. Insect-pests of processed vegetables and ornamental crops, their host range, bio-ecology, injury and integrated management. Insecticidal residue problems in vegetables and ornamental crops, tolerance limits etc.

Practical:

Study of symptoms, damage, collection, identification, preservation, assessment of damage/population of important insect-pests affecting vegetable, ornamental and spice crops in field and during storage.

Farm Management, Production and Resource Economics 3(2+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, laws of return, factor-product, factor-factor and product-product relationship, law of equi-marginal/or principles of opportunity cost and law of comparative advantage. Meaning and concept of cost, types of costs and their interrelationship, importance of cost in managing farm business and estimation of gross farm income, net farm income, family labor income and farm business income. Farm business analysis: meaning and concept of farm income and profitability, technical and economic efficiency measures in crop and livestock enterprises. Importance of farm records and accounts in managing a farm, various types of farm records needed to maintain on farm, farm inventory, balance sheet, profit and loss accounts. Meaning and importance of farm planning and budgeting, partial and complete budgeting, steps in farm planning and budgeting-linear programming, appraisal of farm resources, selection of crops and livestock's enterprises. Concept of risk and uncertainty occurs in agriculture production, nature and sources of risks and its management strategies, Crop/livestock/machinery insurance – weather based crop insurance, features, determinants of compensation. Concepts of resource economics, differences between NRE and agricultural economics, unique properties of natural resources. Positive and negative externalities in agriculture, Important issues in economics and management of common property resources of land, water, pasture and forest resources etc.

Practical

Preparation of farm layout. Determination of cost of fencing of a farm. Computation of depreciation cost of farm assets. Application of equi-marginal returns/opportunity cost principle in allocation of farm resources. Determination of most profitable level of inputs use in a farm production process. Determination of least cost combination of inputs. Selection of most profitable enterprise combination. Application of cost principles including CACP concepts in the estimation of cost of crop

and livestock enterprises. Preparation of farm plan and budget, farm records and accounts and profit & loss accounts. Collection and analysis of data on various resources in India.

Horti-Business Management (Horticulture)

2 (2+0)

Theory:

Farm management - definition, nature, characteristics and scope. Farm management principles and decision making, production function, technical relationships, factors, product, relationship – factors relationship, product relationship, optimum conditions, principles of opportunity cost-equi-marginal returns and comparative advantages, time value of money, economic of scale, returns to scale, cost of cultivation and production, break even analysis, decision making under risk and uncertainty. Farming systems and types. Management Planning – meaning, steps and methods of planning, types of plan, characteristics of effective plans. Organizations – forms of business organizations, organizational principles, division of labour. Unity of command, scalar pattern, job design, span of control responsibility, power authority and accountability. Direction – guiding, leading, motivating, supervising, coordination – meaning, types and methods of controlling – evaluation, control systems and devices. Budgeting as a tool for planning and control. Record keeping as a tool of control. Functional areas of management – operations management – physical facilities, implementing the plan, scheduling the work, controlling production in terms of quantity and quality. Materials management – types of inventories, inventory costs, managing the inventories, economic order quantity (EOQ). Personnel management – recruitment, selection and training, job specialization. Marketing management – definitions, planning the marketing programmes, marketing mix and four P's. Financial management – financial statements and ratios, capital budgeting. Project management – project preparation evaluation measures.

Proposed Practical:

Study of Horti-input markets: Seed, fertilizers, pesticides. Study of output markets: fruits, vegetables, flowers. Study of product markets, retails trade commodity trading, and value added products. Study of financing institutions- Cooperative, Commercial banks, RRBs, NABARD. Preparations of projects and Feasibility reports for Horti-business entrepreneur. Appraisal/evaluation techniques of identifying viable project- Non-discounting techniques. Case study of horti-based industries. Trend and growth rate of prices of horti-cultural commodities.