

Department wise course curriculum for B.Sc. (Hons.) Agriculture (4-year programme)

Name of the Degree: B.Sc. (Hons.) Agriculture

Discipline-wise Courses

S.N.	Course Code	Discipline/Course title	Credit Hrs.
		Agronomy	
1.	AU.Agron.111	Fundamentals of Agronomy	4(3+1)
2.	AU.Agron.112	Agricultural Heritage	1(1+0)
3.	AU.Agron.233	Crop Production Technology – I (<i>Kharif</i> crops)	2(1+1)
4.	AU.Agron.244	Introductory Agro-meteorology & Climate Change	2(1+1)
5.	AU.Agron.245	Crop Production Technology – II (<i>Rabi</i> crops)	2(1+1)
6.	AU.Agron.246	Farming System & Sustainable Agriculture	1(1+0)
7.	AU.Agron.247	Agrochemicals	3(2+1)
8.	AU.Agron.358	Practical Crop Production - I (<i>Kharif</i> crops)	2(0+2)
9.	AU.Agron.359	Geoinformatics and Nano-technology for Precision Farming	2(1+1)
10.	AU.Agron.3611	Practical Crop Production - II (<i>Rabi</i> crops)	2(0+2)
11.	AU.Agron.3612	Principles of Organic Farming	2(1+1)
12.	AU.Agron.3613	Rainfed Agriculture & Watershed Management	2(1+1)
13.	AU.Agron.3614	System simulation and Agro-Advisory	3(2+1)
Genetics & Plant Breeding			
1.	AU.PBG.121	Fundamentals of Genetics	3(2+1)
2.	AU.PBG.232	Fundamentals of Plant Breeding	3(2+1)
3.	AU.PBG.243	Principles of Seed Technology	3(1+2)
4.	AU.PBG.354	Crop Improvement-I (<i>Kharif</i> crops)	2(1+1)
5.	AU.PBG.355	Commercial Plant Breeding	3(1+2)
6.	AU.PBG.366	Crop Improvement-II (<i>Rabi</i> crops)	2(1+1)
1.	AU.Soils.111	Fundamentals of Soil Science	3(2+1)
2.	AU.Soils.242	Problematic soils and their Management	2(2+0)
3.	AU.Soils.353	Manures, Fertilizers and Soil Fertility Management	3(2+1)
Entomology			
1..	AU.Ento.121	Fundamentals of Entomology	4(3+1)

2.	AU.Ento.352	Pests of Crops and Stored Grain and their Management	3(2+1)
3.	AU.Ento.363	Management of Beneficial Insects	2(1+1)
Agricultural Economics			
1.	AU.Ag.Econ.121	Fundamentals of Agricultural Economics	2(2+0)
2.	AU.Ag.Econ.232	Agricultural Finance and Co-Operation	3(2+1)
3.	AU.Ag.Econ.243	Agricultural Marketing Trade & Prices	3(2+1)
4.	AU.Ag.Econ.354	Agri-Business Management	3(2+1)
5.	AU.Ag.Econ.365	Farm Management, Production & Resource Economics	2(1+1)
Agricultural Engineering			
1.	AU.Ag.Engg.121	Introductory Soil and Water Conservation Engineering	2(1+1)
2.	AU.Ag.Engg.232	Farm Machinery and Power	2(1+1)
3.	AU.Ag.Engg.243	Renewable Energy and Green Technology	2(1+1)
4.	AU.Ag.Engg.354	Protected Cultivation and Primary Agriculture	3(2+1)
5.	AU.Ag.Engg.365	Protected Cultivation and Secondary Agriculture	2(1+1)
Plant Pathology			
1.	AU.Pl.Patho.121	Fundamentals of Plant Pathology	4(3+1)
2.	AU.Pl.Patho.352	Diseases of Field and Horticultural Crops and their Management-I	3(2+1)
3.	AU.Pl.Patho.353	Principles of Integrated Pest and Disease Management	3(2+1)
4.	AU.Pl.Patho.364	Diseases of Field and Horticultural Crops and their Management-II	3(2+1)
5.	AU.Pl.Patho.365	Bio-Pesticides and Bio-Fertilizers	3(2+1)
Horticulture			
1.	AU.Hort.111	Fundamentals of Horticulture	2(1+1)
2.	AU.Hort.232	Production Technology for Vegetables and Spices	2(1+1)
3.	AU.Hort.243	Production Technology for Fruit and Plantation Crops	2(1+1)
4.	AU.Hort.244	Production Technology for Ornamental Crops, MAP and Landscaping	2(1+1)
5.	AU.Hort.245	Landscaping	3(2+1)
6.	AU.Hort.366	Post-harvest Management and Value Addition of Fruits and Vegetables	2(1+1)

7.	AU.Hort.367	Micro-propagation Technologies 2	3(2+1)
8.	AU.Hort.368	Hi-tech Horticulture	3(2+1)
Food Science and Technology			
1.	AU.FSS.241	Food Safety and Standard	3(2+1)
2.	AU.FSS.362	Principles of Food Science & Nutrition	2(2+0)
Agricultural Extension			
1.	AU.Ag.Extn.111	Rural Sociology & Educational Psychology	2(2+0)
2.	AU.Ag.Extn.122	Fundamentals of Agricultural Extension Education	3(2+1)
3.	AU.Ag.Extn.123	Communication Skills and Personality Development	2(1+1)
4.	AU.Ag.Extn.244	Agricultural Journalism	3(2+1)
5.	AU.Ag.Extn.355	Entrepreneurship Development and Business Communication	2(1+1)
Biochemistry / Physiology / Microbiology/ Environmental Sciences			
1.	AU.Biochem.111	Fundamentals of Plant Biochemistry and Biotechnology	3(2+1)
2.	AU.Forest.111	Introduction to Forestry	2(1+1)
3.	AU.Cr.Physiol.121	Fundamentals of Crop Physiology	2(1+1)
4.	AU.Ag.Micro.121	Agricultural Microbiology	2(1+1)
5.	AU.Env.DM.231	Environmental Studies & Disaster Management	3(2+1)
Statistics, Computer Application and I.P.R.			
1.	AU.Stat.231	Statistical Methods	2(1+1)
2.	AU.Ag.Info.231	Agriculture Informatics	2(1+1)
3.	AU.IPR.351	Intellectual Property Rights	1(1+0)
Animal Production			
1.	AU.LPM.231	Livestock and Poultry Management	4(3+1)
Language			
1.	AU.Eng.111	Comprehension & Communication Skills in English (Gradiual course)	2(1+1)
Remedial Courses			
1.	AU. Agron. 112	Agricultural Heritage	1(1+0)
2.	AU.Bio.111	Introductory Biology	2(1+1)

3. .	AU.El.Maths.111	Elementary Mathematics	2(2+0)
Non-Gradial Courses			

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1. .	AU. NSS/ Phy. Edu./Yoga	NSS/NCC/Physical Education & Yoga Practices	2(0+2)
2. .	AU.HVE.111	Human Values & Ethics	1(1+0)
3. .	AU. Ed. Tr.	Educational Tour	2(0+2)

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Semester- wise distribution of courses

SEMESTER I				
1.	AU.Hort.111	Fundamentals of Horticulture	2 (1+1)	12
2.	AU.Biochem.111	Fundamentals Biotechnology of Plant Biochemistry and Biotechnology	3(2+1)	12
3.	AU.Soils.111	Fundamentals of Soil Science	3(2+1)	13
4.	AU.Forest.111	Introduction to Forestry	2 (1+1)	14
5.	AU.Eng.111	Comprehension & English Communication Skills in	2 (1+1)	15
6.	AU.Agron.111	Fundamentals of Agronomy	4(3+1)	16
7.	AU.Bio.111/ AU.El.Maths.111	Introductory Biology*/Elementary Mathematics*	2 (1+1)/ 2(2+0)*	16
8.	AU. Agron. 112	Agricultural Heritage*	1(1+0)*	17
9.	AU.Ag.Extn.111	Rural Sociology & Educational Psychology	2 (2+0)	17
10.	AU.HVE.111	Human Values & Ethics (non gradial)	1(1+0)**	18
11.	AU.NSS	National Service Scheme I	2 (0+2)**	18
TOTAL			18+04*/03**+03**	
*R: Remedial course; **NC: Non-gradial courses				
SEMESTER II				
1.	AU.PBG.121	Fundamentals of Genetics	3(2+1)	21
2.	AU.Micro.121	Agricultural Microbiology	2(1+1)	21
3.	AU.Ag.Engg.121	Introductory Soil Engineering and Water Conservation	2(1+1)	22
4.	AU.Cr.Physiol.121	Fundamentals of Crop Physiology	2(1+1)	23
5.	AU.Ag.Econ.121	Fundamentals of Agricultural Economics	2(2+0)	23
6.	AU.Pl.Patho.121	Fundamentals of Plant Pathology	4(3+1)	24
7.	AU.Ento.121	Fundamentals of Entomology	4(3+1)	25
8.	AU.Ag.Extn.122	Fundamentals of Education Agricultural Extension	3(2+1)	26
9.	AU.Ag.Extn.123	Communication Development Skills and Personality	2(1+1)	27
10.	AU.NSS	National Service Scheme II	2 (0+2)*	28

	Total	24(16+8)
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SEMESTER III

1.	AU.Agron.233	Crop Production Technology – I (<i>Kharif Crops</i>)	2 (1+1)	30
2.	AU.PBG.232	Fundamentals of Plant Breeding	3 (2+1)	30
3.	AU.Ag.Econ.232	Agricultural Finance and Cooperation	3 (2+1)	31
4.	AU.Ag.Info.231	Agricultural Informatics	2(1+1)	32
5.	AU.Ag.Engg.232	Farm Machinery and Power	2 (1+1)	33
6.	AU.Hort.232	Production Technology for Vegetables and Spices	2 (1+1)	34
7.	AU.Env.DM.231	Environmental Studies and Disaster Management	3(2+1)	35
8.	AU.Stat.231	Statistical Methods	2(1+1)	36
9.	AU.LPM.231	Livestock and Poultry Management	4 (3+1)	37
10.	AU.NSS	National Service Scheme III	2(0+2)	38
	Total		25(14+11)	

SEMESTER IV

1.	AU.Agron.244	Introductory Agro-meteorology & Climate Change	2(1+1)	44
2.	AU.Agron.245	Crop Production Technology –II (<i>Rabi Crops</i>)	2(1+1)	39
3.	AU.Hort.243	Production Technology for Fruit and Plantation Crops	2(1+1)	41
4.	AU.Ag.Engg.243	Renewable Energy and Green Technology	2(1+1)	40
5.	AU.Soils.242	Problematic Soils and their Management	2(2+0)	41
6.	AU.Hort.244	Production Technology for Ornamental Crops, MAP and Landscaping	2(1+1)	39
7.	AU.PBG.243	Principles of Seed Technology	3(1+2)	42
8.	AU.Agron.246	Farming System & Sustainable Agriculture	1(1+0)	42
9.	AU.Ag.Econ.243	Agricultural Marketing Trade & Prices	3(2+1)	43
10.	Elective Course		3 credit	
1.	AU.FSS.241	Food Safety and Standards	3(2+1)	6
2.	AU.Hort.245	Landscaping	3(2+1)	61
3.	AU Ag. Ext. 244	Agricultural Journalism	3(2+1)	61
4.	AU.Agron./soils247	Agrochemicals	3(2+1)	62
5.	AU.NSS	National Service Scheme IV	2(0+2)	
	Total		21(11+10) + 3cr.	

SEMESTER V				
1.	AU.Pl.Patho.352	Diseases of Field and Horticultural Crops and their Management -I	3 (2+1)	48
2.	AU.Soils.353	Manures, Fertilizers and Soil Fertility Management	3 (2+1)	46
3.	AU.Ento.352	Pests of Crops and Stored Grain and their Management	3 (2+1)	47
4.	AU.Pl.Patho.353	Principles of Integrated Pest and Disease Management	3(2+1)	46
5.	AU.PBG.354	Crop Improvement-I (<i>Kharif Crops</i>)	2 (1+1)	49
6.	AU.Ag.Extn.355	Entrepreneurship Development and Business Communication	2 (1+1)	50
7.	AU.Agron.358	Practical Crop Production – I (<i>Kharif crops</i>)	2 (0+2)	51
8.	AU.Agron.359	Geoinformatics and Nano-technology for Precision Farming	2 (1+1)	50
9.	AU.IPR.351	Intellectual Property Rights	1(1+0)	51
10.	Elective Course		3 credit	
1.	AU.Ag.Econ.354	Agribusiness Management	3(2+1)	63
2.	AU.PBG.355	Commercial Plant Breeding	3(1+2)	65
3.	AU.Ag.Engg.354	Protected Cultivation	3(2+1)	64
4.	AU.Agron.3510	Weed Management	3(2+1)	66
	Total		21 (12+09) + 3 Credit	
SEMESTER VI				
1.	AU.Agron.3611	Practical Crop Production –II (<i>Rabi crops</i>)	2 (0+2)	53
2.	AU.Agron.3612	Principles of Organic Farming	2 (1+1)	57
3.	AU.Agron.3613	Rainfed Agriculture & Watershed Management	2 (1+1)	53
4.	AU.Ag.Engg.365	Protected Cultivation and Secondary Agriculture	2 (1+1)	53
5.	AU.Pl.Patho.364	Diseases of Field and Horticultural Crops and their Management-II	3 (2+1)	54
6.	AU.Hort.365	Post-harvest Management and Value Addition of Fruits and Vegetables	2 (1+1)	55
7.	AU.Ento.363	Management of Beneficial Insects	2 (1+1)	56
8.	AU.PBG.366	Crop Improvement-II (<i>Rabi crops</i>)	2 (1+1)	56

9.	AU.Ag.Econ.365	Farm Management, Production & Resource Economics	2 (1+1)	58
10.	AU.FSN.362	Principles of Food Science and Nutrition	2(2+0)	59
11.	Elective Course		3 credits	
1.	AU.Pl.Patho.365	Biopesticides & Biofertilizers	3(2+1)	66
2.	AU.Hort.366	Micro propagation Technologies	3(2+1)	67
3.	AU.Hort.367	Hi-tech. Horticulture	3(1+2)	68
4.	AU. Agron. 3614	System Simulation and Agro-Advisory	3(2+1)	68
	Education Tour		2(0+2)	
	Total		21 (11 + 10)+ 3 cr.	

Elective Courses: A student can select three elective courses out of the following and offer during 4th, 5th and 6th semesters.

SEMESTER VII			
S.N.	Rural Agricultural Work Experience and Agro-industrial Attachment (RAWE & AIA)		
	Activities	No. of weeks	Credit Hours
1	General orientation & On campus training by different faculties	1	14
2.	Village attachment	8	
	Unit attachment in Univ./ College. KVK/ Res. Stn. attachment	5	
3.	Plant Clinic	2	02
	Agro-Industrial Attachment	3	04
4	Project Report Preparation, Presentation and Evaluation	1	
Total weeks for RAWE & AIA		20	20

- **Agro- Industrial Attachment:** The students would be attached with the agro-industries for a period of 10 weeks to get an experience of the industrial environment and working.
 - Educational tour will be conducted in break between IV & V Semester or Vi & VII Semester
- RAWE Component-I**

Village Attachment Training Programme

Sl. No.	Activity	Duration
1.	Orientation and Survey of Village	1 week
2.	Agronomical Interventions	1 week
3.	Plant Protection Interventions	1 week
4.	Soil Improvement Interventions (Soil sampling and testing)	1 week
5.	Fruit and Vegetable production interventions	1 week
6.	Food Processing and Storage interventions	1 week
7.	Animal Production Interventions	1 week
8.	Extension and Transfer of Technology activities	1 week

RAWE Component –II

Agro Industrial Attachment

- Students shall be placed in Agro-and Cottage industries and Commodities Boards for 03 weeks.
- Industries include Seed / Sapling production, Pesticides-insecticides, Post-harvest- processing-value addition, Agri-finance institutions, etc.

Activities and Tasks during Agro-Industrial Attachment Programme

- Acquaintance with industry and staff
- Study of structure, functioning, objective and mandates of the industry
- Study of various processing units and hands-on trainings under supervision of industry staff
- Ethics of industry
- Employment generated by the industry
- Contribution of the industry promoting environment
- Learning business network including outlets of the industry
- Skill development in all crucial tasks of the industry
- Documentation of the activities and task performed by the students
- Performance evaluation, appraisal and ranking of students

Modules for Skill Development and Entrepreneurship: A student has to register 20 credits opting for two modules of (0+10) credits each (total 20 credits) from the package of modules in the VIII semester.

Sr.	Title of the module	Credits
1.	Production Technology for Bioagents and Biofertilizer	0+10

2.	Seed Production and Technology	0+10
3.	Mushroom Cultivation Technology	0+10
4.	Soil, plant , water and seed Testing services	0+10
5.	Commercial Beekeeping	0+10
6.	Poultry Production Technology	0+10
7.	Commercial Horticulture	0+10
8.	Floriculture and Landscaping	0+10
9.	Food Processing	0+10
10.	Agriculture Waste Management	0+10
11.	Organic Production Technology	0+10
12.	Commercial Sericulture	0+10

Evaluation of Experiential Learning Programme/ HOT

Sl.No.	Parameters	Max. Marks
1.	Project Planning and Writing	10
2.	Presentation	10
3.	Regularity	10
4.	Monthly Assessment	10
5.	Output delivery	10
6.	Technical Skill Development	10
7.	Entrepreneurship Skills	10
8.	Business networking skills	10
9.	Report Writing Skills	10
10.	Final Presentation	10
	Total	100

Discipline-wise summary of credit hours

S.N.	Group	Credits
1.	Agronomy	21 (10+11) + Elective
2.	Genetics & Plant Breeding	13 (7+6) + Elective
3.	Soil Science & Agricultural Chemistry	8 (6+2) + Elective

4.	Entomology	9 (6+3)
5.	Agricultural Economics	10 (7+3) + Elective
6.	Agricultural Engineering	8 (4+4) + Elective
7.	Plant Pathology	13 (9+4) + Elective
8.	Horticulture	10 (5+5) + Elective
9.	Food Science	2 (2+0)
10.	Agricultural Extension	9 (6+3) + Elective
11.	Biochemistry / Physiology / Microbiology/ Environmental Sciences	12 (7+5)
12.	Statistics, Computer Application and I.P.R.	5 (3+2)
13.	Animal Production	4 (3+1)
14.	English	2 (1+1)
15.	Remedial Courses	03 (Biol/ Math); 04 (Agriculture)
16.	NSS/NCC/Physical Education & Yoga Practices	2(0+2)
17.	Human Values and Ethics	1(1+0)
18.	Educational Tour	2(0+2)
Total		126+3 (for Bio./Math)/ 01 (Agri) +5NC 126+3+1+5+9 credits elective
RAWE		20+20
ELP		
Grand Total		144+20+20=184
New Courses		24+4 (remedial) +1 (NC)

NSS/NCC/Physical Education & Yoga Practices 2 (0+2)

Theory

Course aims at evoking social consciousness among students through various activities viz., working together, constructive and creative social work, to be skilful in executing democratic leadership, developing skill in programme development to be able for self-employment, reducing gap between educated and uneducated, increasing awareness and desire to help sections of society.

- Following activities are to be taken up under the NSS course:
- Introduction and basic components of NSS: Orientation

- NSS programmes and activities
- Understanding youth
- Community mobilisation
- Social harmony and national integration
- Volunteerism and shramdan
- Citizenship, constitution and human rights
- Family and society
- Importance and role of youth leadership
- Life competencies
- Youth development programmes
- Health, hygiene and sanitation
- Youth health, lifestyle, HIV AIDS and first aid
- Youth and yoga
- Vocational skill development
- Issues related environment
- Disaster management
- Entrepreneurship development
- Formulation of production oriented project
- Documentation and data reporting
- Resource mobilization
- Additional life skills
- Activities directed by the Central and State Government

All the activities related to the National Service Scheme course is distributed under four different courses viz., National Service Scheme I, National Service Scheme II, National Service Scheme III and National Service Scheme IV each having one credit load. The entire four courses should be offered continuously for two years. A student enrolled in NSS course should put in at least 60 hours of social work in different activities in a semester other than five regular one day camp in a year and one special camp for duration of 7 days at any semester break period in the two year. Different activities will include orientation lectures and practical works. Activities directed by the Central and State Government have to be performed by all the volunteers of NSS as per direction.

SEMESTER I

AU.Hort.111 Fundamentals of Horticulture

Credit hours: 2(1+1)

Sem. I

Theory

UNIT I

Horticulture-Its definition and branches, importance and scope; horticultural and botanical classification; climate and soil for horticultural crops.

UNIT II

Plant propagation-methods and propagating structures; principles of orchard establishment; Principles and methods of training and pruning, juvenility and flower bud differentiation; unfruitfulness; pollination, pollinizers and pollinators.

UNIT III

Fertilization and parthenocarpy; medicinal and aromatic plants.

UNIT IV

Importance of plant bio-regulators in horticulture. Irrigation- methods, fertilizer application in horticulture crops.

Practical

Identification of garden tools. Identification of horticultural crops. Preparation of seed bed/nursery bed. Practice of sexual and asexual methods of propagation. Layout and planting of orchard plants. Training and pruning of fruit trees. Transplanting and care of vegetable seedlings. Making of herbaceous and shrubby borders. Preparation of potting mixture, potting and repotting. Fertilizer application in different crops. Visits to commercial nurseries/orchard.

AU.Biochem.111 Fundamentals of Plant Biochemistry and Biotechnology

Credit hours: 3(2+1)

Sem. I

Theory

Unit I

Importance of Biochemistry. Properties of Water, pH and Buffer. Carbohydrate: Importance and classification. 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.

Unit II

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; RNA: Types and Secondary & Tertiary structure. Metabolism of carbohydrates: Glycolysis, TCA cycle,

Glyoxylate cycle, Electron transport chain. Metabolism of lipids: Beta oxidation, Biosynthesis of fatty acids.

Unit III

Concepts and applications of plant biotechnology: Scope, organ culture, embryo culture, cell suspension culture, callus culture, anther culture, pollen culture and 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.

Unit IV

Introduction to recombinant DNA methods: physical (Gene gun method), chemical (PEG mediated) and Agrobacterium mediated gene transfer methods; Transgenics and its importance in

crop improvement; PCR techniques and its applications; RFLP, RAPD, SSR; Marker Assisted Breeding in crop improvement; Biotechnology regulations.

Practical

Preparation of 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, Paper chromatography/ TLC demonstration for separation of amino acids/ Monosaccharides. Sterilization techniques. Composition of various tissue culture media and preparation of stock solutions for MS nutrient medium. Callus induction from various explants. Micro-propagation, hardening and acclimatization. Demonstration on isolation of DNA. Demonstration of gel electrophoresis techniques and DNA finger printing.

AU.Soils.111 Fundamentals of Soil Science

Credit hours: 3(2+1)

Sem. I

Theory

Unit I

Soil as a natural body, Pedological and edaphological concepts of soil; Soil genesis: soil forming rocks and minerals; weathering, processes and factors of soil formation; Soil Profile, components of soil; Soil physical properties: soil-texture, structure, density and porosity, soil colour, consistence and plasticity; Elementary knowledge of soil taxonomy classification and soils of India.

Unit II

Soil water retention, movement and availability; soil air, composition, gaseous exchange, problem and plant growth; soil temperature, source, amount and flow of heat in soil; Soil reaction-pH, soil acidity and alkalinity, buffering, effect of pH on nutrient availability.

Unit III

Soil colloids - inorganic and organic; silicate clays: constitution and properties; sources of charge ion exchange, cation exchange capacity, base saturation.

Unit IV

Soil organic matter: composition, properties and its influence on soil properties; humic substances - nature and properties; soil organisms: macro and microorganisms, their beneficial and harmful effects; Soil pollution - behaviour of pesticides and inorganic contaminants, prevention and mitigation of soil pollution.

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. Determination of cation exchange capacity

of soil. Study of soil map. Determination of soil colour. Demonstration of heat transfer in soil. Estimation of organic matter content of soil.

AU.Forest.111 Introduction to Forestry

Credit hours: 2(1+1)

Sem. I

Theory

Unit I

Introduction – definitions of basic terms related to forestry, objectives of silviculture, forest classification, salient features of Indian Forest Policies.

Unit II

Forest regeneration, Natural regeneration - natural regeneration from seed and vegetative parts, coppicing, pollarding, root suckers; Artificial regeneration – objectives, choice between natural and artificial regeneration, essential preliminary considerations. Crown classification. Tending operations – weeding, cleaning, thinning – mechanical, ordinary, crown and advance thinning.

Unit III

Forest mensuration – objectives, diameter measurement, instruments used in diameter measurement; Non instrumental methods of height measurement - shadow and single pole method; Instrumental methods of height measurement - geometric and trigonometric principles, instruments used in height measurement; tree stem form, form factor, form quotient, measurement of volume of felled and standing trees, age determination of trees.

Unit IV

Agroforestry – definitions, importance, criteria of selection of trees in agroforestry, different agroforestry systems prevalent in the country, shifting cultivation, taungya, alley cropping, wind breaks and shelter belts, home gardens. Cultivation practices of two important fast growing tree species of the region.

Practical

Identification of tree-species. Diameter measurements using calipers and tape, diameter measurements of forked, buttressed, fluted and leaning trees. Height measurement of standing trees by shadow method, single pole method and hypsometer. Volume measurement of logs

using various formulae. Nursery lay out, seed sowing, vegetative propagation techniques. Forest plantations and their management. Visits of nearby forest based industries.

AU.Eng.111 Comprehension and Communication Skills in English

Credit hours: 2(1+1)

Sem. I

Unit-I

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.

Unit-II

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.

Unit –III

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.

Unit –IV

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.

AU.Agron.111 Fundamentals of Agronomy

Credit hours: 4(3+1) Sem. I

Theory

UNIT I

Agronomy and its scope, seeds and sowing, tillage and tith, crop density and geometry, Crop nutrition, manures and fertilizers, nutrient use efficiency.

UNIT II

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

UNIT III

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

UNIT IV

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.

Practical

Identification of crops, seeds, fertilizers, pesticides and tillage implements, study of agroclimatic zones of India and Himachal Pradesh, Identification of weeds in crops, Methods of herbicide and fertilizer application, Study of yield contributing characters and yield estimation, Seed germination

and viability test, Numerical exercises on fertilizer requirement, plant population, herbicides and water requirement, Use of tillage implements-reversible plough, one way plough, harrow, leveler, seed drill, Study of soil moisture measuring devices, Measurement of field capacity, bulk density and infiltration rate, Measurement of irrigation water.

AU.Bio.111 Introductory Biology*

Credit hours: 2(1+1)

Sem. I

Theory

UNIT I

Introduction to the living world, diversity and characteristics of life, origin of life, Evolution and Eugenics. **UNIT II**

Binomial nomenclature and classification Cell and cell division.

UNIT III

Morphology of flowering plants. Seed and seed germination. **UNIT**

IV

Plant systematic- viz; Brassicaceae, Fabaceae and Poaceae. Role of animals in agriculture.

Practical:

- Morphology of flowering plants – root, stem and leaf and their modifications.
- Internal structure of root, stem and leaf.
- Inflorescence, flower and fruits.
- Cell, tissues & cell division.. Study of specimens and slides.
- Description of plants - Brassicaceae, Fabaceae and Poaceae.

AU.El.Maths.111 Elementary Mathematics*

Credit hours: 2(2+0)

Sem. I

Theory

UNIT I

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.

UNIT II

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 , $\sin x$ & $\cos x$ from first principle, Derivatives of sum, difference, product and quotient of two functions, Differentiation of functions of functions (Simple problem based on it), Logarithmic differentiation (Simple problem 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).

UNIT III

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).

UNIT IV

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 evaluation.

AU. Agron. 112 Agriculture Heritage*

Credit hours: 1(1+0)

Sem. I

Theory

UNIT I

Introduction of Indian agricultural heritage, Ancient agricultural practices, Relevance of heritage to present day agriculture, Past and present status of agriculture and farmers in the society. **UNIT**

UNIT II

Journey of agriculture and its development from past to modern era; plant production and protection through indigenous traditional knowledge.

UNIT III

Crop voyage in India and world; agriculture scope, importance of agriculture and agricultural resources available in India.

UNIT IV

Crop significance and classifications; National agriculture set up in India; Current Scenaria of Indian agriculture; Indian agriculture concerns and future prospects.

AU.Ag.Extn.111 Rural Sociology & Educational Psychology

Credit hours: 2(2+0)

Sem. I

Theory

UNIT I

Sociology and Rural sociology: Definition and scope, its significance in agriculture extension.

UNIT II

Social ecology; Rural society, Social Groups, Social Stratification, Culture concept, Social Institution, Social Change & Development.

UNIT III

Educational psychology: Meaning & its importance in agriculture extension.

UNIT IV

Behavior: Cognitive, affective, psychomotor domain, Personality, Learning, Motivation, Theories of Motivation, Intelligence.

AU.HVE.111 Human Value and Ethics

Credit hours: 1(1+0) Sem. I

Theory

UNIT I

Values and Ethics-An Introduction. Goal and Mission of Life. Vision of Life.

UNIT II

Principles and Philosophy. Self Exploration. Self Awareness. Self Satisfaction.

UNIT III

Decision Making. Motivation. Sensitivity. Success. Selfless Service. Case Study of Ethical Lives.

UNIT IV

Positive Spirit. Body, Mind and Soul. Attachment and Detachment. Spirituality Quotient. Examination.

AU. NSS/Physical Education & Yoga Practices

Credit hours: 2 (0+2) Sem. I

Course Title: National Service Scheme I

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, 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.

Course Title: Physical Education and Yoga Practices

Credit hours: 2(0+2)

Sem. I

1. Teaching of skills of Football – demonstration, practice of the skills, correction, involvement in game situation (For girls teaching of Tennikoit)
2. Teaching of different skills of Football – demonstration, practice of the skills, correction, involvement in game situation (For girls teaching of Tennikoit)
3. Teaching of advance skills of Football – involvement of all the skills in game situation with teaching of rules of the game
4. Teaching of skills of Basketball – demonstration, practice of the skills, correction of skills, involvement in game situation
5. Teaching of skills of Basketball – demonstration, practice of the skills, involvement in game situation
6. Teaching of skills of Basketball – involvement of all the skills in game situation with teaching of rule of the game
7. Teaching of skills of Kabaddi – demonstration, practice of the skills, correction of skills, involvement in game situation
8. Teaching of skills of Kabaddi – demonstration, practice of the skills, correction of skills, involvement in game situation
9. Teaching of advance skills of Kabaddi – involvement of all the skills in game situation with teaching of rule of the game
10. Teaching of skills of Ball Badminton – demonstration, practice of the skills, correction of skills, involvement in game situation
11. Teaching of skills of Ball Badminton – involvement of all the skills in game situation with teaching of rule of the game
12. Teaching of some of Asanas – demonstration, practice, correction and practice
13. Teaching of some more of Asanas – demonstration, practice, correction and practice
14. Teaching of skills of Table Tennis – demonstration, practice of skills, correction and practice and involvement in game situation
15. Teaching of skills of Table Tennis – demonstration, practice of skills, correction and practice and involvement in game situation

16. Teaching of skills of Table Tennis – involvement of all the skills in game situation with teaching of rule of the game
17. Teaching – Meaning, Scope and importance of Physical Education
18. Teaching – Definition, Type of Tournaments
19. Teaching – Physical Fitness and Health Education
20. Construction and laying out of the track and field (*The girls will have Tennikoit and Throw Ball).

SEMESTER II

AU.PBG.121 Fundamentals of Genetics

Credit hours: 3(2+1)

Sem. II

Theory

Unit I

Pre and Post Mendelian concepts of heredity, Mendelian principles of heredity, architecture of chromosome, chromonemata, chromosome matrix, chromomeres, centromere, secondary constrictions and telomere; special types of chromosomes. Chromosomal theory of inheritance-cell cycle and cell division – mitosis, meiosis, Probability and Chi-square. Dominance relationships, epistatic interactions with examples.

Unit II

Multiple alleles, pleiotropism and pseudoalleles, Sex determination and sex linkage, sex limited and sex influenced traits, Blood group genetics, Linkage and its estimation, crossing over mechanisms, chromosome mapping. Structural changes in chromosome and their implications, Use of haploids, dihaploids and doubled haploids in Genetics.

Unit III

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. Genetic disorders,. Nature, structure & replication of genetic material.

Unit IV

Protein synthesis, Transcription and translational mechanism of genetic material, Gene concept: Gene structure, function and regulation, Lac and Trp operons.

Practical

Study of microscope. Study of cell structure. Mitosis and meiosis cell division. Experiments on monohybrid, dihybrid, trihybrid, test cross and back cross, Experiments on epistatic interactions including test cross and back cross, Practice on mitotic and meiotic cell division, Experiments 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 on sex linked inheritance in *Drosophila*. Study of models on DNA and RNA structures.

AU.Ag.Micro.121 : Agricultural Microbiology

Credit hour: 2(1+1)

Sem. II

UNIT I

Introduction Microbial world: Prokaryotic and eukaryotic microbes. Bacteria: cell structure, chemoautotrophy, photo autotrophy, growth.

UNIT II

Bacterial genetics: Genetic recombination: transformation, conjugation and transduction, plasmids, transposon.

UNIT III

Role of microbes in soil fertility and crop production: Carbon, Nitrogen, Phosphorus and sulphur cycles. Biological nitrogen fixation- symbiotic, associative and aysmbiotic. Azolla, blue green algae and mycorrhiza. Rhizosphere and phyllosphere.

UNIT IV

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. Staining and microscopic examination of microbes.

AU.Ag.Engg.121 Introductory Soil and Water Conservation Engineering

Credit hours: 2(1+1)

Sem. II

Theory

Unit I

Introduction to Soil and Water Conservation, causes of soil erosion. Definition and agents of soil erosion, water erosion: Forms of water erosion.

Unit II

Gully classification and control measures. Soil loss estimation by universal Loss Soil Equation. Soil loss measurement techniques.

Unit III

Principles of erosion control: Introduction to contouring, strip cropping. Contour bund. Graded bund and bench terracing. Grassed water ways and their design.

Unit IV

Water harvesting and its techniques. Principles of wind erosion control and its control measures.

Practical

General status of soil conservation in India. Calculation of erosion index. Estimation of soil loss. Measurement of soil loss. Preparation of contour maps. Design of grassed water ways. Design of contour bunds. Design of graded bunds. Design of bench terracing system. Problem on wind erosion.

AU.Cr.Physiol.121 Fundamentals of Crop Physiology

Credit hour: 2(1+1) Sem. II

Theory

Unit-1

Introduction to crop physiology and its importance in Agriculture; Plant cell: an Overview; Diffusion and osmosis; Absorption of water, transpiration and Stomatal Physiology.

Unit-2

Mineral nutrition of Plants: Functions and deficiency symptoms of nutrients, nutrient uptake mechanisms; Photosynthesis: Light and Dark reactions, C₃, C₄ and CAM plants. **Unit-3**

Respiration: Glycolysis, TCA cycle and electron transport chain; Fat Metabolism: Fatty acid synthesis and Breakdown.

Unit-4

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).

AU. Ag. Econ. 121 Fundamentals of Agricultural Economics

Credit hours: 2 (2+0) Sem. II

Theory

Unit I

Economics: Meaning, scope and subject matter, definitions, activities, approaches to economic analysis; micro and macro economics, positive and normative analysis. Nature of economic theory; rationality assumption, concept of equilibrium, economic laws as generalization of human behavior. Basic concepts: Goods and services, desire, want, demand, utility, cost and price, wealth, capital, income and welfare. Agricultural economics: meaning, definition, characteristics of agriculture, importance and its role in economic development. Agricultural planning and development in the country.

Unit II

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: process, creation of utility, factors of production, input output relationship. *Laws of returns*: 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. Distribution theory: meaning, factor market and pricing of factors of production. Concepts of rent, wage, interest and profit.

Unit III

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, evolution, meaning and functions of money, classification of money, money supply, general price index, inflation and deflation. Banking: Role in modern economy, types of banks, functions of commercial and central bank, credit creation policy. Agricultural and public finance: meaning, micro v/s macro finance, need for agricultural finance, public revenue and public expenditure. *Tax*: meaning, direct and indirect taxes, agricultural taxation, VAT.

Unit IV

Economic systems: Concepts of economy and its functions, important features of capitalistic, socialistic and mixed economies, elements of economic planning.

AU.PI.Patho.121 Fundamentals of Plant Pathology

Credit hours: 4(3+1)

Sem. II

Theory

Unit I

Introduction: Importance of plant diseases, scope and objectives of Plant Pathology. History of Plant Pathology with special reference to Indian work. Terms and concepts in Plant Pathology. Pathogenesis. Cause and classification of plant diseases. Important plant pathogenic organisms, different groups: fungi, bacteria, fastidious vesicular bacteria, phytoplasmas, spiroplasmas, viruses, viroids, algae, protozoa, phanerogamic parasites and nematodes with examples of diseases caused by them. Diseases and symptoms due to abiotic causes.

Unit II

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

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

Viruses: nature, architecture, multiplication and transmission.

Unit III

Study of phanerogamic plant parasites.

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

Unit IV

Principles and methods of plant disease management.

Nature, chemical combination, classification, mode of action and formulations of fungicides and antibiotics.

Practical

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

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

Study of fungicides and their formulations. Methods of pesticide application and their safe use. Calculation of fungicide sprays concentrations.

AU.Ento.121 Fundamentals of Entomology

Credit hours: 4(3+1)

Sem. II

Unit-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.

Unit -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.

Unit -III

Categories of pests. Host plant resistance, 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 and genetic control. Insecticides Act 1968- Important provisions. Application techniques of spray fluids. Phytotoxicity of insecticides. Symptoms of poisoning, first aid and antidotes.

Unit -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. Pesticides appliances and their maintenance. Sampling techniques for insect population and damage.

AU.Ag.Extn.121 Fundamentals of Agricultural Extension Education

Credit hours: 3(2+1)

Sem. II

Theory

Unit -I

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.

Unit -II

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.

Unit -III

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.

Unit -IV

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.

AU.Ag.Extn.124 Communication Skills and Personality Development

Credit hours: 2(1+1)

Sem. II

Theory

Unit -I

Communication Skills: Structural and functional grammar; meaning and process of communication, verbal and nonverbal communication; listening and note taking.

Unit -II

Writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures.

Unit -III

Reading and comprehension of general and technical articles, precise writing, summarizing, abstracting. **Unit -IV**

Individual and group presentations, impromptu presentation, public speaking; Group discussion. Organizing seminars and conferences.

Practical

Listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures. Reading and comprehension of general and technical articles, precise writing, summarizing, abstracting; individual and group presentations.

AU. NSS/ Physical Education & Yoga Practices

Credit hours: 2 (0+2)

Sem. II

Course Title: National Service Scheme II

Importance and role of youth leadership

Meaning, types and traits of leadership, qualities of good leaders; importance and roles of youth leadership.

Life competencies

Definition and importance of life competencies, problem-solving and decision-making, inter personal communication.

Youth development programmes

Development of youth programmes and policy at the national level, state level and voluntary sector; youth-focused and youth-led organisations.

Health, hygiene and sanitation

Definition needs and scope of health education; role of food, nutrition, safe drinking water, water born diseases and sanitation (Swachh Bharat Abhiyan) for health; national health programmes and reproductive health.

Youth health, lifestyle, HIV AIDS and first aid

Healthy lifestyles, HIV AIDS, drugs and substance abuse, home nursing and first aid.

Youth and yoga

History, philosophy, concept, myths and misconceptions about yoga; yoga traditions and its impacts, yoga as a tool for healthy lifestyle, preventive and curative method.

Course Title: Physical Education and Yoga Practices

1. Teaching of skills of Hockey – demonstration practice of the skills and correction.
2. Teaching of skills of Hockey – demonstration practice of the skills and correction. And involvement of skills in games situation
3. Teaching of advance skills of Hockey – demonstration practice of the skills and correction. Involvement of all the skills in games situation with teaching of rules of the game
4. Teaching of skills of Kho-Kho – demonstration practice of the skills and correction.
5. Teaching of skills of Kho-Kho – demonstration practice of the skills and correction. Involvement of the skills in games situation

6. Teaching of advance skills of Kho-Kho – demonstration practice of the skills and correction. Involvement of all the skills in games situation with teaching of rules of the game
7. Teaching of different track events – demonstration practice of the skills and correction.
8. Teaching of different track events – demonstration practice of the skills and correction.
9. Teaching of different track events – demonstration practice of the skills and correction with competition among them.
10. Teaching of different field events – demonstration practice of the skills and correction.
11. Teaching of different field events – demonstration practice of the skills and correction.
12. Teaching of different field events – demonstration practice of the skills and correction.
13. Teaching of different field events – demonstration practice of the skills and correction with competition among them.
14. Teaching of different asanas – demonstration practice and correction. 15. Teaching of different asanas – demonstration practice and correction.
16. Teaching of different asanas – demonstration practice and correction.
17. Teaching of different asanas – demonstration practice and correction.
18. Teaching of weight training – demonstration practice and correction.
19. Teaching of circuit training – demonstration practice and correction.
20. Teaching of calisthenics – demonstration practice and correction.

Note: 1) Compulsory Uniform: Half pants, Tee Shirts, Shoes and socks all white (Girls will have white Tee Shirt and Track pants) 2) The games mentioned in the practical may be inter changed depending on the season and facilities.

SEMESTER III

AU.Agron.233 Crop Production Technology-I (*Kharif* Crops)

Credit hours: 2(1+1)

Sem. III

Theory

UNIT I

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Kharif* crops. Cereals – rice, maize, sorghum, pearl millet and minor millets. Pseudo cereals: buckwheat and grain amaranth.

UNIT II

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of pulses- pigeonpea, mungbean, rajmash (frenchbean), horsegram, rice-bean, mothbean and urdbean.

UNIT III

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of oilseeds- groundnut, sesame, soybean and fibre crops- cotton & jute and sunhemp.

UNIT IV

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of forage crops- sorghum, maize, cowpea, cluster bean, napier and setaria.

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 Committee agronomic experiments at experimental farm. Study of forage experiments, morphological description of *kharif* season crops, visit to research centres of related crops.

AU.PBG.232 Fundamentals of Plant Breeding

Credit hours: 3(2+1)

Sem. III

Theory

Unit I

Historical development, concept, nature and role of plant breeding, major achievements and future prospects; Genetics in relation to plant breeding, modes of reproduction and apomixes, self – incompatibility and male sterility- genetic consequences, cultivar options.

Unit II

Domestication, Acclimatization, introduction; Centre of origin/diversity, component of Genetic variation; Heritability and genetic advance; Genetic basis and breeding methods in self- pollinated crops-mass and pure line selection, hybridization techniques and handling of segregating population; Multiline concept.

Unit III

Concepts of population genetics and Hardy-Weinberg Law, Genetic basis and methods of breeding cross pollinated crops, modes of selection; Heterosis and inbreeding depression, development of inbred lines and hybrids, composite and synthetic varieties; Breeding methods in asexually propagated crops, clonal selection and hybridization; Wide hybridization and pre- breeding; Polyploidy in relation to plant breeding, mutation breeding-methods and uses.

Unit IV

Breeding for important biotic and abiotic stresses; Biotechnological tools-DNA markers and marker assisted selection. Participatory plant breeding; Intellectual Property Rights, Patenting, Plant Breeders and & Farmer's Rights.

Practical

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

AU. Ag. Econ. 232 Agricultural Finance and Co-Operation

Credit hours: 3(2+1)

Sem. III

Theory

Unit I

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 3C's of credits. Sources of agricultural finance: institutional and non-institutional sources, commercial banks, social control and nationalization of commercial banks, Micro financing including KCC.

Unit II

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. 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.

Unit III

Agricultural Cooperation – Meaning, brief history of cooperative development in India, objectives, principles of cooperation, significance of cooperatives in Indian agriculture.

Unit IV

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.

Practicals

Determination of most profitable level of capital use. 2 Optimum allocation of limited amount of capital among different enterprise. 3 Analysis of progress and performance of cooperatives using published data. 4 Analysis of progress and performance of commercial banks and RRBs using published data. 5 Visit to a commercial bank, cooperative bank and cooperative society to acquire firsthand knowledge of their management, schemes and procedures. 6 Estimation of credit requirement of farm business – A case study. 7 Preparation and analysis of balance sheet – A case study. 8 Preparation and analysis of income statement – A case study. 9 Appraisal of a loan proposal – A case study. 10 Techno-economic parameters for preparation of projects. 11 Preparation of Bankable projects for various agricultural products and its value added products. 12 Seminar on selected topics.

AU. Ag. Info.231 Agricultural Informatics

Credit hours: 2(1+1)

Sem. III

Theory

Unit I

Introduction to Computers, Anatomy of Computers, Memory Concepts, Units of Memory, Operating System, definition and types, Applications of MS-Office for creating, Editing and Formatting a document, Data presentation, tabulation and graph creation, statistical analysis, mathematical expressions, Database, concepts and types, creating database, uses of DBMS in Agriculture, Internet and World Wide Web (WWW), Concepts and components.

Unit II

Computer Programming, General Concepts, Introduction to Visual Basic, Java, Fortran, C/ C++, etc, concepts and standard input/output operations. **Unit III** e-Agriculture, concepts, design and development. Application of innovative ways to use information and communication technologies (IT) in Agriculture. Computer Models in Agriculture: statistical, weather analysis and crop simulation models, concepts, structure, inputs- outputs files, limitation, advantages and application of models for understanding plant processes, sensitivity, verification, calibration and validation. IT application for computation of water and nutrient requirement of crops, Computer-controlled devices (automated systems) for Agri-input management, Smartphone mobile apps in Agriculture for farm advises, market price, postharvest management etc;

Unit IV

Geospatial technology, concepts, techniques, components and uses for generating valuable agri-information. Decision support systems, concepts, components and applications in Agriculture,

Agriculture Expert System, Soil Information Systems etc for supporting Farm decisions. Preparation of contingent crop-planning and crop calendars using IT tools.

Practical

Study of Computer Components, accessories, practice of important DOS Commands. Introduction of different operating systems such as windows, Unix/ Linux, Creating, Files & Folders, File Management. Use of MS-WORD and MS Power-point for creating, editing and presenting a scientific Document. MS-EXCEL - Creating a spreadsheet, use of statistical tools, writing expressions, creating graphs, analysis of scientific data, handling macros. MS-ACCESS: Creating Database, preparing queries and reports, demonstration of Agri-information system. Introduction to World Wide Web (WWW) and its components. Introduction of programming languages such as Visual Basic, Java, Fortran, C, C++. Hands on practice on Crop Simulation Models (CSM), DSSAT/Crop-Info/CropSyst/ Wofost. Preparation of Inputs file for CSM and study of model outputs, computation of water and nutrient requirements of crop using CSM and IT tools. Use of smart phones and other devices in agro-advisory and dissemination of market information. Introduction of Geospatial Technology, for generating information important for Agriculture. Hands on practice on preparation of Decision Support System. Preparation of contingent crop planning.

AU.Ag.Engg.232 Farm Machinery and Power

Credit hours: 2(1+1)

Sem. III

Theory

Unit I

Status of Farm Power in India, Sources of Farm Power , I.C. engines, working principles of I C engines, comparison of two stroke and four stroke cycle engines , Study of different components of I.C. engine, I.C. engine terminology and solved problems.

Unit II

Familiarization with different systems of I.C. engines: Air cleaning, cooling, lubrication ,fuel supply and hydraulic control system of a tractor, Familiarization with Power transmission system : clutch, gear box, differential and final drive of a tractor , Tractor types, Cost analysis of tractor power and attached implement.

Unit III

Familiarization with Primary and Secondary Tillage implement, Implement for hill agriculture, implement for intercultural operations

Unit IV

Familiarization with sowing and planting equipment, calibration of a seed drill and solved examples, Familiarization with Plant Protection equipment, Familiarization with harvesting and threshing equipment.

Practicals

Study of different components of I.C. engine. To study air cleaning and cooling system of engine, Familiarization with clutch, transmission, differential and final drive of a tractor, Familiarization

with lubrication and fuel supply system of engine, Familiarization with brake, steering, hydraulic control system of engine, Learning of tractor driving, Familiarization with operation of power tiller, Implements for hill agriculture, Familiarization with different types of primary and secondary tillage implements: mould plough, disc plough and disc harrow . Familiarization with seed-cum-fertilizer drills their seed metering mechanism and calibration, planters and transplanter Familiarization with different types of sprayers and dusters Familiarization with different inter-cultivation equipment, Familiarization with harvesting and threshing machinery.

AU.Hort.232 Production Technology for Vegetable and Spices

Credit hours: 2(1+1)

Sem. III

Theory

UNIT I

Importance of vegetables & spices in human nutrition and national economy, kitchen gardening.

UNIT II

Brief about origin, area, production, improved varieties and cultivation practices such as time of sowing, sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting, storage, physiological disorders of important vegetables and spices (Tomato, Brinjal, Chilli, Capsicum).

UNIT III

Brief about origin, area, production, improved varieties and cultivation practices such as time of sowing, sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting, storage, physiological disorders of important vegetables and spices (Cucumber, Melons, Gourds, Pumpkin, French bean, Peas).

UNIT IV

Brief about origin, area, production, improved varieties and cultivation practices such as time of sowing, sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting, storage, physiological disorders of important vegetables and spices (Cole crops such as Cabbage, Cauliflower, Knol-khol; Bulb crops such as Onion, Garlic; Root crops such as Carrot, Raddish, Beet root, Tuber crops such as Potato, Leafy vegetables such as Amaranth, Palak, Perennial Vegetables).

Practical

Identification of vegetables & spices crops and their seeds. Nursery raising. Direct seed sowing and transplanting. Study of morphological characters of different vegetables & spices. Fertilizers applications. Raising of nursery of vegetables & spices. Vegetables & spices seed extraction. Harvesting & preparation for market. Economics of vegetables and spices cultivation.

AU.Env.DM.231 Environmental Studies and Disaster Management

Credit hours: 3(2+1)

Sem. III

Theory

Unit I

Multidisciplinary nature of environmental studies Definition, scope and importance.

Natural Resources: Renewable and non-renewable resources, Natural resources and associated problems. a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams- benefits and problems. c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies. f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles.

Unit II

Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem. Ecological succession, Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem: a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity and its conservation: - Introduction, definition, genetic, species & ecosystem diversity and biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels, India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit III

Environmental Pollution: definition, cause, effects and control measures of: a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear hazards. Solid Waste Management: causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution.

Social Issues and the Environment: From Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management. Environmental ethics: Issues and possible solutions, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Wasteland reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness.

Human Population and the Environment: population growth, variation among nations, population explosion, Family Welfare Programme. Environment and human health: Human Rights, Value Education, HIV/AIDS. Women and Child Welfare. Role of Information Technology in Environment and human health. **Unit IV**

DISASTER MANAGEMENT

Natural Disasters- Meaning and nature of natural disasters, their types and effects. Floods, drought, cyclone, earthquakes, landslides, avalanches, volcanic eruptions, Heat and cold waves, Climatic change: global warming, Sea level rise, ozone depletion.

Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, air pollution, water pollution, deforestation, industrial waste water pollution, road accidents, rail accidents, air accidents, sea accidents.

Disaster Management- Effect to migrate natural disaster at national and global levels. International strategy for disaster reduction. Concept of disaster management, national disaster management framework; financial arrangements; role of NGOs, community –based organizations and media. Central, state, district and local administration; Armed forces in disaster response; Disaster response; Police and other organizations.

Practical

Pollution case studies. Case Studies- Field work: Visit to a local area to document environmental assets river/ forest/ grassland/ hill/ mountain, visit to a local polluted site- Urban/Rural/Industrial/Agricultural, study of common plants, insects, birds and study of simple ecosystems-pond, river, hill slopes, etc.

AU.Stat.231 Statistical Methods

Credit hours: 2(1+1)

Sem. III

Theory

Unit I

Introduction to Statistics and its Applications in Agriculture, Graphical Representation of Data, Measures of Central Tendency & Dispersion, Definition of Probability, Addition and Multiplication Theorem (without proof).

Unit II

Simple Problems Based on Probability. Binomial & Poisson Distributions, Definition of Correlation, Scatter Diagram. Karl Pearson's Coefficient of Correlation. Linear Regression Equations.

Unit III

Introduction to Test of Significance, One sample & two sample test t for Means, Chi-Square Test of Independence of Attributes in 2 × 2 Contingency Table. Introduction to Analysis of Variance, Analysis of One Way Classification.

Unit IV

Introduction to Sampling Methods, Sampling versus Complete Enumeration, Simple Random Sampling with and without replacement, Use of Random Number Tables for selection of Simple Random Sample.

Practical

Graphical Representation of Data. Measures of Central Tendency (Ungrouped data) with Calculation of Quartiles, Deciles & Percentiles. Measures of Central Tendency (Grouped data)

with Calculation of Quartiles, Deciles & Percentiles. Measures of Dispersion (Ungrouped Data). Measures of Dispersion (Grouped Data). Moments, Measures of Skewness & Kurtosis (Ungrouped Data). Moments, Measures of Skewness & Kurtosis (Grouped Data). Correlation & Regression Analysis. Application of One Sample t-test. Application of Two Sample Fisher's t- test. Chi-Square test of Goodness of Fit. Chi-Square test of Independence of Attributes for 2 \times 2 contingency table. Analysis of Variance One Way Classification. Analysis of Variance Two Way Classification. Selection of random sample using Simple Random Sampling.

AU.LPM.231 Livestock & Poultry Management

Credit hours: 4(3+1)

Sem. III

Theory

Unit I

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.

Unit II

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

Unit III

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.

Unit IV

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

AU. NSS/Physical Education & Yoga Practices

Credit hours: 2 (0+2)

Sem. III

Course Title: National Service Scheme III

Vocational skill development

To enhance the employment potential and to set up small business enterprises skills of volunteers, a list of 12 to 15 vocational skills will be drawn up based on the local conditions and opportunities. Each volunteer will have the option to select two skill-areas out of this list.

Issues related environment

Environmental conservation, enrichment and sustainability, climatic change, natural resource management (rain water harvesting, energy conservation, forestation, waste land development and soil conservations) and waste management.

Disaster management

Introduction and classification of disaster, rehabilitation and management after disaster; role of NSS volunteers in disaster management.

Entrepreneurship development

Definition, meaning and quality of entrepreneur; steps in opening of an enterprise and role of financial and support service institution.

Formulation of production oriented project

Planning, implementation, management and impact assessment of project.

Documentation and data reporting

Collection and analysis of data, documentation and dissemination of project reports.

SEMESTER IV

AU.Agron.245 Crop Production Technology-II (*Rabi* crops)

Credit hours: 2(1+1)

Sem. IV

Theory

UNIT I

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Rabi* crops; cereals – wheat and barley, sugar crops-sugarcane and sugar beet.

UNIT II

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of pulses- chickpea, lentil, peas, oilseeds- rapeseed, mustard, sunflower, safflower and linseed.

UNIT III

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of medicinal and aromatic crops- mentha, lemon grass, citronella, isabgol, saffron and kalazira.

UNIT IV

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of commercial crops- potato and 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.

AU. Hort. 244 Production Technology for Ornamental Crops, MAPs and Landscaping

Credit hours: 2(1+1)

Sem. IV

Theory

UNIT I

Importance and scope of ornamental crops, medicinal and aromatic plants and landscaping. Principles of landscaping. Landscape uses of trees, shrubs and climbers.

UNIT II

Production technology of important cut flowers like rose, gerbera, carnation, liliun and orchids under protected conditions and gladiolus, tuberose, chrysanthemum under open conditions.

UNIT III

Package of practices for loose flowers like marigold and jasmine under open conditions. Production technology of important medicinal plants like asparagus, aloe, costus, Cinnamomum, periwinkle, isabgol and aromatic plants like mint, lemongrass, citronella, palmarosa, ocimum, rose, geranium, vetiver.

UNIT IV

Processing and value addition in ornamental crops and MAPs produce.

Practical

Identification of Ornamental plants. Identification of Medicinal and Aromatic Plants. Nursery bed preparation and seed sowing. Training and pruning of Ornamental plants. Planning and layout of garden. Bed preparation and planting of MAP. Protected structures – care and maintenance. Intercultural operations in flowers and MAP. Harvesting and post-harvest handling of cut and loose flowers. Processing of MAP. Visit to commercial flower/MAP unit.

AU.Ag.Engg.243 Renewable Energy and Green Technology

Credit hours: 2(1+1)

Sem. IV

Theory

Unit I

Classification of energy sources, contribution of these of sources in agricultural sector, Familiarization with biomass utilization for biofuel production and their application.

Unit II

Familiarization with types of biogas plants and gasifiers, biogas, bioalcohol, biodiesel and biooil production and their utilization as bioenergy resource, introduction of solar energy, collection and their application.

Unit III

Familiarization with solar energy gadgets: solar cooker, solar water heater, application of solar energy: solar drying, solar pond, solar distillation.

Unit IV

Familiarization with solar energy gadgets: solar photovoltaic system and their application, introduction of wind energy and their application.

Practical

Familiarization with renewable energy gadgets. To study biogas plants, To study gasifier, To study the production process of biodiesel, To study briquetting machine, To study the production process of bio-fuels. Familiarization with different solar energy gadgets. To study solar photovoltaic system: solar light, solar pumping, solar fencing. To study solar cooker, To study solar drying system. To study solar distillation and solar pond.

AU.Soils.242 Problematic Soils and their Management

Credit Hours: 2(2+0)

Sem. IV

Theory

Unit I

Soil quality and health, Distribution of Waste land and problem soils in India. Their categorization based on properties.

Unit II

Reclamation and management of Saline and sodic soils, Acid soils, Acid Sulphate soils, Eroded and Compacted soils, Flooded soils, Polluted soils.

Unit III

Irrigation water – quality and standards, utilization of saline water in agriculture. Remote sensing and GIS in diagnosis and management of problem soils.

Unit IV

Multipurpose tree species, bio remediation through MPTs of soils, land capability and classification, land suitability classification. Problematic soils under different Agroeco systems.

AU.Hort.243 Production Technology for Fruit and Plantation Crops

Credit hours: 2(1+1)

Sem. IV

Theory

Unit I

Importance and scope of fruit and plantation crop industry in India; High density planting; Use of rootstocks.

Unit II

Production technologies for the cultivation of major fruits- mango, banana, citrus, grape, guava, litchi, papaya, apple, pear, peach.

Unit III

Production technologies for the cultivation of minor fruits pineapple, pomegranate, jackfruit, strawberry.

Unit IV

Production technologies for the cultivation of nut crops; plantation crops-coconut, arecanut, cashew, tea, coffee & rubber.

Practical

Seed propagation. Scarification and stratification of seeds. Propagation methods for fruit and plantation crops including Micro-propagation. Description and identification of fruit. Preparation of plant bio regulators and their uses, Pests, diseases and physiological disorders of above fruit and plantation crops, Visit to commercial orchard.

AU.PBG.243 Principles of Seed Technology

Credit hours: 3(1+2)

Sem. IV

Theory

Unit I

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.

Unit II

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.

Unit III

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.

Unit IV

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. Private and public sectors and their production and marketing strategies.

Practical

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

AU.Agron.246 Farming System and Sustainable Agriculture

Credit hours: 1(1+0)

Sem. IV

Theory

UNIT I

Farming System-scope, importance, and concept, Types and systems of farming system and factors affecting types of farming, Farming system components and their maintenance.

UNIT II

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.

UNIT III

Sustainable agriculture-problems and its impact on agriculture, indicators of sustainability, adaptation and mitigation, conservation agriculture strategies in agriculture, HEIA, LEIA and LEISA and its techniques for sustainability.

UNIT IV

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.

AU. Ag. Econ. 243 Agricultural Marketing, Trade and Prices

Credit hours: 3(2+1)

Sem. IV

Theory

Unit I

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.

Unit II

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.

Unit III

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.

Unit IV

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.

Practicals:

1 Plotting and study of demand and supply curves and calculation of elasticities; 2 Study of relationship between market arrivals and prices of some selected commodities; 3 Computation of marketable and marketed surplus of important commodities; Study of price behaviour over time for some selected commodities; 4 Construction of index numbers; Visit to a local market to study various marketing functions performed by different agencies, 5 Identification of marketing channels for selected commodity, collection of data regarding marketing costs, margins and price spread and presentation of report in the class; 6 Visit to market institutions – NAFED, SWC, CWC, cooperative marketing society, etc. to study their organization and functioning; 7 Application of principles of comparative advantage of international trade.

AU.Agron.244 Introductory Agro-meteorology & Climate Change

Credit hours: 2(1+1)

Sem. IV

Theory

UNIT I

Meaning and scope of agricultural meteorology; 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.

UNIT II

Nature and properties of solar radiation, solar constant, depletion of solar radiation, short wave, long wave 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.

UNIT III

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.

UNIT IV

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 Agro-meteorological 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 wind rose. Measurement, tabulation and analysis of rain. Measurement of open pan evaporation and evapotranspiration. Computation of PET and AET.

Course Title: National Service Scheme IV

Credit hours: 2(0+2)

Sem. IV

Youth and crime

Sociological and psychological factors influencing youth crime, cyber crime, peer mentoring in preventing crime and awareness for juvenile justice.

Civil/self defence

Civil defence services, aims and objectives of civil defence; needs and training of self defence.

Resource mobilisation

Writing a project proposal of self fund units (SFUs) and its establishment.

Additional life skills

Positive thinking, self confidence and esteem, setting life goals and working to achieve them, management of stress including time management.

SEMESTER V

AU.PI.Patho.354 Principles of Integrated Pest and Disease Management

Credit hours: 3(2+1) Sem. V

Theory

Unit I

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.

Unit II

Methods of detection and diagnosis of insect pest and diseases. Calculation and dynamics of economic injury level and importance of Economic threshold level.

Unit III

Methods of control: Host plant resistance, cultural, mechanical, physical, legislative, biological and chemical control. 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.

Unit IV

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.

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.

AU. Soils.353 Manures, Fertilizers and Soil Fertility Management

Credit Hours: 3(2+1) Sem. V

Theory

Unit I

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.

Unit II

Chemical fertilizers: classification, composition and properties of major nitrogenous, phosphatic, potassic fertilizers, secondary & micronutrient fertilizers, Complex fertilizers, nano fertilizers Soil amendments, Fertilizer Storage, Fertilizer Control Order.

Unit III

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.

Unit IV

Soil fertility evaluation, Soil testing. Critical levels of different nutrients in soil. Forms of nutrients in soil, plant analysis, rapid plant tissue tests. Indicator plants. Methods of fertilizer recommendations to crops. Factor influencing nutrient use efficiency (NUE), methods of application under rainfed and irrigated conditions.

Practical

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

AU.Ento.352 Pests of Crops and Stored Grains and their Management

Credit hours: 3(2+1)

Sem. V

Theory

Unit I

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.

Unit II

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, narcotics, spices and condiments.

Unit III

Factors affecting losses of stored grain and role of physical, biological, mechanical and chemical factors in deterioration of grain.

Unit IV

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.

AU.Pl.Patho.352 Diseases of Field & Horticultural Crops & their Management-I

Credit hours: 3 (2+1)

Sem. V

Theory

Unit I

Symptoms, etiology, disease cycle 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; **Sorghum**: smuts, grain mold and anthracnose, **Bajra** :downy mildew and ergot; **Groundnut**: early and late leaf spots, wilt

Unit II

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

Soybean: Rhizoctonia blight, bacterial spot, seed and seedling rot and mosaic; **Pigeonpea**: Phytophthora blight, wilt and sterility mosaic; **Finger millet**: Blast and leaf spot; black & green gram: Cercospora leaf spot and anthracnose, web blight and yellow mosaic; **Castor**: Phytophthora blight; **Tobacco**: black shank, black root rot and mosaic.

Unit III

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

Horticultural Crops: **Guava**: wilt and anthracnose; **Banana**: Panama wilt, bacterial wilt, Sigatoka and bunchy top; **Papaya**: foot rot, leaf curl and mosaic, **Pomegranate**: bacterial blight; **Cruciferous vegetables**: Alternaria leaf spot and black rot; **Brinjal**: Phomopsis blight and fruit rot and Sclerotinia blight;

Unit IV

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

Tomato: damping off, wilt, early and late blight, buck eye rot and leaf curl and mosaic;
Okra: Yellow Vein Mosaic; **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.

AU.PBG.354 Crop Improvement – I (*Kharif Crops*) resign

Credit hours: 2(1+1)

Sem. V

Theory

Unit I

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

Unit II

Plant genetic resources, its utilization and conservation, study of genetics of qualitative and quantitative characters. Important concepts of breeding self-pollinated, cross pollinated and vegetatively propagated crops.

Unit III

Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, adaptability, stability, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional).

Unit IV

Hybrid seed production technology of in Maize, Rice, Sorghum, Pearl millet, and Pigeonpea, etc. Ideotype concept and climate resilient crop varieties for future.

Practical

loral biology, emasculation and hybridization techniques in different crop species; viz., Rice, Jute, Maize, Sorghum, Pearl millet, Ragi, Pigeonpea, Urdbean, Mungbean, Soybean, Groundnut, Sesame, Caster, Cotton, Cowpea, Tobacco, Brinjal, Okra and Cucurbitaceous crops. Maintenance breeding of different kharifcrops. Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods; Study of field techniques for seed production and hybrid seeds production in Kharifcrops; Estimation of heterosis, inbreeding depression and heritability; Layout of field experiments; Study of quality characters, donor parents for different characters; Visit to seed production plots; Visit to AICRP plots of different field crops.

AU.Ag.Extn.354 Entrepreneurship Development and Business Communication

Credit hours: 2(1+1)

Sem. V

Theory

Unit I

Concept of Entrepreneur, Entrepreneurship Development, Characteristics of entrepreneurs; Assessment of entrepreneurship skills, SWOT Analysis & achievement motivation.

Unit II

Government policy and programs and institutions for entrepreneurship development, impact of economic reforms on Agribusiness on Agribusiness/ Agrienterprises, Entrepreneurial Development Process.

Unit III

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.

Unit IV

Project Planning Formulation and report preparation; Financing of enterprise, Opportunities for Agri- entrepreneurship and rural enterprise.

Practical

Assessing entrepreneurial traits, problem solving ability, 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.

AU.Agron.359 Geoinformatics and Nano-technology for Precision Farming

Credit hours: 2(1+1)

Sem. V

Theory

UNIT I

Precision agriculture: concepts and techniques; their issues and concerns for Indian agriculture; Geo-informatics- definition, concepts, tool and techniques; their use in Precision Agriculture.

UNIT II

Crop discrimination and Yield monitoring, soil mapping; fertilizer recommendation using geospatial technologies; Spatial data and their management in GIS.

UNIT III

Remote sensing concepts and application in agriculture; Image processing and interpretation; Global positioning system (GPS), components and its functions; Introduction to crop Simulation Models and their uses for optimization of Agricultural Inputs; STCR approach for precision agriculture.

UNIT IV

Nanotechnology, definition, concepts and techniques, brief introduction about nanoscale effects, nano-particles, nano-pesticides, nano-fertilizers, nano-sensors, Use of nanotechnology in 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.

AU.Agron.358 Practical Crop Production-I (*Kharif Crops*)

Credit hours: 2(0+2)

Sem. V

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 a group of students.

AU.IPR.351 Intellectual Property Rights

Credit hours: 1(1+0)

Sem. V

Theory

Unit I

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.

Unit II

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.

Unit III

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.

Unit IV

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.

SEMESTER VI

AU.Agron. 3613 Rainfed Agriculture and Watershed Management

Credit hours: 2(1+1)

Sem. VI

Theory

UNIT I

Rainfed agriculture: Introduction, types, History of rainfed agriculture and watershed in India; Problems and prospects of rainfed agriculture in India; Soil and climatic conditions prevalent in rainfed areas; Soil and water conservation techniques.

UNIT II

Drought: types, effect of water deficit on physio-morphological characteristics of the plants, Crop adaptation and mitigation to drought.

UNIT III

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

UNIT IV

Contingent crop planning for aberrant weather conditions, Concept, objective, principles and components of watershed management, factors affecting watershed management.

Practical

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

AU.Ag.Engg.365 Protected Cultivation and Secondary Agriculture

Credit hours: 2(1+1)

Sem. VI

Theory

Unit I

Green house technology: Introduction, Types of Green Houses; Plant response to Green house environment, Planning and design of greenhouses, Design criteria of green house for cooling and heating purposes.

Unit II

Green house equipments, materials of construction for traditional and low cost green houses. Irrigation systems used in greenhouses, typical applications, passive solar green house, hot air green house heating systems, green house drying. Cost estimation and economic analysis.

Important Engineering properties such as physical, thermal and aero & hydrodynamic properties of cereals, pulses and oilseed, their application in PHT equipment design and operation.

Unit II

Drying and dehydration; moisture measurement, EMC, drying theory, various drying method, commercial grain dryer (deep bed dryer, flat bed dryer, tray dryer, fluidized bed dryer, recirculatory dryer and solar dryer).

Unit IV

Material handling equipment; conveyer and elevators, their principle, working and selection.

Practical

Study of different type of green houses based on shape. Determine the rate of air exchange in an active summer winter cooling system. Determination of drying rate of agricultural products inside green house. Study of green house equipments. Visit to various Post-Harvest Laboratories. Determination of Moisture content of various grains by oven drying & infrared moisture methods. Determination of engineering properties (shape and size, bulk density and porosity of biomaterials). Determination of Moisture content of various grains by moisture meter. Field visit to seed processing plant.

AU.Pl.Patho.364 Diseases of Field & Horticultural Crops & their Management-II

Credit hours: 3(2+1)

Sem. VI

Theory

Unit I

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

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

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

II

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

Sunflower: Sclerotinia stem rot and Alternaria blight; **Mustard:** Alternaria blight, white rust, downy mildew and Sclerotinia stem rot; **Gram:** wilt, grey mould and Ascochyta blight; **Lentil:** rust and wilt; **Cotton:** anthracnose, vascular wilt, and black arm; **Pea:** downy mildew, powdery mildew and rust; **Horticultural Crops:** **Mango:** anthracnose, malformation, bacterial blight and powdery mildew; **Citrus:** canker and gummosis; **Grape vine:** downy mildew, Powdery mildew and anthracnose; **Apple:** scab, powdery mildew, fire blight and crown gall; **Peach:** leaf curl

Unit III

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

Strawberry: leaf spot **Potato:** early and late blight, black scurf, leaf roll, and mosaic; **Unit**

IV

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

Cucurbits: downy mildew, powdery mildew, wilt; **Onion and garlic:** purple blotch, and Stemphylium blight; **Chillies:** anthracnose and fruit rot, wilt and leaf curl; **Turmeric:** leaf spot **Coriander:** stem gall **Marigold:** Botrytis blight; **Rose:** dieback, powdery mildew and black leaf spot.

Practical

Identification and histopathological studies of selected diseases of field and horticultural crops covered in theory. Field visit for the diagnosis of field problems. Collection and preservation of plant diseased specimens for herbarium. Note: Students should submit 50 pressed and well-mounted specimens.

AU.Hort.365 Post-harvest Management and Value Addition of Fruits and Vegetables

Credit hours: 2(1+1)

Sem. VI

Theory

UNIT I

Importance of fruits and vegetables, extent and possible causes of post-harvest losses; Pre-harvest factors affecting postharvest quality, maturity, ripening and changes occurring during ripening; Respiration and factors affecting respiration rate.

UNIT II

Harvesting and field handling; Storage (ZECC, cold storage, CA, MA, and hypobaric).

UNIT III

Value addition concept; Principles and methods of preservation; Intermediate moisture food- Jam, jelly, marmalade, preserve, candy – Concepts and Standards.

UNIT IV

Fermented and non-fermented beverages. Tomato products- Concepts and Standards; Drying/ Dehydration of fruits and vegetables – Concept and methods, osmotic drying. Canning – Concepts and Standards, packaging of products.

Practical

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

AU.Ento.363 Management of Beneficial Insects

Credit hours: 2(1+1)

Sem. VI

Theory

Unit I

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

Unit II

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

Unit III

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

Unit IV

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

Practical

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

AU.PBG.366 Crop Improvement – II (*Rabi crops*)

Credit hours: 2(1+1)

Sem. VI

Theory

Unit I

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

Unit II

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

Unit III

Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, adaptability, stability, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional).

Unit IV

Hybrid seed production technology *rabi* crops. Ideotype concept and climate resilient crop varieties for future.

Practical

Floral biology, emasculation and hybridization techniques in different crop species namely Wheat, Oat, Barley, Chickpea, Lentil, Field pea, Rajma, Horse gram, Rapeseed Mustard, Sunflower, Safflower, Potato, Berseem. Sugarcane, Tomato, Chilli, Onion; Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods; Study of field techniques for seed production and hybrid seeds production in Rabi crops; Estimation of heterosis, inbreeding depression and heritability; Layout of field experiments; Study of quality characters, study of donor parents for different characters; Visit to seed production plots; Visit to AICRP plots of different field crops.

AU.Agron.3611 Practical Crop Production-II (*Rabi Crops*)

Credit hours: 2(0+2)

Sem. VI

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 a group of students.

AU.Agron.3612 Principles of Organic Farming

Credit hours: 2(1+1)

Sem. VI

Theory

UNIT I

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

UNIT II

Organic ecosystem and their concepts; Organic nutrient resources and its fortification; Restrictions to nutrient use in organic farming.

UNIT III

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.

UNIT IV

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

Practical

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

AU. Ag. Econ. 365 Farm Management, Production and Resource Economics

Credit hours: 2(1+1)

Sem. VI

Theory

Unit I

Meaning and concept of farm management, objectives and relationship with other sciences. Meaning and definition of farms, its types and characteristics, factor determining types and size of farms. Principles of farm management: concept of production function and its type, use of production function in decision-making on a farm.

Unit II

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.

Unit III

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.

Unit IV

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, Inefficiency and welfare loss, solutions, Important issues in economics and management of common property resources of land, water, pasture and forest resources etc.

Practicals

Preparation of farm layout. Determination of cost of fencing of a farm. 2 Computation of depreciation cost of farm assets. Application of equi-marginal returns/opportunity cost principle in allocation of farm resources. 3 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. 4 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.

AU.FSN. 362 Principles of Food Science and Nutrition

Credit hours: 2(2+0)

Sem. VI

Theory

UNIT I

Concepts of Food Science (definitions, measurements, density, phase change, pH, osmosis, surface tension, colloidal systems etc.)

UNITE II

Food composition and chemistry (water, carbohydrates, proteins, fats, vitamins, minerals, flavours, colours, miscellaneous bioactives, important reactions).

UNIT III

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

UNIT IV

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

ELECTIVE COURSES

AU. FSN 241 Food Safety and Standards

Credit hours: 3(2+1)

Sem. IV

Theory

UNIT I

Food Safety – Definition, Importance, Scope and Factors affecting Food Safety. Hazards and Risks, Types of hazards - Biological, Chemical, Physical hazards. Management of hazards - Need. Control of parameters. Temperature control. Food storage. Product design.

UNIT II

Hygiene and Sanitation in Food Service Establishments- Introduction. Sources of contamination and their control. Waste Disposal. Pest and Rodent Control. Personnel Hygiene. Food Safety Measures.

UNIT III

Food Safety Management Tools- Basic concepts. PRPs, GHPs, GMPs, SSOPs etc. HACCP. ISO series. TQM - concept and need for quality, components of TQM, Kaizen. Risk Analysis. Accreditation and Auditing, Water Analysis, Surface Sanitation and Personal Hygiene. Food laws and Standards- Indian Food Regulatory Regime, FSSAI. Global Scenario CAC. Other laws and standards related to food.

UNIT IV

Recent concerns- New and Emerging Pathogens. Packaging, Product labeling and Nutritional labeling. Genetically modified foods\ transgenics. Organic foods. Newer approaches to food safety. Recent Outbreaks. Indian and International Standards for food products.

Practical

Water quality analysis physico-chemical and microbiological. Preparation of different types of media. Microbiological Examination of different food samples. Assessment of surface sanitation by swab/rinse method. Assessment of personal hygiene. Biochemical tests for identification of bacteria. Scheme for the detection of food borne pathogens. Preparation of plans for Implementation of FSMS - HACCP, ISO: 22000

AU. Hort. 245 Landscaping

Credit hours: 3(2+1)

Sem. IV

Theory

UNIT I

Importance and scope of landscaping. Principles of landscaping, garden styles and types, terrace gardening, vertical gardening, garden components, adornments, lawn making, rockery, water garden, walk-paths, bridges, other constructed features etc. gardens for special purposes.

UNIT II

Trees: selection, propagation, planting schemes, canopy management, shrubs and herbaceous perennials: selection, propagation, planting schemes, architecture.

UNIT III

Climber and creepers: importance, selection, propagation, planting, Annuals: selection, propagation, planting scheme, Other garden plants: palms, ferns, grasses and cacti succulents. Pot plants: selection, arrangement, management.

UNIT IV

Bio-aesthetic planning: definition, need, planning; landscaping of urban and rural areas, Peri-urban landscaping, Landscaping of schools, public places like bus station, railway station, townships, river banks, hospitals, play grounds, airports, industries, institutions. Bonsai: principles and management, lawn: establishment and maintenance. CAD application.

Practical

Identification of trees, shrubs, annuals, pot plants; Propagation of trees, shrubs and annuals, care and maintenance of plants, potting and repotting, identification of tools and implements used in landscape design, training and pruning of plants for special effects, lawn establishment and maintenance, layout of formal gardens, informal gardens, special type of gardens (sunken garden, terrace garden, rock garden) and designing of conservatory and lathe house. Use of computer software, visit to important gardens/ parks/ institutes.

AU. Ag. Ext. 245 Agricultural Journalism

Credit hours: 3(2+1)

Sem. IV

Theory

UNIT I

Agricultural Journalism: The nature and scope of agricultural journalism characteristics and training of the agricultural journalist, how agricultural journalism is similar to and different from other types of journalism.

UNIT II

Newspapers and magazines as communication media: Characteristics; kinds and functions of newspapers and magazines, characteristics of newspaper and magazine readers. Form and content of newspapers and magazines: Style and language of newspapers and magazines, parts of newspapers and magazines.

UNIT III

The agricultural story: Types of agricultural stories, subject matter of the agricultural story, structure of the agricultural story. Gathering agricultural information: Sources of agricultural information, interviews, coverage of events, abstracting from research and scientific materials, wire services, other agricultural news sources.

UNIT IV

Writing the story: Organizing the material, treatment of the story, writing the news lead and the body, readability measures. Illustrating agricultural stories: Use of photographs, use of artwork (graphs, charts, maps, etc.), writing the captions. Editorial mechanics: Copy reading, headline and title writing, proofreading, lay outing.

Practical

Practice in interviewing. Covering agricultural events. Abstracting stories from research and scientific materials and from wire services. Writing different types of agricultural stories. Selecting pictures and artwork for the agricultural story. Practice in editing, copy reading, headline and title writing, proofreading, layouting. Testing copy with a readability formula. Visit to a publishing office.

AU. Agron./ Soils 247 Agrochemicals

Theory**UNIT I**

An introduction to agrochemicals, their type and role in agriculture, effect on environment, soil, human and animal health, merits and demerits of their uses in agriculture, management of agrochemicals for sustainable agriculture. Herbicides-Major classes, properties and important herbicides. Fate of herbicides.

UNIT II

Fungicides - Classification – Inorganic fungicides - characteristics, preparation and use of sulfur and copper, Mode of action-Bordeaux mixture and copper oxychloride. Organic fungicides- Mode of action- Dithiocarbamates-characteristics, preparation and use of Zineb and maneb. Systemic fungicides- Benomyl, carboxin, oxycarboxin, Metalaxyl, Carbendazim, characteristics and use.

UNIT III

Introduction and classification of insecticides: inorganic and organic insecticides Organochlorine, Organophosphates, Carbamates, Synthetic pyrethroids, Neonicotinoids, Biorationals, Insecticide Act and rules, Insecticides banned, withdrawn and restricted use, Fate of insecticides in soil & plant. IGRs Biopesticides, Reduced risk insecticides, Botanicals, plant and animal systemic insecticides their characteristics and uses.

UNIT IV

Fertilizers and their importance. Nitrogenous fertilizers: Feedstocks and Manufacturing of ammonium sulphate, ammonium nitrate, ammonium chloride, urea. Slow release N-fertilizers. Phosphatic fertilizers: feedstock and manufacturing of single superphosphate. Preparation of bone meal and basic slag. Potassic fertilizers: Natural sources of potash, manufacturing of potassiumchloride, potassium sulphate and potassium nitrate. Mixed and complex fertilizers: Sources and compatibility–preparation of major, secondary and micronutrient mixtures. Complex fertilizers: Manufacturing of ammonium phosphates, nitrophosphates and NPK complexes. Fertilizer control order. Fertilizer logistics and marketing. Plant bio-pesticides for ecological agriculture, Bio-insect repellent.

Practical

Sampling of fertilizers and pesticides. Pesticides application technology to study about various pesticides appliances. Quick tests for identification of common fertilizers. Identification of anion and cation in fertilizer. Calculation of doses of insecticides to be used. To study and identify various formulations of insecticide available in market. Estimation of nitrogen in Urea.

Estimation of 120 Report of the ICAR Fifth Deans' Committee water soluble P_2O_5 and citrate soluble P_2O_5 in single super phosphate. Estimation of potassium in Murreite of Potash/ Sulphate of Potash by flame photometer. Determination of copper content in copper oxychloride. Determination of sulphur content in sulphur fungicide. Determination of thiram. Determination of ziram content.

AU.Ag. Econ. 354 Agri-business Management

Credit hours: 3(2+1)

Sem. IV

Theory

Unit I

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.

Unit II

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.

Unit III

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.

Unit IV

Marketing Management: Segmentation, targeting & positioning. Marketing mix and marketing strategies. Consumer behaviour 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.

AU. Ag. Engg. 354 Protected Cultivation

Credit hours: 3(2+1)

Sem. V

Theory

UNIT I

Protected cultivation- importance and scope, Status of protected cultivation in India and World types of protected structure based on site and climate. Cladding material involved in greenhouse/ poly house.

UNIT II

Greenhouse design, environment control, artificial lights, Automation. Soil preparation and management, Substrate management. Types of benches and containers. Irrigation and fertigation management. Propagation and production of quality planting material of horticultural crops. **UNIT III**

Greenhouse cultivation of important horticultural crops – rose, carnation, chrysanthemum, gerbera, orchid, anthurium, liliun, tulip, tomato, bell pepper, cucumber, strawberry, pot plants, etc.

UNIT IV

Cultivation of economically important medicinal and aromatic plants. Off-season production of flowers and vegetables. Insect pest and disease management.

Practical

Raising of seedlings and saplings under protected conditions, use of protrays in quality planting material production, Bed preparation and planting of crop for production, Inter cultural operations, Soil EC and pH measurement, Regulation of irrigation and fertilizers through drip, fogging ad misting.

AU. PBG 355 Commercial Plant Breeding

Credit hours: 3(1+2)

Sem. V

Theory

UNIT I

Types of crops and modes of plant reproduction. Line development and maintenance breeding in self and cross pollinated crops (A/B/R and two line system) for development of hybrids and seed production.

UNIT II

Genetic purity test of commercial hybrids. Advances in hybrid seed production of maize, rice, sorghum, pearl millet, castor, sunflower, cotton pigeon pea, Brassica etc. Quality seed production of vegetable crops under open and protected environment.

UNIT III

Alternative strategies for the development of the line and cultivars: haploid inducer, tissue culture techniques and biotechnological tools.

UNIT IV

IPR issues in commercial plant breeding: DUS testing and registration of varieties under PPV & FR Act. Variety testing, release and notification systems in India. Principles and techniques of seed production, types of seeds, quality testing in self and cross pollinated crops.

Practical

Floral biology in self and cross pollinated species, selfing and crossing techniques. Techniques of seed production in self and cross pollinated crops using A/B/R and two line system. Learning techniques in hybrid seed production using male-sterility in field crops. Understanding the difficulties in hybrid seed production, Tools and techniques for optimizing hybrid seed production. Concept of rouging in seed production plot. Concept of line its multiplication and purification in hybrid seed production. Role of pollinators in hybrid seed production. Hybrid seed production techniques in sorghum, pearl millet, maize, rice, rapeseed-mustard, sunflower, castor, pigeon pea, cotton and vegetable crops. Sampling and analytical procedures for purity testing and detection of spurious seed. Seed drying and storage structure in quality seed management. Screening techniques during seed processing viz., grading and packaging. Visit to public private seed production and processing plants.

AU. Agron. 3510 Weed Management

Credit hours: 3(2+1)

Sem. V

Theory

UNIT I

Introduction to weeds, characteristics of weeds their harmful and beneficial effects on ecosystem. Classification, reproduction and dissemination of weeds.

UNIT II

Herbicide classification, concept of adjuvant, surfactant, herbicide formulation and their use. Introduction to mode of action of herbicides and selectivity.

UNIT III

Allelopathy and its application for weed management. Bio-herbicides and their application in agriculture. Concept of herbicide mixture and utility in agriculture.

UNIT IV

Herbicide compatibility with agro-chemicals and their application. Integration of herbicides with non chemical methods of weed management. Herbicide Resistance and its management.

Practical

Techniques of weed preservation. Weed identification and their losses study. Biology of important weeds. Study of herbicide formulations and mixture of herbicide. Herbicide and agrochemicals study. Shift of weed flora study in long term experiments. Study of methods of herbicide application, spraying equipments. Calculations of herbicide doses and weed control efficiency and weed index.

AU. Pl.Path. 365 Biopesticides & Biofertilizers

Credit hours: 3(2+1)

Sem. VI

Theory

UNIT I

History and concept of biopesticides. Importance, scope and potential of biopesticide. Definitions, concepts and classification of biopesticides viz. pathogen, botanical pesticides, and biorationales. Botanicals and their uses. Mass production technology of bio-pesticides.

UNIT II

Virulence, pathogenicity and symptoms of entomopathogenic pathogens and nematodes. Methods of application of biopesticides. Methods of quality control and Techniques of biopesticides. Impediments and limitation in production and use of biopesticide.

UNIT III

Biofertilizers - Introduction, status and scope. Structure and characteristic features of bacterial biofertilizers- Azospirillum, Azotobacter, Bacillus, Pseudomonas, Rhizobium and Frankia; Cyanobacterial biofertilizers- Anabaena, Nostoc, Hapalosiphon and fungal biofertilizers- AM mycorrhiza and ectomycorrhiza. Nitrogen fixation -Free living and symbiotic nitrogen fixation. Mechanism of phosphate solubilization and phosphate mobilization, K solubilization.

UNIT IV

Production technology: Strain selection, sterilization, growth and fermentation, mass production of carrier based and liquid biofertilizers. FCO specifications and quality control of biofertilizers. Application technology for seeds, seedlings, tubers, sets etc. Biofertilizers -Storage, shelf life, quality control and marketing. Factors influencing the efficacy of biofertilizers.

Practical

Isolation and purification of important biopesticides: Trichoderma Pseudomonas, Bacillus, Metarhizium etc. and its production. Identification of important botanicals. Visit to biopesticide laboratory in nearby area. Field visit to explore naturally infected cadavers. Identification of entomopathogenic entities in field condition. Quality control of biopesticides. Isolation and purification of Azospirillum, Azotobacter, Rhizobium, P-solubilizers and cyanobacteria. Mass multiplication and inoculum production of biofertilizers. Isolation of AM fungi -Wet sieving method and sucrose gradient method. Mass production of AM inoculants.

AU. Hort. 366 Micro propagation Technologies

Credit hours: 3(1+2)

Sem. VI

Theory

UNIT I

Introduction, History, Advantages and limitations.

UNIT II

Types of cultures (seed, embryo, organ, callus, cell), Stages of micropropagation, Axillary bud proliferation (Shoot tip and meristem culture, bud culture),

UNIT III

Organogenesis (callus and direct organ formation), Somatic embryogenesis, cell suspension cultures, Production of secondary metabolites

UNIT IV

Somaclonal variation, Cryopreservation.

Practical

Identification and use of equipments in tissue culture Laboratory, Nutrition media composition, sterilization techniques for media, containers and small instruments, sterilization techniques for explants, Preparation of stocks and working solution, Preparation of working medium, Culturing of explants: Seeds, shoot tip and single node, Callus induction, Induction of somatic embryos regeneration of whole plants from different explants, Hardening procedures.

AU. Hort. 367 Hi-tech. Horticulture

Credit hours: 3(2+1)

Sem. VI

Theory

UNIT I

Introduction & importance; Nursery management and mechanization; micro propagation of horticultural crops; Modern field preparation and planting methods

UNIT II

Protected cultivation: advantages, controlled conditions, method and techniques, Micro irrigation systems and its components; EC, pH based fertilizer scheduling, canopy management, high density orcharding

UNIT II

Components of precision farming: Remote sensing, Geographical Information System (GIS), Differential Geo-positioning System (DGPS), Variable Rate applicator (VRA),

UNIT II

Application of precision farming in horticultural crops (fruits, vegetables and ornamental crops); mechanized harvesting of produce.

Practical

Types of polyhouses and shade net houses, Intercultural operations, tools and equipments identification and application, Micro propagation, Nursery-protrays, micro-irrigation, EC, pH based fertilizer scheduling, canopy management, visit to hi-tech orchard/nursery.

AU. Agron. 3614 System Simulation and Agroadvisory

Credit hours: 3(2+1)

Sem. VI

Theory

UNIT I

System Approach for representing soil-plant-atmospheric continuum, system boundaries, Crop models, concepts & techniques, types of crop models, data requirements, relational diagrams.

UNIT II

Evaluation of crop responses to weather elements; Elementary crop growth models; calibration, validation, verification and sensitivity analysis. Potential and achievable crop production- concept and modelling techniques for their estimation.

UNIT III

Crop production in moisture and nutrients limited conditions; components of soil water and nutrients balance. Weather forecasting, types, methods, tools & techniques, forecast verification; Value added weather forecast, ITK for weather forecast and its validity.

UNIT IV

Crop-Weather Calendars; Preparation of agro-advisory bulletin based on weather forecast. Use of crop simulation model for preparation of Agro-advisory and its effective dissemination.

Practical

Preparation of crop weather calendars. Preparation of agro-advisories based on weather forecast using various approaches and synoptic charts. Working with statistical and simulation models for crop growth. Potential & achievable production; yield forecasting, insect & disease forecasting models. Simulation with limitations of water and nutrient management options. Sensitivity analysis of varying weather and crop management practices. Use of statistical approaches in data analysis and preparation of historical, past and present meteorological data for medium range weather forecast. Feedback from farmers about the agroadvisory.