FIFTH DEANS' COMMITTEE REPORT

Syllabus and Lecture

Schedule for

B.Sc. (Hons) Agriculture

COLLEGE OF AGRICULTURE, UMMEDGANJ, KOTA

AGRICULTURE UNIVERSITY, KOTA

RAJASTHAN- 324 001

SYLLABUS AND

LECTURE

SCHEDULE FOR

B.Sc. (Hons) Agriculture

COLLEGE OF AGRICULTURE, UMMEDGANJ, KOTA

AGRICULTURE UNIVERSITY, KOTA

RAJASTHAN- 324 001

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Semester wise course distribution of B.Sc. (Hons) Agriculture

S.No.	Course Code	Title of the Course	Credit Hours
		SEMESTER – I	
1.	HORT-111	Fundamentals of Horticulture	2(1+1)
2.	BIOCHEM-111	Fundamentals of Plant Biochemistry and Biotechnology	3(2+1)
3.	SSAC-111	Fundamentals of Soil Science	3(2+1)
4.	HORT-112	Introduction to Forestry	2(1+1)
5.	ENG-111	Comprehension & Communication Skills in English	2(1+1)
6.	AGRON-111	Fundamentals of Agronomy	4(3+1)
7.	BIO-111/ MATHS-111	Introductory Biology* / Elementary Mathematics*	2(1+1)/ 2(2+0)*
8.	AGHR-111	Agricultural Heritage*	1(1+0)*
9.	EXCOM-111	Rural Sociology & Educational Psychology	2(2+0)
10.	EXCOM-112	Human Values & Ethics (non gradial)	1(1+0)**
11.	NSS / NCC / PEYP	NSS /NCC/ Physical Education & Yoga Practices**	2(0+2)**
		Total	**18+04*/03* +03****
* R: Remedial Course ** NC:Non-gradial course			
		SEMESTER – II	
1.	GPB-121	Fundamentals of Genetics	3(2+1)
2.	SSAC-121	Agricsultural Microbiology	2(1+1)
3.	AGENGG-121	Soil and Water Conservation Engineering	2(1+1)
4.	CPHYS-121	Fundamentals of Crop Physiology	2(1+1)
5.	AGECON-121	Fundamentals of Agricultural Economics	2(2+0)
6.	PPATH-121	Fundamentals of Plant Pathology	4(3+1)
7.	ENTO-121	Fundamentals of Entomology	4(3+1)
8.	EXCOM-121	Fundamentals of Agricultural Extension Education	3(2+1)
9.	EXCOM-122	Communication Skills and Personality Development	2(1+1)
10.	AGRON-121	Introductory Agro-meteorology & Climate Change	2(1+1)
	NSS/NCC/PEYP	NSS/NCC/Physical Education & Yoga Practices**	To be continued
		Total	**24(16+08)**
		SEMESTER – III	
1.	AGRON-211	Crop Production Technology – I (*Kharif* Crops)	3(2+1)

2.	GPB-211	Fundamentals of Plant Breeding	3(2+1)
3.	AGECON-211	Agricultural Finance and Cooperation	3(2+1)
4.	AGRINFO-211	Agri- Informatics	2(1+1)
5.	AGENGG-211	Farm Machinery and Power	2(1+1)
6.	HORT-211	Production Technology for Vegetables and Spices	2(1+1)
7.	ESDM-211	Environmental Studies and Disaster Management	3(2+1)
8.	STAT-211	Statistical Methods	2(1+1)
9.	ANISC-211	Livestock and Poultry Management	4(3+1)
	NSS	NSS**	To be continued
		Total	**23(14+09)**
AGRINFO-211 is to be revised by adding 25% content of ICT with equal deletion from the existing contents of the existing course. ***Action*** – HOH , Department of Statistics, Mathematics & computer Science			
SEMESTER – IV			
1.	AGRON-221	Crop Production Technology – II (*Rabi* Crops)	3(2+1)
2.	HORT-221	Production Technology for Ornamental Crops, MAP and Landscaping	2(1+1)
3.	AGENGG-221	Renewable Energy and Green Technology	2(1+1)
4.	SSAC-221	Problematic Soils and their Management	2(2+0)
5.	HORT-222	Production Technology for Fruit and Plantation Crops	2(1+1)
6.	GPB-221	Principles of Seed Technology	3(1+2)
7.	AGRON222	Farming System & Sustainable Agriculture	1(1+0)
8.	AGECON-221	Agricultural Marketing, Trade & Prices	3(2+1)
9.	AGRON-121	Introductory Agro-meteorology & Climate Change	2(1+1)
10.	AGECON-222	Agri Bussiness Managment (Elective Course)	3(2+1)
	NSS	NSS**	To be continued
		Total	**19(11+8) +3**
ENTO-221 isdegined as a new course			
SEMESTER – V			
1.	ENTO-311	Principles of Integrated Pest and Disease Management	3(2+1)
2.	SSAC-311	Manures, Fertilizers and Soil Fertility Management	3(2+1)
3.	ENTO-312	Pests of Crops and Stored Grains and their management	3(3+1)
4.	PPATH-311	Epidemiology And Integrated Disease Management	2(1+1)
5.	PPATH-312	Diseases of Field and Horticultural Crops and their management - I	3(2+1))
6.	GPB-311	Crop Improvement-I (*Kharif* Crops)	2(1+1)
7.	EXCOM-311	Entrepreneurship Development and Business Communication	2(1+1)
8.	AGRON-311	Geoinformatics and Nano-technology and Precision	2(1+1)

		Farming	
9.	AGRON-312	Practical Crop Production-I (*Kharif* crops)	2(0+2)
10.	GPB-312	Intellectual Property Rights	1(1+0)
11.	EXCOM-312	Agricultuire Journalise (Elective Course)	3(2+1)
		Total	**21(12+09) +3**
SEMESTER – VI			
1.	AGRON-321	Rainfed Agriculture & Watershed Management	2(1+1)
2.	AGENGG-321	Protected Cultivation and Secondary Agriculture	2(1+1)
3.	PPATH-321	Diseases of Field and Horticultural Crops and their Management-II	3(2+1)
4.	HORT-321	Post-harvest Management and Value Addition of Fruits and Vegetables	2(1+1)
5.	ENTO-321	Management of Beneficial Insects	2(1+1)
6.	GPB-321	Crop Improvement-II (*Rabi* crops)	2(1+1)
7.	AGRON-322	Practical Crop Production-II (*Rabi* crops)	2(0+2)
8.	AGRON-323	Principles of Organic Farming	2(1+1)
9.	AGECON-321	Farm Management, Production & Resource Economics	2(1+1)
10.	HORT-322	Principles of Food Science and Nutrition	2(2+0)
11.	HORT-323	Food Safety & Standared (Elective Course)	3(2+1)
		Total	**21(11+10)+ 3**

SEMESTER – VII

Rural Agricultural Work Experience and Agri-industrial Attachment (RAWE&AIA)

S. No.	Course Code	Activities	No. of weeks	Cr. Hrs
1.	READY 411	General orientation & On campus training by different faculties	1	14
2.	READY 412	(a) Village attachment	8	
		(b) Unit attachment in- University/ College/KVK/ Research Station Attachment	5	
	READY 413	(c) Plant clinic	2	02
3.	READY 414	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 03 weeks to get an experience of the industrial environment and working**.**

Educational tour will be conducted in break between IV and V Semester or VI and VII semester.

RAWE

Component-I

Village Attachment Training Programme

S. 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

S. No.	Activities and Tasks during Agro-Industrial Attachment Programme
1.	Acquaintance with industry and staff
2.	Study of structure, functioning, objective and mandates of the industry
3.	Study of various processing units and hands-on trainings under supervision of industry staff
4.	Ethics of industry
5.	Employment generated by the industry
6.	Contribution of the industry promoting environment
7.	Learning business network including outlets of the industry Skill development in all crucial tasks of the industry
8.	Documentation of the activities and task performed by the students
9.	Performance evaluation, appraisal and ranking of students

Evaluation of RAWE Programme

Attendance: Minimum attendance - 85%.

Records: Students would complete the record work/ report writing/ presentations, etc. based on daily field observations recorded in notebooks and weekly diaries maintained by them.

Evaluation Procedure: Students shall be evaluated component-wise under village attachment and agro-industrial attachment. The respective component In-Charge Instructor(s), agro-industrial official and Course Coordinator will evaluate the students as under:

ACTIVITY		Max. Marks
1. Village attachment training		
a.	KVK/ARS/NGO scientist	50
b.	Report Preparation	10
c.	University Committee (Presentation & Viva-voce)	40
2. Industrial attachment training		
a.	Industry officials	50
b.	Report Preparation	10
c.	University Committee (Presentation & Viva-voce)	40

Assessment Parameters (RAWE & AIA):

	Parameters	Marks (%)
A	**Village Attachment**	
	Regularity	10
	Initiative & creativity	10
	General conduct & discipline	10
	Work performance	20
B.	**Industrial Attachment**	
	Initiative & compliance	10
	General conduct and discipline	10
	Project planning & implementation	10
	Work performance	20

VIII SEMESTER (Experiential Learning Programme/ Hot)

	Module	Credit Hr.
	1. Module-I	0+10
	2. Module-II	0+10
	Total	20 (0+20)

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.

S.No.	Course Code	Title of the module	Credits
1.	READY 421	Production Technology for Bioagents and Biofertilizer	0+10
2.	READY 422	Seed Production and Technology	0+10
3.	READY 423	Mushroom Cultivation Technology	0+10
4.	READY 424	Soil, plant , water and seed Testing	0+10
5.	READY 425	Commercial Beekeeping	0+10
6.	READY 426	Poultry Production Technology	0+10
7.	READY 427	Commercial Horticulture	0+10
8.	READY 428	Floriculture and Landscaping	0+10
9.	READY 429	Food Processing	0+10
10.	READY 430	Agriculture Waste Management	0+10

11.	READY 431	Organic Production Technology	0+10
12.	READY 432	Nursery Management	0+10
13.	READY 433	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. No.	Group	Credit Hours
1	Agronomy	21(10+11)
2	Genetics & Plant Breeding	13(7+6)
3	Plant Pathology	13(9+4)
4	Biochemistry / Physiology / Microbiology/ Environmental Sciences	12(7+5)
5	Agricultural Economics	10(7+3)
6	Horticulture	10(5+5)
7	Agricultural Extension	9(6+3)
8	Entomology	9(6+3)
9	Agricultural Engineering	8(4+4)
10	Soil Science & Agricultural Chemistry	8(6+2)
11	Statistics, Computer Application and I.P.R.	5(3+2)
12	Animal Production	4(3+1)
13	Food Science	2(2+0)

6.1 Discipline-wise courses (UG)

Agronomy		
S. No.	**Title of the Course**	**Credit Hours**
1	Fundamentals of Agronomy	4(3+1)
2	Introductory Agro-meteorology & Climate Change	2(1+1)
3	Crop Production Technology – I (Kharif crops)	2(1+1)
4	Crop Production Technology – II (Rabi crops)	2(1+1)
5	Farming System & Sustainable Agriculture	1(1+0)

6	Practical Crop Production - I (Kharif crops)	2(0+2)
7	Practical Crop Production - II (Rabi crops)	2(0+2)
8	Principles of Organic Farming	2(1+1)
9	Geoinformatics and Nanotechnology and Precision Farming	2(1+1)
10	Rainfed Agriculture & Watershed Management	2(1+1)
	Total	**21(10+11**
Genetics & Plant Breeding		
1	Fundamentals of Genetics	3(2+1)
2	Principles of Seed Technology	3(1+2)
3	Fundamentals of Plant Breeding	3(2+1)
4	Crop Improvement-I (Kharif crops)	2(1+1)
5	Crop Improvement-II (Rabi crops)	2(1+1)
	Total	**13(7+6)**
Soil Science & Agricultural Chemistry		
1	Fundamentals of Soil Science	3(2+1)
2	Manures, Fertilizers and Soil Fertility Management	3(2+1))
3	Problematic soils and their Management	2(2+0)
	Total	**8(6+2)**
Agricultural Economic		
1	Fundamentals of Agricultural Economics	2(2+0)
2	Agricultural Finance and Co-Operation	3(2+1)
3	Agricultural Marketing Trade & Prices	3(2+1)
4	Farm Management, Production & Resource Economics	2(1+1)
	Total	**10(7+3)**
Agricultural Engineering		
1	Soil and Water Conservation Engineering	2(1+1)
2	Farm Machinery and Power	2(1+1)
3	Renewable Energy and Green Technology	2(1+1)
4	Protected Cultivation and Secondary Agriculture	2(1+1)
	Total	**8(4+4)**
Plant Pathology		
1	Fundamentals of Plant Pathology)	4(3+1
2	Diseases of Field and Horticultural Crops and their Management-I	3(2+1)
3	Diseases of Field and Horticultural Crops and their Management-II	3(2+1)
4	Principles of Integrated Pest and Disease Management	3(2+1)
	Total	**13(9+4)**
Horticulture		
1	Fundamentals of Horticulture	2(1+1)
2	Production Technology for Fruit and Plantation Crops	2(1+1)
3	Production Technology for Vegetables and Spices	2(1+1)

4	Production Technology for Ornamental Crops, MAP and Landscaping	2(1+1)
5	Post-harvest Management and Value Addition of Fruits and Vegetables	2(1+1)
	Total	**10(5+5**
Food Science & Technology		
1	Principles of Food Science & Nutrition)	2(2+0
Agricultural Extension and Communication		
1	Fundamentals of Agricultural Extension Education	3(2+1)
2	Rural Sociology & Educational Psychology	2(2+0)
3	Entrepreneurship Development and Business Communication	2(1+1)
4	Communication Skills and Personality Development	2(1+1)
	Total	9(6+3)
Biochemistry / Physiology / Microbiology/ Environmental Sciences		
1	Fundamentals of Plant Biochemistry and Biotechnology	3(2+1)
2	Fundamentals of Crop Physiology	2(1+1)
3	Agricultural Microbiology	2(1+1)
4	Environmental Studies & Disaster Management	3(2+1)
5	Introduction to Forestry	2(1+1)
	Total	**12(7+5)**
Statistics, Computer Application and I.P.R.		
1	Statistical Methods	2(1+1)
2	Agri- Informatics	2(1+1)
3	Intellectual Property Rights	1(1+0)
	Total	**05**
Animal Production		
1	Livestock and poultry Management	4(3+1)
Language		
1	Comprehension & Communication Skills in English (Gradial course)	2(1+1)
Remedial Courses		
1	Agricultural Heritage	1(1+0)
2	Introductory Biology	2(1+1)
3	Elementary Mathematics	2(2+0)
	Total	**05**
Non-Gradial Courses		
1	NSS/NCC/Physical Education & Yoga Practices	2(0+2)
2	Human Values & Ethics 1(1+0) Educational Tour	2(0+2)
3	Educational Tour	2(0+2)

	Total	**06**

SEMESTER – I

Semester wise course distribution of B.Sc. (Hon's) Agriculture

S.N.	Course Code	Title of the Course	Credit Hours
		Semester – I	
1.	HORT-111	Fundamentals of Horticulture	2(1+1)
2.	BIOCHEM-111	Fundamentals of Plant Biochemistry and Biotechnology	3(2+1)
3.	SSAC-111	Fundamentals of Soil Science	3(2+1)
4.	HORT-112	Introduction to Forestry	2(1+1)
5.	ENG-111	Comprehension & Communication Skills in English	2(1+1)
6.	AGRON-111	Fundamentals of Agronomy	4(3+1)
7.	BIO-111/ MATHS-111	Introductory Biology* / Elementary Mathematics*	2(1+1)/ 2(2+0)*
8.	AGHR-111	Agricultural Heritage*	1(1+0)*
9.	EXCOM-111	Rural Sociology & Educational Psychology	2(2+0)
10.	EXCOM-112	Human Values & Ethics(non gradial)	1(1+0)**
11.	NSS / NCC / PEYP	NSS / NCC/ Physical Education & Yoga Practices**	2(0+2)**
		Total	**18+04*/03*+03****
* Remedial Course ** NC-Non-gradial course			

HORT-111	Fundamentals of Horticulture	2(1+1)

Theory

Horticulture - Its definition and branches, importance and scope; horticultural and botanical classification; climate and soil for horticultural crops; Plant propagation-methods and propagating structures; Seed dormancy, Seed germination, principles of orchard establishment; Principles and methods of training and pruning, juvenility and flower bud differentiation; unfruitfulness; pollination, pollinizers and pollinators; fertilization and parthenocarpy; Planning and layout of orchards; importance of plant bio-regulators in horticulture. Irrigation – methods, Fertilizer application in horticultural crops.

Practical

Identification of garden tools. Identification of horticultural crops. Preparation of seed bed/nursery bed. Practice of sexual and asexual methods of propagation including micro-propagation. Layout and planting of orchard. Training and pruning of fruit trees. Preparation of potting mixture. Fertilizer application in different crops. Visits to commercial nurseries/orchard.

Lecture Schedule: Fundamentals of Horticulture

Theory

S. No.	Topic to be covered	No. of Lectures
1.	Horticulture - Its definition and branches importance and scope	1
2.	Horticultural and botanical classification	1
3.	Climate and soil for horticultural crops	1
4.	Nursery raising and its importance	1
5.	Plant propagation-methods and	2
6.	propagating structures	1
7.	Seed dormancy, Seed germination	1
8.	Principles of orchard establishment	2
9.	Principles and methods of training and pruning	1
10.	juvenility and flower bud differentiation unfruitfulness pollination, pollinizers and pollinators fertilization and parthenocarpy	1
11.	medicinal and aromatic plants-Importance & Scpoe	2
12.	importance of plant bio-regulators in horticulture	1
13.	Irrigation – methods, Fertilizer application in horticultural crops	1

Lecture Schedule: Fundamentals of Horticulture

Practical

S. No.	Topic to be covered	No. of Lectures
1.	Identification of Horticultural Crops	1
2.	Identification of garden tools	1
3.	Preparation of seed bed/nursery bed	1
4.	Practice of sexual and asexual methods of propogation	3
5.	Micro-propagation	1
6.	Layout and planting of orchard	2
7.	Training and pruning of fruit trees	1
8.	Preparation of potting mixture	1
9.	Ferilizer application in different crops	1
10.	Layout and components of a model nursery	2
11.	Visits to commercial nurseries/orchard	2

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BIOCHEM-111	Fundamentals of Plant Biochemistry and Biotechnology	3(2+1)

Theory

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

Carbohydrate: Importance and Classification, Reducing and Nonreducing sugars, Structures and properties of Monosaccharides, Disaccharides and Polysaccharides.

Lipid: Importance and classification, Structures and properties of fatty acids includingmembrane lipids.

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

Vitamins- Introduction, Classiification and functions

Enzymes: General properties, Classification, Mechanism of action, Allosteric enzymes.

Nucleic acids: Importance and classification, Structure of Nucleotides, Secondary and Tertiarystructures.

Metabolism of carbohydrates including Glycolysis, TCA cycle and Electron Transport Chain. Metabolism of lipids: Beta oxidation and Biosynthesis.

Plant Biotechnology: Concepts, Scope and applications. Scope and applications of organ cultures, embryo, cell suspension, callus, anther, pollen and ovule culture.

Micro-propagation methods: Organogenesis, Embryogenesis, Synthetic seeds and their significance; Embryo rescue and its significance, Somatic hybridization and cybrids.

Somaclonal variation and its use in crop improvement and Cryo-preservation.

Introduction to recombinant DNA methods: Physical (Gene gun method), chemical (PEG mediated) and Agrobacterium mediated gene transfer methods.

Transgenics: PCR techniques and its applications including Molecular Markers in crop improvement.

Practical

Preparation of solution, pH & buffers, Qualitative tests of carbohydrates and amino acids.

Quantitative estimation of glucose/ proteins. Estimation of amino acids/lipids, Paper chromatography/ TLC demonstration for separation of amino acids/ Monosaccharides.

Sterilization techniques. Demonstration of isolation of DNA and gel electrophoresis techniques

Lecture Schedule: Fundamentals of Plant Biochemistry and Biotechnology

Theory

S. No.	Topic to be covered	No. of Lectures
1.	Importance of Biochemistry: Properties of Water, pH and Buffer	1
2.	Carbohydrate: Importance and Classification, Reducing and Nonreducing sugars	1
3.	Structures and properties of Monosaccharides, Disaccharides and Polysaccharides	2
4.	Lipid: Importance and classification	1
5.	Structures and properties of fatty acids includingmembrane lipids	2
6.	Proteins: Importance and classification, Structures	2
7.	Titration and zwitter ion nature of amino acids	1
8.	Structural organization of proteins	1
9.	Vitamins- Introduction, Classiification and functions	1
10.	Enzymes: General properties, Classification	1
11.	Mechanism of action, Allosteric enzymes	1
12.	Nucleic acids: Importance and classification, Structure of Nucleotides	1
13.	Secondary and Tertiarystructures of nucleic acids	1
14.	Metabolism of carbohydrates including Glycolysis	1
15.	TCA cycle and Electron Transport Chain	2
16.	Metabolism of lipids: Beta oxidation and Biosynthesis	2
17.	Plant Biotechnology: Concepts, Scope and applications	1
18.	Scope and applications of organ cultures, embryo, cell suspension, callus, anther, pollen and ovule culture	3
19.	Micro-propagation methods: Organogenesis, Embryogenesis, Synthetic seeds and their significance	3
20.	Embryo rescue and its significance	1
21.	Somatic hybridization and cybrids	2
22.	Somaclonal variation and its use in crop improvement and Cryo-preservation	
23.	Introduction to recombinant DNA methods: Physical (Gene gun method), chemical (PEG mediated) and Agrobacterium mediated gene transfer methods	3
24.	Transgenics: PCR techniques and its applications	1
25.	Molecular Markers in crop improvement and Biotechnology regulations	2

References-

SSAC-111	Fundamentals of Soil Science	3(2+1)

Theory

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; soil taxonomical classification and soils of India; 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; effect on plant growth, Soil reaction-pH, soil acidity and alkalinity, buffering, effect of pH on nutrient availability; soil colloids - inorganic and organic; silicate clays: constitution and properties; sources of charge; ion exchange, cation exchange capacity, base saturation; soil moisture determination by gravimetric method.

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.Determination of soil pH and electrical conductivity. Determination of cation exchange capacity of soil. Determination of soil colour.

Lecture Schedule: Fundamentals of Soil Science

S. No.	Topic to be covered	No. of Lectures
1.	Soil as a natural body, Pedological and edaphological concepts of soil	1
2.	Soil genesis: soil forming rocks and minerals classification	2
3.	Weathering of rocks-Chemical, Physical and Biological	2
4.	Factors of Soil formation, fundamental and specific soil forming processes	2
5.	Soil Profile	1
6.	Definition and components of soil	1
7.	Soil physical properties: soil-texture, classifications of soil separates, importance of soil texture, particle size analysis, Stoke's law	2
8.	Soil structure and types of soil structure, mechanism of soil structure formation, management of soil structure	2
9.	Bulk desity, Practicle density and porosity, factors affecting them, agricultural significance and manipulation	1
10.	Soil sonsistence and Plasticity and their agricultural significance	1
11.	Soil Colour and expression of soil colour with munsell soil colour chart	1
12.	Soil taxonomical classification and soils of India	2
13.	Soil water classification and soil water retention	2
14.	Movement of soil water and availability to plants	1
15.	Soil air, composition, gaseous exchange and its composition, importance and in plant growth	2
16.	Soil temperature: source, amount and flow of heat in soil: effect on plant growth	2
17.	Soil reaction-pH, Soil acidity and alkalinity, buffering	1
18.	Effect of pH on nutrient availability	1
19.	Soil colloids, types of layer soil colloids and their significance	2
20.	1:1, 2:1 and 2:1:1 types of layer silicates, their structure and characteristics, sources of charges on soil colloids	2
21.	Cation and anion exchange phenomenon and factors influencing ion	1

	exchange, Base saturation	
22.	Soil moisture determination by gravimetric method.	1

Lecture Schedule: Fundamentals of Soil Science

Practical

S. No.	Topic to be covered	No. of Lectures
1.	Study of Soil Profile in field	1
2.	Study of soil sampling tools, Collection of representative sample, its processing and storage	2
3.	Study of soil forming rocks and minerals	2
4.	Determination of bulk density of undisturbed soil by core sampler method	1
5.	Determination of bulk density of disturbed soil by R D bottle method	1
6.	Determination of practicle density of soil by R D bottle and computation of porosity of soil	1
7.	Determination of lower and upper plastic limit of soil	1
8.	Determination of field capacity, permanent wilting point of soil and WHC	2
9.	Determination of soil texture by feel and Bouyoucos Methods	1
10.	Determination of soil pH and electrical conductivity	1

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HORT-112	Introduction to Forestry	2(1+1)

Theory

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

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.

Lecture Schedule: Introduction to Forestry

Theory

S. No.	Topic to be covered	No. of Lectures
1.	Introduction – definitions of basic terms related to forestry, objectives of silviculture, forest classification, salient features of Indian Forest Policies	2
2.	Forest regeneration, Natural regeneration - natural regeneration from seed and vegetative parts, coppicing, pollarding, root suckers	2
3.	Artificial regeneration – objectives, choice between natural and artificial regeneration, essential preliminary considerations	2
4.	Crown classification	1
5.	Tending operations – weeding, cleaning, thinning – mechanical, ordinary, crown and advance thinning	2
6.	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	3
7.	Agroforestry – definitions, importance	1
8.	criteria of selection of trees in agroforestry	1
9.	different agroforestry systems prevalent in the country, shifting cultivation, taungya, alley cropping, wind breaks and shelter belts, home gardens	1
10.	Cultivation practices of two important fast growing tree species of the region.	1

Lecture Schedule: Introduction to Forestry

Practical

S. No.	Topic to be covered	No. of Lectures
1.	Identification of tree-species	1
2.	Diameter measurement using calipers and tape	2
3.	Diameter measurements of forked, buttressed, fluted and leaning trees	2
4.	Height measurement of standing trees by shadow method, single pole method and hypsometer	
5.	Volume measurement of logs using various formulae	2
6.	Nursery lay out, seed sowing, vegetable propagation techniquies	4
7.	Forest plantations and their management	2
8.	Visits of nearby forest based industries	1

Reference

ENG-111	Comprehension & Communication Skills in English (Gradial course)	2(1+1)

Theory

War Minus Shooting- The Sporting Spirit. A Dilemma – A layman looks at science Raymond B. Fosdick. You and Your English– Spoken English and broken English G.B. Shaw. Reading Comprehension, Vocabulary-Antonym, Synonym, Homophones, Homonyms, often confused words. Exercises to Help the students in the enrichment of vocabulary based on TOEFL and other competitive examinations. Functional grammar: Articles, Prepositions, Verb, Subject verb Agreement, Transformation, Synthesis, Direct and Indirect Narration. Written Skills: Paragraph writing, Precise writing, Report writing and Proposal writing. The Style: Importance of professionalwriting. Preparation of CurriculumVitae andJob 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: test inginitiative, team spirit, leadership, intellectual ability. Group Discussions.

Lecture Schedule: Comprehension & Communication Skills in English (Gradial course)

Theory

S. No.	Topic to be covered	No. of Lectures
1.	War Minus Shooting- The sporting Spirit	1
2.	A Dilemma – A layman looks at science Raymond B. Fosdick	1
3.	You and Your English– Spoken English and broken English G.B. Shaw.	1

	Reading Comprehension	
4.	Vocabulary-Antonym, Synonym	1
5.	Homophones, Homonyms, often confused words	1
6.	Exercises to Help the students in the enrichment of vocabulary based on TOEFL and other competitive examinations	1
7.	Functional grammar: Articles, Prepositions, Verb, Subject verb Agreement	1
8.	Transformation, Synthesis	1
9.	Direct and Indirect Narration	1
10.	Written Skills: Paragraph writing	1
11.	Precise writing, Report writing and Proposal writing	1
12.	The Style: Importance of professionalwriting	1
13.	PreparationofCurriculumVitaeandJobapplications	1
14.	SynopsisWriting	1
15.	Interviews: kinds	1
16.	Importance and process	1

Lecture Schedule: Comprehension & Communication Skills in English (Gradial course)

Practical

S. No.	Topic to be covered	No. of Lectures
1.	Listening Comprehension :Listening to short talks lectures	1
2.	speeches (scientific, commercial and general in nature)	1
3.	Oral Communication: Phonetics	1
4.	stress and intonation	1
5.	Conversation practice	1
6.	Conversation : rate of speech, clarity of voice	1
7.	Functional grammer: Articles, Prepositions, Verb, Subject verb Agreement	1
8.	speaking and Listening, politeness	1
9.	Reading skills: reading dialogues	1
10.	rapid reading	1
11.	Intensive reading	1
12.	improving reading skills	1
13.	Mock Interviews: test inginitiative	1
14.	Team spirit	1
15.	leadership, intellectual ability	1
16.	Group Discussions	1

AGRON-111	**Fundamentals of Agronomy**	**4(3+1)**

Theory

Agronomy and its scope, seeds and sowing, tillage and tilth, crop density and geometry, Crop nutrition, manures and fertilizers, nutrient use efficiency, water resources, soil plant water relationship, crop water requirement, water use efficiency, irrigation- scheduling criteria and methods, quality of irrigation water, water logging.

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

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, Effect of sowing depth on germination and seedling vigour, 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.

Lecture Schedule: Fundamentals of Agronomy

Theory

S. No.	Topic to be covered	No. of Lectures
1.	Agriculture-defination and importance of agriculture	1
2.	Agronomy-meaning and scope of Agronomy	1
3.	Types of seeds, dormancy of seeds	1
4.	Viability of seeds, seed treatment	1
5.	Sowing-methods, depth, plant density	1
6.	Nursery bed and transplanting	1
7.	Crop density and geometry	1
8.	Optimum plant Population	1
9.	Tillage-defination and types of tillage including minimum and no tillage	1
10.	Tilth-defination and characteristics of good tilthe	1
11.	Crop nutrition-essential nutrients-classification	1
12.	Nuterient mobility in plants, Factors affecting nutrient availability	1
13.	Functions and deficiency symptoms of primary nutrients	1
14.	Manures-types, nutrient content	1
15.	Green manures, compost	1
16.	Fertilizers, INM	1
17.	Nuterient use efficiency	1
18.	Irrigation:definition and objectives	1
19.	Water resources and irrigation development in India and Rajasthan	1
20.	Soil moisture constants and theories of soil water availability	1
21.	Crop water requirement and factors affecting it	1
22.	Scheduling of irrigation: meaning and different approachs for scheduling irrigation in field crops	1
23.	Surface methods of irrigation; border, furrow, check basin and basin methods	1
24.	Sprinkler and drip methods; their layput, adaptability, advantages and limitation	1

25.	Irrigation efficiency; different terms used and their importance	1
26.	Water use efficiency; factors affecting and agronomic techniques to boost WUE	1
27.	Irrigation water quality-different criteria and limits used, effect of poor quality water on plant growth	1
28.	Management practices for efficient, benefits and different methods of drainage	1
29.	Agricultural drainage: definition, benefits and different methods of drainage	1
30.	Growth and development of crops	1
31.	Factors affecting growth and development	1
32.	Plant ideotypes	1
33.	Crop rotation and its principles	1
34.	Adaptation and distribution of crops	1
35.	Crop management technologies in problematic areas	1
36.	Harvesting and Threshing of crops	1
37.	Weeds-defination, harmful and beneficial effects and classification	1
38.	Ecology of weeds	1
39.	Weed-reproduction and seed dissemination	1
40.	Crop-weed competition-concept and allelopathy	1
41.	Concepts of weed prevention, eradication and weed control	1
42.	Physical and cultural methods of weed control	1
43.	Chemical and biological methods of weed control	1
44.	Integrated weed management_An introduction	1
45.	Introduction to herbicides, advantages and limitations of herbicides usages	1
46.	Classification of herbicides	1
47.	Herbicidal selectivity and resistance	1
48.	Allelopathy	1

Lecture Schedule: Fundamentals of Agronomy

Practical

S. No.	Topic to be covered	No. of Lectures
1.	Identification of crops, seeds, fertilizers	1
2.	Common Pesticides in agriculture	1
3.	Study of agro-climatic zones of India and Rajasthan	1
4.	Identification of weeds in crop	1
5.	Methods of herbicide and fertilizer application	1
6.	Study of yield contributing characters and yield estimation	1
7.	Seed germination and viability test	1
8.	Numerical excercises on fertilizer requirement of crops	1
9.	Plant geometry and plant population of various crops	1
10.	Herbicides requirement calculations and water requirement	1
11.	Use of tillage implements-reversible plough, one way plough, harrow leveler, seed drill	1
12.	Study of soil moisture measuring devices	1

13.	Measurement of field capacity	1
14.	Determination of bulk density	1
15.	Determination of infiltration rate	1
16.	Measurement of irrigation water	1

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IB-111	Introductory Biology (New)	2(1+1)

Theory

Introduction to the living world, diversity and characteristics of life, origin of life, Evolution and Eugenics.Binomial nomenclature and classification Cell and cell division. Morphology of flowing plants. Seed and seed germination. Plant systematic- viz; Brassicaceae, Fabaceae and Poaceae.Role of animals in agriculture.

Practical

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

Lecture Schedule: Theory

S. N.	Topic	No. of lectures

1.	Introduction to the living world, diversity and characteristics of life, origin of life, Evolution and Eugenics.	3
2.	Binomial nomenclature and classification Cell and cell division.	3
3.	Morphology of flowing plants.	2
4.	Seed and seed germination.	3
5.	Plant systematic- viz; Brassicaceae, Fabaceae and Poaceae.	3
6.	Role of animals in agriculture	2

Lecture Schedule: Practical

S. N.	Topic	No. of lectures
1.	Morphology of flowering plants – root, stem and leaf and their modifications	3
2.	Inflorence, flower and fruits.	2
3.	Cell, tissues	3
4.	cell division	2
5.	Internal structure of root, stem and leaf.	2
6.	Study of specimens and slides.	2
7.	Description of plants - Brassicaceae, Fabaceae and Poaceae.	2

References

MATHS-111	Elementary Mathematics	2(2+0)

Straight lines : Distance formula, section formula (internal and external division), Change of axes (only origin changed), Equation of co-ordinate axes, Equation of lines parallel to axes, Slope intercept form of equation of line, Slope-point form of equation of line, Two point form of equation of line, Intercept form of equation of line, Normal form of equation of line, General form of equation of line, Point of intersection of two st. lines, Angles between two st. lines, Parallel lines, Perpendicular lines, Angle of bisectors between two lines, Area of triangle and quadrilateral.Circle: Equation of circle whose centre and radius is known, General equation of a circle, Equation of circle passing through three given points, Equation of circle whose diameters is line joining two points (x_1, y_1) and (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).

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

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

Lecture Schedule: Elementary Mathematics-Theory

S. No.	Topic to be covered	No. of Lectures
1.	Straight lines	1
2.	Distance formula	1
3.	section formula	1
4.	Change of axes	1
5.	Equation of co-ordinate axes, Equation of lines parallel to axes	1
6.	Slope intercept form of equation of line, Slope-point form of equation of line	1
7.	Two point form of equation of line, Intercept form of equation of line	1
8.	Normal form of equation of line, General form of equation of line	1
9.	Point of intersection of two st. lines	1
10.	Angles between two st. lines, Parallel lines, Perpendicular lines	1
11.	Angle of bisectors between two lines, Area of triangle and quadrilateral	1
12.	Circle: Equation of circle whose centre and radius is known, General equation of a circle	1
13.	Equation of circle passing through three given points	1
14.	Equation of circle whose diameters is line joining two points (x_1, y_1) and (x_2, y_2)	1
15.	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 $x^2 + y^2 = a^2$	1
16.	Functions, Evaluation of Functions, Operations with functions	2
17.	Limits, continuity, $\lim_{x \to a} \frac{X^n - a^n}{x - a}$ $\lim_{x \to 0} \frac{\sin x}{x}$, $\lim_{n \to \infty} [1+1]^n$	4
18.	Problem on continuty	1
19.	Differentiation of x^n, e^x, sinx & cos x from first principle	2
20.	Differentiation of sum and product of functions	1
21.	Quotient Rule, function of functions	2
22.	Differentiation of function of functions, Parametric Equation	2
23.	Logarithmic differentiation	1
24.	Differentiation of Inverse Trigonometric functions	1
25.	Successive differentiation, Maxima and minima	2
26.	Integration Formulae	1

27.	Integration by Substitution	2
28.	Integration by parts	2
29.	Definite Integration	1
30.	Area under Curves	2
31.	Matrices, Matrix Addition, equality of matrices, square matrix, identity, null matrix	2
32.	Substraction, Scalar Multiplication, Matrix Multiplication, Transpose of Matrix	2
33.	Determinats	1
34.	Inverse up to 3rd order	2

References

1. Krishi Ganita by Gokhroo and Jain
2. Differential Calculus by Gokhroo.
3. Integral Calculus by Gokhroo.

AGHR-111	**Agricultural Heritage (New Course)**	**1(1+0)***

Theory

Introduction of Indian agricultural heritage; Ancient agricultural practices, Relevance of heritage to present day agriculture; Past and present status of agriculture and farmers in society; Journey of Indian agriculture and its development from past to modern era; Plant production and protection through indigenous traditional knowledge; Crop voyage in India and world; Agriculture scope; Importance of agriculture and agricultural resources available in India; Crop significance and classifications; National agriculture setup in India; Current scenario of Indian agriculture; Indian agricultural concerns and future prospects.

Lecture Schedule: Agricultural Heritage (New Course)

Theory

S. No.	Topic to be covered	No. of Lectures
1.	Introduction of Indian agricultural heritage	1
2.	Ancient agricultural practices	1
3.	Relevance of heritage to present day agriculture	1
4.	Past and present status of agriculture and farmers in society	2
5.	Journey of Indian agriculture and its development from past to modern era	1
6.	Plant production and protection through indigenous traditional knowledge	2
7.	Crop voyage in India and world	1
8.	Agriculture scope; Importance of agriculture and agricultural resources available in India	1
9.	Crop significance and classifications	1
10.	Classification of crops-botanical, agronomic, seasonal	1
11.	Classification of crops based on life span, special purpose i.e. cover, green manure, catch, trap, cash, soiling	1
12.	National agriculture setup in India	1
13.	Current scenario of Indian agriculture	1

14.	Indial agricultural concerns and future prospects	1

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EXCOM-111	**Rural Sociology & Educational Psychology**	**2 (2+0)**

Theory:

Sociology and Rural sociology: Definition and scope, its significance in agriculture extension, Social Ecology: Definition, objectives, history, challenges and social ecology in Indian context, Rural society: Important characteristics, differences & Relationship between Rural and Urban societies., Social Groups: Meaning, Definition, Classification, Factors considered in formation and organization of groups. Social Stratification – Meaning, Definition, Functions, Forms of Social stratification. Culture concept - Culture, Customs, Folkways, Mores, Taboos, Rituals and Traditions - Meaning, Definition and their role in Agricultural Extension. Social Institution: Meaning, Definition, Major institutions in Rural society, Functions., Social Change & Development: Meaning, Definition, Nature of Social change and factors of social change. Social process- Meaning, Definition, types. Social Control- - Meaning, Definition, Need and Means of Social control.. Rural Leadership: concept and definition, types and roles of leaders in rural context; Methods of selection of leaders.

Educational psychology: Meaning & its importance in agriculture extension. Behavior: Cognitive, affective, psychomotor domain, Cognitive skills, Personality- Meaning, Definition, Types, Factors influencing the Personality and Role of Personality in Agricultural Extension., Motivation; Meaning , Definition, Importance in extension, Theories of Motivation, Intelligence- Meaning, Definition, Types, Factors affecting intelligence..Teaching Learning Process process- Meaning and Definition of Teaching, Learning, Learning experience and Learning situation, Elements of learning situation and its characteristics.Perception, Emotions.

Lecture Schedule: Rural Sociology & Educational Psychology

Theory

S. No.	**Topic to be covered**	**No. of Lectures**
1.	Sociology and Rural sociology: Defination and scope, its significance in agriculture extension	1
2.	Social Ecology: Definition, objectives, history, challenges and social ecology in Indian context	1
3.	Rural society: Important characteristics, differences & Relationship between Rural and Urban societies	1

4.	Social Groups: Meaning, Definition, Classification, Factors considered in formation and organization of groups	2
5.	Social Stratification – Meaning, Definition, Functions, Forms of Social stratification	2
6.	Culture concept - Culture, Customs, Folkways, Mores, Taboos, Rituals and Traditions - Meaning, Definition and their role in Agricultural Extension	2
7.	Social Institution: Meaning, Definition, Major institutions in Rural society, Functions.	2
8.	Social Change & Development: Meaning, Definition, Nature of Social change and factors of social change	2
9.	Social process- Meaning, Definition, types	2
10.	Social Control- - Meaning, Definition, Need and Means of Social control	2
11.	Rural Leadership: concept and definition, types and roles of leaders in rural context; Methods of selection of leaders	2
12.	Educational psychology: Meaning & its importance in agriculture extension	1
13.	Behavior: Cognitive, affective, psychomotor domain, Cognitive skills	2
14.	Personality- Meaning, Definition, Types, Factors influencing the Personality and Role of Personality in Agricultural Extension	2
15.	Motivation; Meaning , Definition, Importance in extension, Theories of Motivation	2
16.	Intelligence-Meaning, Definition, Types, Factors affecting intelligence	2
17.	Teaching Learning Process process- Meaning and Definition of Teaching, Learning, Learning experience and Learning situation, Elements of learning situation and its characteristics	3
18.	Perception, Emotions	1

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EXCOM-112	Human Value and Ethics 1(1+0)	1 (1+0)

Theory

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

Lecture Schedule: Human Values and Ethics

Theory

S. No.	Topic to be covered	No. of Lectures
1.	Values and Ethics-An Introduction. Goal and Mission of Life	1
2.	Vision of Life & Principles	2
3.	Self Exploration. Self Awareness. Self Satisfaction	1
4.	Decision Making	1
5.	Motivation	1
6.	Sensitivity. Success. Selfless Service	2
7.	Case Study of Ethical Lives	2
8.	Positive Spirit. Body, Mind and Soul	1
9.	Attachment and Detachment	2
10.	Spirituality Quotient	2
11.	Examination	1

References:

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

National Service Scheme Credit hours: 2(0+2)

Practical

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:

1. Introduction and basic components of NSS: Orientation
2. NSS programmes and activities
3. Understanding youth
4. Community mobilisation
5. Social harmony and national integration
6. Volunteerism and shramdan
7. Citizenship, constitution and human rights
8. Family and society
9. Importance and role of youth leadership
10. Life competencies
11. Youth development programmes
12. Health, hygiene and sanitation
13. Youth health, lifestyle, HIV AIDS and first aid
14. Youth and yoga
15. Vocational skill development
16. Issues related environment
17. Disaster management
18. Entrepreneurship development
19. Formulation of production oriented project
20. Documentation and data reporting
21. Resource mobilization
22. Additional life skills
23. 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
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 volunteer's awareness about health
- **NSS programmes and activities**

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

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

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

  Indian history and culture, role of youth in nation building, conflict resolution and peace-building
- **Volunteerism and shramdan**
- Indian tradition of volunteerism, its need, importance, motivation and constraints; shramdan as part ofvolunteerism
- **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

Semester 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

Semester 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
Course Title: National Service Scheme IV
Youth and crime

Sociological and psychological factors influencing youth crime, cyber crime, pear 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.

National Cadet Corps Credit hours: 2(0+2)

Semester I: National Cadet Corps I

- Aims, objectives, organization of NCC and NCC song. DG's cardinals of discipline.
- Drill- aim, general words of command, attention, stands at ease, stand easy and turning.
- Sizing, numbering, forming in three ranks, open and close order march and dressing.
- Saluting at the halt, getting on parade, dismissing and falling out.
- Marching, length of pace, and time of marching in quick/slow time and halt. Side pace, pace forward and to the rear.
- Turning on the march and wheeling. Saluting on the march.
- Marking time, forward march and halt.
- Changing step, formation of squad and squad drill.
- Command and control, organization, badges of rank, honours and awards
- Nation Building- cultural heritage, religions, traditions and customs of India.
- National integration.

Semester II: National Cadet Corps II

- Values and ethics, perception, communication, motivation, decision making, discipline and duties of good citizen.
- Leadership traits, types of leadership. Character/personality development.
- Civil defense organization, types of emergencies, fire fighting, protection,
- Maintenance of essential services, disaster management, aid during development projects.
- Basics of social service, weakersections of society andtheirneeds, NGO's andtheircontribution, contribution of youth towards social welfare and family planning.
- Structure and function of human body, diet and exercise, hygiene and sanitation.
- Preventable diseases including AIDS, safe blood donation, first aid, physical and mental health.
- Adventure activities
- Basic principles of ecology, environmental conservation, pollution and its control.
- Precaution and general behaviour of girl cadets, prevention of untoward incidents, vulnerable parts of the body, self defense.

Semester III: National Cadet Corps III

- Arms Drill- Attention, stand at ease, stand easy. Getting on parade. Dismissing and falling out. Ground/take up arms, examine arms.
- Shoulder from the order and vice-versa, present from the order and vice-versa.
- Saluting at the shoulder at the halt and on the march. Short/long trail from the order and vice- versa.
- Guard mounting, guard of honour, Platoon/Coy Drill.
- Characteristics of rifle (.22/.303/SLR), ammunition, fire power, stripping, assembling, care, cleaning and sight setting.
- Loading, cocking and unloading. The lying position and holding.
- Trigger control and firing a shot. Range Procedure and safety precautions. Aiming and alteration of sight.
- Theory of groups and snap shooting. Firing at moving targets. Miniature range firing.
- Characteristics of Carbine and LMG.
- Introduction to map, scales and conventional signs. Topographical forms and technical terms.

Semester IV: National Cadet Corps IV

- The grid system. Relief, contours and gradients. Cardinal points and finding north. Types of bearings and use of service protractor.
- Prismatic compass and its use. Setting a map, finding north and own position. Map to ground and ground to map.
- Knots and lashings, Camouflage and concealment, Explosives and IEDs.
- Field defenses obstacles, mines and mine lying. Bridging, waterman ship
- Field water supplies, tracks and their construction.
- Nuclear, Chemical and Biological Warfare (NCBW)
- Judging distance. Description of ground and indication of landmarks.
- Recognition and description of target. Observation and concealment. Field signals. Section formations.
- Fire control orders. Fire and movement. Movement with/without arms. Section battle drill.
- Types of communication, media, latest trends and developments.
-

Physical Education and Yoga Practices **Credit**

hours: 2(0+2) Semester I: PHED- I : Physical Education and Yoga

Practices

- Teaching of skills of Football – demonstration, practice of the skills, correction, involvement in game situation (For girls teaching of Tennikoit)
- Teaching of different skills of Football – demonstration, practice of the skills, correction,

involvement in game situation (For girls teaching of Tennikoit)

- Teaching of advance skills of Football – involvement of all the skills in game situation with teaching of rules of the game
- Teaching of skills of Basketball – demonstration, practice of the skills, correction of skills, involvement in game situation
- Teaching of skills of Basketball – demonstration, practice of the skills, involvement in game situation
- Teaching of skills of Basketball – involvement of all the skills in game situation with teaching of rule of the game
- Teaching of skills of Kabaddi – demonstration, practice of the skills, correction of skills, involvement in game situation
- Teaching of skills of Kabaddi – demonstration, practice of the skills, correction of skills, involvement in game situation
- Teaching of advance skills of Kabaddi – involvement of all the skills in game situation with teaching of rule of the game
- Teaching of skills of Ball Badminton – demonstration, practice of the skills, correction of skills, involvement in game situation

Semester II: PHED- II : Physical Education and Yoga Practices

1. Teaching of skills of Ball Badminton – involvement of all the skills in game situation with teaching of rule of the game
2. Teaching of some of Asanas – demonstration, practice, correction and practice
3. Teaching of some more of Asanas – demonstration, practice, correction and practice
4. Teaching of skills of Table Tennis – demonstration, practice of skills, correction and practice and involvement in game situation
5. Teaching of skills of Table Tennis – demonstration, practice of skills, correction and practice and involvement in game situation
6. Teaching of skills of Table Tennis – involvement of all the skills in game situation with teaching of rule of the game
7. Teaching – Meaning, Scope and importance of Physical Education
8. Teaching – Definition, Type of Tournaments
9. Teaching – Physical Fitness and Health Education
10. Construction and laying out of the track and field (*The girls will have Tennikoit and Throw Ball).

Semester III: PHED- III : 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.

Semester IV: PHED- IV : Physical Education and Yoga Practices

1. Teaching of different field events – demonstration practice of the skills and correction.
2. Teaching of different field events – demonstration practice of the skills and correction.
3. Teaching of different field events – demonstration practice of the skills and correction with competition among them.
4. Teaching of different asanas – demonstration practice and correction.
5. Teaching of different asanas – demonstration practice and correction.
6. Teaching of different asanas – demonstration practice and correction.
7. Teaching of different asanas – demonstration practice and correction.
8. Teaching of weight training – demonstration practice and correction.
9. Teaching of circuit training – demonstration practice and correction.
10. 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 – II

Semester wise course distribution of B.Sc. (Hon's) Agriculture

Semester – II			
S.No.	**Course Code**	**Course Title**	**Credit Hrs**
1.	GPB-121	Fundamentals of Genetics	3(2+1)
2.	SSAC-121	Agricultural Microbiology	2(1+1)
3.	AGENGG-121	Introductory Soil and Water Conservation Engineering	2(1+1)
4.	CPHYS-121	Fundamentals of Crop Physiology	2(1+1)
5.	AGECON-121	Fundamentals of Agricultural Economics	2(2+0)
6.	PPATH-121	Fundamentals of Plant Pathology	3(2+1)
7.	ENTO-121	Fundamentals of Entomology	3(2+1)
8.	EXCOM-121	Fundamentals of Agricultural Extension Education	3(2+1)
9.	EXCOM-122	Communication Skills and Personality Development	2(1+1)
10.	AGRON-121	Introductory Agro-meteorology & Climate Change	2(1+1)
11.	NSS/NCC/PEYP	NSS/NCC/Physical Education & Yoga Practices**	To be continued
		Total	**24(15+09)**

PLANT BREEDING & GENETICS

GPB-121	**Fundamentals of Genetics**	**3(2+1)**

Theory

Pre and Post Mendelian concepts of heredity, Mendelian principles of heredity, Cell division – mitosis, meiosis, Probability and Chi-square. Dominance relationships, gene interaction. 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, Numerical changes in chromosome, Proof for DNA as genetic material and Genetic code, Mutation, classification, Methods of inducing mutation & CIB technique, mutagenic agents and induction of mutation. Qualitative & Quantitative traits, Polygenes and continuous variations, multiple factor hypothesis, Epistatic interactions with examples. Cytoplasmic inheritance. Genetic disorders Nature, structure & replication of genetic material. 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. stains and fixatives, 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 structure.

Lecture Schedule: Fundamentals of Genetics

Theory

S. No.	Topic to be covered	No. of Lectures
1.	Pre and Post Mendelian concepts of heredity	1
2.	Mendelian principles of heredity	1
3.	Cell division – mitosis	1
4.	Cell division - meiosis	1
5.	Probability and Chi-square	1
6.	Dominance relationships, gene interaction	1
7.	Epistatic gene interactions with examples (Complementary, Supplementary, Duplicate gene interactions)	1
8.	Epistatic gene interactions with examples (masking, inhibitory, polymeric and additive gene interactions)	1
9.	pleiotropism and pseudoalleles, Multiple alleles and Blood group genetics	1
10.	Sex determination	1
11.	sex limited and sex influenced traits	1
12.	sex linkage	1
13.	Linkage and its estimation	1
14.	crossing over : Introduction & mechanisms	1
15.	chromosome mapping	1
16.	Structural changes in chromosome	1
17.	Numerical changes in chromosome	1
18.	Mutation: Introduction, Characteristics & Classification	1
19.	Mutagenic agents: Physical and chemical mutagens	1
20.	Introduction of mutation, Methods of including mutation & CIB technique	1
21.	Quantative & Quantitative traits, Polygenes and continuous variations	1
22.	Multiple factor hypothesis	1
23.	Cytoplasmic inheritance	1
24.	Genetics disorders	1
25.	Nature, structure and types of genetics material	1
26.	Proof for DNA as genetic material	1
27.	Replication of genetic material	1
28.	Genetic code & Protein synthesis	1
29.	Transcription mechanism of genetic material	1
30.	Translational mechanism of genetic material	1
31.	Gene concept: Gene structure and function	1
32.	Gene regulation, operon concept, Lac and Trp operons	1

Lecture Schedule: Fundamentals of Genetics

Practical

S. No.	Topic to be covered	No. of Lectures
1.	Study of microscope: Parts and types	1
2.	Study of cell structure	1
3.	Experiments on monohybrid, test cross and back cross	1
4.	Experiments on dihybrid, test cross and back cross	1
5.	Experiments on trihybrid, test cross and back cross	1
6.	Experiments on epistatic interactions including test cross and back cross	1
7.	Experiments on epistatic interactions including test cross and back cross	1
8.	Stains and their preparation	1
9.	Fixative and their preparation	1
10.	Practice on mitotic cell division	1
11.	Practice on meiotic cell division	1
12.	Experiments on probability	1
13.	Experiments on Chi-square test	1
14.	Determination of linkage and cross over analysis (through two point test cross and three point test cross data)	1
15.	Study on sex linked inheritance in Drosophila	1
16.	Study of models on DNA and RNA structure	1

References:

1. Gupta P.K. (2004) Cytology, Genetics and evolution. Rastogi Publications, Meerut.
2. Klug, W.W. and Cummings, M.R. (2005) Concepts of genetics Pearson Education
3. Singh, B.D. (2001). Kalyani Publishing House, New Delhi.
4. Strickberger, M.W. (2001) Genetics. Prentice Hall of india. Pvt. Ltd., New Delhi.

SSAC-121	Agricultural Microbiology (Course to be shared with Plant Pathology)	2(1+1)

Theory

Introduction to microbial world: Prokaryotic and eukaryotic microbes. Sterilization, disinfection, pasteurization and Koch's postulates. Bacteria: cell structure, growth, Gram positive and Gram negative bacteria, chemoautotrophy and photoautotrophy. Bacterial genetics: Genetic recombination: transformation, conjugation and transduction, plasmids, transposon. Role of microbes in soil fertility and crop production: Carbon, Nitrogen, Phosphorus and Sulphur cycles. Biological nitrogen fixation: symbiotic, associative and asymbiotic. Azolla, blue green algae and mycorrhiza. Rhizosphere and phyllosphere. Microbes in human welfare: silage production, bio-fertilizers, bio-pesticides, bio-fuel production and biodegradation of agro-wastes. Germ Theory and biogas

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. Methods of isolation and purification of microbial cultures. Isolation of *Rhizobium, Azotobacter* andBGA. Staining and microscopic examination of microbes. Enumeration of microbial population in soil- bacteria, fungi and actinomycetes.

Lecture Schedule: Agricultural Microbiology (Course to be shared with Plant Pathology)

Theory

S. No.	Topic to be covered	No. of Lectures
1.	Introduction to microbial world: Prokaryotic and eukaryotic microbes	1
2.	Sterilization, disinfection, pasteurization and Koch's postulates	1
3.	Bacteria: cell structure, growth, Gram positive and Gram negative bacteria, chemoautotrophy and photoautotrophy	2
4.	Bacterial genetics: Genetic recombination: transformation, conjugation and transduction, plasmids, transposon	3
5.	Role of microbes in soil fertility and crop production: Carbon, Nitrogen, Phosphorus and Sulphur cycles	3
6.	Biological nitrogen fixation: symbiotic, associative and asymbiotic	2
7.	Azolla, blue green algae and mycorrhiza.Rhizosphere and phyllosphere	1
8.	Microbes in human welfare: silage production	1
9.	bio-fertilizers, bio-pesticides and bio-fuel production	1
10.	biodegradation of agro-wastes	1
11.	Germ Theory and biogas	1

Lecture Schedule: Agricultural Microbiology (Course to be shared with Plant Pathology)

Practical

S. No.	Topic to be covered	No. of Lectures
1.	Introduction to microbiology laboratory and its equipments	1
2.	Microscope: parts, principles of microscopy, resolving power and numerical aperture	2
3.	Methods of sterilization	1
4.	Nutritional media and their preparations	3
5.	Methods of isolation and purification of microbial cultures	3
6.	Isolation of *Rhizobium,Azotobacter* andBGA	2
7.	Staining and microscopic examination of microbes	2
8.	Enumeration of microbial population in soil- bacteria, fungi and actinomycetes	2

References:

1. Biswas, T.D. and Mukherjee, S.K. (1990) Text Book of Soil Sciences, Tata McGraw-Hill Publishing Company Limited, New Delhi.
2. Mukherjee, N. and Ghosh T. (1998) Agricultural Microbiology, Kalyani Publishers, New Delhi.
3. Pelczar, Jr. Michel J. Chan, E.C.S. and Krieg, Noel R. 1(997) Microbiology. Tata McGraw - Hill Edition, 1993. India.
4. Rangaswami, G. and Bagyaraj, D.J. (1993) Agricultural Microbiology. Prentice Hall of India Pvt. Limited, New Delhi.
5. Rao, N.S. (2000) Soil Microbiology. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

6. Vishunavat, K. and Kolte, S.J. (2005) Essentials of Phytopathological Techniques. Kalyani Publishers, New Delhi
7. Sharma, P.D. (2010) Microbiology. 3rd edition Rastogi Publishers, Meerut
8. Dube H.C. (2007) A Text Book of Fungi, Bacteria & Viruses. 3rd ed. Agrobios India, Jodhpur.
9. Agrios, G.N. (2005) Plant Pathology. 5th ed. Academic Press, New York.

AGENGG-121	Soil and Water Conservation Engineering	2(1+1)

Theory

Introduction to Soil and Water Conservation, causes of soil erosion. Definition and agents of soil erosion, water erosion: Forms of water erosion. Gully classification and control measures. Introduction to universal soil loss equation rational formula for runoff measurement. Introduction to contouring, strip cropping. Contour bund. Graded bund and bench terracing. Grassed water ways. Water harvesting and its techniques. Wind erosion - principle of wind erosion control and its control measures. Familiarization with centrifugal pumps, measurement of irrigation water, water conveyance system and familiarization with pressurized irrigation methods.

Practical

General status of soil conservation in India and Rajasthan.Calculation of erosion index.Estimation of soil loss. Measurement of soil loss.Preparation of contour maps.Design of contour bunds.Design of graded bunds. Problem on wind erosion. Numerical problems on friction head, velocity head, total head and horse power calculation of pumps. Measurement of irrigation water in the field by different methods and related numerical. Study of components of drip and sprinkler system. Study of watershed area.

Lecture Schedule: Introductory Soil and Water Conservation Engineering

Theory

S. No.	Topic to be covered	No. of Lectures
1.	Introduction to Soil and Water Conservation, causes of soil erosion	1
2.	Definition and agents of soil erosion, water erosion	1
3.	Forms of soil erosion-rain drop, sheet, rill and gully erosion: factor affecting soil erosion	1
4.	Gully classification and control measures	1
5.	Introduction to universal soil loss equation rational formula for runoff measurement	1
6.	Soil loss estimation by universal Soil Loss Equation	1
7.	Principles of erosion control: Introduction to contouring, strip cropping, Contour bund. Graded bund and bench terracing, Grassed water ways	2
8.	Water harvesting and its techniques	1
9.	Wind erosion-principle of wind erosion and its control measures	1
10.	Centrifugal pumps-volute and diffuser types; Principle of operation of centrifugal pumps	1

11.	Pump related terms-capacity, suction lifts, suction heads, discharge heads, frition head, pressure head, total head, velocity head, net positive suction head, maximum practical suction lift of pumps, water horsepower, shaft horse power, pump efficiency, brake horsepower	2
12.	Measurement of irrigation water-volume method, velocity-area methods, water meter, weirs-rectangular, cipolletti, 90° v-notch	2
13.	Drip irrigation methods-Adoptability, limitation, Components and layout	1
14.	Sprinkler irrigation method-adoptability, limitations, types, components and layout	1

Lecture Schedule: Introductory Soil and Water Conservation Engineering

Practical

S. No.	Topic to be covered	No. of Lectures
1.	General status of soil conservation in India and Rajasthan	1
2.	Calculation of erosion index	1
3.	Estimation of soil loss	2
4.	Preparation of contour maps	2
5.	Numericals on Problem on wind erosion	2
6.	Numerical problems on friction head, velocity head, total head and horse power calculation of pumps	2
7.	Measurement of irrigation water in the field by different methods and related numerical	2
8.	Study of components of drip irrigation system	1
9.	Study of components of Sprinkler irrigation system	1
10.	Visit to nearby watersheds	2

References:

1. Land and Water Management Engineering. 1982. Murthy V.V.N. Kalyani Pubhliers, New Delhi.
2. Irrigation: Theory and Practices.2012. Michael A.M. Vikas Publishing House Pvt. Ltd., New Delhi.
3. Principles of Agricultural. Engineering. Vol. II. 2012. Michael A.M. and T.P. Ojha. Jain Brothers, New Delhi.
4. Soil and Water Conservation Water Management. 2010. Mahnot, S.C., Singh P.K. and Chaplot, P.C. Apex Publication House, Udaipur.

CPHYS-121	**Fundamentals of Crop Physiology**	**2(1+1)**

Theory: Introduction to crop physiology and its importance in Agriculture. Plant cell: an Overview, Diffusion and osmosis, Absorption of water, transpiration and Stomatal Physiology. Mineral nutrition of Plants; functions and deficiency symptoms of nutrients and nutrient uptake mechanisms. Photosynthesis; Light reaction and Dark reactions:C_3, C_4 and CAM plants.

Respiration; Glycolysis, TCA cycle and electron transport chain. Physiology of flowering. Plant growth regulators; physiological roles and agricultural uses. Acsent of sape, introduction to stress physiology -drought, tempreture and salinity stress, growth and development

Practical: Preparation of solutions and buffers. Demonstration of the process of osmosis, plasmolysis, root pressure in plants. Measurement of transpiration rate using Ganongs potometer. Estimation of relative water content in plants. Visual symptoms of nutrient deficiency in plants. To study structure and distribution of stomata in leaf. Separation of photosynthetic pigments through paper chromatography. To demonstrate that O_2 is evolved during photosynthesis and light and CO_2 is essential for photosynthesis using Molls half leaf experiment. Measurement of photosynthetic CO_2 assimilation by Infra Red Gas Analyzer (IRGA. Demonstration of anaerobic respiration. Measurement of respiration quotient, plant growth by Arc auxanometer and growth analysis parameters.

Lecture Schedule: Fundamentals of Crop Physiology-Theory

S. No.	Topic to be covered	No. of Lectures
1.	Introduction to crop physiology and its importance in Agriculture	1
2.	Plant cell: an Overview	1
3.	Diffusion and osmosis, Absorption of water, transpiration and Stomatal Physiology	2
4.	Mineral nutrition of Plants; functions and deficiency symptoms of nutrients and nutrient uptake mechanisms	2
5.	Photosynthesis; Light reaction	1
6.	Dark reactions:C_3, C_4 and CAM plants	1
7.	Respiration; Glycolysis	1
8.	TCA cycle and electron transport chain	1
9.	Physiology of flowering	1
10.	Plant growth regulators; physiological roles and agricultural uses	2
11.	Acsent of sape, introduction to stress physiology -drought, tempreture and salinity stress, growth and development	1
12.	Physiological aspects of growth and development of major crops	1
13.	Growth analysis.Role of Physiological growth parameters in crop productivity	2

Lecture Schedule: Fundamentals of Crop Physiology-Practical

S. No.	Topic to be covered	No. of Lectures
1.	To prepare solutions and buffers	1
2.	To Demonstrate the process of osmosis	1
3.	To Demonstrate the process of plasmolysis	1
4.	To measure the root pressure in plants	1
5.	To measure the rate of transpiration using Ganongs potometer	1

6.	Estimation of relative water content in plants	1
7.	Visual symptoms of nutrient deficiency in plants	1
8.	To study structure and distribution of somata in leaf	1
9.	Separation of photosynthetic pigment through paper chromatography	1
10.	To demonstrate that O_2 is evolved during photosynthesis	1
11.	To demonstrate that light and CO_2 is essential for photosynthesis using Molls half leaf experiment	1
12.	Measurement of photosynthetic CO_2 assimilation by Infra Red Gas Analyzer (IRGA)	1
13.	To demonstrate anaerobic respiration	1
14.	Measurement of respiration quotient	1
15.	Measurement of plant growth by Arc auxanometer	1
16.	Measurement of growth analysis parameters	1

References:

1. S. N. Pandey and B. K. Sinha (1977) Plant Physiology. Vikas Publishing House Pvt. Ltd, New Delhi.
2. Kumar, A. and Purohit, S.S. (1998) Plant Physiology Fundamental and Application. Agrobotanica 4E 176 J.N. Vyas Nagar, Bikaner.
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4. Bala,M., Gupta, S. and Gupta, N.K. (2013) Practicals in Plant Physiology. Scientific publisher, Jodhpur.
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AGECON-121	**Fundamentals of Agricultural Economics**	**2(2+0)**

Theory

Economics: Meaning, scope and subject matter, definitions, activities, approaches to economic analysis; micro and macro economics, positive and normative analysis. Nature of economic theory; rationality assumption, concept of equilibrium. 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. *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, 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 markets. Price determination under perfect competition in short run. Distribution theory: meaning, factor market and pricing of factors of production. Concepts of rent, wage, interest and profit. *National income:* Meaning and importance, concepts of national income accounting and approaches to measurement. Population: Importance, Malthusian population theory, current policies and programmes on population control. Money meaning and

functions of money, general price index, inflation and deflation. Banking: types of banks, functions of commercial Bank. *Tax:* meaning, direct and indirect taxes, agricultural taxation, VAT & GST. *Economic systems:* meaning of capitalistic, socialistic and mixed economies.

Lecture Schedule: Fundamentals of Agricultural Economics-Theory

S. No.	Topic to be covered	No. of Lectures
	Economics	
1.	Meaning, scope and subject matter	1
2.	Definitions, activities, Approaches to economic analysis	1
3.	Micro and macro economics, positive and normative analysis	1
4.	Nature of economic theory; rationality assumption	1
5.	Concept of equilibrium	1
6.	Economic laws as generalization of human behavior	1
7.	Basic concepts: Goods and services, desire, want, demand, utility, cost and price, wealth, capital, income and welfare	1
	Agricultural economics:	
8.	Meaning, definition, characteristics of agriculture	1
9.	Importance and its role in economic development	1
10.	Agricultural planning and development in the country	1
	Demand:	
11.	Law of demand, demand schedule and demand curve	1
12.	Determinants	1
13.	Utility theory; law of diminishing marginal utility	1
14.	Equi-marginal utility principle	1
15.	Consumer's equilibrium and derivation of demand curve, concept of consumer surplus	1
16.	Elasticity of demand: concept and measurement of price elasticity	1
17.	Income elasticity and cross elasticity	1
	Production:	
18.	Process, creation of utility	1
19.	Factors of production, input output relationship	1
20.	Laws of returns	1
21.	Law of variable proportions and law of returns to scale	1
22.	Cost: Cost concepts, short run and long run cost curves	1
23.	Supply: Stock v/s supply, law of supply, supply schedule, supply curve	1
24.	Determinants of supply, elasticity of supply	1
	Market structure	
25.	Meaning and types of market	1
26.	Basic features of perfectly competitive and imperfect markets	1
27.	Price determination under perfect competition	1
28.	Short run and long run equilibrium of firm and industry	1
29.	Shut down and break even points	1
	Distribution theory	
30.	Meaning, factor market and pricing of factors of production	1
31.	Concepts of rent, wage, interest and profit	1
	National income:	

32.	Meaning and importance, circular flow	1
33.	Concepts of national income accounting and approaches to measurement, difficulties in measurement	1
34.	Good and services tax (GST) - meaning, definition, advantage and disadvantages and its implication on Indian economy.	1
	Tax:	
35.	Meaning, direct and indirect taxes, agricultural taxation	1

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PPATH-121	Fundamentals of Plant Pathology	3(2+1)

Theory

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

Fungi: general characters, somatic structures, outline of fungi classification, types of fungal thalli, fungal tissues, modifications of thallus, reproduction (asexual and sexual). Nomenclature, Binomial system of nomenclature, classification of fungi (key to Domain to Phylum).

Bacteria and mollicutes: general morphological characters, reproduction and classification of plant pathogenic bacteria. **Viruses:** nature, structure and transmission.

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

Role of enzymes and toxins in disease development. Defense mechanism in plants.

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.Staining and identification of plant pathogenic bacteria.Transmission of plant viruses.Identification of plant parasitic nematodes (*Heterodera, Meloidogyne* and *Anguina*).Sampling and extraction of nematodes from soil and plant material, preparation of nematode mounting.

Lecture Schedule: Fundamentals of Plant Pathology- **Theory**

S. No.	Topic to be covered	No. of Lectures
1.	Importance of plant diseases, scope and objectives of Plant Pathology.	1
2.	History of Plant Pathology with special reference to Indian work.	3
3.	Terms and concepts in Plant Pathology	3
4.	Pathogenesis.	2
5.	Causes and classification of plant diseases	1
6.	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.	3
7.	Diseases and symptoms due to abiotic causes	1
8.	Fungi**:** general characters, somatic structures, types of fungal thalli, fungal tissues, modifications of thallus, reproduction (asexual and sexual).	2
9.	Fungi**:** reproduction (asexual and sexual).	1
10.	Fungi**:** Nomenclature, Binomial system of nomenclature, Classification of fungi (key to Domain to Phylum).	3
11.	**Bacteria and mollicutes:** general morphological characters, reproduction and classification of plant pathogenic bacteria.	2
12.	classification of plant pathogenic bacteria	2
13.	**Viruses:** nature, structure and transmission	2
14.	**Nematodes:** General morphology, outline of classification	2
15.	**Nematodes:** symptoms and nature of damage caused by plant nematodes (*Heterodera, Meloidogyne* and *Anguina*)	2
16.	Role of enzymes and toxins in disease development	1
17.	Defense mechanism in plants	1
18.	outline of fungi classification	1

Lecture Schedule: Fundamentals of Plant Pathology- **Practical**

S. No.	Topic to be covered	No. of Lectures
1.	Acquaintance with various laboratory equipments and microscopy	2
2.	Preparation of media and isolation	2
3.	Koch's postulates	1
4.	General study of different structures of fungi	1
5.	Study of symptoms of various plant diseases	2
6.	Staining and identification of plant pathogenic bacteria	2
7.	Transmission of plant viruses	2
8.	Identification of plant parasitic nematodes (*Heterodera, Meloidogyne* and	2

	Anguina)	
9.	Sampling and extraction of nematodes from soil and plant material, preparation of nematode mounting	2

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ENTO-121	Fundamentals of Entomology	3(2+1)

Theory

Part - I- History of Entomology in India. Major points related to dominance of Insecta in Animal kingdom. Classification of phylum Arthropoda upto classes. 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. Major sensory organs like simple and compound eyes, chemoreceptor. Metamorphosis 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.

Part-II-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, Gryllidae; Dictyoptera: Mantidae, Blattidae; Odonata; Isoptera: Termitidae; Thysanoptera: Thripidae; Hemiptera: Pentatomidae, Coreidae, Pyrrhocoridae, Lygaeidae, Cicadellidae, Delphacidae, Aphididae, Coccidae, Lophophidae, Aleurodidae, Pseudococcidae; Neuroptera: Chrysopidae; Lepidoptera: Pieridae, Papiloinidae, Noctuidae, Sphingidae, Pyralidae, Gelechiidae, Arctiidae, Bombycidae; Coleoptera: Coccinellidae, Gelerucidae, Cerambycidae, Curculionidae, Bruchidae, Melonthidae; Hymenoptera: Tenthridinidae, Apidae. Trichogrammatidae, lchneumonidae, Braconidae, Chalcididae; Diptera: Cecidomyiidae, Tachinidae, Agromyziidae, Culicidae, Muscidae, Tephritidae. Saturnidae family of order lapidopetra

Practical

Methods of collection and preservation of insects including immature stages; External features of Grasshopper/Cockroach; 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 nervus system; Study of characters of orders Orthoptera, Dictyoptera, Odonata, Isoptera, Thysanoptera, Hemiptera, Lepidoptera, Neuroptera, Coleoptera, Hymenoptera, Diptera and their families of agricultural importance.

Lecture Schedule: Fundamentals of Entomology-**Theory**

S. No.	Topic to be covered	No. of Lectures
1.	History of Entomology in India	1
2.	Major points related to dominance of Insecta in Animal kingdom	1
3.	Classification of phylum Arthropoda upto classes	1
4.	Structure and functions of insect cuticle and molting	1
5.	Morphology of grasshopper : Body segmentation.Structure of Head, thorax and abdomen	2
6.	Structure and modifications of insect antennae	1
7.	Structure and modifications of insect mouth parts	3
8.	Structure and modifications of insect legs	1
9.	Wing venation, modifications and wing coupling apparatus	1
10.	Structure of genital organs and sensory organs (Simple and compound eyes, chemoreceptor)	2
11.	Metamorphosis in insects.Types of larvae and pupae	1
12.	Structure and functions of digestive system	1

13.	Structure and functions of circulatory, excretory system	2
14.	Structure and functions of respiratory system	1
15.	Structure and functions of nervous system	1
16.	Structure and functions of secretary (endocrine) system	1
17.	Structure and functions of reproductive system, in insects.Types of reproduction in insects	2
18.	**Taxonomy –**importance, history and development and binomial nomenclature. Definitions of Biotype, Sub-species, Species, Genus, Family and Order	2
19.	Orthoptera: Acrididae, Gryllidae; Dictyoptera: Mantidae, Blattidae; Odonata; Isoptera: Termitidae; Thysanoptera: Thripidae	2
20.	Hemiptera: Pentatomidae, Coreidae, Pyrrhocoridae, Lygaeidae, Cicadellidae, Delphacidae, Aphididae, Coccidae, Lophophidae, Aleurodidae, Pseudococcidae	1
21.	Lepidoptera: Pieridae, Papiloinidae, Noctuidae, Sphingidae, Pyralidae, Gelechiidae, Arctiidae, Bombycidae	1
22.	Coleoptera: Coccinellidae, Gelerucidae, Cerambycidae, Curculionidae, Bruchidae, Melonthidae	1
23.	Hymenoptera: Tenthridinidae, Apidae. Trichogrammatidae, lchneumonidae, Braconidae, Chalcididae	1
24.	Diptera: Cecidomyiidae, Tachinidae, Agromyziidae, Culicidae, Muscidae, Tephritidae, Neuroptera: Chrysopidae	1
25.	Saturnidae family of order lapidopetra	1

Lecture Schedule: Fundamentals of Entomology-**Practical**

S. No.	**Topic to be covered**	**No. of Lectures**
1.	Methods of collection and preservation of insects including immature stages	1
2.	External features of Grasshopper/Cockroach	1
3.	Types of insect antennae, mouthparts and legs	4
4.	Wing venation, types of wings and wing coupling apparatus	1
5.	Dissection of digestive system in insects (Grasshopper/ Cockroach)	1
6.	Dissection of nervus system	1
7.	Dissection of male and female reproductive systems in insects (Grasshopper/ Cockroach)	1
8.	Study of characters of orders Orthoptera, Dictyoptera with their families	1
9.	Study of characters of orders Odonata, Isoptera, Thysanoptera with their families	1
10.	Study of characters of orders Hemiptera with its families	1
11.	Study of characters of orders Lepidoptera with its families	1
12.	Study of characters of orders Coleoptera with its families	1
13.	Study of characters of orders Diptera with its families	1
14.	Study of characters of orders Hymenoptera and Neuroptera with their families	1

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EXCOM-121	Fundamentals of Agricultural Extension Education	3(2+1)

Theory:

Education: Meaning, definition & Types; Extension Education- meaning, definition, scope and process; objectives and principles of Extension Education; Extension Programme planning- Meaning, Process, Principles and Steps in Programme Development.

Extension systems in India: Extension efforts in Pre-independence era (Sriniketan, Marthandam, Firka Development Scheme, Gurgaon Experiment, etc.). 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, NARP, ATIC, RKVY, Pradhan Mantri Fasal Bima Yojana, Soil Health Card, NRLM etc.)

New trends in agriculture extension: privatization extension, cyber extension/ e-extension, market-led extension, farmer-led extension, expert systems, etc.. Rural Development: Concept, meaning, definition; various rural development programmes launched by Govt. of India. T & V System, SGSY, ICDS, IRDP, NHM, MNREGA, Rajiv Ganghi Scheme for empowerment of Adolesenct girls / Boys, Gramin Bhandaran Yojana, Pradhan Mantri Adarsh Gram yojana, Pradhan Mantri Kaushal Vikas yojana,

Community Development-meaning, definition, concept & principles, Philosophy of C.D, Panchayati Raj System.Extension administration: meaning and concept, principles and functions. Monitoring and evaluation: concept and definition, monitoring and evaluation of extension programmes; Transfer of technology: concept and models, capacity building of extension personnel; Training: Types, planning a training Programme.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; preparation and use of AV aids, preparation of extension literature – leaflet, booklet, folder, pamphlet news stories and success stories; A visit to village to understand the problems being encountered by the villagers/ farmers; to study organization and functioning of 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.

Lecture Schedule: Fundamentals of Agricultural Extension Education

Theory

S. No.	Topic to be covered	No. of Lectures
1.	Education: Meaning, definition & Types	1
2.	Extension Education- meaning, definition, scope and process; objectives and principles of Extension Education	3
3.	Extension Programme planning- Meaning, Process, Principles and Steps in Programme Development	2
4.	Extension systems in India: Extension efforts in Pre-independence era	3

	(Sriniketan, Marthandam, Firka Development Scheme, Gurgaon Experiment, etc.)	
5.	Post-independence era (Etawah Pilot Project, Nilokheri Experiment, etc.)	2
6.	Various extension/ agriculture development programmes launched by ICAR/ Govt. of India (IADP, IAAP, HYVP, KVK, IVLP, ORP, ND,NATP, NAIP, NARP, ATIC,RKVY, Pradhan Mantri Fasal Bima Yojana, Soil Health Card, NRLM etc.)	6
7.	New trends in agriculture extension: privatization extension, cyber extension/ e-extension, market-led extension, farmer-led extension, expert systems, etc	3
8.	Rural Development: Concept, meaning, definition; various rural development programmes launched by Govt. of India. T & V System,SGSY, ICDS, IRDP, NHM,MNREGA, Rajiv Ganghi Scheme for empowerment of Adolesenct girls / Boys, Gramin Bhandaran Yojana, Pradhan Mantri Adarsh Gram yojana, Pradhan Mantri Kaushal Vikas yojana	5
9.	Community Development-meaning, definition, concept & principles, Philosophy of C.D	1
10.	Panchayati Raj System	1
11.	Extension administration: meaning and concept, principles and functions	1
12.	Monitoring and evaluation: concept and definition, monitoring and evaluation of extension programmes	1
13.	Transfer of technology: concept and models, capacity building of extension personnel	1
14.	Training: Types , planning a training Programme	1
15.	Diffusion and adoption of innovation: concept and meaning, process and stages of adoption, adopter categories.	1

Lecture Schedule: Fundamentals of Agricultural Extension Education

Practical

S. No.	Topic to be covered	No. of Lectures
1.	To get acquainted with university extension system	1
2.	Group discussion- exercise	1
3.	preparation and use of AV aids	4
4.	preparation of extension literature – leaflet, booklet, folder, pamphlet news stories and success stories	4
5.	A visit to village to understand the problems being encountered by the villagers/ farmers	1
6.	to study organization and functioning of development departments at district level	1
7.	visit to NGO and learning from their experience in rural development	1
8.	understanding PRA techniques and their application in village development planning	2
9.	Exposure to mass media	1

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EXCOM-122	**Communication Skills and PersonalityDevelopment**	**2(1+1)**

Theory

Communication: meaning and definition; Principles and Functions of Communication, models and barriers to communication. Communication Skills: Structural and functional grammar; meaning and process of communication, verbal and nonverbal communication; listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures. Reading and comprehension of general and technical articles, precise writing, summarizing, abstracting; individual and group presentations, impromptu presentation, public speaking; Group discussion. Organizing seminars and conferences. Soft Skills.Extension teaching methods: meaning, classification, individual, group and mass contact methods.ICT Applications in TOT (New and Social Media), media mix strategies;

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. Handling and use of audio visual equipments and digital camera and LCD projector; Group discussion- exercise; Presentation skills exercise; micro teaching exercise; Script writing, writing for print and electronic media, developing script for radio and television. Visit to community radio.

Lecture Schedule: Communication Skills and PersonalityDevelopment

Theory

S. No.	Topic to be covered	No. of Lectures
1.	Communication:meaning and definition; Principles and Functions of Communication, models and barriers to communication	2
2.	Communication Skills: Structural and functional grammar; meaning and process of communication, verbal and nonverbal communication	1
3.	listening and note taking	1
4.	writing skills, oral presentation skills	1
5.	field diary and lab record; indexing, footnote and bibliographic procedures	1
6.	Reading and comprehension of general and technical articles, precise writing, summarizing, abstracting	2
7.	individual and group presentations, impromptu presentation, public speaking	2
8.	Group discussion. Organizing seminars and conferences	2
9.	Soft Skills	1
10.	Extension teaching methods: meaning, classification, individual, group and mass contact methods	2
11.	ICT Applications in TOT (New and Social Media), media mix strategies	1

Lecture Schedule: Communication Skills and Personality Development

Practical

S. No.	Topic to be covered	No. of Lectures
1.	Listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures	3
2.	Reading and comprehension of general and technical articles	1
3.	precise writing, summarizing, abstracting; individual and group presentations	2
4.	Handling and use of audio visual equipments and digital camera and LCD projector	4
5.	Group discussion- exercise	1
6.	Presentation skills exercise	1
7.	micro teaching exercise	1
8.	Script writing, writing for print and electronic media, developing script for radio and television	2
9.	Visit to community radio	1

References-

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AGRON-121	**Introduction Agrometeology & Climate Change**	**2(1+1)**

Theory

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

Practical

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

Lecture Schedule: Introduction Agrometeology & Climate change

Theory

S. No.	Topic to be covered	No. of Lectures
1.	Meaning and Scope of agricultural meteorology	1
2.	Earths atmosphere- its composition, extent and structure	1
3.	Atmospheric weather variables; Atmospheric pressure, its variation with height	1
4.	Wind, types of wind, daily and seasonal variation of wind speed	1
5.	cyclone, anticyclone, land breeze and sea breeze	1
6.	Nature and properties of solar radiation, solar constant, depletion of solar radiation	1
7.	short wave, longwave and thermal radiation, net radiation, albedo	1
8.	Atmospheric temperature, temperature inversion, lapse rate, daily and seasonal variations of temperature	1
9.	Energy balance of earth; Atmospheric humidity, concept of saturation, vapor pressure	1
10.	process of condensation, formation of dew, fog, mist, frost, cloud	1
11.	process of precipitation, types of precipitation such as rain, snow, sleet, and hail	1
12.	Cloud formation and classification; Artificial rainmaking. Monsoon-mechanism and importance in Indian agriculture	1
13.	Weather hazards - drought, floods, frost, tropical cyclones and extreme weather conditions such as heat-wave and cold-wave	1
14.	Agriculture and weather relations; Modifications of crop microclimate, climatic normals for crop and livestock production	1
15.	Weather forecasting- types of weather forecast and their uses	1
16.	Climate change, climatic variability, global warming, causes of climate change and its impact on regional and national Agriculture	1

Lecture Schedule: Introduction Agrometeology & Climate change

Practical

S. No.	Topic to be covered	No. of Lectures
1.	Visit of Agrometeorological Observatory, site selection of observatory, exposure of instruments and weather data recording	2
2.	Measurement of total, shortwave and longwave radiation, and its estimation using Planck's intensity law	2
3.	Measurement of albedo and sunshine duration, computation of Radiation Intensity using BSS	2
4.	Measurement of maximum and minimum air temperatures, its tabulation, trend and variation analysis	1
5.	Measurement of soil temperature and computation of soil heat flux	1
6.	Determination of vapor pressure and relative humidity	1
7.	Determination of dew point temperature	1

8.	Measurement of atmospheric pressure and analysis of atmospheric conditions	1
9.	Measurement of wind speed and wind direction, preparation of windrose	1
10.	Measurement, tabulation and analysis of rain	1
11.	Measurement of open pan evaporation and evapotranspiration	1
12.	Computation of PET and AET	2

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1.	NSS/NCC/PEYP	NSS/NCC/Physical Education & Yoga Practices**	To be continued

SEMESTER – III

Semester wise course distribution of B.Sc. (Hon's) Agriculture

Semester – III			
1.	AGRON-211	Crop Production Technology – I (*Kharif* Crops)	3(2+1)
2.	GPB-211	Fundamentals of Plant Breeding	3(2+1)
3.	AGECON-211	Agricultural Finance and Cooperation	3(2+1)
4.	AGRINFO-211	Agri- Informatics	2(1+1)
5.	AGENGG-211	Farm Machinery and Power	2(1+1)
6.	HORT-211	Production Technology for Vegetables and Spices	2(1+1)
7.	ESDM-211	Environmental Studies and Disaster Management	3(2+1)
8.	STAT-211	Statistical Methods	2(1+1)
9.	ANISC-211	Livestock and Poultry Management	4(3+1)

10.	NSS	NSS**	To be continued
		Total	**24(16+08)**
AGRINFO-211 is to be revised by adding 25% content of ICT with equal deletion from the existing contents of the existing course. Action – HOH , Department of Statistics, Mathematics & computer Science			

AGRON-211	**Crop Production Technology – I (*Kharif* crops)**	**3(2+1)**

Theory

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Kharif* crops. Cereals – rice, maize, sorghum, pearl millet and finger millet, pulses- pigeonpea, mungbean and urdbean; oilseeds- groundnut, soybean and **sesame**; fibre crops- cotton & Jute; forage crops-sorghum, cowpea, cluster bean and napier.

Practical

Rice nursery preparation, transplanting of Rice, sowing of soybean, pigeonpea and mungbean. maize, groundnut, cotton and urdbean, effect of seed size on germination and seedling vigour of *kharif* season crops, effect of sowing depth on germination of kharif crops, identification of weeds in *kharif* season crops, top dressing and foliar feeding of nutrients, study of yield contributing characters and yield calculation of *kharif* season crops, study of crop varieties and important agronomic experiments at experimental farm. study of forage experiments, morphological description of *kharif* season crops, visit to research centres of related crops.

Lecture Schedule: Crop Production Technology – I (*Kharif* crops)

Theory

S. No.	Topic to be covered	No. of Lectures
1.	Pearl millet-importance, origin, distribution, production, soil and climatic requirement (grain & forage)	1
2.	Pearl millet-improved varieties, (grain and forage) seed and sowing, intercultural operation/weed management, mid-season corrections, intercropping and fertilizer management (grain & forage)	1
3.	Pearl millet-water management, plant pretection measures, harvesting, yield and cutting management in forage	1

4.	Maize-importance, origin, distribution, production, soil and climatic requirement, improved varieties, seed and sowing	1
5.	Maize-intercultural operations/weed management, fertilizer and water management, plant protection measures, harvesting and yield.	1
6.	Sorghum-Importance, origin, distribution, production, soil and climatic requirement and improved varieties for grain and forage.	1
7.	Sorghum- Seed and sowing, intercultural operations/weed management , fertilizer, and water management for grain and forage	1
8.	Sorghum-plant protection measures, harvesting, yield and cutting management in forage	1
9.	Rice-importance, origin, distribution, production, soil and climatic requirement	1
10.	Rice-improved varirties, nuresy raising, seed and sowing, intercultural operations/weed management, fertilizer and water management	1
11.	Rice-plant protection measures, harvesting, processing and yield	1
12.	Groundnut-importance of oilseed and groundnut, origin, distribution, production, soil and climatic requirements	1
13.	Groundnut-growth habits, improved varieties, seed and sowing pegging	1
14.	Ground-intercultural operations/weed management, ferlizer and water management, plant protection measures, harvesting shelling and yield	1
15.	Soybean-importance, origin, distribution, production, soil and climatic requirement, improved varieties, seed and sowing	1
16.	Soybean-fertilizer, water and weed management, plant protection measures, harvesting and yield	1
17.	Sesame- importance, origin, distribution, production, soil and climatic requirement, improved varieties, seed and sowing	1
18.	Sesame-Soybean-fertilizer, water and weed management, plant protection measures, harvesting and yield	1
19.	Pigeonpea-importance of pulses and pigeonpea, origin, distribution, soil and climatic requirement, improved varieties	1
20.	Pigeonpea-Seed and sowing, intercultural operations/weed management fertilizer and water management, plant protection measures, harvesting and yield	1
21.	Cotton-importance, origin, distribution, production, soil and climatic requirements types of cotton, improved varieties	1
22.	Cotton-Seed and sowing, intercultural operations weed management, fertilizer and water management	1
23.	Cotton-Plant protection measures, harvesting, quality and yield	1
24.	Clusterbean-Package of practices	1
25.	Sesame-Package of practices	1
26.	Castor-Package of practices	1
27.	Mothbean-Package of practices	1
28.	Urdbean-Package of practices	1
29.	Mungbean-Package of practices	1
30.	Cowpea-Package of practices	1
33.	Napier-Package of practices	1
34.	Minor millets-Package of practices	1
35.	Sunhemp-Package of practices	1
36.	Acquaintance about panicum, Lasiuras and Cenchrus	1

Lecture Schedule: Crop Production Technology – I (*Kharif* crops)

Practical

S. No.	Topic to be covered	No. of Lectures
1.	Identification of seeds, crops and other inputs of Kharif season	1

2.	Sowing methods of different kharif crops	1
3.	Seed bed preparation of kind crops including rice nursery and transplanting	1
4.	Working out seed rate, real value, seed size, depth and germination related numerical	1
5.	Seed treatment and preparation of seed materials for sowing	1
6.	Preparation of seed material for planting of grasses	1
7.	Fertilizer application in crops, including top dressing and foliar feeding	1
8.	Identification of weeds in kharif season crops	1
9.	Morphological description of kharif season crops	1
10.	Irrigation operation in various crops	1
11.	Judging physiological maturity in standing, crops	1
12.	Cotton seed treatment	1
13.	Effect of seed size on germination and standing vigour	1
14.	Yield attributes and calculation on theoretical yield and harvest index	1
15.	Study of crop varities and important agronomic and forage experiments at farm	1
16.	Visit of experiments at farm/research centres of related crops	1
17.	**urdbean**	1

GPB-211	**Fundamentals of Plant Breeding**	**3(2+1)**

Theory

Historical development, concept, nature and role of plant breeding, objectives of plant breeding, major achievements and future prospects; Genetics in relation to plant breeding, modes of reproduction and pollination, apomixes, self – incompatibility and male sterility- genetic consequences, cultivar options. Domestication, Acclimatization, introduction; Centre of origin/diversity. Component of Genetic variation; Heritability and genetic advance; Genetic basis and breeding methods in self- pollinated crops- mass and pure line selection, hybridization techniques and handling of segregating population; Multiline concept.

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

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

Practical

Plant Breeder's kit, Study of germplasm of various crops. Study of floral structure of self pollinated and cross pollinated crops. Emasculation and hybridization techniques in self & cross pollinated crops.

Consequences of inbreeding on genetic structure of resulting populations. Study of male sterility system. Handling of segregating populations. Methods of calculating mean, range, variance, standard deviation, heritability.

Designs used in plant breeding experiment, analysis of Randomized Block Design and components of genetic variance. To work out the mode of pollination in a given crop and extent of natural out crossing. Prediction of performance of double cross hybrids.

Lecture Schedule: Fundamentals of Plant Breeding

Theory

S. No.	Topic to be covered	No. of Lectures
1.	Plant breeding: concept, nature, objectives and role of plant breeding	1
2.	Historical development of plant breeding	1
3.	Major achievements and future prospects	1
4.	Genetics in relation to plant breeding	1
5.	Modes of reproduction and pollination, apomixes	1
6.	Self – incompatibility	1
7.	Male sterility- genetic consequences	1
8.	Domestication, Acclimatization, introduction, Centre of origin/diversity	1
9.	Component of Genetic variation; Heritability and genetic advance	1
10.	Genetic basis of self- pollinated crops and pure line theory	1
11.	Breeding methods in self- pollinated crops- mass and pure line selection	1
12.	Hybridization techniques	
13.	Handling of segregating population (pedigree, bulk and back cross method)	1
14.	Multiline concept	1
15.	Concepts of population genetics and Hardy-Weinberg Law	1
16.	Genetic basis and methods of breeding cross pollinated crops	1
17.	Population improvement and modes of selection	1
18.	Heterosis and inbreeding depression	1
19.	Development of inbred lines and hybrids	1
20.	Composite and synthetic varieties	1
21.	Breeding methods in asexually propagated crops	1
22.	Clonal selection and hybridization	1
23.	Wide hybridization and pre-breeding	1
24.	Polyploidy in relation to plant breeding	1
25.	Mutation breeding- methods and uses	1
26.	Breeding for important biotic and abiotic stresses	1
27.	Breeding for important abiotic stresses	1
28.	Biotechnological tools-DNA markers	1
29.	Marker assisted selection	1
30.	Participatory plant breeding	1
31.	Intellectual Property Rights and Patenting	1
32.	Plant Breeders and & Farmer's Rights	1

Lecture Schedule: Fundamentals of Plant Breeding
Practical

S. No.	Topic to be covered	No. of Lectures
1.	Plant Breeder's kit	1
2.	Study of germplasm of various crops	1
3.	Study of floral structure of self pollinated crops	1
4.	Study of floral structure of cross pollinated crops	1
5.	Emasculation and hybridization techniques in self pollinated crops I	1
6.	Emasculation and hybridization techniques in self pollinated crops II	1
7.	Emasculation and hybridization techniques in self & cross pollinated crops	1
8.	Emasculation and hybridization techniques in self & cross pollinated crops	1
9.	Consequences of inbreeding on genetic structure of resulting populations	1
10.	Study of male sterility system	1
11.	Handling of segregating populations	1
12.	Methods of calculating mean, range, variance, standard deviation, heritability	1
13.	Designs used in plant breeding experiment	1
14.	Analysis of Randomized Block Design and components of genetic variance	1
15.	To work out the mode of pollination in a given crop and extent of natural out crossing	1
16.	Prediction of performance of double cross hybrids	1

AGECON-211	Agricultural Finance and Co-Operation	3(2+1)

Theory

Agricultural Finance- meaning, scope and significance, credit needs and its role in Indian agriculture. Agricultural credit: meaning, definition, need, classification. Credit analysis: 4 R's, and 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. 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. Preparation and analysis of financial statements – Balance Sheet and Income Statement. Basic guidelines for preparation of project reports

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

Practicals

Optimum allocation of limited amount of capital among different enterprise. Analysis of progress and performance of cooperatives using published data. Analysis of progress and performance of commercial banks and RRBs using published data. Visit to a commercial bank, cooperative bank and cooperative society to acquire firsthand knowledge of their management,

schemes and procedures. Estimation of credit requirement of farm business – A case study. Preparation and analysis of balance sheet – A case study. Preparation and analysis of income statement – A case study. Appraisal of a loan proposal–A case study. Techno-economic parameters for preparation of projects.

Lecture Schedule: Agricultural Finance and Co-Operation

Theory

S. No.	Topic to be covered	No. of Lectures
1.	Agricultural Finance- meaning, scope and significance, credit needs and its role in Indian agriculture	2
2.	Agricultural credit: meaning, definition, need, classification	2
3.	Credit analysis: 4 R's, and 3C's of credits	2
4.	Sources of agricultural finance: institutional and Non-institutional	2
5.	commercial banks, social control and nationalization of commercial banks, Micro financing including KCC	2
6.	Lead bank scheme, RRBs, Scale of finance and unit cost	2
7.	An introduction to higher financing institutions – RBI, NABARD, ADB, IMF	2
8.	World bank, Insurance and Credit Guarantee Corporation of India. Cost of credit	2
9.	Preparation and analysis of financial statements – Balance Sheet and Income Statement	2
10.	Basic guidelines for preparation of project reports	2
11.	Agricultural Cooperation – Meaning, brief history of cooperative development in India	2
12.	objectives, principles of cooperation, significance of cooperatives in Indian agriculture	2
13.	Agricultural Cooperation in India- credit, marketing, consumer and multi-purpose cooperatives	3
14.	farmers' service cooperative societies, processing cooperatives, farming cooperatives	3
15.	cooperative warehousing; role of NAF	2
16.	Status and succuess story of co-operatives in rajasthan.	1

Lecture Schedule: Agricultural Finance and Co-Operation

Practical

S. No.	Topic to be covered	No. of Lectures
1.	Optimum allocation of limited amount of capital among different enterprise	2
2.	Analysis of progress and performance of cooperatives using published data	1
3.	Analysis of progress and performance of commercial banks and RRBs using published data	2
4.	Visit to a commercial bank, cooperative bank and cooperative society to acquire firsthand knowledge of their management, schemes and procedures	2
5.	Estimation of credit requirement of farm business – A case study	2
6.	Preparation and analysis of balance sheet – A case study	2

7.	Preparation and analysis of income statement – A case study	2
8.	Appraisal of a loan proposal – A case study	1
9.	Techno-economic parameters for preparation of projects	2

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AGRINFO-211©	**Agricultural Informatics**	**2(1+1)**

Theory

Introduction to Computers, Anatomy of Computers, MemoryConcepts, Units of Memory, Operating System, types of operating system, Applications of MS-Office for creating, Editing and Formatting adocument, Data presentation, tabulation and graphcreation, statistical analysis, mathematical expressions, Database, concept sand types, creating database, uses of DBMS in Agriculture, Internetand World Wide Web (WWW), Concepts, components and creation of web, HTML, XML coding.

Computer Programming: General Concepts, Introduction to programming languages, concept sand standard input/output operations, Variables and Constants, Operators and Expressions, Flow of control, Inbuilt and User defined functions, programming techniques for agriculture.

e- Agriculture: concepts, design and development, application of innovative way stouse information and communication technologies (IT) in Agriculture. ICT for Data Collection, IT application for computation of water and nutrient requirement of crops etc., Computer-controlled devices (automated systems) for Agri-input management, Smart phone mobile appsin Agriculture for farm advises marketprice, post-harvest management etc; Introduction of DSS and its role in agriculture, Introduction and role of expert system in agriculture.

Practical

Study of Computer Components and accessories. Introduction of different operating system

ssuchas windows, Unix, Linux, Creating, Files & Folders, File Management. Use of MS-WORD and MS Powerpoint for creating, editing and presenting a scientific Document, Handling of Tabulardata, animation, video tools, arttool, graphics, template & designs. MS-EXCEL – Creating as pread sheet, 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 to HTML,

Use of smart phones and theirdevices inagro-advisory and dissemination of market information.

Lecture Schedule: Agricultural Informatics

Theory

S. No.	Topic to be covered	No. of Lectures
1.	Introduction to Computers, Anatomyof Computers	1
2.	MemoryConcepts, Units of Memory, Operating System, types of operating system	1
3.	Applications of MS-Office for creating, Editing and Formatting adocument, Data presentation	1
4.	tabulation and graphcreation, statistical analysis, mathematical expressions, Database, concept sand types	1
5.	creating database,uses of DBMS in Agriculture, Internetand World Wide Web (WWW), Concepts, components and creation of web, HTML, XML coding	1
6.	Computer Programming: General Concepts, Introduction to programming languages	1
7.	concept sand standard input/output operations	1
8.	Variables and Constants	1
9.	Operators and Expressions, Flow of control	1
10.	Inbuilt and User defined functions, programming techniques for agriculture	1
11.	e- Agriculture: concepts, design and development, application of innovative way stouse information and communication technologies (IT) in Agriculture	1
12.	ICT for Data Collection	1
13.	IT application for computation of water and nutrient requirement of crops etc.	1
14.	Computer-controlled devices (automated systems) for Agri-input management	1
15.	Smart phone mobile appsin Agriculture for farm advises marketprice, post-harvest management etc	1
16.	Introduction of DSS and its role in agriculture, Introduction and role of expert system in agriculture	1

Lecture Schedule: Agricultural Informatics

Practical

S. No.	Topic to be covered	No. of Lectures
1.	Study of Computer Components and accessories	
2.	Introduction of different operating system ssuchas windows, Unix, Linux, Creating, Files & Folders	1
3.	File Management. Use of MS-WORD	1
4.	MS Powerpoint for creating, editing and presenting a scientific Document	1
5.	Handling of Tabulardata, animation, video tools, arttool, graphics, template & designs	1
6.	MS-EXCEL – Creating as pread sheet, use of statistical tools	1
7.	writing expressions, creating graphs, analysis of scientific data,	1
8.	Handling macros	1
9.	MS-ACCESS: Creating Database	1
10.	preparing queries and reports, demonstration of Agri-information system	1

AGENGG-211	Farm Machinery and Power	2(1+1)

Theory

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 numerical, 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 farm machinaries, Estimation of field capacity and power requirements of implements Familiarization with Primary and Secondary Tillage implement, implement for intercultural operations, Familiarization with sowing and planting equipment, Familiarization with Plant Protection equipment, Familiarization with harvesting (reeper and combine) 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, Familiarization with different types of primary and secondary tillage implements: mould board plough, disc plough and disc harrow. Familiarization with seed metering mechanism and calibration of seed drill, Familiarization with different types of sprayers and dusters Familiarization with different inter-culture implement, Familiarization with harvesting and threshing equipments and machinery. Numerical on filed capacity of implements.

Lecture schedule: Theory

S.No.	Topic	No. of lectures
1.	Sources of farm power and its status in India and Rajasthan.	1
2.	I.C. engines, working principles of I C engines, comparison of two stroke and four stroke cycle engines	1
3.	Study of different components of I.C. engine, I.C. engine terminology and numerical.	2
4.	Air supply and exhaust system- Pre cleaners, oil soaked element type and oil bath type air cleaners; Fuel supply system	1
5.	Lubricating system- splash system and forced feed system; Cooling system-thermosiphon system and forced circulation system	1
6.	Transmission system- clutch, gear box, differential, final drive, P.T.O. shaft and hydraulic control system	1
7.	Tractor types, Estimation of operational cost of a tractor	1
8.	Cost analysis of tractor power and farm machinaries	1
9.	Familiarization with primary and secondary tillage implement	2
10.	Numerical on field capacity and power requirement of implements	2
11	Familiarization with implement for intercultural operations	1
12	Familiarization with sowing and planting equipment,	1
13	Familiarization with Plant Protection equipment	1
14	Familiarization with harvesting and threshing equipment	1
15	Familiarization with harvesting (reeper and combine) and threshing equipment.	1

Lecture schedule: Practical

S.No.	Topic	No. of lectures
1	Study of different components of I.C. engine.	1
2	To study air cleaning and fuel supply system of engine,	1
3	Study of cooling and lubricating system.	1
4	Study of transmission system-clutch, gear box, differential, final drive and P.T.O.	1
5	Familiarization with brake, steering, hydraulic control system of engine,	1
6	Tractor driving	2
7	Daily and periodic maintenance of tractor	1
8	Study of power tiller and garden tractor	1
9	Study of primary and secondary tillage implements: mould board plough, disc plough	1
10	Study of secondary tillage implements- cultivators, harrows and hoes	1
11	Study of seed metering mechanism and calibration of seed drill and numerical	2
12	Study of different types of sprayers and dusters	1
13	Study of reaper and thresher	2
14	Numerical on filed capacity of implements.	1

HORT-211	Production Technology for Vegetables and Spices	2(1+1)

Theory

Importance of vegetables & spices in human nutrition and national economy, kitchen gardening, brief about origin, area, climate, soil, improved varieties and cultivation practices such as time and methods of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting and yield, physiological disorders, of important vegetable and spices (Tomato, Brinjal, Chilli, Capsicum, Cucumber, Melons, Gourds, Pumpkin, French bean, Peas; Cole crops such as Cabbage, Cauliflower, Knol-khol; Bulb crops such as Onion, Garlic, cumin, coriander, fenugreek and fennel ; Root crops such as Carrot, Radish, Beetroot; Tuber crops such as Potato; Leafy vegetables such as Amaranth, Palak. Perennial vegetables (drumstick and pointed guards).

Practical (Production Technology for Vegetable and Spices)**:**

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

Lecture Schedule: Theory

S.No.	Topics	No.of lectures
1	Importance of vegetables & spices in human nutrition and national economy	1
2	Classification of Vegetables	1
3	Types of vegetable gardening with special reference to kitchen gardening	1
4	Brief about origin, area, climate, soil, improved varieties and cultivation practices such as time and methods of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting and yield, physiological disorders, of important vegetable and spices: Tomato	1
5	Brinjal, Chilli, Capsicum,	1
6	Cucumber, Melons, Gourds, Pumpkin,	1
7	French bean, Peas and Okra	1
8	Cole crops such as Cabbage, Knol-khol, Cauliflower	1
9	Bulb crops such as Onion , Garlic cumin, coriander, fenugreek and fennel	1
10	Root crops such as Carrot, Radish, Beet-root	1
11.	Tuber crops such as Potato and Sweet potato	1
12.	Leafy vegetables such as Amaranthus and Palak, Perennial vegetables (drumstick and pointed guards).	1
13.	Perennial vegetables such as drumstick and pointed gourd	1
14.	Seed spices: Coriander, cumin, fenugreek & fennel	1
15.	Black pepper and Cardamom	1
16.	Turmeric & Ginger	1

Lecture Schedule: Practical

S.No.	Topics	No.of lectures
1	Identification of Vegetables & Spice crops and their seeds	1
2	Nursery raising, Direct seed sowing and Transplanting	1
3	Study of morphological characters of different vegetables & spices Solanaceous crops (Tomato, Brinjal, Capsicum)	1
4	Cucurbitaceous crops	1
5	Bulb crops	1
6	Beans, Pea and Okra	1
7	Root crops	1
8	Tuber crop **(**Potato and Sweet Potato)	1
9	Leafy vegetables	1
10.	Seed spices	1
11.	Black pepper and Cardamom	1
12.	Ginger and Turmeric	1
13.	Fertilizers applications	1
14.	Harvesting & preparation for market	1
15.	Economics of vegetables and spices cultivation	2

ESDM-211	Environmental Studies and Disaster Management (to be shared with Soil Science & Agril. Chemistry)	3(2+1)

Theory

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 nonrenewable 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.

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-sports 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. 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. dies. 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.

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.

Lecture Schedule: Theory

S. N.	Topic	No. of lectures
1.	Multidisciplinary nature of environmental studies Definition, scope and importance.	1
2.	Natural Resources: Renewable and non-renewable resources, Natural resources and associated problems.	1
3.	a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.	1
4.	b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.	1
5.	c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.	1
6.	d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, waterlogging, salinity, case studies.	1
7.	e) Energy resources: Growing energy needs, renewable and nonrenewable energy sources, use of alternate energy sources. Case studies.	1
8.	f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.	1
9.	Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.	1
10.	Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem	1
11.	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)	2

12.	Biodiversity and its conservation: - Introduction, definition, genetic, species & ecosystem diversity and biogeographical classification of India.	1
13	Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.	1
14.	Biodiversity at global, National and local levels, India as a mega-diversity nation. Hot-sports of biodiversity.	1
15.	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.	1
16.	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.	1
17.	Solid Waste Management: causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution.	1
18.	Social Issues and the Environment: From Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management.	1
19.	Environmental ethics: Issues and possible solutions, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. dies.	1
20.	Wasteland reclamation. Consumerism and waste products.	1
21.	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.	1
22.	Human Population and the Environment: population growth, variation among nations, population explosion, Family Welfare Programme.	1
23.	Environment and human health: Human Rights, Value Education, HIV/AIDS. Women and Child Welfare. Role of Information Technology in Environment and human health.	1
24.	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.	3
25.	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.	2

26.	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.	3

Lecture Schedule: Practical

S. No.	Topic	No. of lectures
1.	Pollution case studies. Case Studies- Field work	1
2.	Visit to a local area to document environmental assets river/ forest/ grassland/ hill/ mountain,	5
3.	Visit to a local polluted site-Urban/Rural	2
	Visit to a local polluted site- Industrial/ Agricultural	2
4.	Study of common plants	1
5.	Study of common insects	1
6.	Study of common birds	1
7.	Study of simple ecosystems- pond	1
8.	Study of simple ecosystems- river	1
9.	Study of simple ecosystems- hill slopes,	1

References-

1. Bamanayha B.R., Verma, L.N. and Verma A (2005). Fundamentals of Environmental Sciences, Yash Publishing House, Bikaner.
2. Dhaliwal G.S., Sangha G.S. and Ralhan P.K. (2000) Fundamentals of Environmental Sciences, Kalyani Publishers, New Delhi.
3. Odum E.P. and Barrett G.W. (2007) Fundamentals of Ecology, Akash Press, New Delhi.
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6. Dhaliwal G.S., and D.S. Kley (2006) Principles of Agricultural Ecology. Himalyan Publishing house, Bombay
7. Brij Gopal, and N. Bhardwaj (2004) Elements of Ecology.Vikash Publishing House, Pvt. Ltd., New Delhi.
8. Kudesta, V.P. (1990). Pollution Everywhere, Pragatgi Prakashan, Meerut
9. Nemeron, R.L.1976. Industrial Water Pollution. Addison Wesley
10. Mishra, P.C. (2001). Soil pollution and Soil Organism, Ashish Publishing House, 8/81, Punjab Bagh, New Delhi- 110026.
11. Pathak, H.and Kumar, S., (2003). Soil and Green House Effect, CBS Publishers and Distributors, 4596/1-A, 11, Dayaganj, New Delhi – 10002.

STAT-211	Statistical Methods	2(1+1)

Theory

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). Simple Problems Based on Probability. Normal, Binomial &Poisson Distributions, Definition of Correlation, Scatter Diagram.Karl Pearson's Coefficient of Correlation.Linear Regression Equations.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.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□□2 contingency table.Analysis of Variance One Way Classification.Analysis of Variance Two Way Classification.Selection of random sample using Simple Random Sampling.

Lecture Schedule: Theory

S.N.	Topic	No. of lectures
1.	Introduction to Statistics and its Applications in Agriculture,	1
2.	Graphical Representation of Data, Measures of Central Tendency & Dispersion,	1
3.	Definition of Probability, Addition and Multiplication Theorem (without proof).	1
4.	Simple Problems Based on Probability	1
5.	Binomial & Poisson Distributions,	1
6.	Definition of Correlation, Scatter Diagram.	1
7.	Karl Pearson's Coefficient of Correlation. Linear Regression Equations.	1
8.	Introduction to Test of Significance,	1
9.	One sample & two sample test t for Means,	1
10.	Chi-Square Test of Independence of Attributes in 2X2 Contingency Table	1
11.	Introduction to Sampling Methods	2
12.	Sampling versus Complete Enumeration,	2
13.	Use of Random Number Tables for selection of Simple Random Sample.	2

Lecture Schedule: Practical

S. N.	Topic	No. of lectures
1.	Graphical Representation of Data.	1
2.	Measures of Central Tendency (Ungrouped data) with Calculation of Quartiles,	1
3.	Deciles & Percentiles.	1
4.	Measures of Central Tendency (Grouped data) with Calculation of Quartiles, Deciles & Percentiles.	1
5.	Measures of Dispersion (Ungrouped Data). Measures of Dispersion (Grouped Data).	1
6.	Moments,	1
7.	Measures of Skewness & Kurtosis (Ungrouped Data).	1
8.	Moments, Measures of Skewness & Kurtosis (Grouped Data).	1
9.	Correlation & Regression Analysis.	1
10.	Application of One Sample t-test.	1
11.	Application of Two Sample Fisher's t- test.	1
12.	Chi-Square test of Goodness of Fit.	1
13.	Chi-Square test of Independence of Attributes for 2 □2 contingency table.	1
14.	Analysis of Variance One Way Classification.	1
15.	Analysis of Variance Two Way Classification.	1
16.	Selection of random sample using Simple Random Sampling.	1

References:

1. Chandel, S.R.S. 1998. Handbook of Agril. Statistics. Achal Prakashan Mandir, Kanpur.
2. Gupta S.P. 2002. Statistical Methods. Sultan Chand & Sons, New Delhi.
3. Agarwal B.L. 1991. Basic Statistics Wiley Eastern, New Delhi.

ANISC-211	Livestock and poultry Management	4(3+1)

Theory

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

Important Indian and exotic breeds of cattle, buffalo, sheep, goat and poultry. Improvement of farm animals and poultry. Digestion in livestock and poultry. Classification of feedstuffs. Proximate principles of feed. Nutrients and their functions. Feed ingredients for ration for livestock and poultry. Feed supplements and feed additives. Feeding of livestock and poultry.

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

Practical

External body parts of cattle, buffalo, sheep, 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.

1.	NSS	NSS**	To be continued

SEMESTER – IV

Semester – IV			
S. No.	**Course Code**	**Course Title**	**Credit Hrs**
11.	AGRON-221	Crop Production Technology – II (*Rabi* Crops)	3(2+1)
12.	HORT-221	Production Technology for Ornamental Crops, MAP and Landscaping	2(1+1)
13.	AGENGG-221	Renewable Energy and Green Technology	2(1+1)
14.	SSAC-221	Problematic Soils and their Management	2(1+1)
15.	HORT-222	Production Technology for Fruit and Plantation Crops	2(1+1)
16.	GPB-221	Principles of Seed Technology	3(1+2)
17.	AGRON-222	Farming System & Sustainable Agriculture	1(1+0)
18.	AGECON-221	Agricultural Marketing, Trade Prices	3(2+1)
19.	ENTO-221	Insect Ecology and Principles of Integrated Pest Management	2(1+1)
20.	ENTO-222	Bio-Pesticides and Bio-fertilizers (Elective Course)	3(2+1)
11.	NSS	NSS**	To be continued
		Total	**23(13+10)**

AGRON-221	**Crop Production Technology – II (*Rabi* crops)**	**2(2+1)**

Theory

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Rabi* crops; cereals –wheat and barley, pulses-chickpea, lentil, peas, oilseeds-rapeseed, mustard and sunflower; sugar crops-sugarcane; medicinal and aromatic crops-mentha, lemon grass and citronella, rajmash and makkan grass 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.

Lecture schedule: Theory

S. No.	Topic	No. of lectures
1.	Wheat- Origin, geographical distribution, economic importance, soil and climatic requirements	1
2.	Wheat- varieties, cultural practices and yield	1
3.	Barley- Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield	1
4.	Rapeseed and mustard- Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield	1
5.	Sunflower- Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield	
6.	Chickpea-Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield	1
7.	Lentil- Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield	1
8.	Peas- Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield	1
9.	Sugarcane- Origin, geographical distribution, economic importance, soil and climatic requirements	1
10.	Sugarcane- varieties, cultural practices and yield	1
11.	Lucerne – Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield	1
12.	Oat – Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield	1
13.	Berseem ,Safflower,- package of practices	
14.	Sugarbeet, Opium poppy- package of practices	1
15.	Taramira, Linseed- - package of practices	1
16.	Medicinal and aromatic crops-mentha, lemon grass and citronella	1
17.	rajmash and makkan grass	1

Lecture schedule: Practical

S.No.	Topic	No. of lectures
1.	Identification of seeds, crops and other inputs of *rabi* season	1
2.	Identification of weeds in *rabi* season crops	1
3.	Seed rate and related numerical	1

4.	Sowing of wheat and planting of sugarcane.	1
5.	Application of herbicides and related numerical.	1
6.	Judging physiological maturity of various crops	1
7.	Fertilizer application in crops and related numerical	1
8.	Morphological difference in wheat, barley and oat, rapeseed and mustard, berseem and lucerne.	1
9.	Judging sugarcane maturity based on brix ratio and related calculation	1
10.	Yield attributing characters, Theoretical yield and related numerical	1
11.	Crop harvesting and related numericals on harvest index.	1
12.	Working out seed index (test weight) and cost of cultivation.	1
13.	Oil extraction of medicinal crops	1
14.	Study of *rabi* forage experiments	1
15.	Study of important agronomic experiments of *rabi* crops at experimental farms	1
16.	Visit to research stations of related crops	1

References:

1. Singh, C, Singh, P. and Singh, R. 2003. Modern Techniques of Raising Field Crops, Oxford & IBH Publishing Co., New Delhi.
2. Singh, S.S.1998. Crop Management Under Irrigated and Rainfed Conditions. Kalyani Publishers, New Delhi.
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5. Rathore, P.S. 2000. Techniques and Management of Field Crop Production, Agrobios (India), Jodhpur.
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7. ICAR. 2010. Handbook of Agriculture (6th edition), Indian Council of Agricultural Research, New Delhi.
8. Reddy, S.R. 2012. Agronomy of Field Crops. Kalyani Books, New Delhi.
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HORT-221	**Production Technology for Ornamental Crops, MAP and Landscaping**	**2(1+1)**

Theory

Importance and scope of ornamental crops, medicinal and aromatic plants and landscaping. Principles of landscaping. Landscape uses of trees, shrubs climbers and annual flowers. Production technology of important cut flowers like rose, gerbera, carnation, lilium and orchids under protected conditions and gladiolus, tuberose, chrysanthemum under open conditions. Package of practices for loose flowers like marigold and jasmine under open conditions. Production technology of important medicinal plants like ashwagandha, asparagus, aloe, costus, Cinnamomum, periwinkle, isabgol and aromatic plants like mint, lemongrass, citronella, palmarosa, ocimum, rose, geranium, vetiver. Processing and value addition in ornamental crops and MAPs produce.

Practical (Production Technology for Ornamental Crops, MAPs and Landscaping)**:**

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.

Lecture schedule: Theory

S.N.	Topics	No. of lectures
1.	Importance and scope of ornamental crops, medicinal and aromatic plants	1
2.	Importance and scope landscaping and Principles of landscaping	1
3.	Landscape uses of trees, shrubs climbers and annual flowers	1
4.	Production technology of important cut flowers like rose	1
5.	Gerbera and carnation under protected conditions	2
6.	Gladiolus, tuberose, chrysanthemum under open conditions	2
7.	Package of practices for loose flowers like marigold and jasmine under open conditions	1
8.	Production technology of important medicinal plants like ashwagandha, asparagus, safed musli	1
9.	Aloe, Cinnamon, periwinkle, isabgol	1
10.	Aromatic plants like mint, lemongrass	1
11.	Citronella, palmarosa	1
12.	Ocimum, rose	1

13.	Geranium, vetiver	1
14.	Processing and value addition in ornamental crops and MAPs produce	1

Lecture schedule: Practical

S.N.	Topics	No.of lectures
1.	Identification of Ornamental plants	1
2.	Identification of Medicinal and Aromatic Plants	1
3.	Nursery bed preparation and seed sowing	1
4.	Propagation of Ornamental and MAPs	2
5.	Training and pruning of Ornamental plants	2
6.	Planning and layout of garden. Bed preparation and planting of MAP	2
7.	Protected structures – care and maintenance	1
8.	Intercultural operations in flowers and MAP	1
9.	Harvesting and post harvest handling of cut and loose flowers. Processing of MAP	3
10.	Visit to commercial flower and MAP unit	2

References

1. Tiwari, A.K. and Kumar, R. 2012, Fundamentals of ornamental horticulture and landscape gardening, New India Publisher
2. Arora, J.S. 2006 Introductory Ornamental Horticulture, Kalyani Publishers
3. Chadha, K.L. and Chaudhary, B. 1986 Ornamental Horticulture in India, ICAR
4. Peter, K.V. 2009 Ornamental plants, New India publishing agency
5. Roy, R.K. 2013 Fundamentals of Garden designing, New India publishing agency
6. Randhawa, G.S. and Mukhopadhyay A. 2004 Floriculture in India Allied Publishers Pvt. Ltd., New Delhi
7. Tiwari, A.K. 2004 Fundamentals of Ornamental Horticulture and Landscaping Gardening New India publishing agency

AGENGG-221	Renewable Energy and Green Technology	2(1+1)

Theory

Classification of energy sources, contribution of these of sources in agricultural sector, Familiarization with biomass utilization for bio-fuel production and their application, Familiarization with different types of biogas plants and gasifiers, bio-alcohol, biodiesel. Familiarization with briquetting techniques, Introduction of wind enegery and its applications, Introduction of solar energy, solar collectors and their application, Familiarization with solar energy gadgets: solar cooker, solar water heater, application of solar energy: solar drying, solar distillation, 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 briquetting machine, Familiarization with different solar energy gadgets. To study solar photovoltaic system: solar light, solar pumping, solar fencing. To study solar cooker, To study solar dryers. To study solar distillation system.

Lecture schedule: Theory

S.N.	Topic	No. of lectures
1.	Classification of energy sources, contribution of these sources in agricultural sector.	1
2.	Familiarization with biomass utilization for bio fuel production and their application	2
3.	Familiarization with different types of biogas plants.	2
4.	Biogas production techniques and various uses of biogas.	2
5.	Biomass gasification and familiarization with different gasifiers	2
6	Concept of briquetting and familiarization with briquetting machines	1
7	Introduction of solar energy, solar collectors and their application	2
8	Solar thermal applications in different gadgets	2
9	Solar photovoltaic techniques and applications.	1
10	Introduction of wind energy and its application	1

Lecture schedule: Practical

S.N.	Topic	No. of lectures
. 1	Study of fixed dom and floating drum type biogas plants	2
2	Study of cross draft, updraft and down draft gasifiers	2
3	To study briquetting machine	1
4	Study of box type solar cooker	1

5	Study of solar water heating system	1
6	Study of solar distillation system	1
7	Study of solar dryer	2
8	Study of solar animal concentrate cooker	1
9	Study of solar photovoltaic water pumping system and visit to nearby solar photovoltaic water pumping system	2
10	Study of solar photovoltaic sprayer	1
11	Study of wind mill	1
12	Study of improved cook stove	1

References:

1. Rai, G.D. Non-Conventional Energy Sources, Kh Publishers, New Delhi.
2. Rathore, N.S., Kurchania, A.K. and Panwar, N.L. 2007. Non-Conventional Energy Sources, Himanshu Publications.
3. Rathore, N.S., Kurchania, A.K. and Panwar, N.L. 2007. Renewable Energy, Theory and Practice, Himanshu Publications.
4. Khandelwal, K.C. & Mandi, S.S. 1990. Biogas Technology.

SSAC-221	Problematic Soils and Their Management	2(1+1)

Theory

Quality and health of cultivated soils. Distribution of problem soils in different agro ecosystem of India. Their categorization based on properties. Reclamation and management of problem soils, Acid soils and highly and low permeable soils.

Bio-remediation of problem soils through multipurpose trees (MPTs). Land capability classification, land suitability classification.

Irrigation water – quality and standards. Utilization of poor quality water in agriculture.

Practical

- Visual diagnosis of problem soils
- Determination of cations (Na^+, K^+, Ca^{++} and Mg^{++}) in ground water and soil samples
- Determination of anions (Cl^-, $SO4^{--}$, $CO3^{--}$ and $HCO3^-$) in ground waters and soil samples
- Determination of $CaCO_3$ in calcareous soils
- Lime requirements of acid soil and gypsum requirements of sodic soil.
- Computation of SAR and RSC of irrigation water

Lecture Schedule: Theory

S.No.	Topic	No. of lectures
1.	Soil quality-Physical, Chemical and Biological indicators and major factors affecting the soil quality. Soil health and Soil health card , its importance to farmer and crop productivity	2
2.	Distribution of Waste land and problem soils in different agro-ecosystem of India.	1
3.	Categorization of Saline and sodic soils based on properties and its reclamation and management	2
4.	Categorization of acid and acid sulphate soils based on properties and its reclamation and management	2
5.	Highly and low permeable soils	1
6.	Remote sensing and GIS in diagnosis and management of problem soils	2
7.	Bio remediation of soils through multipurpose trees (MPTs),	1
8.	Land capability and land suitability classification	1
9.	Irrigation water – quality, criteria and classification and standards	2
10.	Management and Utilization of saline water for irrigation	2

Lecture Schedule: Practical

S.No.	Topic	No. of lectures
1.	Characterization of acid soils	1
2.	Characterization of salt-affected soils	1
3.	Characterization of calcareous soils	1
4.	Determination of Ca^{++} and Mg^{++} in soil	1
5.	Determination of Ca^{++} and Mg^{++} in ground water	1
6.	Determination of Potassium in ground water and Soil	1

7.	Determination of sodium in irrigation water and Soil	1
8.	Determination of $CaCO_3$ in calcareous soil	1
9.	Determination of $CO3^{--}$ and $HCO3^{-}$ in irrigation waters	1
10.	Determination of $CO3^{--}$ and $HCO3^{-}$ in soil	1
11.	Determination of chloride in irrigation waters and in soil	1
12.	Determination of sulphate ($SO4^{--}$) in irrigation waters	1
13.	Determination of sulphate ($SO4^{--}$) in soil	1
14.	Determination of gypsum requirement of sodic soil	1
15.	Determination of lime requirement of acid soil	1
16.	Computation of SAR and RSC of irrigation water	1

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HORT-222	Production Technology for Fruit and Plantation Crops	2(1+1)

Theory

Importance and scope of fruit and plantation crop industry in India; Importance of rootstocks; Production technologies for the cultivation of major fruits-mango, banana, citrus, grape, guava, litchi, papaya, sapota, apple, pear, peach, walnut, almond and; minor fruits- date, ber, pineapple, pomegranate, jackfruit, strawberry, plantation crops-coconut, arecanut, cashew, tea, coffee & rubber.

Practical (Production Technology for Fruit and Plantation Crops)**:**

Seed propagation. Scarification and stratification of seeds. Propagation methods for fruit and plantation crops. Description and identification of fruit. Preparation of plant bio regulators and their uses, Important pests, diseases and physiological disorders of above fruit and plantation crops, Visit to commercial orchards.

Lecture schedule: Theory

S.No.	Topics	No.of lectures
1.	Importance and scope of ornamental crops, medicinal and aromatic plants	1
2.	Importance and scope landscaping and Principles of landscaping	1
3.	Landscape uses of trees, shrubs and climbers	1
4.	Production technology of important cut flowers like rose	1
5.	Gerbera and carnation under protected conditions	2
6.	Gladiolus, tuberose, chrysanthemum under open conditions	2
7.	Package of practices for loose flowers like marigold and jasmine under open conditions	1
8.	Production technology of important medicinal plants like ashwagandha, asparagus, safed musli	1
9.	Aloe, Cinnamon, periwinkle, isabgol	1
10.	Aromatic plants like mint, lemongrass	1
11.	Citronella, palmarosa	1
12.	Ocimum, rose	1
13.	Geranium, vetiver	1
14.	Processing and value addition in ornamental crops and MAPs produce	1

Lecture schedule: Practical

S.N.	Topics	No.of lectures
1.	Identification of Ornamental plants	1
2.	Identification of Medicinal and Aromatic Plants	1
3.	Nursery bed preparation and seed sowing	1
4.	Propagation of Ornamental and MAPs	2
5.	Training and pruning of Ornamental plants	2
6.	Planning and layout of garden. Bed preparation and planting of MAP	2
7.	Protected structures – care and maintenance	1
8.	Intercultural operations in flowers and MAP	1
9.	Harvesting and post harvest handling of cut and loose flowers. Processing of MAP	3
10.	Visit to commercial flower and MAP unit	2

References (Production Technology for Fruit and Plantation Crops)**:**

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GPB-221	Principles of Seed Technology	3(1+2)

Theory

Seed and seed technology: introduction, definition and importance. Deterioration causes of crop varieties and their control; Maintenance of genetic purity during seed production, seed quality; Definition, Characters of good quality seed, different classes of seed.

Foundation and certified seed production of important cereals (Wheat, Rice, Maize, Sorghum and Bajra), pulses (Urd, Mung, Cowpea, Pigeon pea, Lentil, Gram, Field pea), oilseeds (Soybean, Rapeseed and Mustard, Groundnut, sesame), fodder (Berseem) and vegetables (Potato, cauliflower, tomato and chilli), Seed spices (Cumin, Coriander, Fennel and Fenugreek).

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. Organic certification procedure and standards, filed inspection

Varietal Identification through Grow Out Test and Electrophoresis, Molecular and Biochemical test. Detection of genetically modified crops, Transgene contamination in non-GM crops, GM crops and organic seed production.

Seed drying, processing and their steps, seed testing for quality assessment, seed treatment, its importance, method of application and seed packing. Seed storage; general principles, stages and factors affecting seed longevity during storage. Measures for pest and disease control during storage.

Seed marketing: structure and organization, sales generation activities, promotional media. Factors affecting seed marketing, Role of WTO and OECD in seed marketing.

Practical

Seed production in major cereals: Wheat, Rice, Maize, Sorghum and Bajra. Seed production in major pulses: Urd, Mung, Cowpea, Pigeonpea, Lentil, Gram, Fieldpea. Seed production in major oilseeds: Soybean, Rapeseed and Mustard, Groundnut. Seed production in vegetable crops & Seed spices.

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.

Lecture Schedule: Theory

S.No.	Topic	No. of lectures
1	Seed and seed technology: introduction, definition and importance	1
2	Deterioration causes of crop varieties and their control; Maintenance of genetic purity during seed production	1
3	Seed quality; Definition, Characters of good quality seed, different classes of seed	1
4	Foundation and certified seed production of important cereals & fodder	1
5	Foundation and certified seed production of important pulses	1
6	Foundation and certified seed production of important oilseeds	1
7	Foundation and certified seed production of important vegetables	1
8	Foundation and certified seed production of important seed spices	1

9	Seed certification, phases of certification, procedure forseed certification, field inspection	1
10	Seed Act and Seed Act enforcement. Duty and powers of seed inspector,	1

	offences and penalties. Seeds Control Order 1983	
11	Varietal Identification through Grow Out Test and Electrophoresis, Molecular and Biochemical test	1
12	Detection of genetically modified crops, Transgene contamination in non-GM crops	1
13	GM crops and organic seed production	1
14	Seed drying, processing and their steps, seed testing for quality assessment, seed treatment, its importance, method of application and seed packing	1
15	Seed storage; general principles, stages and factors affecting seed longevity during storage. Measures for pest and disease control during storage	1
16	Seed marketing: structure and organization, sales generation activities, promotional media. Factors affecting seed marketing, Role of WTO and OECD in seed marketing	1

Lecture Schedule: Practical

S.N.	Topic	No. of lectures
1	Seed production in wheat including seed standards	1
2	Seed production in rice including seed standards	1
3	Seed production in Maize including seed standards	1
4	Seed production in Sorghum including seed standards	1
5	Seed production in Bajra including seed standards	1
6	Seed production in Urd, Mung and Cowpea including seed standards	1
7	Seed production in Pigeonpea including seed standards	1
8	Seed production in Lentil including seed standards	1
9	Seed production in Gram including seed standards	1
10	Seed production in Field pea including seed standards	1
11	Seed production in Soybean including seed standards	1
12	Seed production in Rapeseed and Mustard including seed standards	1
13	Seed production in Groundnut and Sesame including seed standards	1
14	Seed production in vegetable crops (Potato, cauliflower, tomato and chilli) including seed standards	1
15	Seed production in Seed spices (fenugreek, fennel, cumin & coriander) including seed standards	1
16	Seed sampling methods	1
17	Physical purity test	1
18	Germination test	

19	Viability test	1
20	Seed and seedling vigour test	1
21	Genetic purity test: Grow out test	1
22	Electrophoresis	1
23	Seed certification: Procedure	1
24	Field inspection and Preparation of field inspection report	2
25	Visit to seed production farms	3
26	Visit to seed testing laboratories	2
27	Visit to seed processing plant	2

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AGRON-222	**Farming System & Sustainable Agriculture**	**1(1+0)**

Theory

Farming System-scope, importance, and concept, Types and systems of farming system and factors affecting types of farming, Farming system components and their maintenance, Cropping system and pattern, multiple cropping system, Efficient cropping system and their evaluation, Allied enterprises and their importance, Tools for determining production and efficiencies in cropping and farming system; Sustainable agriculture-problems and its impact on agriculture, indicators of sustainability, adaptation and mitigation, conservation agriculture strategies in agriculture, HEIA, LEIA and LEISA and its techniques for sustainability, Integrated farming system-historical background, objectives and characteristics, components of IFS and its advantages, Site specific development of IFS model for different agro-climatic zones, resource use efficiency and optimization techniques, Resource cycling and flow of energy in different

farming system, farming system and environment, Visit of IFS model in different agro-climatic zones of nearby states University/ institutes and farmers field.

Lecture schedule: Theory

S.N.	Topic	No.of lectures
1.	Farming System-scope, importance, and concept	1
2.	Types and systems of farming system and factors affecting types of farming	1
3.	Farming system components and their maintenance,	1
4.	Cropping system and pattern, multiple cropping system, Efficient cropping system and their evaluation	1
5.	Allied enterprises and their importance, Tools for determining production and efficiencies in cropping and farming system	2
6.	Sustainable agriculture-problems and its impact on agriculture	1
7.	indicators of sustainability, adaptation and mitigation,	1
8.	Conservation agriculture strategies in agriculture	1
9.	LEIA (Low external input agriculture),LEISA	1
10.	HEIA (High external input agriculture)	1
11.	Integrated farming system-historical background, objectives and characteristics,	1
12.	components of IFS and its advantages,	1
13.	Site specific development of IFS model for different agro-climatic zones, resource use efficiency and optimization techniques,	1
14.	Resource cycling and flow of energy in different farming system,	1
15.	farming system and environment, Visit of IFS model in different agro-climatic zones of nearby states University/ institutes and farmers field.	1

References

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2. Panda, S.C. 2012. Modern Concepts and Advance Principles in Crop Production. Agrobios (India), Jodhpur
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AGECON-221	Agricultural Marketing, Trade & Prices	3(2+1)

Theory

Agricultural Marketing: Concepts and definitions of market, marketing, agricultural marketing, market structure, marketing mix and market segmentation, classification and characteristics of agricultural markets**;** demand, supply and producer's surplus of agri-commodities: nature and determinants of demand and supply of farm products, producer's surplus – meaning and its types, marketable and marketed surplus, factors affecting marketable surplus of agri-commodities;

Product life cycle (PLC) Meaning and stages in PLC; characteristics of PLC; strategies in different stages of PLC. Market promotion – advertising, personal selling, sales promotion and publicity – their meaning and merits & demerits; marketing process and functions: exchange functions – buying and selling; physical functions – storage, transport and processing; facilitating functions – packaging, branding, grading, quality control and labeling (Agmark);Market functionaries and marketing channels: Types and importance of agencies involved in agricultural marketing; meaning and definition of marketing channel; marketing channels for different farm products; Integration, efficiency, costs and price spread: Meaning, definition and types of market integration; marketing efficiency; marketing costs, margins and price spread; factors affecting cost of marketing; reasons for higher marketing costs of farm commodities; ways of reducing marketing costs;

Role of Govt. in agricultural marketing. Introduction to CWC, SWC, FCI, CACP, FPO & DMI. 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 and types; Trade: Concept of International Trade and its need, theories of absolute and comparative advantage. GATT and WTO; Agreement on Agriculture (AoA) and its implications on Indian agriculture; IPR.

Practical

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

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

Lecture Schedule: Theory

S.N.	Topic	No. of lectures
	Agricultural marketing:	
1.	Concepts and definitions of market, marketing, agricultural marketing,	1
2.	Market structure	1
	Marketing mix and market segmentation	1
3.	Classification and characteristics of agricultural markets	1
	Demand, supply and producer's surplus of agri-commodities:	
4.	Nature and determinants of demand and supply of farm products	1
5.	Producer's surplus – meaning and its types, marketable and marketed surplus	1
6.	Factors affecting marketable surplus of agri-commodities	1
	Product life cycle	
7.	PLC and competitive strategies: Meaning and stages in PLC	1
8.	Characteristics of PLC; strategies in different stages of PLC	1
9.	Pricing and promotion strategies: pricing considerations and approaches – cost based and competition based pricing	1
	Market promotion	
10.	Advertising, personal selling,	1
11.	Sales promotion and publicity – their meaning and merits & demerits	1
	Marketing process and functions:	
12.	Marketing process-concentration, dispersion and equalization;	1
13.	Exchange functions – buying and selling;	1
	Physical functions – storage, transport and processing;	1
14.	Facilitating functions – packaging, branding, grading, quality control and labeling (AGMARK)	1
15.	Market functionaries and marketing channels	1
16.	Types and importance of agencies involved in agricultural marketing; meaning and definition of marketing channel; number of channel levels;	2
17.	Integration, efficiency, costs and price spread: Meaning, definition and types of market integration;	1
18.	Marketing efficiency; marketing costs, margins and price spread;	1
19.	Factors affecting cost of marketing; reasons for higher marketing costs of farm commodities; ways of reducing marketing costs;	1
	Role of Govt. In agricultural marketing:	

20.	Public sector institutions- CWC, SWC, FCI, CACP & DMI – their objectives and functions	1
21.	Cooperative marketing in India	1
22.	Risk in marketing: Types of risk in marketing	1
23.	Speculation & hedging; an overview of futures trading	1
24.	Agricultural prices and policy: Meaning and functions of price	1
25.	Administered prices; need for agricultural price policy	1
	Trade:	
26.	Concept of International Trade and its need,	1
27.	Theories of absolute and comparative advantage	1
28.	Present status and prospects of international trade in agri-commodities; GATT and WTO	1
29.	Agreement on Agriculture (AoA and its implications on Indian agriculture; IPR	1

Lecture Schedule: Practical

S.N.	Topic	No. of lectures
1.	Plotting and study of demand and supply curves and calculation of elasticities**;**	2
2.	Study of relationship between market arrivals and prices of some selected commodities	2
3.	Computation of marketable and marketed surplus of important commodities	2
4.	Study of price behaviour over time for some selected commodities, Construction of index numbers	2
5.	Price forecasting; Visit to a local market to study various marketing functions performed by different agencies, identification of marketing channels for selected commodity	2
6.	Collection of data regarding marketing costs, margins and price spread and presentation of report in the class;	2
7.	Visit to market institutions – NAFED, SWC, CWC, cooperative marketing society, etc. To study their organization and functioning;	2
8.	Application of principles of comparative advantage of international trade	2

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2. Moore, J.R., Johl S.S. and Khusro, A.M. (1973) Indian Food Grain Marketing, Printice Hall.
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ENTO-221	**Insect Ecology and Principles of Integrated Pest Management (New Course)**	**2(1+1)**

Theory

Part-I

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. Agroecosystem.

Part-II

Categories of insect pests. IPM: Introduction, history, importance, concept, principles and limitations of IPM. Economic decision levels. Survey, surveillance and forecasting of insect pests. Assessment of insect pest population. Tools/ methods of IPM: Cultural, mechanical, physical, legislative, host plant resistance, biological, and chemical control. Importance, hazards and limitations of chemical control. Classification, toxicity and formulations of insecticides. Insecticides Act 1968-Important provisions. Symptoms of poisoning, first aid and antidotes. Recent methods of pest control- repellents, antifeedants, hormones and pheromones, attractants, gamma radiation and genetic control.

Practical

Sampling techniques for estimation of insect population and damage. Monitoring of insect population through light and pheromone traps. Insecticides and their formulations. Pesticide

appliances and their maintenance. Calculations on the doses of insecticides and application techniques. Safe use of pesticides. Identification of biocontrol agents. Calculations on concentration of insecticides. Mass production of trichogramma .

Lecture Schedule: Theory

S.N.	Topic	No. of lectures
1.	**Insect Ecology:** Introduction, Environment and its components.	2
2.	Effect of abiotic factors–temperature, moisture, humidity, rainfall, light, atmospheric pressure and air currents.	2
3.	Effect of biotic factors – food competition, natural and environmental resistance. Agroecosystem.	2
4.	**IPM:** Categories of pests. Introduction, history, importance, concept, principles and limitations of IPM.	3
5.	Economic decision levels.	2
6.	Survey, surveillance and forecasting of insect pests. Assessment of insect pest population.	3
7.	Tools/ methods of IPM: Cultural, mechanical, physical, legislative, host plant resistance, biological.	4
8.	Chemical control: Importance, hazards and limitations. Classification, toxicity and formulations of insecticides.	3
9.	Insecticides Act 1968-Important provisions.	3
10.	Application techniques of insecticides, symptoms of poisoning, first aid and antidotes.	4
11.	Recent methods of pest control- repellents, antifeedants, hormones and pheromones, attractants, gamma radiation and genetic control.	4

Lecture Schedule: Practical

S.N.	Topic	No. of lectures
1.	Sampling techniques for estimation of insect population and damage.	2
2.	Monitoring of insect population through light and pheromone traps	1
3.	Insecticides and their formulations.	2
4.	Pesticide appliances: Handling and their maintenance of small kitchen garden sprayer, hand compression sprayer, knapsack sprayer, foot sprayer, power sprayer, hand rotary duster, power duster	4
5.	Calculations on the doses of insecticides	1

6.	Application techniques of insecticides.	1
7.	Safe use of pesticides	1
8.	Identification of biocontrol agents	1
9.	Mass production of NPV and fungi	3

References

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3. Dhaliwal, G.S. and Ramesh Arora 2001. Integrated Pest Management. Concepts and Approaches. Kalyani publishers, New Delhi.
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6. Srivastava, K.P. 2004. A Text Book of Entomology, Vol. I, Kalyani Publishers, New Delhi.
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ENTO-222	**Bio pesticides and Biofertilizers (Elective course)**	**3(2+1)**

Theory

History and concept of biopesticides. Importance, scope and potential of biopesticide. Definitions, concepts and classification of bio pesticides viz. pathogen, botanical pesticides and biorationales. Botanicals and their uses. Mass production technology of bio-pesticides. Virulence, pathogenicity and symptoms of entomopathogenic pathogens and nematodes. Methods of application of biopesticides. Methods of quality control. Impediments and limitations in production and use of biopesticide.

Biofertilizers: introduction, status and scope. Structure and characteristic features of bacterial biofertilizers: *Azospirillum, Azotobacter, Bacillus, Pseudomonas, Rhizobium* and *Frankia;* cynobacterial biofertilizers: *Anabaena*, *Nostoc*, Hapalosiphon and fungal biofertilizers: AM mycorrhiza and ectomycorhiza. Nitrogen fixation: free living and symbiotic nitrogen fixation. Mechanism of phosphate solubilization and phosphate mobilization, K solubilization. Production

technology: strain selection, sterilization, growth and fermentation, mass production of carrier based and liquid biofertiizers. 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, Metarhyzium* 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 inoculums production of biofertilizers. Isolation of AM fungi -Wet sieving method and sucrose gradient method. Mass production of AM inoculants.

Lecture Schedule: Theory

S.N.	Topic	No. of lectures
1.	History and concept of biopesticides.	3
2.	Importance, scope and potential of biopesticide. Definitions, concepts and classification of biopesticides viz. pathogen, botanical pesticides, and biorationales. Botanicals and their uses.	3
3.	Mass production technology of bio-pesticides.	2
4.	Virulence, pathogenicity and symptoms of entomopathogenic pathogens and nematodes.	2
5.	Methods of application of biopesticides.	2
6.	Methods of quality control and Techniques of biopesticides. Impediments and limitation in production and use of biopesticide	3
7.	Biofertilizers - Introduction, status and scope. Structure and characteristic features of bacterial biofertilizers- *Azospirillum, Azotobacter, Bacillus, Pseudomonas, Rhizobium* and *Frankia*; Cynobacterial biofertilizers- *Anabaena*, *Nostoc*, Hapalosiphon and fungal biofertilizers- AM mycorrhiza and ectomycorhiza.	4
8.	Nitrogen fixation -Free living and symbiotic nitrogen fixation. Mechanism of phosphate solubilization and phosphate mobilization, K	3
9	Production technology: Strain selection, sterilization, growth and fermentation, mass production of carrier based and liquid biofertiizers.	3
10	FCO specifications and quality control of biofertilizers	2
11	Application technology for seeds, seedlings, tubers, sets etc.	2
12	Biofertilizers -Storage, shelf life, quality control and marketing.	1
13	Factors influencing the efficacy of biofertilizers	2

Lecture Schedule: Practical

S.N.	Topic	No. of lectures
1.	Isolation and purification of important biopesticides: *Trichoderma Pseudomonas, Bacillus, Metarhyzium* etc. and its production.	2
2.	Identification of important botanicals.	2
3.	Visit to biopesticide laboratory in nearby area.	2
4.	Field visit to explore naturally infected cadavers.	1
5.	Identification of entomopathogenic entities in field condition. Quality control of biopesticides.	2
6.	Isolation and purification of *Azospirillum , Azotobacter, Rhizobium*, P-solubilizers and cyanobacteria.	2
7.	Mass multiplication and inoculums production of biofertilizers.	1
8.	Isolation of AM fungi -Wet sieving method and sucrose gradient method.	2
9.	Mass production of AM inoculants.	2

References

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	NSS	NSS**	To be continued

SEMESTER – V			
S. No.	**Course Code**	**Course Title**	**Credit Hrs**
12.	PPATH-311	Epidemiology and Integrated Disease Management	2(1+1)
13.	SSAC-311	Manures, Fertilizers and Soil Fertility Management	3(2+1)
14.	ENTO-311	Pests of Crops and Stored Grains and their management	4(3+1)
15.	PPATH-312	Diseases of Field and Horticultural Crops and their management - I	3(2+1))
16.	GPB-311	Crop Improvement-I (*Kharif* Crops)	2(1+1)
17.	EXCOM-311	Entrepreneurship Development and Business Communication	2(1+1)
18.	AGRON-311	Geoinformatics and Nano-technology and Precision Farming	2(1+1)
19.	AGRON-312	Practical Crop Production-I (*Kharif* crops)	1(0+1)
20.	GPB-312	Intellectual Property Rights	1(1+0)
21.	HORT-311	Landscaping (Elective Course)	3(2+1)
		Total	**23(14+09)**

PPATH-311	Epidemiology and Integrated Disease Management	2(1+1)

Theory

Epidemiology and factors affecting disease development. Diagnosis of plant diseases. Disease triangle and tetrahedron. Forecasting of plant diseases.

Principles of plant disease management. Methods of integrated disease management: Host plant resistance, cultural, physical, legislative, biological and chemical control. IDM modules for wheat, rice, sugarcane, cotton, groundnut, mustard, potato, cumin, citrus and chickpea. Integrated nematode management in protected cultivation. Nature, chemical combination, general classification of fungicides and antibiotics. Safety issues in fungicidal uses. Pest risk analysis.

Practical

Diagnosis of plant diseases. Methods of plant disease measurement. Assessment of crop yield losses. Identification of bio-control agents. Mass multiplication of *Trichoderma, Pseudomona*s and *Bacillus*. Methods of pesticide application and their safe use. Study of structural details of sprayers, dusters and seed dressers. Awareness campaign at farmer's fields.

Lecture Schedule: Theory

S.N.	Topics	No. of Lectures
1.	Epidemiology and factors affecting disease development	01
2.	Diagnosis of plant diseases	01
3.	Disease triangle and tetrahedron and forecasting of plant diseases	02
4.	Principles of plant disease management	02
5.	Methods of integrated disease management: - Host plant resistance, cultural, physical, legislative, biological and chemical control	02
6.	IDM modules for wheat, rice, sugarcane, cotton, groundnut, citrus and chickpea	02
7.	Integrated nematode management in protected cultivation	02
8.	Nature, chemical combination, general classification of fungicides and antibiotics	02
9.	Safety issues in fungicidal uses	01
10.	Pest risk analysis	01

Lecture Schedule: Practical

S.N.	Topic	No. of lectures
1.	Diagnosis of plant diseases	01
2.	Methods of plant disease measurement	02
3.	Assessment of crop yield losses	04
4.	Identification of bio-control agents.	01
5.	Mass multiplication of *Trichoderma, Pseudomona*s and *Bacillus*	04
6.	Methods of pesticide application and their safe use	01
7.	Study of structural details of sprayers, dusters and seed dressers.	02
8.	Awareness campaign at farmer's fields.	01

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SSAC-311	Manures, fertilizers and Soil Fertility Management	3(2+1)

Theory

Introduction and importance of organic manures, properties and methods of preparation of bulky and concentrated manures. Green/leaf manuring. Soil organic matter, composition, properties and influences of soil fertility, Humic substances – nature and properties.

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

History of soil fertility and plant nutrition. criteria of essentiality. Forms of nutrients in soil, role, deficiency and toxicity symptoms of essential plant nutrients, Mechanisms of nutrient transport to plants, factors affecting nutrient availability to plants. Soil fertility evaluation, Soil testing. Critical levels of different nutrients in soil. Indicator plants. Methods of fertilizer recommendations to crops. Factor influencing nutrient use efficiency (NUE), Integrated nutrient management.

Practical

Introduction of analytical instruments and their principles, Estimation of soil organic carbon, Estimation of available N in soils. Estimation of soil extractable P in soils. Estimation of exchangeable K; Ca and Mg in soils. Estimation of soil extractable S in soils. Estimation of DTPA extractable Zn in soils. Estimation of N in plants. Estimation of P in plants. Estimation of K in plants. Estimation of S in plants.

Lecture Schedule - Theory

S. No.	Topic	No. of lectures
1.	Introduction and importance of organic manures	1
2.	Classification of organic manures	1
3.	Properties and methods of preparation of bulky manures.	2
4.	Properties and methods of preparation of concentrated manures.	2
5.	Green/leaf manuring.	1
6.	Soil organic matter, composition, properties and influences of on soil fertility	2
7.	Humic substances – nature and properties.	1
8.	Chemical fertilizers: classification,	1
9.	Major Nitrogenous fertilizers (Urea, Ammonium sulphate, CAN) Chemistry of manufacturing and fate in soil	2
10.	Major Phosphatic fertilizers(SSP, TSP and DAP)- Chemistry of manufacturing and fate in soil	2
11.	Major Potassic fertilizers (MOP and Potassium sulphate) - Chemistry of manufacturing and fate in soil	1

12.	Secondary & micronutrient fertilizers sources and application	1
13.	Complex fertilizers, nano fertilizers sources and application	1
14.	Soil amendments, Fertilizer Storage, Fertilizer Control Order.	2
15.	History of soil fertility and plant nutrition	1
16.	Criteria of essentiality. Forms of nutrients in soil,	1
17.	role, deficiency and toxicity symptoms of essential plant nutrients,	2
18.	Mechanisms of nutrient transport to plants	1
19.	Factors affecting nutrient availability to plants	1
20.	Soil fertility evaluation	2
21.	Soil testing. Critical levels of different nutrients in soil.	1
22.	Indicator plants. Methods of fertilizer recommendations to crops.	1
23.	Factor influencing nutrient use efficiency (NUE),	1
24.	Integrated nutrient management.	1

Lecture Schedule: Practical

S.N.	Topic	No. of lectures
1.	Introduction of analytical instruments and their principles	2
2.	Determination of organic matter in soil	1
3.	Determination of available nitrogen in soil	1
4.	Determination of soil extractable phosphorus	2
5.	Determination of exchangeable potassium in soil	1
6.	Determination of soil extractable sulphur in soil	2
7.	Determination of available DTPA extractable -zinc in soil	1
8.	Rapid plant tissue test- N, P and K	3
9.	Estimation of N,P, K and S in plant	3

ENTO-311	Pests of Crops and Stored Grains and Their Management	4(3+1)

Theory

Scientific name, order, family, distribution, identification, host range and nature of damage, biology and bionomics, and management of important arthropod pests.

Polyphagous insect pests: Locust, grasshopper, white grub, termite and red hairy caterpillar.

Pests of field crops: Cereals and millets- Rice: Brown plant hopper, yellow stem borer. Sorghum: Shootfly; Maize: Stem borer; Sugarcane: Pyrilla, whitefly, shoot borer. Pulses: Gram pod borer, cutworm. Tobacco: Tobacco caterpillar. Oilseeds: Mustard aphid, sawfly, painted bug, groundnut aphid, soybean girdle beetle, castor semilooper, castor capsule borer, sesame leaf and capsule borer. Cotton: Jassid, whitefly, spotted and pink bollworm, red cotton bug, mealy bug.

Pests of vegetables Brinjal- brinjal shoot and fruit borer; Tomato- Fruit borer (Covered in gram); Okra- Shoot and fruit borer (Covered in cotton). Potato: Tuber moth. Chilli: Thrips; Onion and garlic: Thrips. Cruciferous vegetables: Cabbage caterpillar, diamondback moth, semilooper, tobacco caterpillar (Covered in tobacco). Pea: Stem fly. Cucurbitaceous vegetables: Melon fruit fly, red pumpkin beetle, red vegetable mite.

Pests of fruit crops Mango: Mango hopper, mealy bug, stem borer, fruit fly; Guava: Fruit fly. Citrus: Citrus psylla, citrus caterpillar, bark eating caterpillar. Citrus: Citrus psylla, citrus caterpillar, bark eating caterpillar. Pomegranate: Anar butterfly; Ber: Fruit fly.; Apple: San Jose scale, woolly aphid. Coconut; Rhinocerous beetle;

Pests of ornamental crops: Rose aphid, hollyhock tinged bug, jasmine budworm.

Pests of spices and condiments: Aphid.

Pests of stored grains: Khapra beetle, lesser grain borer, rice weevil, red rust flour beetle, pulse beetle, Angoumois grain moth, grain mite, storage fungi. Storage structures and methods of grain storage. managament of stored grain pests

Rodents and their management in fields and godowns.

Birds of agricultural importance and their management.

Practical

Study of identification, host range and nature of damage, biology and bionomics, and management of important arthropod pests of various field crops, vegetable crops, fruit crops, ornamental crops, spices and condiments including polyphagous insect pests. Identification of insect pests and mtes associated with stored grains. Determination of insect infestation by different methods. Fumigation of grain stores and godowns. Identification of rodents and birds and their control operations. Determination of moisture content of grain.Visit to nearest FCI godowns.

Lecture Schedule: Theory

S.No.	Topic	No. of lectures
1.	Polyphagous insect pests: Locust, grasshopper, whitegrub, termite and red hairy caterpillar	2
2.	Rice: Brown plant hopper, yellow stem borer, rice hispa.	2
3.	Sorghum: Shootfly; Maize: Stem borer; Sugarcane: Pyrilla, whitefly, shoot borer	2
4.	Pulses: Gram pod borer, cutworm. Tobacco: Tobacco caterpillar	2
5.	Oilseeds: Mustard aphid, sawfly, painted bug, groundnut aphid, soybean girdle beetle, castor semilooper, castor capsule borer, sesame leaf and capsule borer.	2
6.	Cotton: Jassid, whitefly, spotted and pink bollworm, red cotton bug.	2
7.	Pests of vegetables crops: Brinjal- brinjal shoot and fruit borer; Tomato- Fruit borer (Covered in gram); Okra- Shoot and fruit borer (Covered in cotton). Potato: Tuber moth. Pea: Stem fly.	2
8.	Chilli: Thrips; Onion and garlic: Thrips	1
9.	Cruciferous vegetables: Cabbage caterpillar, diamondback moth, semilooper, tobacco caterpillar (Covered in tobacco).	2
10.	Cucurbitaceous vegetables: Melon fruit fly, red pumpkin beetle, red vegetable mite.	2
11.	Pests of fruit crops: Mango: Mango hopper, mealy bug, stem borer, fruit fly; Guava: Fruit fly.	2
12.	Citrus: Citrus psylla, citrus caterpillar, bark eating caterpillar.	1
13.	Pomegranate: Anar butterfly; Ber: Fruit fly.	1
14.	Coconut: Black headed caterpillar; Apple: San Jose scale, woolly aphid.	1
15.	Ornamental Crops: Rose aphid, hollyhock tinged bug, jasmine budworm.	1
16.	Spices and condiments: Aphid, seed midge	1
17.	Pests of stored grains: Khapra beetle, lesser grain borer, rice weevil, red rust flour beetle, pulse beetle, Angoumois grain moth, grain mite.	2
19	Rodents and their management in fields and godowns.	1
20.	Birds of agricultural importance and their management.	1
21.	Storage structures and methods of grain storage.	1
22.	Principles of stored grain pest management.	1

Lecture Schedule: Practical

S. No.	Topic	No.of lectures
1.	Study of identification, host range and nature of damage, biology and bionomics, and management of important arthropod pests of various field crops: Polyphagous pests-Locust, grasshopper, whitegrub, termite and red hairy caterpillar	2

2.	Field crops Rice: Brown plant hopper, yellow stem borer, rice hispa Sorghum: Shootfly; Maize: Stem borer; Sugarcane: Pyrilla, whitefly, shoot borer Pulses: Gram pod borer, cutworm. Tobacco: Tobacco caterpillar Oilseeds: Mustard aphid, sawfly, painted bug, groundnut aphid, soybean girdle beetle, castor semilooper, castor capsule borer, sesame leaf and capsule borer. Cotton: Jassid, whitefly, spotted and pink bollworm, red cotton bug.	4
3.	Vegetable crops: Identification, host range and nature of damage, biology and bionomics, and management of important insect pests: Brinjal- brinjal shoot and fruit borer; Tomato- Fruit borer; Okra- Shoot and fruit borer; Potato: Tuber moth; Chilli: Thrips; Onion and garlic: Thrips; Cruciferous vegetables: Cabbage caterpillar, diamondback moth, semilooper, tobacco caterpillar; Pea: Stem fly; Cucurbitaceous vegetables: Melon fruit fly, red pumpkin beetle, red vegetable mite.	3
4.	Pests of fruit crops: Mango: Mango hopper, mealy bug, stem borer, fruit fly; Guava: Fruit fly; Citrus: Citrus psylla, citrus caterpillar, bark eating caterpillar; Pomegranate: Anar butterfly; Ber: Fruit fly.	2
5.	Pests of stored grains: Khapra beetle, lesser grain borer, rice weevil, red rust flour beetle, pulse beetle, Angoumois grain moth.	1
6.	Rodents and their management in fields and godowns.	1
7.	Birds of agricultural importance and their management.	1
8.	Storage structures and methods of grain storage.	1
9.	Management of stored grain pests.	1

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PPATH-312	Diseases of Field and Horticultural Crops and their Management-I	3(2+1)

Theory

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

Field Crops: Rice: Blast, brown spot, bacterial blight, sheath blight, khaira and tungro. **Maize:** Stalk rots, leaf blights and downy mildews. **Sorghum:** Grain smut, anthracnose and blight. **Bajra:** Downy mildew and ergot. **Groundnut:** Tikka, collar rot and peanut clump and bud necrosis virus. **Soybean:** Rhizoctonia blight, Charcol rot and bacterial pustule. **Pigeon pea**: Sterility mosaic. **Moong, urd and moth beans:** Web blight and yellow mosaic. **Castor:** Phytophthora blight and bacterial blight and wilt. **Guar:** Bacterial blight and Alternaria blight. **Sesamum:** Stem & root rot and phyllody. **Cotton:** Wilt, root rot, bacterial blight and leaf curl.

Horticultural Crops: Guava: Wilt and Anthracnose. **Banana:** Panama wilt, Sigatoka and bunchy top. **Papaya:** Foot rot, leaf curl, ring spot, mosaic and root knot. **Pomegranate:** leaf spots and Bacterial blight. **Cabbage**: Alternaria leaf spot and black rot. **Brinjal:** Phomopsis blight, rootknot and little leaf. **Tomato:** Damping off, bacterial wilt, early blight, leaf curl and root knot. **Okra:** Powdery mildew, yellow vein mosaic. **Ginger:** Rhizome rot. **Date palm**: Graphiola leaf spot. **Coconut:** Root wilt, cadang cadang and bud rot. **Tea:** Blister blight and red rust. **Coffee:** Rust. **Colocasia**-Alternaria leaf spot and cruciferous mosaic

Practical:

Identification and histopathological studies of following selected diseases of field and horticultural crops. Field visit for the diagnosis of field problems. Collection and preservation of plant diseased specimens for herbarium.

Maize: Stalk rots, leaf blights and downy mildews. **Sorghum:** Grain smut and anthracnose. **Bajra:** Downy mildew and ergot. **Groundnut:** Tikka, collar rot and peanut clump virus. **Soybean:** Rhizoctonia blight and bacterial pustule. **Pigeon pea**: Sterility mosaic. **Moong, urd and moth beans:** Web blight and yellow mosaic. **Castor:** Bacterial blight. **Guar:** Bacterial blight and Alternaria blight. **Sesamum:** Phyllody. **Cotton:** Wilt, root rot, bacterial blight and leaf curl. **Guava**: Wilt and zinc deficiency. **Banana:** Sigatoka and bunchy top. **Papaya:** Leaf curl, ring spot and root knot. **Pomegranate:** leaf spots and Bacterial blight. **Cabbage**: Alternaria leaf spot and black rot. **Brinjal:** Little leaf. **Tomato:** Damping off, bacterial wilt, early blight, leaf curl and root knot. **Okra:** Yellow vein mosaic. **Ginger:** rhizome rot. **Date palm**: Graphiola leaf spot.

Note: Students should submit 25 pressed and well-mounted specimens.

Lecture Schedule: Theory

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

S.N.	Topic	No. of lectures
1.	Rice: Blast, brown spot, bacterial blight, sheath blight, khaira and tungro.	2
2.	Maize: Stalk rots, leaf blights and downy mildews.	2
3.	Sorghum: Grain smut and anthracnose.	1
4.	Bajra: Downy mildew and ergot.	1
5.	Groundnut: Tikka, collar rot and peanut clump virus.	2
6.	Soybean: Rhizoctonia blight and bacterial pustule.	2
7.	Pigeonpea: Sterility mosaic.	1
8.	Moong, urd and moth beans: Web blight and yellow mosaic.	2
9.	Castor: Phytophthora blight and bacterial blight.	1
10.	Guar: Bacterial blight and Alternaria blight.	2
11.	Sesamum: Stem & root rot and phyllody.	2
12.	Cotton: Wilt, root rot, bacterial blight and leaf curl.	2

13.	Guava: Wilt and zinc deficiency.	1
14.	Banana: Panama wilt, Sigatoka and bunchy top.	2
15.	Papaya: Foot rot, leaf curl, ring spot and root knot.	1
16.	Pomegranate: leaf spots and Bacterial blight.	1
17.	Date palm: Graphiola leaf spot. Coconut: Root wilt, cadang cadang and bud rot.	2
18.	Tea: Blister blight and red rust, Coffee: Rust.	1
19.	Cucurbits: Powdery mildew, mosaic, Choanephora rot and root knot.	1
20.	Brinjal: Phomopsis blight and little leaf.	1
21.	Tomato: Damping off, bacterial wilt, early blight, leaf curl and root knot.	1
22.	Okra: Yellow vein mosaic. Ginger: Rhizome rot	1

Lecture Schedule: Practical

Identification and histopathological studies of following selected diseases of field and horticultural crops. Field visit for the diagnosis of field problems. Collection and preservation of plant diseased specimens for herbarium.

S.N.	Topic	No. of lectures
1.	Maize: leaf blights and downy mildews.	1
2.	Sorghum: Grain smut and anthracnose.	1
3.	Bajra: Downy mildew and ergot.	1
4.	Groundnut: Tikka, collar rot and peanut clump virus.	1
5.	Pigeon pea: Sterility mosaic.	1
6.	Moong, urd and moth beans: Web blight and yellow mosaic.	1
7.	Castor: Bacterial blight, Sesamum: Phyllody.	1
8.	Guar: Bacterial blight and Alternaria blight.	1
9.	Cotton: Wilt, root rot, bacterial blight and leaf curl.	1
10.	Guava: zinc deficiency.	1
11.	Papaya: Leaf curl	1
12.	Pomegranate: leaf spots and Bacterial blight.	1
13.	Cucurbits: Powdery mildew, mosaic, Choanephora rot and root knot	1
14.	Brinjal: Little leaf, Tomato: Damping off, early blight, leaf curl and root knot.	1
15.	Okra: Yellow vein mosaic.	1
16.	Date palm: Graphiola leaf spot	1

*Note : Student should submit at least 30 pressed well mounted disease specimens

GPB-311	Crop Improvement-I (*Kharif* crops)	2(1+1)

Theory

Centers of origin, distribution of species, wild relatives in different cereals (Rice, Maize, Sorghum and Bajra); pulses (Urd, Mung, Cowpea and Pigeonpea); oilseeds (Soybean, sessame and Groundnut); fibres (Cotton); fodders (Bajra) and cash crops (Castor); vegetable and horticultural crops (Chilli and tomato); Plant genetic resources, its utilization and conservation Floral biology, study of genetics of qualitative and quantitative characters; Important concepts of breeding self-pollinated, cross pollinated and vegetatively propagated crops; Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, adaptability, stability, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional); Seed production technology in self-pollinated, cross pollinated and vegetatively propagated crops. Hybrid seed production technology in Maize, Rice, Sorghum, Pearl millet and Pigeonpea, etc. Ideotype concept and climate resilient crop varieties for future.

Practical

Emasculation and hybridization techniques in different crop species; viz., Rice, Maize, Sorghum, Pearl Millet, Ragi, Pigeonpea, Urdbean, Mungbean, Soybean, Groundnut, Seasame, Castor, Cotton, Cowpea, Pearl millet and Tobacco. Maintenance breeding of different kharif crops. Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods; Study of field techniques for seed production and hybrid seeds production in *Kharif* crops; 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.

Lecture Schedule: Theory

S.N.	Topic	No. of lectures
1	Crop improvement aspects in rice as mentioned in the syllabus such as Centers of origin, distribution of species Floral biology breeding objectives and procedures etc & hybrid seed production	1
2	Crop improvement aspects in maize as mentioned in the syllabus such as Centers of origin, distribution of species Floral biology breeding objectives and procedures etc & hybrid seed production	1
3	Crop improvement aspects in sorghum as mentioned in the syllabus such as Centers of origin, distribution of species Floral biology breeding objectives and procedures etc& hybrid seed production	1
4	Crop improvement aspects in bajra as mentioned in the syllabus such as Centers of origin, distribution of species Floral biology breeding objectives and procedures etc & hybrid seed production	1
5	Crop improvement aspects in urd, mung and cowpea as mentioned in the syllabus such as Centers of origin, distribution of species Floral biology breeding objectives and procedures etc	1
6	Crop improvement aspects in pigeonpea as mentioned in the syllabus such as Centers of origin, distribution of species Floral biology breeding objectives and procedures etc& hybrid seed production	1
7	Crop improvement aspects in soybean as mentioned in the syllabus such as Centers of origin, distribution of species Floral biology breeding objectives and procedures etc.	1

8	Crop improvement aspects in sesame as mentioned in the syllabus such as Centers of origin, distribution of species Floral biology breeding objectives and procedures etc.	1
9	Crop improvement aspects in groundnut as mentioned in the syllabus such as Centers of origin, distribution of species Floral biology breeding objectives and procedures etc.	1
10	Crop improvement aspects in cotton and castor as mentioned in the syllabus such as Centers of origin, distribution of species Floral biology breeding objectives and procedures etc.	1
11	Crop improvement aspects in chilli as mentioned in the syllabus such as Centers of origin, distribution of species Floral biology breeding objectives and procedures etc.	1
12	Crop improvement aspects in tomato mentioned in the syllabus such as Centers of origin, distribution of species Floral biology breeding objectives and procedures etc.	1
13	Modern innovative approaches for development of hybrids and varieties for yield, adaptability, stability, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional)	1
14	Seed production technology in self-pollinated, cross pollinated and vegetatively propagated crops	1
15	Ideotype concept	1
16	Climate resilient crop varieties for future.	1

Lecture Schedule: Practical

S.N.	Topic	No. of lectures
1	Emasculation and hybridization techniques in rice, maize	1
2	Emasculation and hybridization techniques in sorghum and bajra	1
3	Emasculation and hybridization techniques in urd, mung, cowpea, pigeonpea	1
4	Emasculation and hybridization techniques in, soybean, sesame	1
5	Emasculation and hybridization techniques in and groundnut and cotton	1
6	Maintenance breeding of different kharif crops	1
7	Handling of germplasm and segregating populations by different	1
8	methods like pedigree, bulk and single seed decent methods	
9	Study of field techniques for seed production and hybrid seeds production in *Kharif* crops	1
10	Estimation of heterosis, inbreeding depression and heritability	1
11	Layout of field experiments	1
12	Study of quality characters	1
13	Donor parents for different characters	1
14	Visit to seed production plots	2
15	Visit to AICRP plots of different field crops	2

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EXCOM-311	Entrepreneurship Development and Business Communication	2 (1+1)

Theory

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

Practical

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

Lecture Schedule: Theory

S.N.	Topic	No.of Lectures
1.	Concept of Entrepreneur, Entrepreneurship Development	1
2.	Concept and Meaning	1
3.	Characteristics of entrepreneurs	1
4.	SWOT Analysis & achievement motivation	1
5.	Government policy and programs and institutions for entrepreneurship development	2
6.	Impact of economic reforms on Agribusiness/ Agri-enterprises	1
7.	Entrepreneurial Development Process; Business Leadership Skills	1
8.	Developing organizational skill (controlling, supervising, problem solving, monitoring & evaluation)	2
9.	Developing Managerial skills, Business Leadership Skills (Communication, direction and motivation Skills)	2
10.	Problem solving skill, Supply chain management and Total quality management	2
11.	Project Planning Formulation and report preparation	1
12.	Financing of enterprise, Opportunities for agri-entrepreneurship and	1

Lecture Schedule: Practical

S.N.	Topic	No.of Lectures
1.	Assessing entrepreneurial traits	2
2.	Practice on SWOT analysis	2
3.	Practicing problem solving skills, managerial skills and achievement motivation	3
4.	Exercise in creativity, time audit through planning, monitoring and supervision	2
5.	Identification and selection of business idea	2
6.	Preparation of business plan and proposal writing	2
7.	Visit to entrepreneurship development institute and interaction with entrepreneurs	3

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AGRON-311	Geoinformatics and Nanotechnology and Precision Farming	2(1+1)

Theory

Precision agriculture: concepts and techniques; their issues and concerns for Indian agriculture; Geo-informatics- definition, concepts, tool and techniques; their use in Precision Agriculture. Crop discrimination and Yield monitoring, soil mapping; fertilizer recommendation using geospatial technologies; Spatial data and their management in GIS; 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; 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.

Lecture Schedule-Theory

S. No.	Topic	No. of lectures
1.	Precision agriculture: concepts and techniques; their issues and concerns for Indian agriculture;	2
2.	Geo-informatics- definition, concepts, tool and techniques; their use in Precision Agriculture	1
3.	Crop discrimination and Yield monitoring, soil mapping;	1
4.	fertilizer recommendation using geospatial technologies; Spatial data and their management in GIS;	2
5.	Remote sensing concepts and application in agriculture;	1
6.	Image processing and interpretation;	1
7.	Global positioning system (GPS), components and its functions;	1
8.	Introduction to crop Simulation Models and their uses for optimization of Agricultural Inputs;	1
9.	STCR approach for precision agriculture;	1

10	Nanotechnology, definition, concepts and techniques,	1
11.	brief introduction about nanoscale effects,	1
12.	nano-particles, nano-pesticides, nano-fertilizers, nano-sensors,	1
13.	Use of nanotechnology in seed and water for scaling-up farm productivity	1
14.	Use of nanotechnology in fertilizer and plant protection for scaling-up farm productivity	1

Lecture schedule: Practical

S.N.	Topic	No. of lectures
1.	Introduction to GIS software, spatial data creation and editing.	2
2.	Introduction to image processing software. Visual and digital interpretation of remote sensing images.	2
3.	Generation of spectral profiles of different objects.	2
4.	Supervised and unsupervised classification and acreage estimation.	2
5.	Multispectral remote sensing for soil mapping.	1
6.	Creation of thematic layers of soil fertility based on GIS.	1
7.	Creation of productivity and management zones	1
8.	Fertilizers recommendations based of VRT and STCR techniques.	1
9.	Crop stress (biotic/abiotic) monitoring using geospatial technology.	1
10	Use of GPS for agricultural survey.	1
11.	Formulation, characterization and applications of nanoparticles in agriculture.	1
12.	Projects formulation and execution related to precision farming	1

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AGRON-312	Practical Crop Production – I (*Kharif* crops)	1(0+1)

Practical

Crop planning, raising field crops in multiple cropping systems: Field preparation, seed, treatment, nursery raising, sowing, nutrient, water and weed management and management of insect-pests diseases of crops, harvesting, threshing, drying winnowing, storage and marketing of produce. The emphasis will be given to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies. Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of 8-10 students.

Lecture schedule: Practical

S.No.	Topic	No. of lectures
1.	Introduction of the course, crop planning and allotment of field	2
2.	Field preparation, application of manures and fertilizers	2
3.	Selection of crop and varieties, seed treatment and sowing	2
4.	Sowing of crops.	2
5.	Observation of germination	2
6.	Thinning and gap filling	2
7.	Intercultural operations-hoeing and weeding	2
8.	Intercultural operations-hoeing and weeding	2
9.	Water management- application of irrigation water and demonstrating methods of irrigation	2
10.	Top dressing of fertilizer (urea).	2
11.	Insect and pest management (control)- application of insecticides	2
12.	Disease management (control)- application of fungicides	2
13.	Harvesting	2
14.	Threshing, winnowing and storage	2
15.	Marketing of produce	2
16.	Preparation of balance sheet including estimating cost of cultivation and net return per student as well as per team of a group of student	2

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GPB-312	Intellectual Property Rights	1(1+0)

Theory

Introduction and meaning of intellectual property, brief introduction to GATT, WTO, TRIPs and WIPO, Treaties for IPR protection: Madrid protocol, Berne Convention, Budapest treaty, etc.

Types of Intellectual Property and legislations covering IPR in India:-Patents, Copyrights,

Trademark, Industrial design, Geographical indications, Integrated circuits, Trade secrets. Patents Act 1970 and Patent system in India, patentability, process and product patent, filing of patent, patent specification, patent claims, Patent opposition and revocation, infringement, Compulsory licensing, Patent Cooperation Treaty, Patent search and patent database.

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

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

Lecture Schedule: Theory

S. N.	Topic	No. of lectures
1.	Introduction and meaning of intellectual property, brief introduction to GATT, WTO, TRIPs and WIPO	2
2.	Treaties for IPR protection: Madrid protocol, Berne Convention, Budapest treaty, etc	1
3.	Types of Intellectual Property and legislations covering IPR in India:- Patents, Copyrights, Trademark, Industrial design, Geographical indications, Integrated circuits, Trade secrets	1
4.	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	2
5.	Compulsory licensing, Patent Cooperation Treaty, Patent search and patent database	2
6.	Origin and history including a brief introduction to UPOV for protection of plant varieties	1
7.	Protection of plant varieties under UPOV and PPV&FR Act of India, Plant breeders rights, Registration of plant varieties under PPV&FR Act 2001	1
8.	Breeders, researcher and farmer's rights. Traditional knowledge-meaning and rights of TK holders	2
9.	Convention on Biological Diversity, International treaty on plant genetic resources for food and agriculture (ITPGRFA)	2
10.	Indian Biological Diversity Act, 2002 and its salient features, access and benefit sharing	2

HORT-311	Landscaping (Elective course)	3(2+1)

Theory

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. Trees: selection, propagation, planting schemes, canopy management, shrubs and herbaceous perennials: selection, propagation, planting schemes, architecture. 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. 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. Styles of gardening types of garden: mughal and english and japanies.

Practical (Landscaping)

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 lath house. Use of computer software, visit to important gardens/ parks/ institutes.

Lecture schedule: Theory

S.No.	Topics	No.of lectures
1.	Importance and scope of landscaping	1
2.	Principles of landscaping	2
3.	Garden styles and types	3
4.	Terrace gardening	1
5.	Vertical gardening	1
6.	Garden components	1
7.	Garden adornments	1
8.	Rockery	1
9.	Water garden	1
10.	Walk-paths, bridges, other constructed features etc. gardens for special purposes	1
11.	Trees: selection, propagation, planting schemes, canopy management	1
12.	Shrubs and herbaceous perennials: selection, propagation, planting, schemes, architecture	1

13.	Climber and creepers: importance, selection, propagation, planting	1
14.	Annuals: selection, propagation, planting scheme	1
15.	Other garden plants: palms, ferns, grasses, cacti succulents and shade loving plants	2
16.	Pot plants: selection, arrangement, management	1
17.	Bio-aesthetic planning: definition, need, planning	2
18.	Landscaping of urban and rural areas	1
19.	Peri-urban landscaping (roof garden)	1
20.	Landscaping of schools, public places like bus station, railway station, townships, river banks, hospitals, play grounds, airports, industries, institutions	2
21.	Bonsai: principles and management	2
22.	Lawn: establishment and maintenance	2
23.	CAD application	2

Lecture schedule: Practical

S. No.	Topics	No. of lectures
1.	Identification of trees, shrubs, annuals, pot plants	2
2.	Identification of tools and implements used in landscape design	1
3.	Propagation of trees, shrubs and annuals	2
4.	Care and maintenance of plants, shrubs and trees	1
5.	Potting and repotting	1
6.	Training and pruning of plants for special effects	1
7.	Lawn establishment and maintenance	1
8.	Layout of formal gardens	1
9.	Layout of informal gardens	1
10.	Layout of special type of gardens (sunken garden, terrace garden, rock garden)	2
11.	Designing of conservatory and lath house	1
12.	Use of computer software	1
13.	Visit to important gardens/ parks/ institutes	1

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11. Gopalaswamiengar, K.S. The Complete Gardening in India. The Hosali Press, Bengaluru.

SEMESTER – VI

Semester – VI			
S. No.	**Course Code**	**Course title**	**Course Credit**
12.	AGRON-321	Rainfed Agriculture & Watershed management	2(1+1)
13.	AGENGG-321	Protected Cultivation and Secondary Agriculture	2(1+1)
14.	PPATH-321	Diseases of Field and Horticultural Crops and their management-II	3(2+1)
15.	HORT-321	Post-harvest management and Value Addition of Fruits and Vegetables	2(1+1)
16.	ENTO-321	Management of Beneficial Insects	2(1+1)
17.	GPB-321	Crop Improvement-II (*Rabi* crops)	2(1+1)
18.	AGRON-322	Practical Crop Production-II (*Rabi* crops)	1(0+1)
19.	AGRON-323	Principles of Organic Farming	2(1+1)
20.	AGECON-321	Farm Management, Production & Resource Economics	2(1+1)
21.	HORT-322	Principles of Food Science and Nutrition	2(2+0)
22.	GPB-322	Micro-Propagation Technology (Elective Course)	3(2+1)
		Total	**23(13+10)**

AGRON-321	**Rainfed Agriculture & Watershed Management**	**2(1+1)**

Theory

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

Water harvesting: importance, its techniques, Efficient utilization of water through soil and crop management practices, Management of crops in rainfed areas, Contingent crop planning for aberrant weather conditions, Concept, objective, principles and components of watershed management, factors affecting watershed management.

Practical

Studies on climate classification, studies on rainfall pattern in rainfed areas of the country and pattern of onset and withdrawal of monsoons. Studies on cropping pattern of different 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

Lecture schedule: Theory

S.No.	Topic	No. of lectures
1.	Rainfed agriculture- definition, history and its importance in India with particular to references Rajasthan	1
2.	Problems of dryland agriculture related to climate, soil, technological and socio economic conditions	1
3.	Soil and water conservation techniques,	1
4.	Drought: types,	1
5.	effect of water deficit on physio- morphological characteristics of the plants,	1
6.	Use of antitranspirants-their kind, mode of action and effect on crop yield.	1
7.	Crop adaptation and mitigation to drought;	1
8.	Water harvesting: importance, its techniques,	1
9.	Efficient utilization of water through soil and crop management practices,	1
10.	Water harvesting techniques in dry farming areas	1
11.	Watershed management- concept, definition, objectives and principles	1
12.	Integrated watershed management for drylands	1
13.	A study of model watershed area	1
14.	Management of crops in rainfed areas,	1
15.	Contingent crop planning for aberrant weather conditions,	1
16.	Alternate cropping and land use strategies for dryland agriculture	1

Lecture schedule: Practical

S No.	Topic	No. of lectures
1.	Studies on climate classification,	1
2.	studies on rainfall pattern in rainfed areas of the country and pattern of onset and withdrawal of monsoons.	1

3.	Studies on cropping pattern of different rainfed areas in the country and demarcation of rainfed area on map of India.	1
4.	Interpretation of meteorological data and scheduling of supplemental irrigation on the basis of evapo-transpiration demand of crops.	1
5.	Critical analysis of rainfall and estimation of moisture index and aridity index and possible drought period in the country	1
6.	Field demonstration on construction of water harvesting structures	1
7.	effective rainfall and its calculation.	1
8.	Studies on cultural practices for mitigating moisture stress.	1
9.	Spray of antitranspirants on dryland crops and their effect on crops	1
10.	Characterization and delineation of model watershed	1
11.	Field demonstration on soil & moisture conservation measures	1
12.	Crops and cropping systems for drylands	1
13.	Acquiring skill in tillage methods for *in-situ* moisture c conservation	1
14.	Mulching and its effects on soil moistures conservation	1
15.	Seed soaking, seed treatment with chemicals for sowing in dryland areas	1
16.	Visit to rainfed research station/watershed**.**	1

References

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AGENGG-321	**Protected Cultivation and Secondary Agriculture**	**2(1+1)**

Theory

Green house technology: Introduction, Types of Green Houses; climate control in Green house, Planning and design of greenhouses, Design criteria of green house for cooling and heating purposes. Green house equipment's, materials of construction for traditional and low cost green houses. Irrigation systems used in greenhouses naturally ventilated solar green house, high tech green house, use of green house in drying. Concept and construction of low tunnels. Use of shade net house in protected cultivation.

Important Engineering properties such as physical, thermal and aero & hydrodynamic of cereals, pulses and oilseed. Concepts of cleaning, grading, drying and dehydration: Moisture measurement, EMC, drying theory, various drying methods, commercial grain dryers (bin dryer, tray dryer, fluidized bed dryer, re-circulatory dryer and solar dryer). Material handling equipment: conveyer and elevators, their principle, working and selection.

Practical

Study of different types of green houses based on shape. Measurement of solar radiation, CO_2 level, humidity and temperature inside and outside green house. Determination of drying rate of agricultural products inside green house. Study of greenhouse equipment's. Visit to various Post Harvest Laboratories. Determination of Moisture content of various grains by oven drying method. Study of spiral, centrifugal and disc separator. Determination of Moisture content of various grains by moisture meter. Field visit to seed processing plant and agro processing plant.

Lecture schedule: Theory

S.N.	Topic	No. of lectures
1.	Introduction to green house technology, types of green houses and climate control inside green house.	1
2.	Planning and design of greenhouses.	1
3.	Design criteria of green house for cooling and heating purposes and green house equipment's	1
4	Materials of construction for traditional and low cost green houses	1
5	Irrigation systems used in green houses	1
6	Naturally ventilated solar green house, high tech green house	1
7	Use of green house in drying	1
8	Concept and construction of low tunnels. Use of shade net house in protected cultivation	2
9	Important engineering properties such as physical, thermal dynamic aero & hydrodynamic of cereals, pulses and oilseed	1
10	Concepts of cleaning and grading vibratory and rotary type air cleaner	1
11	Drying and dehydration: Moisture measurement, EMC, drying theory, various drying methods.	1
12	Commercial grain dryers (bin dryer, tray dryer, fluidized bed dryer, re-circulatory dryer and solar dryer).	2
13	Material handling equipment: conveyers and elevators, their principle, working and selection.	2

Lecture schedule: Practical

S.N.	Topic	No. of lectures
1.	Study of various shapes of green houses.	1
2.	Measurement of climatic factors inside and outside green houses and study of greenhouse equipment's.	1
3.	Construct of low tunnel in vegetable crops.	2
4.	Study of Shade net house and visit to nearby shade net house	2
5.	Drying of agriculture produce in green house	1
6.	Determination of moisture content by oven drying methods.	1
7.	Study of spiral, centrifugal and disc separator.	1
8.	Determination of Moisture content of various grains by moisture meter.	2
9.	Study of mechanical grain dryer- bin dryer, tray dryer, and re-circulatory dryer	2
10.	Visit to seed processing plant	1
11.	Visit to agro processing plants	2

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2. Sharma, A and Salokhe, V.M. 2006. Green House Technology- Application and Practice. Agro Tech. publication, Udaipur
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PPATH-321	Diseases of Field and Horticultural Crops and their Management-II	3(2+1)

Theory

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

Field Crops: **Wheat**: Rusts, loose smut, karnal bunt, powdery mildew and ear cockle & tundu. **Barley:** Stripe, covered smut and molya disease. **Sugarcane:** Red rot, whip smut, grassy shoot, ratoon stunting and Pokkah boeng. **Sunflower**: Alternaria blight. **Lentil:** Wilt. **Mustard:** Alternaria blight, white rust and Sclerotinia rot. **Gram:** Root rot, wilt, colllor rot and Ascochyta

blight. **Isabgol:** Downy mildew. **Coriander:** Stem gall. **Cumin**: Wilt, powdery mildew and Alternaria blight. **Fenugreek:** Powdery and downy mildew, **Opium**: Powdery and downy mildew and Bacterial blight leaf blight

Horticultural Crops: Mango: Malformation, Black tip and Anthracnose. **Citrus:** Canker, dieback and gummosis. **Grape vine:** Downy mildew and anthracnose. **Apple:** Scab. **Ber:** Powdery mildew. **Aonla:** Rust. **Potato:** Late blight, black heart, golden nematode, stem nercrosis virus, black heart and leaf roll. **Cucurbits:** Powdery mildew, mosaic, Choanephora rot and root knot. **Onion**: Purple blotch. **Garlic**: Downy mildew **Chillies:** Anthracnose and leaf curl. **Pea:** Root rot and powdery mildew. **Carrot:** Alternaria blight. **Rose:** Dieback and powdery mildew. **Marigold:** Blight.

Practical:

Identification and histopathological studies of following selected diseases of field and horticultural. Field visit for the diagnosis of field problems. Collection and preservation of plant diseased specimens for herbarium.

Wheat: Rusts, loose smut, karnal bunt and ear cockle. **Barley:** Stripe, covered smut and molya disease. **Sugarcane:** Red rot, whip smut and grassy shoot. **Sunflower**: Alternaria blight. **Lentil:** Wilt. **Mustard:** Alternaria blight, white rust and Sclerotinia stem rot. **Gram:** Root rot, wilt and Ascochyta blight. **Isabgol:** Downy mildew. **Coriander:** Stem gall. **Cumin**: Wilt, powdery mildew and Alternaria blight. **Fenugreek:** Powdery mildew.

Mango: Malformation and black tip. **Citrus:** Canker, dieback and gummosis. **Grape vine:** Downy mildew and anthracnose. **Ber:** Powdery mildew. **Aonla:** Rust. **Potato:** Late blight, black heart, golden nematode and leaf roll. **Cucurbits:** Powdery mildew, mosaic, Choanephora rot and root knot. **Onion**: Purple blotch. **Chillies:** Anthracnose and leaf curl. **Pea:** Root rot and powdery mildew. **Carrot:** Alternaria blight. **Rose:** Dieback and powdery mildew. **Marigold:** Blight.

Note: Students should submit 25 pressed and well-mounted specimens.

Lectures Schedule: Theory

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

S.N.	Topic	No. of lectures
1.	Wheat: Rusts	2
2.	Wheat: loose smut, karnal bunt, flag smut and ear cockle & tundu.	2
3.	Barley: Stripe, covered smut and molya disease.	2
4.	Sugarcane: Red rot, whip smut, grassy shoot, ratoon stunting and Pokk boeng.	3
5.	Lentil: Wilt	1
6.	Mustard: Alternaria blight, white rust and Sclerotinia rot.	2
7.	Gram: Root rot, wilt and Ascochyta blight.	2
8.	Isabgol: Downy mildew, Coriander: Stem gall.	1
9.	Cumin: Wilt, powdery mildew and Alternaria blight, Fenugree Powdery mildew	2

10.	Mango: Malformation and black tip.	1
11.	Citrus: Canker, dieback and gummosis	1
12.	Grape vine: Downy mildew and anthracnose	1
13.	Apple: Scab	1
14.	Ber: Powdery mildew.	1
15.	Aonla: Rust.	1
16.	Potato: Late blight, black heart, golden nematode and leaf roll.	2
17.	Onion: Purple blotch.	1
18.	Chillies: Anthracnose and leaf curl	1
19.	Cabbage: Alternaria leaf spot and black rot	2
20.	Pea: powdery mildew	1
21.	Carrot: Alternaria blight.	1
22.	Rose: Dieback and powdery mildew. Marigold: Blight	1

Lecture Schedule: Practical

Identification and histopathological studies of following selected diseases of field and horticultural crops. Field visit for the diagnosis of field problems. Collection and preservation of plant diseased specimens for herbarium.

S.N.	Topic	No. of lectures
1.	Wheat: Rusts, loose smut, karnal bunt and ear cockle.	1
2.	Barley: Stripe, covered smut and molya disease.	1
3.	Sugarcane: Red rot.	1
4.	Field visit to diagnose the diseases and collect of disease specimen	1
5.	Lentil: Wilt. Mustard: Alternaria blight, white rust and Sclerotinia stem rot.	1
6.	Gram: Root rot, wilt and Ascochyta blight.	1
7.	Isabgol: Downy mildew. Cumin: Wilt, powdery mildew and Alternaria blight.	1
8.	Field visit to diagnose the diseases and collect of disease specimen	1
9.	Fenugreek: Powdery mildew.	1
10.	Mango: Malformation Citrus: Canker, dieback	1
11.	Ber: Powdery mildew.	1
12.	Potato: Late blight, black heart Onion: Purple blotch. Chillies: Anthracnose and leaf curl.	2
13.	Cabbage: Alternaria leaf spot and black rot. Pea: powdery mildew.	2
14.	Carrot: Alternaria blight. Rose: Dieback and powdery mildew	1

References

1. Cook, A.A., 1981. Diseases of Tropical and Sub-Tropical Field Fiber and Oil Plants. Mac Millan Publishing Co. New York.
2. Gupta V.K. and Paul Y.S. 2002. Diseases of Field Crops. Indus Publishing Co. New Delhi.

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HORT-321	Post-Harvest Management and Value Addition of Fruits and Vegetables	2(1+1)

Theory

Importance of post-harvest and value addition 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; Harvesting and field handling; Storage (ZECC, cold storage, CA, MA, and hypobaric); Value addition concept; Principles and methods of preservation; Intermediate moisture food- Jam, jelly, marmalade, preserve, candy – Concepts and Standards; Fermented and non-fermented beverages. Tomato products- Concepts and Standards; Drying/ Dehydration of fruits and vegetables – Concept and methods, osmotic drying. Canning -– Concepts and Standards, packaging of products.

Practical (Post-harvest Management and Value Addition of Fruits and Vegetables) :

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.

Lecture schedule: Theory

S.N.	Topics	No.of lectures
1.	Importance of post-harvest processing of fruits and vegetables	1
2.	Extent and possible causes of post-harvest losses	1

3.	Pre-harvest factors affecting postharvest quality, maturity, ripening and changes occurring during ripening	1
4.	Respiration and factors affecting respiration rate	1
5.	Maturity indices, Harvesting and field handling	1
6.	Storage (ZECC, cold storage, CA, MA, and hypobaric)	1
7.	Value addition concept; Principles and methods of preservation	2
8.	Intermediate moisture food- Jam, jelly, marmalade	1
9.	Preserve, candy – Concepts and Standards	1
10.	Fermented and non-fermented beverages	2
11.	Tomato products- Concepts and Standards	1

12.	Drying/ Dehydration of fruits and vegetables – Concept and methods, osmotic drying	1
13.	Canning -– Concepts and Standards, packaging of products	2

Lecture schedule: Practical

S.N.	Topics	No.of lectures
1.	Identification and applications of different types of packaging, containers for shelf life extension	1
2.	Identification of important tools/equipments/ machines and chemicals required for PHT laboratory	1
3.	Demonstration of Zero energy cool chamber	1
4.	Effect of temperature on shelf life and quality of produce (drying and dehydration)	1
5.	Demonstration of chilling and freezing injury in vegetables and fruits	1
6.	Extraction and preservation of pulps and juices	1
7.	Preparation of Jam and Jelly	1
8.	Pickles	1
9.	RTS, nectar and squash	1
10.	Osmotically dried products	1
11.	Fruit bar and Candy	1
12.	Tomato products (sauce and ketchup)	1
13.	Canned products	1
14.	Quality evaluation of products - physico-chemical (Moisture, TSS, acidity and ascorbic acid) and sensory	2
15.	Visit to processing unit/ industry.	1

References (Post-harvest Management and Value Addition of Fruits and Vegetables) :

1. Battacharjee, S.K. and De, L.C. 2005 Post Harvest Technology of Flowers and Ornamentals Plants, Pointer Publisher
2. Jacob J.P. 2008 A Handbook on Post Harvest management of Fruits and vegetables, Daya Publishing House, Delhi
3. Manoranjan, K. and Sangita, S. 1996 Food Preservation & Processing, Kalyani Publishers
4. Mitra, S.K. 1997 Post Harvest Physiology and Storage of Tropical and Sub-Tropical Fruits CAB International
5. Morris, T.N. 2006 Principles of Fruit Preservation, , Biotech Books, Delhi
6. Saraswathy, S. 2008 Post harvest Management of Horticultural Crops, Agribios

7. Srivastava, R.P. & Kumar, S 2002 Fruits and vegetable Preservation – Principles and Practice, International Book Distributing Co., Lucknow
8. Verma, L. R. and Joshi, V. K. 2000 Post Harvest Technology of Fruits and Vegetables Vol. I & II, Indus Publishing Co., New Delhi
9. Text Book of Food Sciences and Technology (2001) Vijay, K. ICAR
10. Post Harvest management of Horticultural crops Mayani, Desai, Vagadia Jaya Publishing House
11. M.K. Jatav, Good management Practices for Horticultural Crops, Ed., NIPA
12. Sharma, S., Post Harvest management & Processing of fruits & vegetables- Instant notes, NIPA
13. Laboratory Manual of Analytical Techniques in Horticulture Saini, R. Agro Bot
14. Chavan, U. Nutritional Value and Health benefits from fruits, vegetable, nuts & spices, Daya
15. Olive: Improvement, Production and Processing Lal, S. Astral
16. Bose, T., Ornamental Plants and Garden Design in Tropics and subtropics, Vol-2 set Daya
17. Sasikaumar, R., Post Harvest Technology of fruits and Vegetables, Biotech

ENTO-321	**Management of Beneficial Insects**	**2(1+1)**

Theory

Part - I

Beekeeping- Importance, bee species and biology, commercial methods of rearing, equipment used, seasonal management, bee enemies and disease. Bee pasturage, bee foraging and communication.

Sericulture- Importance, species 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. Pests and diseases of silkworm.

Lac culture- Importance, species of lac insect, morphology, biology, host plants, lac production-seed lac, button lac, shellac, lac-products.

Part - II

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

Practical

Honeybee species, castes of bees. Beekeeping appliances and seasonal management, bee enemies and disease. Bee pasturage, bee foraging and communication. Species of silkworm, voltinism of

silkworm. Knowledge of mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves. Species of lac insect, host plant identification. Identification of other important pollinators, weed killers and scavengers. Visit to research and training institutions devoted to beekeeping, sericulture, lac culture and natural enemies. Identification and techniques for mass multiplication of natural enemies.

Lecture Schedule: Theory

S.N.	Topic	No. of lectures
1.	Beekeeping- Importance, bee species and biology.	2
2.	Commercial methods of rearing, equipment used, seasonal management.	1
3.	Bee enemies and diseases.	1
4.	Bee pasturage, bee foraging and communication.	1
5.	Importance, species of silkworm, voltinism and biology.	1
6.	Mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves.	1
7.	Rearing, mounting and harvesting of cocoons. Pest and diseases of silkworm.	1
8.	Importance, species of lac insect, morphology, biology, host plants, lac production- seed lac, button lac, shellac, lac- products.	2
9.	Insect orders bearing parasitoids and predators used in pest control.	2
10.	Mass multiplication techniques of parasitoids (*Trichogramma chilonis* and *Campoletis chloridae*) and predators (ladybird beetle).	3
11.	Important species of pollinators, weed killers and scavengers with their importance.	1

Lecture Schedule: Practical

S.N.	Topic	No. of lectures
1.	Honey bee species, castes of bees.	1
2.	Beekeeping appliances and seasonal management, bee enemies and disease.	2
3.	Bee pasturage, bee foraging and communication.	1
4.	Types of silkworm, voltinism and biology of silkworm.	1
5.	Mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves.	1
6.	Species of lac insect, host plant identification.	1

7.	Identification of important parasitoids, predators, pollinators, weed killers and scavengers.	1
8.	Collection of important parasitoids, predators, pollinators, weed killers and scavengers.	2
9.	Mass multiplication techniques of parasitoids (*Trichogramma chilonis* and *Campoletis chloridae*) and predators (ladybird beetle).	4
10.	Visit to research and training institutions devoted to beekeeping, sericulture, lac culture and natural enemies.	2

References-

1. DeBach, P. 1974. Biological control by Natural enemies. Cambridge University Press.
2. Dhaliwal, G.S. and Arora R. 2001. *Integrated Pest Management: Concepts and approaches.* Kalyani Publ., New Delhi.
3. Dhaliwal, G.S. & Koul O. 2007. *Biopesticides and Pest Management*. Kalyani Publ., New Delhi.
4. Gautam, R.D. Biological Pest Suppression, Westvill Publising Co., New Delhi.
5. Mackaur, M., Laster E. Ehler and Roland., J., 1990. Critical Issues in Biological control-Intercept Ltd. Project Directorate of Biological control. 1994. Technology for mass production of Natural enemies. Technical Bulletin -4.
6. Srivastava, K.P. 2004. A Text Book of Entomology, Vol. I, Kalyani Publishers, New Delhi.
7. Abrol, D.P. 2013. Beekeeping: A Comprehensive Guide to Bee and Beekeeping, Scientific Publishers, Jodhpur.

GPB-321	**Crop Improvement-II *(Rabi crops)***	**2 (1+1)**

Theory

Centers of origin, distribution of species, wild relatives in different cereals(Wheat, Oat and Barley); pulses(Chickpea, Lentil and Field pea); oilseeds (Rapeseed Mustard and Sunflower); fodder crops (Berseem) and cash crops (Sugarcane); vegetable and horticultural crops (Potato); Plant genetic resources, its utilization and conservation; Floral biology, study of genetics of qualitative and quantitative characters; Important concepts of breeding self-pollinated, cross pollinated and vegetatively propagated crops; Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, adaptability, stability, abiotic and biotic stress tolerance and quality (physical,

chemical, nutritional); Seed production technology in self pollinated, cross pollinated and vegetatively propagated crops. Hybrid seed production technology of rabi crops. Ideotype concept and climate resilient crop varieties for future.

Practical

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

Lecture Schedule: Theory

S.N.	Topic	No. of lectures
1	Crop improvement aspects in wheat as mentioned in the syllabus such as Centers of origin, distribution of species Floral biology breeding objectives and procedures etc.	1
2	Crop improvement aspects in oat as mentioned in the syllabus such as Centers of origin, distribution of species Floral biology breeding objectives and procedures etc.	1
3	Crop improvement aspects in barley as mentioned in the syllabus such as Centers of origin, distribution of species Floral biology breeding objectives and procedures etc.	1
4	Crop improvement aspects in chickpea as mentioned in the syllabus such as Centers of origin, distribution of species Floral biology breeding objectives and procedures etc.	1
5	Crop improvement aspects in lentil as mentioned in the syllabus such as Centers of origin, distribution of species Floral biology breeding objectives and procedures etc.	1
6	Crop improvement aspects in field pea as mentioned in the syllabus such as Centers of origin, distribution of species Floral biology breeding objectives and procedures etc.	1
7	Crop improvement aspects in rapeseed mustard as mentioned in the syllabus such as Centers of origin, distribution of species Floral biology breeding objectives and procedures etc.	1
8	Crop improvement aspects in rapeseed mustard as mentioned in the syllabus such as Centers of origin, distribution of species Floral biology breeding objectives and procedures etc & hybrid seed production	1

9	Crop improvement aspects in sunflower as mentioned in the syllabus such as Centers of origin, distribution of species Floral biology breeding objectives and procedures etc.	1
10	Crop improvement aspects in berseem as mentioned in the syllabus such as Centers of origin, distribution of species Floral biology breeding objectives and procedures etc & hybrid seed production	1
11	Crop improvement aspects in lucerne as mentioned in the syllabus such as Centers of origin, distribution of species Floral biology breeding objectives and procedures etc & hybrid seed production	1
12	Crop improvement aspects in sugarcane as mentioned in the syllabus such as Centers of origin, distribution of species Floral biology breeding objectives and procedures etc.	1
13	Modern innovative approaches for development of hybrids and varieties for yield, adaptability, stability, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional)	1
14	Seed production technology in self pollinated, cross pollinated and vegetatively propagated crops	1
15	Ideotype concept	1
16	Climate resilient crop varieties for future	1

Lecture Schedule: Practical

S.N.	Topic	No. of lectures
1	Emasculation and hybridization techniques in wheat, oats, barley	1
2	Emasculation and hybridization techniques in chickpea, lentil, field pea	1
3	Emasculation and hybridization techniques in rapeseed mustard	1
4	Emasculation and hybridization techniques in sunflower, potato	1
5	Emasculation and hybridization techniques in berseem, sugarcane	1
6	Maintenance breeding of different rabi crops	1
7	Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods	1
8	Study of field techniques for seed production and hybrid seeds production in *rabi* crops	1
9	Estimation of heterosis, inbreeding depression and heritability	1
10	Layout of field experiments	1

11	Study of quality characters	1
12	Donor parents for different characters	1
13	Visit to seed production plots	2
14	Visit to AICRP plots of different field crops	2

References:

1. Chopra, V.L. 2000 Breeding of Field Crops (Edt.). Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Chaddha. K.L. and Gupta, R. 1995. Advances in Horticulture Vol. II Medicinal and Aromatic Plant. Malhotra Publishing House, New Delhi.
3. Mandal, A.K., Ganguli, P.K. and Banerjee, S.P. 1991. Advances in Plant Breeding Vol. I and II. CBS Publishers and Distributors, New Delhi.
4. Kang, M.S. 2004. Crop Improvement: Challenges in the Twenti-First Century (Edt). International Book Distributing Co. Lucknow.
5. Poehlman, J.M. 1987. Breeding of Field Crops. AVI Publishing Co..INC, East Port, Conneacticut, USA.
6. Ram, H.H. and Singh, H.G. 1994. Crop Breeding and Genetics. Kalyani Publishers, New Delhi.
7. Sharma, A.K. 2005. Breeding Technology of Crop Plants (Edt.). Yash Publishing House, Bikaner.
8. Ram. H.H. 2005. Vegetable Breeding — Principles and Practices. Kalyani Publishers, New Delhi.

AGRON-322	**Practical Crop Production – II (Rabi crops)**	**1(0+1)**

Practical

Crop planning, raising field crops in multiple cropping systems: Field preparation, seed, treatment, nursery raising, sowing, nutrient, water and weed management and management of insect-pests diseases of crops, harvesting, threshing, drying winnowing, storage and marketing of produce. The emphasis will be given to seed production, mechanization, resource conservation and management of insect-pests and diseases of crops. Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of 8-10 students.

Lecture schedule

S.N.	**Topic**	**No. of lectures**
1.	Allotment of land and field preparation	2

2.	Sowing methods	2
3.	Selection of crops and varieties	2
4.	Seed treatment	2
5.	Preparation of seed bed and sowing of crops	2
6.	Thinning and gap filling	2
7.	Fertilizer application including top dressing of fertilizers	2
8.	Intercultural operations- hoeing and weeding	2
9.	Intercultural operations- hoeing and weeding	2
10.	Application of moisture conservation practices	2
11.	Insect and pest management /control –application of insecticides.	2
12.	Disease management/control –application of fungicides	2
13.	Harvesting of the crops	2
14.	Threshing, winnowing and storage	2
15.	Marketing of produce	2
16.	Preparation of balance sheet including cost of cultivation and netreturn per student as well as team of a group of student	2

References:

1. Yawalkar, K.S., Agarwal, J.P. and Bokde, S. 2008. Manures and Fertilizers (10th edition), Agri-Horticultural Publishing House, Nagpur.
2. Balasubramaniyan, P. and Palaniappan, S.P.2016. Principles and Practices of Agronomy (2nd edition), Agrobios (India), Jodhpur.
3. Reddy, S.R. 2016. Principles of Agronomy (5th edition), Kalyani Publishers, Ludhiana.
4. Singh, S.S. and Singh, R. 2015. Principles and Practices of Agronomy (5th Re-set), Kalyani Publishers, New Delhi, Kalyani Publishers, Ludhiana.

AGRON-323	Principles of Organic Farming	2(1+1)

Theory

Organic farming, principles and its scope in India; Initiatives taken by Government (central/state), NGOs and other organizations for promotion of organic agriculture; Organic ecosystem and their concepts; Organic nutrient resources and its fortification; Restrictions to nutrient use in organic farming; Choice of crops and varieties in organic farming; Fundamentals of insect, pest, disease and weed management under organic mode of production; Operational structure of NPOP; Certification process and standards of organic farming; Processing, leveling, economic considerations and viability, marketing and export potential of organic products.

Practical

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

Lecture Schedule--Theory

S.N.	Topic	No. of lectures
1.	Organic farming, principles and its scope in India;	2
2.	Initiatives taken by Government (central/state), NGOs and other organizations for promotion of organic agriculture;	1
3.	Organic ecosystem and their concepts;	1
4.	Organic nutrient resources and its fortification;	1
5.	Restrictions to nutrient use in organic farming;	1
6.	Choice of crops and varieties in organic farming;	1
7.	Fundamentals of insect, pest, disease mgt	2
8.	weed management under organic mode of production;	1
9.	Operational structure of NPOP	2
10.	Certification process and standards of organic farming;	2
11.	Processing, leveling, economic considerations and viability,	1
12.	marketing and export potential of organic products	1

Lecture Schedule--Practical

S.N.	Topic	No. of lectures
1.	Visit of organic farms to study the various components and their utilization;	2
2.	Preparation of enrich compost,	2
3.	vermicompost,	2
4.	bio-fertilizers/bio-inoculants and their quality analysis;	2
5.	Indigenous technology knowledge (ITK) for nutrient, insect, pest disease and weed management;	2
6.	Cost of organic production system;	2
7.	Post harvest management;	2
8.	Quality aspect, grading, packaging and handling.	2

References:

1. Dhama, A.K. 2014.Organic Farming for Sustainable Agriculture (2nd edition), Agrobios (India), Jodhpur.

2. Sharma, A.K. 2013. A Handbook of Organic Farming, Agrobios (India), Jodhpur

3. Palaniappan, S.P. and Anandurai, K.1999. Organic Farming – Theory and Practice. Scientific Pub. Jodhpur

4. Thapa, U and Tripathy, P. 2006. Organic Farming in India, Problems and prospects, Agrtech, Publising Academy, Udaipur.

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AGECON-321	Farm Management, Production & Resource Economics	2(1+1)

Theory

Meaning and concept of farm management, objectives and relationship with other sciences. Meaning and definition of farms, its types and characteristics, factor determining types and size of farms. Principles of farm management: concept of production function and its type, use of production function in decision-making on a farm, factor-product, factor-factor and product-product relationship, law of equi-marginal/or principles of opportunity cost and law of comparative advantage. Meaning and concept of cost, types of costs and their interrelationship, importance of cost in managing farm business and estimation of gross farm income, net farm income, family labor income and farm business income. Farm business analysis: meaning and concept of farm income and profitability, technical and economic efficiency measures in crop and livestock enterprises. Importance of farm records and accounts in managing a farm, various types of farm records needed to maintain on farm, farm inventory, balance sheet, profit and loss accounts. Meaning and importance of farm planning and budgeting, partial and complete budgeting, steps in farm planning and budgeting. Introduction to linear programming. Concept of risk and uncertainty in agriculture production, nature and sources of risks Crop/livestock/machinery insurance – weather based crop insurance, features, determinants of compensation. Concepts of resource economics, types of natural resources, differences between NRE and agricultural economics, unique properties of natural resources. Positive and negative externalities in agriculture: Identifictaion and its measurement, solutions, Important issues in economics and management of common property resources of land, water, pasture and forest resources etc.

Practical

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

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

Lecture Schedule: Theory

S.No.	Topic	No. of lectures
	Farm management:	
1.	Meaning and concept, objectives and relationship with other sciences	1
2.	Meaning and definition of farms, its types and characteristics, factor determining types and size of farms.	1
3.	Principles of farm management: concept of production function and its type	1
4.	Use of production function in decision-making on a farm, factor-product, factor-factor and product-product relationship,	1
5.	Law of equi-marginal/or principles of opportunity cost and law of comparative advantage	1
6.	Meaning and concept of cost, types of costs and their interrelationship	1
7.	Importance of cost in managing farm business and estimation of gross farm income, net farm income, family labor income and farm business income	1
	Farm business analysis:	
8.	Meaning and concept of farm income and profitability, Technical and economic efficiency measures in crop and livestock enterprises	1
9.	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	1
10.	Meaning and importance of farm planning and budgeting, partial and complete budgeting,	1
11.	Steps in farm planning and budgeting	1
12.	Linear programming, appraisal of farm resources, selection of crops and livestock's enterprises.	1
	Concept of risk and uncertainty	
13.	Concept of risk and uncertainty occurs in agriculture production, Nature and sources of risks and its management strategies	1
	Concepts of resource economics, Differences between NRE and agricultural economics,	
14.	Unique properties of natural resources	1
15.	Positive and negative externalities in agriculture, Inefficiency and welfare loss, solutions	1
16.	Important issues in economics and management of common property resources of land, water, pasture and forest resources etc.	1

Lecture Schedule: Practical

S.N.	Topic	No. of lectures
1.	Preparation of farm layout	1
2.	Determination of cost of fencing of a farm	1
3.	Computation of depreciation cost of farm assets	1
4.	Application of equi-marginal returns/opportunity cost principle in allocation of farm resources.	2
5.	Determination of most profitable level of inputs use in a farm production process	2
6.	Determination of least cost combination of inputs	2
7.	Selection of most profitable enterprise combination	2
8.	Application of cost principles including CACP concepts in the estimation of cost of crop and livestock enterprises.	2
9.	Preparation of farm plan and budget, farm records and accounts and profit & loss accounts.	2
10.	Collection and analysis of data on various resources in India	1

References:

1. Mittal, S.K. and Sethi, C.P. "Linear Programming."
2. Tandan, R.K. and Dhondiyal, S.P. "Principles and Methods of Farm Management".
3. Heady, E.O. and Candler, W. "Linear Programming Methods."
4. Johl, S.S. and Kapoor, T.R. "Fundamental of Farm Business Management, Kalyani Publishers, Ludhiana and New Delhi
5. Sankhayan, P.L "Introduction to the Economics of Agricultural Production."
6. Singh, I.J. "Elements of Farm Management"
7. Dorfman, R. and Samuelson and Solow, R. "Linear Programming and Economic Analysis."
8. Heady, E.O. and Dillors, J.L."Agricultural Production Function".
9. Karam, A.S. and Karan Singh "Economics of Farm Management in India".
10. M.E. Sharpe and Armonk, N.Y.: Environmental and Natural Resource Economics: Theory, Policy and the Sustainable Society
11. Hartieick, J.M. and Olewiler, N.D.: The Economics of Natural Resource Use

HORT-322	Principles of Food Science and Nutrition	2(2+0)

Theory

Concepts of Food Science (definitions, measurements, density, phase change, pH, osmosis, surface tension, colloidal systems etc.); Food composition and chemistry (water, carbohydrates, proteins, fats, vitamins, minerals, flavours, colours, miscellaneous bioactives, important

reactions); 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.); 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.

Lecture Schedule: Theory

S.N.	Topic	No.of Lectures
1.	Concepts of Food Science (definitions, measurements, density, phase change, pH, osmosis, surface tension, colloidal systems etc.);	5
2.	Food composition and chemistry (water, carbohydrates, proteins, fats, vitamins, minerals, flavours, colours, miscellaneous bioactives, important reactions)	5
3.	Food microbiology (bacteria, yeast, moulds, spoilage of fresh & processed foods, Production of fermented foods)	5
4.	Principles and methods of food processing and preservation (use of heat, low temperature, chemicals, radiation, drying etc.)	4
5.	Food and nutrition, Malnutrition (over and under nutrition), nutritional disorders; Energy metabolism (carbohydrate, fat, proteins)	5
6.	Balanced/ modified diets, Menu planning,	4
7.	New trends in food science and nutrition	4

References

1. Srilakshmi, B. 201). Text Book of Food Science. New age international (P) limited, publisher, New Delhi
2. Sehgal, S. and Raghuvanshi, R.S. 200). Text Book of Community Nutrition, ICAR Publication
3. Khaddar V., 1999). Text Book of Food. Storage and Preservation. Kalyani Publishers, New Delhi.
4. Srilakshmi, B. 2010. Text Book of Nutrition Science. New age international (P) limited, publisher, New Delhi
5. Swaminathan. M. 1993. Advanced Textbook on Food and Nutrition. Volume I, Bappco, the Bangalore Press and Publishing Co. Ltd. Bangalore, p. 576.

GPB-322	**Micro-propagation Technology (Elective Course)**	**3(2+1)**

Theory

Meaning and concept of *in vitro* culture and micro-propagation; Historical milestones, advancement and future prospects of micro-propagation; totipotency, dedifferentiation; Tissue culture methodology: Sterile techniques, synthetic and natural media components, growth regulators, environmental requirement, genetic control of regeneration; Plant regeneration pathways - Organogenesis and Somatic embryogenesis;

Micro-propagation- Definition, methods, stages of micro-propagation and its significance; Axillary bud proliferation approach- Shoot tip and meristem culture; Organogenesis- Purpose, methods and requirements for organogenesis, indirect and direct organogenesis; Somatic embryogenesis- Procedures and requirements for organogenesis, indirect and direct embryogenesis; Differences between somatic and gametic embryogenesis, Synthetic seed- Concepts, necessity, procedure and requirements for production of synthetic seeds.

Practical

Laboratory organization, sterilization techniques for explants, glassware, plastic wares, lab wares and working platform. Preparation of stocks and working solution. Preparation and sterilization of growth regulators.

Preparation of working medium and experimentation on determining optimum concentration of growth regulators. Callus induction and regeneration of whole plants from different parts of plants. Direct regeneration into whole plants using bud, node and other tissues.

Induction of somatic embryos. Experiments of synthetic seeds production and testing storability and germination efficiency.

Lecture Schedule: Theory

S.N.	Topic	No. of lectures
1	Meaning and concept of *in vitro* culture and micro-propagation	1
2	Historical milestones of *in vitro* culture and micro-propagation	1
3	Advancement and future prospects of micro-propagation	1
4	Totipotency, dedifferentiation	1
5	Tissue culture methodology: Sterilization techniques	1
6	Synthetic and natural media components	1
7	Growth regulators used in tissue culture media	1
8	Environmental requirement	1
9	Genetic control of regeneration	1

10	Plant regeneration pathways - Organogenesis and Somatic embryogenesis	1
11	Micro-propagation- Definition, methods, stages of micro-propagation and its significance	1
12	Axillary bud proliferation approach- Shoot tip and meristem culture	1
13	Organogenesis- Purpose, methods and requirements for organogenesis, indirect and direct organogenesis	1
14	Somatic embryogenesis- Procedures and requirements for organogenesis, indirect and direct embryogenesis	1
15	Differences between somatic and gametic embryogenesis	1
16	Synthetic seed-Concepts, necessity, procedure and requirements for production of synthetic seeds	1

Lecture Schedule: Practical

S.N.	Topic	No. of lectures
1	Laboratory organization	1
2	Sterilization techniques for explants	2
3	Sterilization techniques for glassware	2
4	Sterilization techniques for plastic wares	2
5	Sterilization techniques for lab wares	2
6	Sterilization techniques for working platform	2
7	Preparation of stocks and working solution	1
8	Preparation of stocks and working solution	1
9	Preparation and sterilization of growth regulators	1
10	Preparation of working medium	2
11	Experimentation on determining optimum concentration of growth regulators	2
12	Callus induction and regeneration of whole plants from different parts of plants	4
13	Direct regeneration into whole plants using bud	2
14	Direct regeneration into whole plants using node	2
15	Direct regeneration into whole plants using other tissues	2
16	Induction of somatic embryos	1
17	Experiments of synthetic seeds production	1
18	Testing storability of synthetic seed	1
19	Germination efficiency of synthetic seed	1

References

1. Chawala H S 2000 Introduction to Plant Biotechnology. Oxford & IBH
2. Gupta, P.K. 2008 Elements of biotechnology Rastogi publications meerut
3. Ray V.H. 2005Introduction to biotechnology (An Agricultural revolution)
4. Shekhawat, M.S. (2011) Plant Biotechnology, In vitro principles, Techniques and Applications, MJP Publishers, Chennai
5. Mascarenhas, A.F. (2008) Hand book of Plant Tissue Culture, ICAR.
6. Singh B.D. 2005. *Biotechnology, Expanding Horizons*. Kalyani.

SEMESTER – VII

Semester – VII			
S. No.	**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.	(a) Village attachment	8	
	(b) Unit attachment in- University/ College/KVK/ Research Station Attachment	5	
	(c) Plant clinic	2	02
3.	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 03 weeks to get an experience of the industrial environment and working**.**

RAWE **Component –I**

Village Attachment Training Programme

S.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.

S.No	Activities and Tasks during Agro-Industrial Attachment Programme
1.	Acquaintance with industry and staff
2.	Study of structure, functioning, objective and mandates of the industry
3.	Study of various processing units and hands-on trainings under supervision of industry staff
4.	Ethics of industry
5.	Employment generated by the industry
6.	Contribution of the industry promoting environment
7.	Learning business network including outlets of the industry Skill development in all crucial tasks of the industry
8.	Documentation of the activities and task performed by the students
9.	Performance evaluation, appraisal and ranking of students

Evaluation of RAWE Programme

Attendance: Minimum attendance - 85%.

Records: Students would complete the record work/ report writing/ presentations, etc. based on daily field observations recorded in notebooks and weekly diaries maintained by them.

Evaluation Procedure: Students shall be evaluated component-wise under village attachment and agro-industrial attachment. The respective component In-Charge Instructor(s), agro-industrial official and Course Coordinator will evaluate the students as under:

ACTIVITY	Max. Marks
1. Village Attachment Training	

a.	KVK/ARS/NGO scientists	50
b.	Report Preparation	10
c.	University Committee (Presentation & Viva-voce)	40
2. Industrial Attachment Training		
a.	Industry officials	50
b.	Report Preparation	10
c.	University Committee (Presentation & Viva-voce)	40

Assessment Parameters (RAWE & AIA) :

	Parameters	**Marks (%)**
A	**Village Attachment**	
	Regularity	10
	Initiative & creativity	10
	General conduct & discipline	10
	Work performance	20
B.	**Industrial Attachment**	
	Initiative & compliance	10
	General conduct and discipline	10
	Project planning & implementation	10
	Work performance	20

VIII Semester (Experiential Learning Programme/ HOT)

	Module	**Credit Hr.**
	1. Module-I	0+10
	2. Module-II	0+10
	Total	20 (0+20)

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, to be decided later on from the modules listed below or as per the sanction of EL units from ICAR and available existing facilities.

S. No.	Title of the module	Credits
14.	Production Technology for Bio agents and Bio fertilizer	0+10
15.	Seed Production and Technology	0+10
16.	Mushroom Cultivation Technology	0+10
17.	Soil, Plant , Water and Seed Testing	0+10
18.	Commercial Beekeeping	0+10
19.	Poultry Production Technology	0+10
20.	Commercial Horticulture	0+10
21.	Floriculture and Landscaping	0+10
22.	Food Processing	0+10
23.	Agriculture Waste Management	0+10
24.	Organic Production Technology	0+10
25.	Nursery Management	0+10
26.	Commercial Sericulture	0+10

Evaluation of Experiential Learning Programme/ HOT

S. 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

Agricultural Economics - Annexures-I (1) to (I) (4)

1.	AGECON-121	Fundamentals of Agricultural Economics	2(2+0)
2	AGECON-211	Agricultural Finance and Co-Operation	3(2+1)
3.	AGECON-221	Agricultural Marketing, Trade & Prices	3(2+1)
4	AGECON-321	Farm Management, Production & Resource Economics	2(1+1)