

PROPOSAL

for

***SEMESTER System
Curriculum for
B.Sc. (Ag.)***

As Per:

***Vth DEANS' Committee
ICAR, New Delhi***

Discipline Wise Courses

Discipline	Course Code	Course Title	Credit Hours
Agricultural Economics & Statistics			
	AES-121	Fundamentals of Agricultural Economics	2(2+0)
	AES-201	Agriculture Finance and Cooperation	3(2+1)
	AES-202	Statistical Methods	2(1+1)
	AES-221	Agricultural Marketing Trade & Prices	3(2+1)
	AES-301	Agri-Informatics	2(1+1)
	AES-321	Farm Management, Production & Resource Economics	2(1+1)
	ELCT-AES-221	Agribusiness Management	3(2+1)
Agricultural Engineering			
	AGE-201	Farm Machinery and Power	2(1+1)
	AGE-221	Renewable energy and Green Technology	2(1+1)
	AGE-321	Protected Cultivation and Secondary Agriculture	2(1+1)
Agricultural Extension			
	EXT-101	Rural Sociology and Educational Psychology	2(2+0)
	EXT-102	Human Values and Ethics**	1(1+0)
	EXT-121	Fundamentals of Agricultural Extension Education	3(2+1)
	EXT-222	Communication Skills and Personality Development	2(1+1)
	EXT-301	Entrepreneurship Development and Business Communication	2(1+1)
	ELCT-EXT-301	Agricultural Journalism	3(2+1)
Agronomy			
	AGR-101	Fundamentals of Agronomy	4(3+1)
	AGR-102	Agriculture Heritage*	1(1+0)
	AGR-121	Farming System and Sustainable Agriculture	1(1+0)
	AGR-201	Crop Production Technology –I (<i>Kharif</i> Crops)	2(1+1)
	AGR-221	Crop Production Technology- II (<i>Rabi</i> Crops)	2(1+1)

	AGR-301	Geoinformatics and Nano-technology and Precision Farming	2(1+1)
	AGR-302	Practical Crop Production-I (<i>Kharif</i> Crops)	2(0+2)
	AGR-321	Principles of Organic Farming	2(1+1)
	AGR-322	Practical Crop production-II (<i>Rabi</i> Crops)	2(0+2)
	ELCT-AGR-321	Weed Management	3(2+1)
Animal Husbandry & Dairying			
	AHD-121	Introductory Animal Husbandry	3(2+1)
	AHD-201	Dairy Science	3(2+1)
	AHD-221	Poultry Production and Management	3(2+1)
	AHD-321	Principles of Food Science and Nutrition	2(2+0)
	ELCT-AHD-221	Food Safety and Standards	3(2+1)
Entomology			
	ENT-121	Fundamental of Entomology-I	2(1+1)
	ENT-201	Fundamentals of Entomology-II	2(1+1)
	ENT-301	Pests of Crops and Stored Grain and their Management	3(2+1)
	ENT-321	Management of Beneficial Insects	2(1+1)
	ELCT-ENT-221	Agrochemicals	3(2+1)
	ELCT-ENT-321	Biopesticides&Biofertilizers	3(2+1)
Genetics & Plant Breeding			
	GPB-101	Fundamentals of Genetics	3(2+1)
	GPB-121	Fundamental of Crop Physiology	2(1+1)
	GPB-201	Fundamentals of Plant Breeding	3(2+1)
	GPB-202	Environmental Studies and Disaster Management	3(2+1)
	GPB-221	Fundamentals of Plant Biotechnology	2(1+1)
	GPB-222	Principles of Seed Technology	3(1+2)
	GPB-301	Crop Improvement-I (<i>Kharif</i> Crops)	2(1+1)
	GPB-302	Intellectual Property Rights	1(1+0)
	GPB-321	Crop Improvement-II (<i>Rabi</i> Crops)	2(1+1)
	ELCT-GPB-301	Commercial Plant Breeding	3(2+1)

Horticulture			
	HOR-101	Fundamentals of Horticulture	2(1+1)
	HOR-121	Production Technology for Fruit and Plantation Crops	2(1+1)
	HOR-201	Production Technology for Vegetable and Spices	2(1+1)
	HOR-221	Production Technology of Ornamental Crops, MAP and Landscaping	2(1+1)
	HOR-321	Post-harvest Management and Value Addition of Fruits and Vegetables	2(1+1)
	ELCT-HOR-221	Landscaping	3(2+1)
	ELCT-HOR-301	Protected Cultivation	3(2+1)
	ELCT-HOR-321	Micro propagation Technologies	3(2+1)
	ELCT-HOR-322	Hi-tech. Horticulture	3(2+1)
Plant Pathology			
	PPA-121	Fundamental of Plant Pathology	4(3+1)
	PPA-201	Principles of Integrated Diseases Management	3(2+1)
	PPA-301	Diseases of Field & Horticultural crops and their Management-I	3(2+1)
	PPA-321	Diseases of Field & Horticultural crops and their Management-II	3(2+1)
Soil Conservation			
	SCW-101	Introductory Agrometeorology and Climate Change	2(1+1)
	SCW-121	Soil and Water Conservation Engineering	2(1+1)
	SCW-301	Introduction to Forestry	2(1+1)
	SCW-321	Rainfed Agriculture and Watershed Management	2(1+1)
	ELCT-SCW-301	System Simulation and Agro-advisory	3(2+1)
Soil Science & Agricultural Chemistry			
	SSC-101	Fundamentals of Soil Science	3(2+1)
	SSC-121	Fundamentals of Plant Biochemistry	2(1+1)
	SSC-201	Agricultural Microbiology	2(1+1)
	SSC-221	Problematic Soils and Their Management	2(2+0)
	SSC-301	Manures, Fertilizer and Soil Fertility Management	3(2+1)

Semester wise Course Distribution

Semester-I

Sl. No.	Subject Name	Course Code	Course Title	Credit Hours
1	Agronomy	AGR-101	Fundamentals of Agronomy	4(3+1)
2	Agronomy	AGR-102	Agriculture Heritage*	1(1+0)
3	English	ENG-101	Comprehension and Communication Skills in English	2(1+1)
4	Agricultural Extension	EXT-101	Rural Sociology and Educational Psychology	2(2+0)
5	Agricultural Extension	EXT-102	Human Values and Ethics**	1(1+0)
6	Genetics & Plant Breeding	GPB-101	Fundamentals of Genetics	3(2+1)
7	Horticulture	HOR-101	Fundamentals of Horticulture	2(1+1)
8	Soil Conservation	SCW-101	Introductory Agrometeorology and Climate Change	2(1+1)
9	Soil Science & Agricultural Chemistry	SSC-101	Fundamentals of Soil Science	3(2+1)
10	Biology/Math	BIO-101/ MAT-101	Introductory Biology*/ Elementary Mathematics*	2(1+1)
11	NSS/NCC/ Physical Education	NSS/NCC/ PHYEDU- 101	NSS/NCC/Physical Education**	2(0+2)
			Total	24

* - Remedial

** - Non Gradual

Semester-II

Sl. No.	Subject Name	Course Code	Course Title	Credit Hours
1	Agricultural Economics & Statistics	AES-121	Fundamentals of Agricultural Economics	2(2+0)
2	Agronomy	AGR-121	Farming System and Sustainable Agriculture	1(1+0)
3	Animal Husbandry & Dairy	AHD-121	Introductory Animal Husbandry	3(2+1)
4	Agricultural Extension	EXT-121	Fundamentals of Agricultural Extension Education	3(2+1)
5	Entomology	ENT-121	Fundamental of Entomology-I	2(1+1)
6	Genetics & Plant Breeding	GPB-121	Fundamental of Crop Physiology	2(1+1)
7	Horticulture	HOR-121	Production Technology for Fruit and Plantation Crops	2(1+1)
8	Plant Pathology	PPA-121	Fundamental of Plant Pathology	4(3+1)
9	Soil Science & Agricultural Chemistry	SSC-121	Fundamentals of Plant Biochemistry	2(1+1)
10	Soil Conservation	SCW-121	Soil and Water Conservation Engineering	2(1+1)
			Total	23

* - Remedial

** - NonGradial

Semester-III

Sl. No.	Subject Name	Course Code	Course Title	Credit Hours
1	Agricultural Economics & Statistics	AES-201	Agriculture Finance and Cooperation	3(2+1)
2	Agricultural Economics & Statistics	AES-202	Statistical Methods	2(1+1)
3	Agricultural Engineering	AGE-201	Farm Machinery and Power	2(1+1)
4	Agronomy	AGR-201	Crop Production Technology –I (<i>Kharij</i> Crops)	2(1+1)
5	Animal Husbandry & Dairy	AHD-201	Dairy Science	3(2+1)
6	Entomology	ENT-201	Fundamentals of Entomology-II	2(1+1)
7	Genetics & Plant Breeding	GPB-201	Fundamentals of Plant Breeding	3(2+1)
8	Genetics & Plant Breeding	GPB-202	Environmental Studies and Disaster Management	3(2+1)
9	Horticulture	HOR-201	Production Technology for Vegetable and Spices	2(1+1)
10	Plant Pathology	PPA-201	Principles of Integrated Diseases Management	3(2+1)
11	Soil Science & Agricultural Chemistry	SSC-201	Agricultural Microbiology	2(1+1)
			Total	27

* - Remedial

** - NonGradial

Semester-IV

Sl. No.	Subject Name	Course Code	Course Title	Credit Hours
1	Agricultural Economics & Statistics	AES-221	Agricultural Marketing Trade & Prices	3(2+1)
2	Agricultural Engineering	AGE-221	Renewable energy and Green Technology	2(1+1)
3	Agronomy	AGR-221	Crop Production Technology- II (<i>Rabi</i> Crops)	2(1+1)
4	Animal Husbandry & Dairy	AHD-221	Poultry Production and Management	3(2+1)
5	Agricultural Extension	EXT-221	Communication Skills and Personality Development	2(1+1)
6	Genetics & Plant Breeding	GPB-221	Fundamentals of Plant Biotechnology	2(1+1)
7	Genetics & Plant Breeding	GPB-222	Principles of Seed Technology	3(1+2)
8	Horticulture	HOR-221	Production Technology of Ornamental Crops, MAP and Landscaping	2(1+1)
9	Soil Science & Agricultural Chemistry	SSC-221	Problematic Soils and Their Management	2(2+0)
10	Elective course related Disciplines	ELCT-AES-221/ ELCT-AHD-221/ ELCT-ENT-221/ ELCT-HOR-221	Elective Course***	3(2+1)
			Total	24

* - Remedial

** - NonGradial

*** - Elective Course

Semester-V

Sl. No.	Subject Name	Course Code	Course Title	Credit Hours
1	Agricultural Economics & Statistics	AES-301	Agri-Informatics	2(1+1)
2	Agronomy	AGR-301	Geoinformatics and Nano-technology and Precision Farming	2(1+1)
3	Agronomy	AGR-302	Practical Crop Production-I (Kharif Crops)	2(0+2)
4	Entomology	ENT-301	Pests of Crops and Stored Grain and their Management	3(2+1)
5	Agricultural Extension	EXT-301	Entrepreneurship Development and Business Communication	2(1+1)
6	Genetics & Plant Breeding	GPB-301	Crop Improvement-I (Kharif Crops)	2(1+1)
7	Genetics & Plant Breeding	GPB-302	Intellectual Property Rights	1(1+0)
8	Plant Pathology	PPA-301	Diseases of Field & Horticultural crops and their Management-I	3(2+1)
9	Soil Conservation	SCW-301	Introduction to Forestry	2(1+1)
10	Soil Science & Agricultural Chemistry	SSC-301	Manures, Fertilizer and Soil Fertility Management	3(2+1)
11	Elective course related Disciplines	ELCT-EXT-301/ ELCT-GPB-301/ ELCT-HOR-301/ ELCT-SCW-301	Elective Course***	3(2+1)
			Total	25

* - Remedial

** - Non Gradual

*** - Elective Course

Semester-VI

Sl. No.	Subject Name	Course Code	Course Title	Credit Hours
1	Agricultural Engineering	AGE-321	Protected Cultivation and Secondary Agriculture	2(1+1)
2	Agricultural Economics & Statistics	AES-321	Farm Management, Production & Resource Economics	2(1+1)
3	Agronomy	AGR-321	Principles of Organic Farming	2(1+1)
4	Agronomy	AGR-322	Practical Crop production-II (<i>Rabi</i> Crops)	2(0+2)
5	Animal Husbandry & Dairy	AHD-321	Principles of Food Science and Nutrition	2(2+0)
6	Entomology	ENT-321	Management of Beneficial Insects	2(1+1)
7	Genetics & Plant Breeding	GPB-321	Crop Improvement-II (<i>Rabi</i> Crops)	2(1+1)
8	Horticulture	HOR-321	Post-harvest Management and Value Addition of Fruits and Vegetables	2(1+1)
9	Plant Pathology	PPA-321	Diseases of Field & Horticultural crops and their Management-II	3(2+1)
10	Soil Conservation	SCW-321	Rainfed Agriculture and Watershed Management	2(1+1)
11	Education Tour Programme	ETP-321	Education Tour	2(0+2)
12	Elective course related Disciplines	ELCT-AGR-321/ ELCT-ENT-321/ ELCT-HOR-321/ ELCT-HOR-322	Elective Course***	3(2+1)
			Total	26

* - Remedial

** - Non Gradual

*** - Elective Course

Semester Wise Offered Courses and Examination Evaluation Pattern

Semester-I

Sl. No.	Course Code	Course Title	Credit Hours	Evaluation Marks			Total
				Mid Term	End Term	Practical	
1	AGR-101	Fundamentals of Agronomy	4(3+1)	20	50	30	100
2	AGR-102	Agriculture Heritage*	1(1+0)	20	80	-	100
3	ENG-101	Comprehension and Communication Skills in English	2(1+1)	20	50	30	100
4	EXT-101	Rural Sociology and Educational Psychology	2(2+0)	20	80	-	100
5	EXT-102	Human Values and Ethics**	1(1+0)	20	80	-	100
6	GPB-101	Fundamentals of Genetics	3(2+1)	20	50	30	100
7	HOR-101	Fundamentals of Horticulture	2(1+1)	20	50	30	100
8	SCW-101	Introductory Agrometeorology and Climate Change	2(1+1)	20	50	30	100
9	SSC-101	Fundamentals of Soil Science	3(2+1)	20	50	30	100
10	BIO-101/ MAT-101	Introductory Biology*/ Elementary Mathematics*	2(1+1)	20	50	30	100
11	NSS/NCC/ PHYEDU-101	NSS/NCC/Physical Education**	2(0+2)	-	-	100	100
		Total	24				

* - Remedial

** - Non Gradual

Semester-II

Sl. No.	Course Code	Course Title	Credit Hours	Evaluation Marks			Total
				Mid Term	End Term	Practical	
1	AES-121	Fundamentals of Agricultural Economics	2(2+0)	20	80		100
2	AGR-121	Farming System and Sustainable Agriculture	1(1+0)	20	80	-	100
3	AHD-121	Introductory Animal Husbandry	3(2+1)	20	50	30	100
4	EXT-121	Fundamentals of Agricultural Extension Education	3(2+1)	20	50	30	100
5	ENT-121	Fundamental of Entomology-I	2(1+1)	20	50	30	100
6	GPB-121	Fundamental of Crop Physiology	2(1+1)	20	50	30	100
7	HOR-121	Production Technology for Fruit and Plantation Crops	2(1+1)	20	50	30	100
8	PPA-121	Fundamental of Plant Pathology	4(3+1)	20	50	30	100
9	SSC-121	Fundamentals of Plant Biochemistry	2(1+1)	20	50	30	100
10	SCW-121	Soil and Water Conservation Engineering	2(1+1)	20	50	30	100
		Total	23				

* - Remedial

** - NonGradial

Semester-III

Sl. No.	Course Code	Course Title	Credit Hours	Evaluation Marks			Total
				Mid Term	End Term	Practical	
1	AES-201	Agriculture Finance and Cooperation	3(2+1)	20	50	30	100
2	AES-202	Statistical Methods	2(1+1)	20	50	30	100
3	AGE-201	Farm Machinery and Power	2(1+1)	20	50	30	100
4	AGR-201	Crop Production Technology –I (<i>Kharif</i> Crops)	2(1+1)	20	50	30	100
5	AHD-201	Dairy Science	3(2+1)	20	50	30	100
6	ENT-201	Fundamentals of Entomology-II	2(1+1)	20	50	30	100
7	GPB-201	Fundamentals of Plant Breeding	3(2+1)	20	50	30	100
8	GPB-202	Environmental Studies and Disaster Management	3(2+1)	20	50	30	100
9	HOR-201	Production Technology for Vegetable and Spices	2(1+1)	20	50	30	100
10	PPA-201	Principles of Integrated Diseases Management	3(2+1)	20	50	30	100
11	SSC-201	Agricultural Microbiology	2(1+1)	20	50	30	100
		Total	27				

* - Remedial

** - NonGradial

Semester-IV

Sl. No.	Course Code	Course Title	Credit Hours	Evaluation Marks			Total
				Mid Term	End Term	Practical	
1	AES-221	Agricultural Marketing Trade & Prices	3(2+1)	20	50	30	100
2	AGE-221	Renewable energy and Green Technology	2(1+1)	20	50	30	100
3	AGR-221	Crop Production Technology- II (<i>Rabi</i> Crops)	2(1+1)	20	50	30	100
4	AHD-221	Poultry Production and Management	3(2+1)	20	50	30	100
5	EXT-221	Communication Skills and Personality Development	2(1+1)	20	50	30	100
6	GPB-221	Fundamentals of Plant Biotechnology	2(1+1)	20	50	30	100
7	GPB-222	Principles of Seed Technology	3(1+2)	20	50	30	100
8	HOR-221	Production Technology of Ornamental Crops, MAP and Landscaping	2(1+1)	20	50	30	100
9	SSC-221	Problematic Soils and Their Management	2(2+0)	20	80	-	100
10	ELCT-AES-221/ ELCT-AHD-221/ ELCT-ENT-221/ ELCT-HOR-221	Elective Course***	3(2+1)	20	50	30	100
		Total	24				

* - Remedial

** - NonGradial

*** - Elective Course

Semester-V

Sl. No.	Course Code	Course Title	Credit Hours	Evaluation Marks			Total
				Mid Term	End Term	Practical	
1	AES-301	Agri-Informatics	2(1+1)	20	50	30	100
2	AGR-301	Geoinformatics and Nano-technology and Precision Farming	2(1+1)	20	50	100	100
3	AGR-302	Practical Crop Production-I (<i>Kharif</i> Crops)	2(0+2)	-	-	100	100
4	ENT-301	Pests of Crops and Stored Grain and their Management	3(2+1)	20	50	30	100
5	EXT-301	Entrepreneurship Development and Business Communication	2(1+1)	20	50	30	100
6	GPB-301	Crop Improvement-I (<i>Kharif</i> Crops)	2(1+1)	20	50	30	100
7	GPB-302	Intellectual Property Rights	1(1+0)	20	80	-	100
8	PPA-301	Diseases of Field & Horticultural crops and their Management-I	3(2+1)	20	50	30	100
9	SCW-301	Introduction to Forestry	2(1+1)	20	50	30	100
10	SSC-301	Manures, Fertilizer and Soil Fertility Management	3(2+1)	20	50	30	100
11	ELCT-EXT-301/ ELCT-GPB-301/ ELCT-HOR-301/ ELCT-SCW-301	Elective Course***	3(2+1)	20	50	30	100
		Total	25				

* - Remedial

** - NonGradial

*** - Elective Course

Semester-VI

Sl. No.	Course Code	Course Title	Credit Hours	Evaluation Marks			Total
				Mid Term	End Term	Practical	
1	AGE-321	Protected Cultivation and Secondary Agriculture	2(1+1)	20	50	30	100
2	AES-321	Farm Management, Production & Resource Economics	2(1+1)	20	50	30	100
3	AGR-321	Principles of Organic Farming	2(1+1)	20	50	30	100
4	AGR-322	Practical Crop production-II (<i>Rabi</i> Crops)	2(0+2)	-	-	100	100
5	AHD-321	Principles of Food Science and Nutrition	2(2+0)	20	80	-	100
6	ENT-321	Management of Beneficial Insects	2(1+1)	20	50	30	100
7	GPB-321	Crop Improvement-II (<i>Rabi</i> Crops)	2(1+1)	20	50	30	100
8	HOR-321	Post-harvest Management and Value Addition of Fruits and Vegetables	2(1+1)	20	50	30	100
9	PPA-321	Diseases of Field & Horticultural crops and their Management-II	3(2+1)	20	50	30	100
10	SCW-321	Rainfed Agriculture and Watershed Management	2(1+1)	20	50	30	100
11	ETP-321	Education Tour	2(0+2)	-	-	100	100
12	ELCT-AGR-321/ ELCT-ENT-321/ ELCT-HOR-321/ ELCT-HOR-322	Elective Course***	3(2+1)	20	50	30	100
		Total	24				

* - Remedial

** - Non Gradual

*** - Elective Course

VII Semester

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

Course Code: RAWE-401

Sl. No.	Activities	Number of weeks	Credit Hours
1	General orientation & On campus training by different faculties	01	14
2	Village attachment	08	
	Unit attachment in University/KVK/ Research Station Attachment	05	
3	Plant clinic	02	02
	Agro-Industrial Attachment	03	04
4	Project Report Preparation, Presentation and Evaluation	01	
	Total week of RAWE and AIA	20	20

- **Agro- Industrial Attachment:** The students would be attached with the agro-industries for a period of 3 weeks to get an experience of the industrial environment and working.

RAWE Component-I

Village Attachment Training Programme

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

RAWE Component –II

Agro Industrial Attachment

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

Activities and Tasks during Agro-Industrial Attachment Programme

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

VIII semester

Experiential Learning Programme (ELP)

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.

Sl. No.	Module Code	Title: of the module	CreditsHours
1	ELP-421	Production Technology for Bioagents and Biofertilizer	0+10
2	ELP-422	Seed Production and Technology	0+10
3	ELP-423	Mushroom Cultivation Technology	0+10
4	ELP-424	Soil, Plant, Water and Seed Testing	0+10
5	ELP-425	Commercial Beekeeping	0+10
6	ELP-426	Poultry Production Technology	0+10
7	ELP-427	Commercial Horticulture	0+10
8	ELP-428	Floriculture and Landscaping	0+10
9	ELP-429	Food Processing	0+10

10	ELP-430	Agriculture Waste Management	0+10
11	ELP-431	Organic Production Technology	0+10
12	ELP-432	Commercial Sericulture	0+10

NOTE: In addition to above ELP modules other important modules may be given to the students

Evaluation of Experiential Learning Programme

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:

Sl. No.	Title: of the module	Credits Hours
1	Agronomy	18 (9+9)
2	Agricultural Economics & Statistics	14 (9+5)
3	Agricultural Engineering	6 (3+3)
4	Agricultural Extension	9 (6+3)
5	Animal Husbandry & Dairying	11 (8+3)
6	Entomology	9 (5+4)
7	Genetics & Plant Breeding	21 (12+9)
8	Horticulture	10 (5+5)
9	Plant Pathology	13 (9+4)
10	Soil Science & Agricultural Chemistry	12 (8+4)
11	Soil Conservation	8 (4+4)
12	English (Language)	2 (1+1)
13	Remedial Courses	03 (Bio/Math) 01 (Agriculture)
14	NCC/NSS/Physical Education & Yoga Practices	2 (0+2)
15	Human Values and Ethics	1 (1+0)
16	RAWE + ELP	20 + 20

17	Educational tour	2(0+2)
	Grand Total	187+ remedial

New Courses

Sl. No.	Title: of the module	Credits Hours
1	Geoinformatics, Nanotechnology and Precision Farming	2(1+1)
2	Rainfed Agriculture and Watershed Management	2(1+1)
3	Problematic Soils and their Management	2(2+0)
4	Renewable Energy and Green Technology	2(1+1)
5	Management of Beneficial Insects	2(1+1)
6	Fundamentals of Horticulture	2(1+1)
7	Introduction to Forestry	2(1+1)
8	Agri- Informatics	2(1+1)
9	Intellectual Property Rights	1(1+0)
10	Principles of Food Science & Technology	2(2+0)
11	Communication Skills and Personality Development	2(1+1)
12	Principles of Integrated Pest & Diseases Management	3(2+1)
13	Agricultural Heritage	1(1+0)*
14	Introductory Biology	2(1+1)*
15	Elementary Mathematics	2(2+0)*
16	Human Values & Ethics (NG)	1(1+0)**

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

Sl. No.	Course Code	Elective Course	Credits Hours
1	ELCT-AES-221	Agribusiness Management	3(2+1)
2	ELCT-AHD-221	Food Safety and Standards	3(2+1)
3	ELCT-ENT-221	Agrochemicals	3(2+1)
4	ELCT-HOR-221	Landscaping	3(2+1)
5	ELCT-EXT-301	Agricultural Journalism	3(2+1)
6	ELCT-GPB-301	Commercial Plant Breeding	3(1+2)
7	ELCT-HOR-301	Protected Cultivation	3(2+1)
8	ELCT-SCW-301	System Simulation and Agro-advisory	3(2+1)
9	ELCT-AGR-321	Weed Management	3(2+1)
10	ELCT-ENT-321	Biopesticides&Biofertilizers	3(2+1)
11	ELCT-HOR-321	Micro propagation Technologies	3(1+2)
12	ELCT-HOR-322	Hi-tech. Horticulture	3(2+1)

Syllabus

Semester- Ist

Course Title: Fundamentals of Agronomy

Course Code: AGR-101

Credit Hours:: 4(3+1)

Theory

Agronomy and its scope, seeds and sowing, tillage and tith, 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, 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, study of agroclimatic zones of India, 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.

Course Title: Agricultural Heritage

Course code: AGR-102

Credit Hours:: 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.

Practical

Morphology of flowering plants – root, stem and leaf and their modifications. Inflorescence, 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.

Course Title: Comprehension and Communication Skills in English

Course Code: ENG-101

CreditHours:: 2(1+1)

Theory

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

Practical

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

Course Title: Rural Sociology & Educational Psychology

Course Code: EXT-101

CreditHours:: 2(2+0)

Theory

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

Course Title: Human Value and Ethics

Course Code: EXT-102

CreditHours:: 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.

Course Title: Fundamentals of Genetics

Course Code: GPB-101

CreditHours:: 3(2+1)

Theory

Pre and Post Mendelian concepts of heredity, Mendelian principles of heredity. Architecture of chromosome; chromonemata, chromosome matrix, chromomeres, centromere, secondary constriction and telomere; special types of chromosomes. Chromosomal theory of inheritance-cell cycle and cell division- mitosis and meiosis. Probability and Chi-square.

Dominance relationships, Epistatic interactions with example. 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 and numerical variations in chromosome and their implications, Use of haploids, dihaploids and doubled haploids in Genetics. Mutation, classification, Methods of inducing mutations & CIB technique, mutagenic agents and induction of mutation. Qualitative & Quantitative traits, Polygenes and continuous variations, multiple factor hypothesis, Cytoplasmic inheritance. Genetic disorders. Nature, structure & replication of genetic material. Protein synthesis.

Practical

Study of microscope.

Study of cell structure.

Mitosis and Meiosis cell division.

Experiments on monohybrid, dihybrid, trihybrid, test cross and back cross,

Experiments on epistatic interactions including test cross and back cross, Practice on mitotic and meiotic cell division,

Experiments on probability and Chi-square test.

Determination of linkage and cross-over analysis (through two point test cross and three point test cross data).

Study of models on DNA and RNA structures.

Course Title: Fundamentals of Horticulture

Course Code: HOR-101

CreditHours: 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; medicinal and aromatic plants; 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.

Course Title: Introductory Agro-Meteorology & Climate Change

Course Code: SCW-101

CreditHours:: 2 (1+1)

Theory

- 1. Meteorology:** Meaning and scope of agricultural meteorology; climate and weather.
- 2. Earth atmosphere:** Its composition, extent and structure; atmospheric weather variables; atmospheric pressure, its variation with height.
- 3. Wind:** Types of wind, daily and seasonal variation of wind speed, cyclone, anticyclone, land breeze and sea breeze.
- 4. Solar radiation:** 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,
- 5. Atmospheric humidity:** Definition, concept of saturation, vapor pressure, process of condensation.
- 6. Precipitation:** Process of precipitation, types and forms of precipitation, cloud formation and classification and artificial rainmaking, rainfall, rainfall intensity and hydrological cycle and its components.
- 7. Monsoon:** Mechanism and importance in Indian agriculture,

8. **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.
9. **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.
10. **Climatic Zone:** Indian Agro-Climatic Zones.

Practical

1. Visit of Agro-meteorological observatory, site selection of observatory, exposure of instruments and weather data recording.
2. Measurement of total, shortwave and longwave radiation, and its estimation using Planck's intensity law.
3. Measurement of albedo and sunshine duration, computation of Radiation Intensity using BSS.
4. Measurement of maximum and minimum air temperatures, its tabulation, trend and variation analysis.
5. Measurement of soil temperature and computation of soil heat flux.
6. Determination of vapor pressure and relative humidity.
7. Determination of dew point temperature.
8. Measurement of atmospheric pressure and analysis of atmospheric conditions.
9. Measurement of wind speed and wind direction, preparation of wind rose.
10. Measurement, tabulation and analysis of rain.
11. Measurement of open pan evaporation and evapotranspiration.
12. Computation of PET and AET.
13. Study of wind vane and anemometer.
14. Computation of average rainfall.
15. Measurement of rainfall by Rain Gauge

Course Title: Fundamentals of Soil Science

Course Code: SSC-101

CreditHours:: 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; Elementary knowledge of soil taxonomy classification and soils of India; Soil water retention, movement and availability; Soil air, composition, gaseous exchange, problem and plant 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 organic matter: composition, properties and its influence on soil properties; humic substances - nature and properties; soil organisms: macro and micro organisms, their beneficial and harmful effects; Soil pollution - behaviour of pesticides and inorganic contaminants, prevention and mitigation of soil pollution.

Practical

Study of soil profile in field. Study of soil sampling tools, collection of representative soil sample, its processing and storage. Study of soil forming rocks and minerals. Determination of soil density, moisture content and porosity. Determination of soil texture by feel and Bouyoucos Methods. Studies of capillary rise phenomenon of water in soil column and water movement in soil. Determination of soil pH and electrical conductivity. Determination of cation exchange capacity of soil. Study of soil map. Determination of soil colour. Demonstration of heat transfer in soil. Estimation of organic matter content of soil. Estimation of CO_3 and HCO_3 in soil water.

Course Title: Introductory Biology

Course Code: BIO-101

Credit Hours: 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 flowering 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. Inflorescence, 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.

Course Title: Elementary Mathematics

Course Code: MAT-101

Credit Hours: 2(1+1)

Theory

Straight lines : Distance formula, section formula (internal and external division), Change of axes (only origin changed), Equation of co-ordinate axes, Equation of lines parallel to axes, Slope-intercept form of equation of line, Slope-point form of equation of line, Two point form of equation of line, Intercept form of equation of line, Normal form of equation of line,

General form of equation of line, Point of intersection of two st. lines, Angles between two st. lines, Parallellines, Perpendicular lines, Angle of bisectors between two lines, Area of triangle and quadrilateral. Circle: Equation of circle whose centre and radius is known, General equation of a circle, Equation of circle passing through three given points, Equation of circle whose diameters is line joining two points (x_1, y_1) & (x_2, y_2) , Tangent and Normal to a given circle at given point (Simple problems), Condition of tangency of a line $y = mx + c$ to the given circle $x^2 + y^2 = a^2$. Differential Calculus: Definition of function, limit and continuity, Simple problems on limit, Simple problems on continuity, Differentiation of x^n , e^x , $\sin x$ & $\cos x$ 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.

Practical

- Problems on Addition-Subtraction-Multiplication-Transpose of matrix 3rd order.
- Problems on minor-Co-factor of matrix-Inverse of matrix up to 3rd order.
- Cramer's rule and simple problems based on it and problems on determinants.
- Function limit and continuity with simple problems.
- Problems on differentiation of x^n - e^x - $\sin x$ and $\cos x$ by first principle.
- Derivatives of sum - difference product and quotient of two functions -
- Differentiation of functions of functions - Simple problems based on it.
- Logarithmic-Inverse-Trigonometric functions-Functions of functions
- Equations of tangent-Normal of given curve at given point-Simple problems.
- Problems on integration of functions-Integration of product of two functions-
- Integration by substitution method.
- Integral (simple problems based on it)-Area under simple well-known curves.
- Problems on different types of straight line forms.

Semester II

Course Title: Fundamentals of Agricultural Economics

Course Code: AES-121

CreditHours:: 2 (2+0)

UNIT I: Economics: Meaning, scope and subject matter, definitions, activities, approaches to economic analysis; micro and macro economics, positive and normative analysis. Nature of economic theory; rationality assumption, concept of equilibrium, economic laws as generalization of human behaviour.

UNIT II: Basic concepts: Goods and services, desire, want, demand, utility, cost and price, wealth, capital, income and welfare.

UNIT III: Agricultural economics : meaning, definition, characteristics of agriculture, importance and its role in economic development. Agricultural planning and development in the country.

UNIT IV: Demand: meaning, law of demand, schedule and demand curve, determinants, utility theory; law of diminishing marginal utility, equi-marginal utility principle. Consumer's equilibrium and derivation of demand curve, concept of consumer surplus.

UNIT V: Elasticity of demand: concept and measurement of price elasticity, income elasticity and cross elasticity.

UNIT VI: Production: Process, creation of utility, factors of production, input output relationship.

UNIT VII: Laws of returns: Law of variable proportions and law of returns to scale. *Cost:* concepts, short run and long run cost curves. Supply law of supply, schedule, supply curve, determinants of supply, and elasticity of supply.

UNIT VIII: Market structure: meaning and types of market, basic features of perfectly competitive and imperfect markets. Price determination under perfect competition; short run and long run equilibrium of firm and industry, shut down and break even points.

UNIT IX: Distribution theory: meaning, factor market and pricing of factors of production. Concepts of rent, wage, interest and profit.

UNIT X: National income: Meaning and importance, circular flow, concepts of national income accounting and approaches to measurement, difficulties in measurement.

UNIT XI: Population: Importance, Malthusian and optimum population theories, natural and socio-economic determinants, current policies and programmes on population control.

UNIT XII: Money: Barter system of exchange and its problems, evolution, meaning and functions of money, classification of money, supply, general price index, inflation and deflation. Public revenue and public expenditure.

UNIT XIII: Tax: meaning, direct and indirect taxes, agricultural taxation, VAT, GST.

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

Course Title: Farming System and Sustainable Agriculture

Course Code: AGR-121

CreditHours:: 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.

Course Title: Introductory Animal Husbandry

Course Code:AHD-121

CreditHours:: 3(2+1)

Theory

Importance of livestock in agriculture and economy. Dairying under specialized and mixed farming. Livestock and milk production statistics. Dairy Cattle and Buffaloes management: cattle and buffaloes breeds, breeding methods and systems, care and management of pregnant and mulching animals, raising of calves, management of heifer and bulls, maintenance of livestock records, milking methods and principles, clean milk production, feed and feeding, Pig, Management: importance, important breeds, raising of piglet up to age of slaughter, general aspect of breeding, care of sow and boar. Sheep and goat: importance, important breeds, raising of kids and lambs, breeding, feeding of goat and sheep. Health Management: Common animal diseases of cattle, buffalo, goat, sheep and swine viz. anthrax, BQ, HS, Brucellosis, Mastitis, swine fever and enterotoxaemia, vaccination schedule.

Practical

Judging of cattle, sheep and wool. Detection of heat and pregnancy, computation of ration for different purposes of different animals. Milking methods, record keeping and use of quadrille in swine.

Course Title: Fundamentals of Agricultural Extension Education

Course Code: EXT-121

CreditHours:: 3 (2+1)

Theory

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

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

Practical

To get acquainted with university extension system. Group discussion- exercise; handling and use of audio visual equipments and digital camera and LCD projector; preparation and use of AV aids, preparation of extension literature – leaflet, booklet, folder, pamphlet news stories and success stories; Presentation skills exercise; micro teaching exercise; A visit to village to understand the problems being encountered by the villagers/ farmers; to study organization and functioning of DRDA and other development departments at district level; visit to NGO and learning from their experience in rural development; understanding PRA techniques and their application in village development planning; exposure to mass media: visit to community radio and television studio for understanding the process of programme production; script writing, writing for print and electronic media, developing script for radio and television.

Course Title: Fundamentals of Entomology-I

Course Code: ENT-121

CreditHours:: 2(1+1)

Theory

History of Entomology in India. Major points related to dominance of Insecta in Animal kingdom. Classification of phylum Arthropoda upto classes. Relationship of class Insecta with other classes of Arthropoda.

Morphology:

Structure and functions of insect cuticle and molting. Body segmentation. Structure of Head, thorax and abdomen. Structure and modifications of insect antennae, mouth parts, legs, Wing venation, modifications and wing coupling apparatus. Metamorphosis and diapause in insects. Types of larvae and pupae.

Structure and functions of digestive, excretory, respiratory, secretory and reproductive system, in insects. Types of reproduction in insects. Major sensory organs like simple and compound eyes, chemoreceptor.

Systematics:

Taxonomy –importance, history and development and binomial nomenclature. Definitions of Biotype, Sub-species, Species, Genus, Family and Order. Classification of class Insecta upto Orders, basic groups of present day insects with special emphasis to orders and families of Agricultural importance like

Orthoptera: Acrididae, Tettigonidae, Gryllidae, Gryllotalpidae;

Dictyoptera: Mantidae, Blattidae;

Odonata;

Isoptera: Termitidae;

Thysanoptera: Thripidae;

Hemiptera: Pentatomidae, Coreidae, Cimicidae, Pyrrhocoridae, Lygaeidae, Cicadellidae, Delphacidae, Aphididae, Coccidae, Lophophidae, Aleurodidae, Pseudococcidae; Neuroptera: Chrysopidae;

Lepidoptera: Pieridae, Papilionidae, Noctuidae, Sphingidae, Pyralidae, Gelechiidae, Arctiidae, Saturnidae, Bombycidae;

Coleoptera: Coccinellidae, Chrysomelidae, Cerambycidae, Curculionidae, Bruchidae, Scarabaeidae;

Hymenoptera: Tenthredinidae, Apidae, Trichogrammatidae, Ichneumonidae, Braconidae, Chalcididae;

Diptera: Cecidomyiidae, Tachinidae, Agromyziidae, Culicidae, Muscidae, Tephritidae.

Practical

Methods of collection and preservation of insects including immature stages; External features of Grasshopper/Blister beetle; Types of insect antennae, mouthparts and legs; Wing venation, types of wings and wing coupling apparatus. Types of insect larvae and pupae; Dissection of digestive system in insects (Grasshopper); Dissection of male and female reproductive systems in insects (Grasshopper);

Study of characters of orders Orthoptera, Dictyoptera, Odonata, Isoptera, Thysanoptera, Hemiptera, Lepidoptera, Neuroptera, Coleoptera, Hymenoptera, Diptera and their families of agricultural importance.

Course Title: Fundamentals of Crop Physiology

Course Code: GPB-121

Credit Hours: 2(1+1)

Theory

Introduction to crop physiology and its importance in Agriculture; Plant cell: an Overview; Diffusion and osmosis; Absorption of water, transpiration and Stomatal Physiology; Mineral nutrition of Plants: Functions and deficiency symptoms of nutrients, nutrient uptake mechanisms; Photosynthesis: Light and Dark reactions, C₃, C₄ and CAM plants; Respiration: Glycolysis, TCA cycle and electron transport chain; Fat Metabolism. Plant growth regulators: Physiological roles and agricultural uses, Physiological aspects of growth and development of major crops: Growth analysis, Role of Physiological growth parameters in crop productivity.

Practical

Study of plant cells, structure and distribution of stomata, imbibitions, osmosis, plasmolysis, measurement of root pressure, rate of transpiration, Separation of photosynthetic pigments through paper chromatography, Rate of transpiration, photosynthesis, respiration, tissue test for mineral nutrients, estimation of relative water content, Measurement of photosynthetic.

Course Title: Production Technology for Fruit and Plantation Crops

Course Code: HOR-121

Credit Hours: 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

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.

Course Title: Fundamentals of Plant Pathology

Course Code:PPA-121

Credit Hours: 4(3+1)

Theory

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

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

Life cycles of *Pythium*, *Phytophthora*, *Albugo*, *Peronospora*, *Sclerospora*, *Ustilago*, *Sphacelotheca*, *Tolyposporium*, *Mucor*, *Rhizopus*, *Erysiphe*, *Aspergillus*, *Penicillium*, *Puccinia*, *Melampsora*, *Claviceps*, *Alternaria*, *Collectotrichum*, *Cercospora*, *Helminthosporium*, *Pyricularia*, *Rhizoctonia*. and *Fusarium*.

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

Viruses: nature, structure, replication and transmission. Study of phanerogamic plant parasites.

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

Liberation / dispersal and survival of plant pathogens. Role of enzymes, toxins and growth regulators in disease development. Defense mechanism in plants. Elementary knowledge of pathogenesis, parasitism, symbiosis and antibiosis. Epidemiology: Factors affecting disease development. Principles and methods of plant disease management. Nature, chemical combination, classification, mode of action and formulations of fungicides and antibiotics.

Practical

Acquaintance with various laboratory equipments and microscopy. Collection and preservation of disease specimen. Preparation of media, isolation and Koch's postulates. General study of different structures of fungi. Study of symptoms of various plant diseases. Study of representative fungal genera. Staining and identification of plant pathogenic bacteria. Transmission of plant viruses. Study of phanerogamic plant parasites. Study of morphological features and identification of plant parasitic nematodes. Sampling and extraction of nematodes from soil and plant material, preparation of nematode mounting. Study of fungicides and their formulations. Methods of pesticide application and their safe use. Calculation of fungicide sprays concentrations.

Course Title: Fundamentals of Plant Biochemistry

Course Code: SSC-121

Credit Hours: 2(1+1)

Theory

Importance of Biochemistry. Properties of Water, pH and Buffer. Carbohydrate: Importance and classification. Structures of Monosaccharides, Reducing and oxidizing properties of Monosaccharides, Mutarotation; Structure of Disaccharides and Poly saccharides. Lipid: Importance and classification; Structures and properties of fatty acids; storage lipids and membrane lipids. Proteins: Importance of proteins and classification; Structures, titration and zwitterions nature of amino acids; Structural organization of proteins. Enzymes: General properties; Classification; Mechanism of action; Michaelis&Menten and Line Weaver Burk equation & plots; Introduction to allosteric enzymes. Nucleic acids: Importance and classification; Structure of Nucleotides, A, B & Z DNA; RNA: Types and Secondary & Tertiary structure. Metabolism of carbohydrates: Glycolysis, TCA cycle, Glyoxylate cycle, Electron transport chain. Metabolism of lipids: Beta oxidation, Biosynthesis of fatty acids.

Practical

Preparation of solution, pH & buffers, Qualitative tests of carbohydrates and amino acids. Quantitative estimation of glucose/ proteins. Titration methods for estimation of amino acids/lipids, Effect of pH, temperature and substrate concentration on enzyme action, Paper chromatography/ TLC demonstration for separation of amino acids/ Monosaccharides.

Course Title: Soil and Water Conservation Engineering

Course Code: SCW-121

Credit Hours::2 (1+1)

1. **Soil and Water Conservation:** Meaning and definition, aims, Causes of soil erosion, Definition and agents of soil erosion, Forms of water erosion.
2. **Gully:** classification and control measures.
3. **Soil loss:** Soil loss estimation by universal Loss Soil Equation and Soil loss measurement techniques.
4. **Control measures of soil erosion:** Agronomical and mechanical. Introduction to contouring, strip cropping.
5. **Bunding:** Contour bund and Graded bund
6. **Terracing:** Bench terracing.
7. Grassed water ways and their design.
8. Water harvesting and its techniques.
9. **Wind erosion:** Mechanics of wind erosion, types of soil movement, Principles of wind erosion control and its control measures.

10. **Run-off**: Meaning and definition, type, factor affecting, estimation and measurement of run-off, Time of Concentration (Tc) and its computation.

Practical

1. General status of soil conservation in India.
2. Calculation of erosion index.
3. Estimation of soil loss.
4. Measurement of soil loss.
5. Preparation of contour maps.
6. Design of grassed water ways.
7. Design of contour bunds.
8. Design of graded bunds.
9. Design of bench terracing system.
10. Problem on wind erosion.
11. Computation of run-off by **Rational** method
12. Computation of Tc

Semester III

Course Title: Farm Machinery and Power

Course Code: AGE-201

Credit Hours: 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 solved problems, Familiarization with different systems of I.C. engines: Air cleaning, cooling, lubrication ,fuel supply and hydraulic control system of a tractor, Familiarization with Power transmission system : clutch, gear box, differential and final drive of a tractor , Tractor types, Cost analysis of tractor power and attached implement, Familiarization with Primary and Secondary Tillage implement, Implement for hill agriculture, implement for intercultural operations, Familiarization with sowing and planting equipment, calibration of a seed drill and solved examples, Familiarization with Plant Protection equipment, Familiarization with harvesting and threshing equipment.

Practicals

Study of different components of I.C. engine. To study air cleaning and cooling system of engine, Familiarization with clutch, transmission, differential and final drive of a tractor, Familiarization with lubrication and fuel supply system of engine, Familiarization with brake, steering, hydraulic control system of engine, Learning of tractor driving, Familiarization with operation of power tiller, Implements for hill agriculture, Familiarization with different types of primary and secondary tillage implements: mould plough, disc plough and disc harrow . Familiarization with seedcum- fertilizer drills their seed metering mechanism and calibration, planters and transplanter Familiarization with different types of sprayers and dusters Familiarization with different intercultural equipment, Familiarization with harvesting and threshing machinery.

Course Title: Agricultural Finance and Co-Operation

Course Code: AES-201

Credit Hours: 3 (2+1)

Theory

UNIT I: Agricultural finance: Meaning, scope and significance, credit needs and its role in Indian agriculture.

UNIT II: Agricultural Credit Hours: Meaning, definition, need, classification. Credit analysis: 4 R's, and 3C's of credits.

UNIT III: 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.

UNIT IV: Financing institutions: RBI, NABARD, ADB, IMF, World Bank, Insurance and Credit Guarantee Corporation of India.

UNIT V: Cost of Credit Hours: Recent development in agricultural credit. Preparation and analysis of financial statements (Balance Sheet, Income Statement and Cash Flow Statement).

UNIT VI: Project report: Basic guidelines for preparation of project reports, Bank norms, SWOT analysis.

UNIT VII: Agricultural cooperation: Meaning, brief history of cooperative development in India, objectives, principles of cooperation, significance of cooperatives in Indian agriculture.

UNIT VIII: Agricultural Cooperation in India: Credit, marketing, consumer and multi-purpose cooperatives, farmers' service cooperative societies, processing cooperatives, farming cooperatives, cooperative warehousing; role of ICA, NCUI, NCDC, NAFED.

Practical

- Determination of most profitable level of capital use.
- Optimum allocation of limited amount of capital among different enterprise.
- Analysis of progress and performance of cooperatives using published data.
- Analysis of progress and performance of commercial banks and RRBs using published data.
- Visit to a commercial bank, cooperative bank and cooperative society to acquire firsthand knowledge of their management, schemes and procedures.
- Estimation of credit requirement of farm business (Preparation and analysis of balance sheet, income statement and cash flow statement).
- A case study of loan proposal for Appraisal.

Course Title: Statistical Methods

Course Code: AES-202

Credit Hours: 2 (1+1)

Theory

UNIT I: Theory of statistics: Introduction to statistics and its applications in agriculture, classification, tabulation and graphical representation of data.

UNIT II: Measures of central tendency: Arithmetic mean, median, mode, geometric mean and harmonic mean.

UNIT III :Dispersion: Range, quartile deviation, mean deviation, standard deviation and coefficient of variation, Moments, Measures of Skewness & Kurtosis.

UNIT IV: Probability: Definition of probability, addition and multiplication theorem (without proof). Simple problems based on probability, binomial & poisson distributions,

UNIT V: Correlation: Definition of correlation, scatter diagram, Karl Pearson's coefficient of correlation, partial correlation coefficient, rank correlation, coefficient of determination and coefficient of multiple determination.

UNIT VI: Regression: Linear regression equations, simple and multiple regression.

UNIT VII: Test of Significance: Introduction to test of significance, Z-test and t-test for Means (One sample & two sample), F-test, Chi-square test of independence of attributes in 2×2 contingency table.

UNIT VIII: Analysis of Variance: Theory of analysis of variance (ANOVA), Analysis of one way and two way classification.

UNIT IX: Sampling: Different sampling methods, sampling versus complete enumeration, simple random sampling with and without replacement, Use of random number tables for selection of simple random sample.

UNIT X : Experimental design: Theory of experimental designs (R.B.D., C.R.D. and L.S.D.)

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.

Course Title: Crop Production Technology-I (Kharif Crops)

Course Code: AGR-201

Credit Hours: 2(1+1)

Theory

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Kharif* crops. Cereals – rice, maize, sorghum, pearl millet and

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

Course Title: Dairy Science

Course Code: AHD-201

Credit Hours: 3(2+1)

Theory

Elementary idea of milk secretion, colostrums its nature and properties, composition. Physical properties & food value of milk, factors influencing, the quality and quantity of milk produced, PFA/BIS Specifications for different milks production or clean milk, adulteration of milk and its detection. **MILK PROCESSING:** Receiving of milk, staining, filtration, classification, standardization, cooling, pasteurization, sterilization and homogenization, packaging and distribution of milk, Cleaning and sanitization of dairy equipments and Machinery.

MILK MICROORGANISM: Types of microorganism in milk, sources of contamination test employed to ascertain the quality of milk & various quality control measures. Fermentation in milk.

MILK PRODUCTS: Composition of cream, different methods of cream separation factors affecting the richness of cream and essentials of successful cream separation objects of ripening natural cream ripening and ripening with starters, neutralization of cream for buttermaking.

BUTTER: Composition of butter, making of butter from ripened cream. Sweet cream and whole milk Factors influencing churning Judging of butter common defects of butter and their causes factors influencing the quality and composition of butter.

GHEE: Manufacture of ghee from cream and butter. Composition, factors affecting the quality of ghee, AG marking of ghee.

FROZEN and FERMENTED MILK PRODUCTS: Classification of ice-cream, Role of ingredients, standardization and manufacture of ice-cream. Defects in ice-cream, Marketing of ice-cream. Manufactures of fermented milk products such as Dahi. Cultured butter milk and yoghurt. Condensed and Evaporated milk product. Milk powders and baby food.

INDEGENIOUS MILK PRODUCTS: Manufacturing techniques of various indigenous milk products such as Chenna&Paneer, Khoa, Rabbari.

PRACTICALS

Sampling of milk, Testing of milk for:

- (a) Specific gravity by Lactometer.
 - (b) Fat by Garber's method.
 - (c) Solid not fat with the help of formula.
 - (d) Total Solid with the help of Richmond's scale and formula. Determination of Acidity in milk.
- Detection of Adulteration of milk.
- (a) Extraction of fat or addition of separated milk.
 - (b) Addition of water.
 - (c) Addition of both separated milk and water. Standardization of milk and cream.

Fitting and adjusting of cream separator. Manufacture of dairy product such as butter. Ghee, dahi, Khoachenna, rabbari and ice- cream. Cream separation and neutralization. Judging of milk products.

Course Title: Fundamentals of Entomology-II

Course Code: ENT-201

Credit Hours: 2(1+1)

Theory

Insect Ecology: Introduction, Environment and its components. Effect of abiotic factors—temperature, moisture, humidity, rainfall, light. Effect of biotic factors – food competition, natural and environmental resistance.

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

Practical

Insecticides and their formulations.

Pesticide appliances and their maintenance.

Sampling techniques for estimation of insect population and damage.

Course Title: Fundamentals of Plant Breeding

Course Code: GPB-201

Credit Hours: 3(2+1)

Theory

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

Concepts of population genetics and Hardy-Weinberg Law, Genetic basis and methods of breeding cross pollinated crops, modes of selection; Population improvement Schemes- Ear to row method, Modified Ear to Row, recurrent selection schemes; Heterosis and inbreeding depression, development of inbred lines and hybrids, composite and synthetic varieties; Breeding methods in asexually propagated crops, clonal selection and hybridization; Maintenance of breeding records and data collection; Wide hybridization and prebreeding; 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 segregation populations.

Methods of calculating mean, range, variance, standard deviation, heritability. Designs used in plant breeding experiments, analysis of Randomized Block Design. To work out the mode of pollination in a given crop and extent of natural out-crossing. Prediction of performance of double cross hybrids.

Course Title:Environmental Studies and Disaster Management

Course Code: GPB-202

Credit Hours: 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.

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

Course Title: Production Technology for Vegetable and Spices

Course Code: HOR-201

Credit Hours: 2 (1+1)

Theory

Importance of vegetables & spices in human nutrition and national economy, vegetable gardening, brief about origin, area, climate, soil, improved varieties and cultivation practices such as time 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; Root crops such as Carrot, Raddish, Beetroot; Tuber crops such as Potato; Leafy vegetables such as Amaranth, Palak. Perennial vegetables, Turmeric, Zinger, Coriander, Black pepper, Cardamom, Saffron, Cumin, Nutmeg, Cinnamon).

Practical

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.

Course Title: Principles of Integrated Disease Management

Course Code: PPA-201

Credit Hours: 3(2+1)

Theory

Categories of diseases, IDM: Introduction, history, importance, concepts, principles and tools of IDM. Economic importance of diseases and methods of detection and diagnosis of diseases. Calculation and dynamics of economic injury level and importance of Economic threshold level. Methods of control: Host plant resistance, cultural, mechanical, physical, legislative, biological and chemical control. Ecological management of crop environment. Introduction to conventional pesticides for the disease management. Survey surveillance and forecasting of diseases. Development and validation of IDM module. Implementation and impact of IDM module for disease. Safety issues in fungicides uses. Political, social and legal implication of IDM. Case histories of important IDM programmes.

Practical

Methods of diagnosis and detection of various plant diseases, Methods of plant disease measurement, Assessment of crop yield losses, calculations based on economics of IDM. Identification of biocontrol agents. Mass multiplication of *Trichoderma* and *Pseudomonas*. Identification and nature of damage of important diseases and their management. Crop (agroecosystem) dynamics of a selected diseases. Plan & assess preventive strategies (IDM module) and decision making. Crop monitoring attacked by diseases. Awareness campaign at farmers fields.

Course Title: Agricultural Microbiology

Course Code: SSC-201

Credit Hours: 2(1+1)

Theory

Introduction. Microbial world: Prokaryotic and eukaryotic microbes. Bacteria: cell structure, chemoautotrophy, photo autotrophy, growth. Bacterial genetics: Genetic recombination transformation, conjugation and transduction, plasmids, transposon. Role of microbes in soil fertility and crop production: Carbon, Nitrogen, Phosphorus and Sulphur cycles. Biological nitrogen fixation- symbiotic, associative and asymbiotic. Azolla, bluegreen algae and

mycorrhiza. Rhizosphere and phyllosphere. Microbes in human welfare: silage production, biofertilizers, biopesticides, biofuel production and biodegradation of agro-waste.

Practical

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

Semester IV

Course Title: Renewable Energy and Green Technology

Course Code: AGE-221

Credit Hours: 2(1+1)

Theory

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

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

Familiarization with solar energy gadgets: solar cooker, solar water heater, application of solar energy: solar drying, solar pond, 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 the production process of biodiesel,

To study briquetting machine,

To study the production process of bio-fuels.

Familiarization with different solar energy gadgets.

To study solar photovoltaic system: solar light, solar pumping, solar fencing.

To study solar cooker,

To study solar drying system.

To study solar distillation and solar pond.

Course : Agricultural Marketing, Trade and Prices

Course Code: AES-221

Credit Hours: 3 (2+1)

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

UNIT II: Marketing process and functions: Marketing process-concentration, dispersion and equalization; exchange functions – buying and selling; physical functions – storage, transport and processing; facilitating functions – packaging, branding, grading, quality control and labeling (AGMARK);

UNIT III: Market functionaries and marketing channels: Types and importance of agencies involved in agricultural marketing; meaning and definition of marketing channel; number of channel levels; marketing channels for different farm products; Integration, efficiency,

UNIT IV: Costs and price spread: Meaning, definition and types of market integration; marketing efficiency; marketing costs, margins and price spread; factors affecting cost of marketing; reasons for higher marketing costs of farm commodities; ways of reducing marketing costs;

UNIT V: Role of Govt. in agricultural marketing: Public sector institutions- CWC, SWC, FCI, CACP & DMI – their objectives and functions; cooperative marketing in India;

UNIT VI: Risk in marketing: Types of risk in marketing; speculation & hedging; an overview of futures trading;

UNIT VII: Agricultural prices and policy: Meaning and functions of price; administered prices; need for agricultural price policy;

UNIT VIII: Trade: Concept of International Trade and its need, theories of absolute and comparative advantage. Present status and prospects of international trade in agri-commodities; GATT and WTO; Agreement on Agriculture (AoA) and its implications on Indian agriculture; IPR.

Practical

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

Course Title: Crop Production Technology-II (*Rabi* crops)

Course Code: AGR-221

Credit Hours: 2(1+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-rape seed, mustard and sunflower; sugar crops-sugarcane; medicinal and aromatic crops-mentha, lemon grass and citronella, Forage crops-berseem, lucerne and oat.

Practical

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

Course Title:Poultry Productionand Management

Course Code: AHD-221

Credit Hours: 3(2+1)

Theory

Development of poultry industry: Development of poultry industry in India and national poultry improvement plans, Different breeds of chickens for egg and meat production, crosses and their relative importance.

Anatomy and Physiology: External feature of the Chickens, digestive and reproductive systems, formation and structure of the egg, nutritive value of egg, abnormalities of eggs.

Breeding: Principles of breeding, Systems of breeding, breeding for egg production and development of strains of broilers selection and Culling, breeding practices.

Incubation of hatching eggs: Selection handling and care of hatching eggs, natural and artificial incubation, types of incubators, embryo mortality and its cause, Factors affecting successful incubation, testing of eggs during incubation stages of embryo development during incubation stages of embryo development during incubation sexing, vaccination packaging and transportation of day old Chicks.

Brooding of Chicks: Brooding requirements natural and artificial brooding care and management during brooding types of brooders used and their relative importance.

FeedingPrinciples and Practices: Requirement of nutrients for different age groups of chickens and their sources in the ration composition formulation and preparation of poultry ration for different categories of chickens, various feeding practices used feed additive and supplements.

Housing, Equipment and Management: Housing system; requirement of house of poultry requirement for different categories of birds, Equipment required in a poultry house, lighting arrangement for poultry, sanitation of poultry house, vaccination Common poultry disease, their control, prevention and treatment such as New Castle, Chicken pox coccidiosis makers and C.R.D. External and internal parasites of Poultry.

Practical

Study of external features of male and female chickens. Study of normal and abnormal eggs. Candling for hatching and marketing of the eggs. Debeaking of chickens. Demonstration of dissection of male and female chickens. Hatchery operations, incubation and hatching. Equipments Formulation of poultry rations for different classes of chickens. Disinfection and litter management of poultry house. Vaccination and deworming of the poultry. Method of sexing of Day Old Chicks. Poultry records on commercial poultry farms. Selection and culling of layers.

Course Title: Communication Skills and Personality Development

Course Code: EXT-221

Credit Hours: 2 (1+1)

Theory

Communication Skills: Structural and functional grammar; meaning and process of communication, verbal and nonverbal communication; listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures. Reading and comprehension of general and technical articles, precise writing, summarizing, abstracting; individual and group presentations, impromptu presentation, public speaking; Group discussion. Organizing seminars and conferences.

Practical

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

Course Title: Fundamentals of Plant Biotechnology

Course Code: GPB-221

Credit Hours: 2(1+1)

Theory

Concepts and applications of plant biotechnology: Scope, organ culture, embryo culture, Cell suspension culture, callus culture, anther culture, pollen culture and ovule culture and their applications; Micro propagation methods; organogenesis and embryogenesis, Synthetic seeds and their significance; Embryo rescue and its significance; somatic hybridization and cybrids;

Somaclonal variation and its use in crop improvement; cryo-preservation; Introduction to recombinant DNA methods: physical (Gene gun method), chemical (PEG mediated) and Agrobacterium mediated gene transfer methods; Transgenics and its importance in crop improvement; PCR techniques and its applications; RFLP, RAPD, SSR; Marker Assisted Breeding in crop improvement; Biotechnology regulations.

Practical

Sterilization techniques. Composition of various tissue culture media and preparation of stock solutions for MS nutrient medium. Callus induction from various explants. Micro-propagation, hardening and acclimatization.

Course Title: Principles of Seed Technology

Course Code: GPB-222

Credit Hours: 3(1+2)

Theory

Seed and seed technology: introduction, definition and importance. Deterioration causes of crop varieties and their control; Maintenance of genetic purity during seed production, seed quality; Definition, Characters of good quality seed, different classes of seed. Foundation and certified seed production of important **cereals, pulses, oilseeds, fodder and vegetables**.

Seed certification, phases of certification, procedure for seed certification, field inspection. Seed Act and Seed Act enforcement. Duty and powers of seed inspector, offences and penalties. Seeds Control Order 1983, Varietal Identification through Grow Out Test. 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. and Electrophoresis, Molecular and Biochemical test. Detection of genetically modified crops, Transgene contamination in non-GM crops, GM crops and organic seed production. Private and public sectors and their production and marketing strategies.

Practical

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

Course Title: Production Technology for Ornamental Crops, MAP and Landscaping

Course Code: HOR-221

Credit Hours: 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 Annuals. Production technology of important cut flowers like rose, gerbera, carnation, liliun 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

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 postharvest handling of cut and loose flowers.

Processing of MAP. Visit to commercial flower/MAP unit.

Course Title: Problematic Soils and their Management

Course Code: SSC-221

Credit Hours: 2(2+0)

Theory

Soil quality and health, Distribution of Waste land and problem soils in India. Their categorization based on properties. Reclamation and management of Saline and sodic soils, Acid soils, Acid Sulphate soils, Eroded and Compacted soils, Flooded soils, Polluted soils. Irrigation water – quality and standards, utilization of saline water in agriculture. Remote sensing and GIS in diagnosis and management of problem soils.

Multipurpose tree species, bio remediation through MPTs of soils, land capability and classification, land suitability classification. Problematic soils under different Agro-ecosystems.

Semester-V

Course Title: Agri-Informatics

Course Code: AES-301

Credits: 2(1+1)

Theory

Introduction to Computers, Operating Systems, definition and types, Applications of MS Office for document creation & Editing, Data presentation, interpretation and graph creation, statistical analysis, mathematical expressions, Database, concepts and types, uses of DBMS in Agriculture, World Wide Web (WWW): Concepts and components. Introduction to computer programming languages, concepts and standard input/output operations.

e-Agriculture, concepts and applications, Use of ICT in Agriculture. Computer Models for understanding plant processes. IT application for computation of water and nutrient requirement of crops, Computer-controlled devices (automated systems) for Agri-input management, Smartphone Apps in Agriculture for farm advises, market price, postharvest management etc; Geospatial technology for generating valuable agri-information. Decision support systems, concepts, components and applications in Agriculture, Agriculture Expert System, Soil Information Systems etc for supporting Farm decisions. Preparation of contingent crop-planning using IT tools.

Practical

Study of Computer Components, accessories, practice of important DOS Commands. Introduction of different operating systems such as windows, Unix/ Linux, Creating, Files & Folders, File Management. Use of MS-WORD and MS Power-point for creating, editing and presenting a scientific Document. MS-EXCEL - Creating a spreadsheet, use of statistical tools, writing expressions, creating graphs, analysis of scientific data. MS-ACCESS: Creating Database, preparing queries and reports, demonstration of Agri-information system. Introduction to World Wide Web (WWW). Introduction of programming languages. Hands on Crop Simulation Models (CSM) such as DSSAT/Crop-Info/CropSyst/ Wofost; Computation of water and nutrient requirements of crop using CSM and IT tools. Introduction of Geospatial Technology for generating valuable information for Agriculture. Hands on Decision Support System. Preparation of contingent crop planning.

Course Title: Geoinformatics, Nano-technology and Precision Farming

Course Code: AGR-301

Credit Hours: 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 Multispectral remote sensing for soil mapping. Creation of thematic layers of soil fertility based onGIS. Creation of productivity and management zones. Fertilizers recommendations based of VRTand STCR techniques. Crop stress (biotic/abiotic) monitoring using geospatial technology. Use ofGPS for agricultural survey. Formulation, characterization and applications of nanoparticles inagriculture. Projects formulation and execution related to precision farming.

Course: Practical Crop Production-I (*Kharif Crops*)

Course Code: AGR-302

Credit Hours: 2(0+2)

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 conservationand 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.

Course Title:Pests of Crops and Stored Grain and their Management

Course Code: ENT-301

Credit Hours: 3(2+1)

Theory

General account on nature and type of damage by different arthropods pests. Scientific name, order, family, host range, distribution, biology and bionomics, nature of damage, and management of major pests and scientific name, order, family, host range, distribution, nature of damage and control practice other important arthropod pests of various field crop, vegetable crop, fruit crop, plantation crops, ornamental crops, spices and condiments.

Factors affecting losses of stored grain and role of physical, biological, mechanical and chemical factors in deterioration of grain. Insect pests, mites, rodents, birds and microorganisms associated with stored grain and their management. Storage structure and methods of grain storage and fundamental principles of grain store management.

Practical

Identification of different types of damage.

Identification and study of life cycle and seasonal history of various insect pests attacking crops and their produce:

(a) Field Crops;

(b) Vegetable Crops;

(c) Fruit Crops;

(d) Plantation, gardens, Narcotics, spices & condiments.

Identification of insect pests and Mites associated with stored grain.

Determination of insect infestation by different methods.

Assessment of losses due to insects.

Calculations on the doses of insecticides application technique.

Fumigation of grain store / godown.

Identification of rodents and rodent control operations in godowns.

Identification of birds and bird control operations in godowns.

Determination of moisture content of grain.

Methods of grain sampling under storage condition.

Visit to Indian Storage Management and Research Institute, Hapur and Quality Laboratory, Department of Food., Delhi.

Visit to nearest FCI godowns.

Course Title: Entrepreneurship Development and Business Communication

Course Code: EXT-301

Credit Hours: 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/ Agri-enterprises, 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.

Course Title: Crop Improvement – I (*Kharif* Crops)

Course Code: GPB-301

Credit Hours: 2(1+1)

Theory

Centers of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fibres; fodders and cash crops; vegetable and horticultural crops; Plant genetic resources, its utilization and conservation, study of genetics of qualitative and quantitative characters; Important concepts of breeding self pollinated, cross pollinated and vegetatively propagated crops; 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); For Maize, Rice, Sorghum, Pearl millet and Pigeonpea, etc. Ideotype concept and climate resilient crop varieties for future.

Practical

Floral biology, emasculation and hybridization techniques in different crop species; viz., Rice, Jute, Maize, Sorghum, Pearl millet, Ragi, Pigeonpea, Urdbean, Mungbean, Soybean, Groundnut, Sesame, Caster, Cotton, Cowpea, Tobacco, Brinjal, Okra and Cucurbitaceous crops. Maintenance breeding of different *kharif* crops. Handling of 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; Visit to seed production plots; Visit to AICRP plots of different field crops.

Course Title: Intellectual Property Rights

Course Code: GPB-302

Credit Hours: 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.

Course Title: Diseases of Field & Horticultural Crops & their Management-I

Course Code: PPA-301

Credit Hours: 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, false smut, khaira and tungro. Maize: stalk rots, downy mildew, leaf spots; Sorghum: smuts, grain mold and anthracnose, Bajra :downy mildew and ergot; Groundnut: early and late leaf spots, wilt Soybean: Rhizoctonia blight, bacterial spot, seed and seedling rot and mosaic; Pigeonpea: Phytophthora blight, wilt and sterility mosaic; Finger millet: Blast and leaf spot; black & greengram: Cercospora leaf spot and anthracnose, web blight and yellow mosaic; Tobacco: mosaic.

Horticultural Crops:

Guava: wilt and anthracnose; Banana: Panama wilt, bacterial wilt, Sigatoka and bunchy top; Papaya: foot rot, leaf curl and mosaic, Pomegranate: bacterial blight; Cruciferous vegetables: Alternaria leaf spot and black rot; Brinjal: Phomopsis blight and fruit rot and Sclerotinia blight; Tomato: damping off, wilt, early, late blight and leaf curl; Okra: Yellow Vein Mosaic; Beans: anthracnose and bacterial blight; Ginger: soft rot; Colocasia: Phytophthora blight; Coconut: wilt and bud rot; Tea: blister blight; Coffee: rust

Practical

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

Course Title: Introduction to Forestry

Course Code: SCW-301

Credit Hours: 2(1+1)

Theory

1. **Forestry:** Definitions of basic terms related to forestry, role of forest, objectives of silviculture, forest classification, and salient features of Indian Forest Policies.
2. **Regeneration:**

- A. Natural regeneration: Natural regeneration from seed and vegetative parts, coppicing, pollarding, root suckers;
 - B. 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.
3. **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.
 4. **Agroforestry:** Definitions, importance, criteria of selection of trees in agroforestry, different agroforestry systems prevalent in the country.
 5. Shifting cultivation, taungya, alley cropping, wind breaks and shelter belts, home gardens. Cultivation practices of two important fast growing tree species of the region (teak and sal).

Practical

1. Identification of tree-species.
2. Afforestation techniques of problematic sites.
3. Diameter measurements using calipers and tape, diameter measurements of forked, buttressed, fluted and leaning trees.
4. Height measurement of standing trees by shadow method, single pole method and hypsometer.
5. Volume measurement of logs using various formulae.
6. Nursery lay out, seed sowing, numerical problems, vegetative propagation techniques.
7. Forest plantations and their management.
8. Visits of nearby forest based industries.

Course Title: Manures, Fertilizers and Soil Fertility Management

Course Code: SSC-301

Credit Hours: 3(2+1)

Theory

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

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

History of soil fertility and plant nutrition. criteria of essentiality. role, deficiency and toxicity symptoms of essential plant nutrients, Mechanisms of nutrient transport to plants, factors affecting nutrient availability to plants. Chemistry of soil nitrogen, phosphorus, potassium,

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

Practical

Introduction of analytical instruments and their principles, calibration and applications, Colorimetry and flame photometry.

Estimation of soil organic carbon,

Estimation of alkaline hydrolysable N in soils.

Estimation of soil extractable P in soils.

Estimation of exchangeable K; Ca and Mg in soils.

Estimation of soil extractable S in soils..

Estimation of DTPA extractable Zn in soils.

Estimation of N in plants.

Estimation of P in plants.

Estimation of K in plants.

Estimation of S in plants.

Semester-VI

Course Title: Protected Cultivation and Secondary Agriculture

Course Code: AGE-321

Credit Hours: 2(1+1)

Theory

Green house technology: Introduction, Types of Green Houses; Plant response to Green house environment, Planning and design of greenhouses, Design criteria of green house for cooling and heating purposes. Green house equipments, materials of construction for traditional and low cost green houses. Irrigation systems used in greenhouses, typical applications, passive solar green house, hot air green house heating systems, green house drying. Cost estimation and economic analysis.

Important Engineering properties such as physical, thermal and aero & hydrodynamic properties of cereals, pulses and oilseed, their application in PHT equipment design and operation. Drying and dehydration; moisture measurement, EMC, drying theory, various drying method, commercial grain dryer (deep bed dryer, flat bed dryer, tray dryer, fluidized bed dryer, recirculatory dryer and solar dryer). Material handling equipment; conveyer and elevators, their principle, working and selection.

Practical

Study of different type of green houses based on shape.

Determine the rate of air exchange in an active summer winter cooling system.

Determination of drying rate of agricultural products inside green house.

Study of green house equipments.

Visit to various Post Harvest Laboratories.

Determination of Moisture content of various grains by oven drying & infrared moisture methods. Determination of engineering properties (shape and size, bulk density and porosity of biomaterials).

Determination of Moisture content of various grains by moisture meter.

Field visit to seed processing plant.

Course Title: Farm Management, Production and Resource Economics

Course Code: AES-321

Credit Hours: 2(1+1)

Theory

UNIT I: Meaning and concept of farm management: Objectives and relationship with other sciences, Meaning and definition of farms, its types, characteristics and factor determining types and size of farms.

UNIT II : 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.

UNIT III: 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 labour income and farm business income.

UNIT IV: Farm business analysis: Meaning and concept of farm income and profitability, technical and economic efficiency measures in crop and livestock enterprises.

UNIT V: Farm records: 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.

UNIT VI: Farm planning and budgeting: Meaning and importance of farm planning and budgeting, partial and complete budgeting, steps in farm planning and budgeting.

UNIT VII: Linear programming: Appraisal of farm resources, selection of crops and livestock's enterprises.

UNIT VIII: Risk and uncertainty: Concept of risk and uncertainty occurs in agriculture production, nature and sources of risks and its management strategies, Crop/livestock/machinery insurance, weather based crop insurance, features, determinants of compensation.

UNIT IX: Concepts of resource economics: Differences between NRE and agricultural economics, unique properties of natural resources. Positive and negative externalities in agriculture, Inefficiency and welfare loss, solutions, Important issues in economics and management of common property resources of land, water, pasture and forest resources etc.

Practical

- Preparation of farm layout.
- Determination of cost of fencing of a farm.
- Computation of depreciation cost of farm assets.
- 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 equi-marginal returns/opportunity cost principle in allocation of farm resources.
- 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 & accounts and profit & loss accounts.
- Collection and analysis of data on various resources in district

Course Title: Principles of Organic Farming

Course Code: AGR-321

Credit Hours: 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

Course Title: Practical Crop Production-II (*Rabi Crops*)

Course Code: AGR-322

Credit Hours: 2(0+2)

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.

Course Title: Principles of Food Science and Nutrition

Course Code: AHD-321

Credit Hours: 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.

Course Title: Management of Beneficial Insects

Course Code: ENT-321

Credit Hours: 2(1+1)

Theory

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

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

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

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

Practical

Honey bee species, castes of bees. Beekeeping appliances and seasonal management, bee enemies and disease. Bee pasturage, bee foraging and communication. Types of silkworm, voltinism and biology of silkworm. Mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves. Species of lac insect, host plant identification.

Identification of other important pollinators, weed killers and scavengers. Visit to research and training institutions devoted to beekeeping, sericulture, lac culture and natural enemies. Identification and techniques for mass multiplication of natural enemies.

Course Title: Crop Improvement – II (*Rabi* Crops)

Course Code: GPB-321

Credit Hours: 2(1+1)

Theory

Centers of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fodder crops and cash crops; vegetable and horticultural crops; Plant genetic resources, its utilization and conservation; study of genetics of qualitative and quantitative characters; 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); For Wheat, Barley, Chickpea, Pea, Mustard, Sugarcane and Tomato. Ideotype concept and climate resilient crop varieties for future.

Practical

Floral biology, emasculation and hybridization techniques in different crop species namely Wheat, Oat, Barley, Chickpea, Lentil, Field pea, Rajma, Horse gram, Rapeseed Mustard, Sunflower, Safflower, Potato, Berseem. Sugarcane, Tomato, Chilli, Onion; Handling of 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; Visit to seed production plots; Visit to AICRP plots of different field crops

Course Title: Post-harvest Management and Value Addition of Fruits and Vegetables

Course Code: HOR-321

Credit Hours: 2(1+1)

Theory

Importance of post-harvest processing 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

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.

Course Title: Diseases of Field & Horticultural Crops & their Management-II

Course Code:PPA-321

Credit Hours: 3(2+1)

Theory

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

Field Crops:

Wheat: rusts, loose smut, karnal bunt, powdery mildew, alternaria blight, and ear cockle; Barley: Covered smut and stripe disease; Sugarcane: red rot, smut, wilt, grassy shoot, ratoon stunting and PokkahBoeng; Sunflower: *Sclerotinia* stem rot and Alternaria blight; Mustard: Alternaria blight, white rust,downy mildew and Sclerotinia stem rot; Gram: wilt, grey mould and Ascochyta blight; Lentil: rust and wilt; Cotton: anthracnose, vascular wilt, and black arm; Pea: downy mildew, powdery mildew and rust.

Horticultural Crops:

Mango: anthracnose, malformation, bacterial blight and powdery mildew; Citrus: canker and gummosis; Grape vine: downy mildew, Powdery mildew and anthracnose; Apple: scab, powdery mildew, fire blight and crown gall; Peach: leaf curl. Potato: early and late blight, black scurf, leaf roll, and mosaic; Cucurbits: downy mildew, powdery mildew, wilt; Onion and garlic: purple blotch, and Stemphylium blight; Chillies: anthracnose and fruit rot, wilt and leaf curl; Turmeric: leaf spot; Coriander: stem gall; Marigold: Botrytis blight; Rose: dieback, powdery mildew and black leafspot.

Practical

Identification and histopathological studies of selected diseases of field and horticulturalcrops covered in theory.

Field visit for the diagnosis of field problems.

Collection and preservation of plant diseased specimens for herbarium.

Note: Students should submit 50 pressed and well-mounted specimens

Course Title: Rainfed Agriculture and Watershed Management

Course Code: SCW-321

Credit Hours: 2 (1+1)

Theory

1. **Rainfed agriculture:** Definition. types, characters, history of rainfed agriculture and watershed in India; Problems and prospects of rainfed agriculture in India.
2. **Soil and climate:** Soil and climatic conditions prevalent in rainfed areas; Soil and water conservation techniques, moisture conservation practices and use of anti-transparent in dry land farming.
3. **Drought:** Types, effect of water deficit on physio-morphological characteristics of the plants, Crop adaptation and mitigation to drought.
4. **Water harvesting:** Meaning, importance, its techniques, efficient utilization of water through soil and crop management practices, contingent crop planning for aberrant weather conditions,
5. **Watershed:** Concept, objective, principles and components of watershed management, factors affecting watershed management.

Practical

1. Studies on climate classification.
2. Studies on rainfall pattern in rainfed areas of the country and pattern of onset and withdrawal of monsoons.
3. Studies on cropping pattern of different rainfed areas in the country and demarcation of rainfed area on map of India.
4. Interpretation of meteorological data and scheduling of supplemental irrigation on the basis of evapo-transpiration demand of crops.
5. Critical analysis of rainfall and possible drought period in the country, effective rainfall and its calculation.
6. Studies on cultural practices for mitigating moisture stress.
7. Characterization and delineation of model watershed.
8. Field demonstration on soil & moisture conservation measures.
9. Field demonstration on construction of water harvesting structures.
10. Preparation of crop rotation and cropping scheme for rainfed areas.
11. Determination of soil moisture content.
12. Study of practical application of anti-transpirants.
13. Visit to rainfed research station/watershed.

Elective Course

Course Title: Agri-business Management

Course Code: ELCT-AES-221

Credit Hours: 3 (2+1)

Theory

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

Practical

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

Course Title: Food Safety and Standards

Course Code: ELCT-AHD-221

Credit Hours: 3(2+1)

Theory

Food Safety – Definition, Importance, Scope and Factors affecting Food Safety. Hazards and Risks, Types of hazards - Biological, Chemical, Physical hazards. Management of hazards - Need.

Control of parameters. Temperature control. Food storage. Product design. Hygiene and Sanitation in Food Service Establishments- Introduction. Sources of contamination and their control. Waste Disposal. Pest and Rodent Control. Personnel Hygiene. Food Safety Measures. Food Safety Management Tools- Basic concepts. PRPs, GHPs, GMPs, SSOPs etc. HACCP. ISO series. TQM concept and need for quality, components of TQM, Kaizen. Risk Analysis. Accreditation and Auditing, Water Analysis, Surface Sanitation and Personal Hygiene.

Food laws and Standards- Indian Food Regulatory Regime, FSSAI. Global Scenario CAC. Other laws and standards related to food. Recent concerns- New and Emerging Pathogens. Packaging, Product labeling and Nutritional labeling. Genetically modified foods\ transgenics. Organic foods. Newer approaches to food safety. Recent Outbreaks. Indian and International Standards for food products.

Practical

Water quality analysis physico-chemical and microbiological.

Preparation of different types of media.

Microbiological Examination of different food samples.

Assessment of surface

sanitation by swab/rinse method.

Assessment of personal hygiene.

Biochemical tests for identification of bacteria.

Scheme for the detection of food borne pathogens.

Course Title:Agrochemicals

Course Code: ELCT-ENT-221

Credit Hours:3 (2+1)

Theory

An introduction to agrochemicals, their type and role in agriculture, effect on environment,soil, human and animal health, merits and demerits of their uses in agriculture, management of agrochemicals for sustainable agriculture.

Herbicides-Major classes, properties and important herbicides. Fate of herbicides.

Fungicides - Classification – Inorganic fungicides - characteristics, preparation and use of sulfur and copper, Mode of action-Bordeaux mixture and copper oxychloride.

Organic fungicides- Mode of action- Dithiocarbamates-characteristics, preparation and use of Zineb and maneb.

Systemic fungicides- Benomyl, carboxin, oxycarboxin, Metalaxyl, Carbendazim, characteristics and use.

Introduction and classification of insecticides: inorganic and organic insecticides Organochlorine, Organophosphates, Carbamates, Synthetic pyrethroids Neonicotinoids, Biorationals, Insecticide Act and rules, Insecticides banned, withdrawn and restricted use, Fate of insecticides in soil & plant. IGRs Biopesticides, Reduced risk insecticides, Botanicals, plant and animal systemic insecticides their characteristics and uses. Fertilizers and their importance. Nitrogenous fertilizers: Feedstocks and Manufacturing of ammonium sulphate, ammonium nitrate, ammonium chloride, urea. Slow release N-fertilizers. Phosphatic fertilizers: feedstock and manufacturing of single superphosphate. Preparation of bone meal and basic slag. Potassic fertilizers: Natural sources of potash, manufacturing of potassium chloride, potassium sulphate and potassium nitrate. Mixed and complex fertilizers: Sources and compatibility—preparation of major, secondary and micronutrient mixtures. Complex fertilizers: Manufacturing of ammonium phosphates, nitrophosphates and NPK complexes. Fertilizer control order. Fertilizer logistics and marketing. Plant bio-pesticides for ecological agriculture, Bio-insect repellent.

Practical

Sampling of fertilizers and pesticides.
Pesticides application technology to study about various pesticides appliances.
Quick tests for identification of common fertilizers.
Identification of anion and cation in fertilizer.
Calculation of doses of insecticides to be used.
To study and identify various formulations of insecticide available in market.
Estimation of nitrogen in Urea.
Estimation of water soluble P₂O₅ and citrate soluble P₂O₅ in single super phosphate. Estimation of potassium in Muriate of Potash/ Sulphate of Potash by flame photometer.
Determination of copper content in copper oxychloride. Determination of sulphur content in sulphur fungicide. Determination of thiram. Determination of ziram content.

Course Title: Landscaping
Course Code: ELCT-HOR-221
Credit Hours: 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.

Practical

Identification of trees, shrubs, annuals, pot plants; Propagation of trees, shrubs and annuals, care and maintenance of plants, potting and repotting, identification of tools and implements used

in landscape design, training and pruning of plants for special effects, lawn establishment and maintenance, layout of formal gardens, informal gardens, special type of gardens (sunken garden,

terrace garden, rock garden) and designing of conservatory and lathe house. Use of computer software, visit to important gardens/ parks/ institutes.

Course Title: Agricultural Journalism

Course Code: ELCT-EXT-301

Credit Hours: 3(2+1)

Theory

Agricultural Journalism: The nature and scope of agricultural journalism characteristics and training of the agricultural journalist, how agricultural journalism is similar to and different from other types of journalism. Newspapers and magazines as communication media: Characteristics; kinds and functions of newspapers and magazines, characteristics of newspaper and magazine readers. Form and content of newspapers and magazines: Style and language of newspapers and magazines, parts of newspapers and magazines. The agricultural story: Types of agricultural stories, subject matter of the agricultural story, structure of the agricultural story. Gathering agricultural information: Sources of agricultural information, interviews, coverage of events, abstracting from research and scientific materials, wire services, other agricultural news sources. Writing the story: Organizing the material, treatment of the story, writing the news lead and the body, readability measures. Illustrating agricultural stories: Use of photographs, use of artwork (graphs, charts, maps, etc.), writing the captions. Editorial mechanics: Copy reading, headline and Title: writing, proofreading, lay outing.

Practical

Practice in interviewing. Covering agricultural events. Abstracting stories from research and scientific materials and from wire services. Writing different types of agricultural stories. Selecting pictures and artwork for the agricultural story. Practice in editing, copy reading,

headline and Title: writing, proofreading, layouting. Testing copy with a readability formula. Visit to a publishing office.

Course Title: Commercial Plant Breeding

Course Code: ELCT-GPB-301

Credit Hours: 3(2+1)

Theory

Types of crops and modes of plant reproduction. Line development and maintenance breeding in self and cross pollinated crops (A/B/R and two line system) for development of hybrids and seed production. Genetic purity test of commercial hybrids. Advances in hybrid seed production of maize, rice, sorghum, pearl millet, castor, sunflower, cotton pigeon pea, Brassica etc. Quality seed production of vegetable crops under open and protected environment. Alternative strategies for the development of the line and cultivars: haploid inducer, tissue culture techniques and biotechnological tools. IPR issues in commercial plant breeding: DUS testing and registration of varieties under PPV & FR Act. Variety testing, release and notification systems in India. Principles and techniques of seed production, types of seeds, quality testing in self and cross pollinated crops.

Practical

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

Course Title: Protected Cultivation

Course Code: ELCT-HOR-301

Credit Hours: 3(2+1)

Theory

Protected cultivation- importance and scope, Status of protected cultivation in India and World types of protected structure based on site and climate. Cladding material involved in greenhouse/poly house. Greenhouse design, environment control, artificial lights, Automation. Soil

preparation and management, Substrate management. Types of benches and containers. Irrigation and fertigation management. Propagation and production of quality planting material of horticultural crops. Greenhouse cultivation of important horticultural crops – rose, carnation, chrysanthemum, gerbera, orchid, anthurium, liliun, tulip, tomato, bell pepper, cucumber, strawberry, pot plants, etc. Cultivation of economically important medicinal and aromatic plants. Off-season production of flowers and vegetables. Insect pest and disease management.

Practical

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

Course Title: System Simulation and Agroadvisory

Course Code: ELCT-SCW-301

Credit Hours: 3(2+1)

Theory

System Approach for representing soil-plant-atmospheric continuum, system boundaries, Crop models, concepts & techniques, types of crop models, data requirements, relational diagrams. Evaluation of crop responses to weather elements; Elementary crop growth models; calibration, validation, verification and sensitivity analysis. Potential and achievable crop production-concept and modelling techniques for their estimation. Crop production in moisture and nutrients limited conditions; components of soil water and nutrients balance. Weather forecasting, types, methods, tools & techniques, forecast verification; Value added weather forecast, ITK for weather forecast and its validity; Crop-Weather Calendars; Preparation of agro-advisory bulletin based on weather forecast. Use of crop simulation model for preparation of Agro-advisory and its effective dissemination.

Practical

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

Course Title: Weed Management

Course Code: ELCT-AGR-321

Credit Hours: 3(2+1)

Theory

Introduction to weeds, characteristics of weeds their harmful and beneficial effects on ecosystem. Classification, reproduction and dissemination of weeds. Herbicide classification, concept of adjuvant, surfactant, herbicide formulation and their use. Introduction to mode of action of herbicides and selectivity. Allelopathy and its application for weed management.

Bio-herbicides and their application in agriculture. Concept of herbicide mixture and utility in agriculture. Herbicide compatibility with agro-chemicals and their application. Integration of herbicides with non chemical methods of weed management. Herbicide Resistance and its management.

Practical

Techniques of weed preservation.

Weed identification and their losses study.

Biology of important weeds.

Study of herbicide formulations and mixture of herbicide.

Herbicide and agrochemicals study.

Shift of weed flora study in long term experiments.

Study of methods of herbicide application, spraying equipments.

Calculations of herbicide doses and weed control efficiency and weed index.

Course Title: Biopesticides&Biofertilizers

Course Code: ELCT-ENT-321

Credit Hours: 3(2+1)

Theory

History and concept of biopesticides. Importance, scope and potential of biopesticide. Definitions, concepts and classification of biopesticides viz. pathogen, botanical pesticides, and biorationals. 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 and Techniques of biopesticides. Impediments and limitation 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*; Cyanobacterialbiofertilizers- *Anabaena*, *Nostoc*, *Hapalosiphon* and fungal biofertilizers- AM mycorrhiza and ectomycorrhiza. Nitrogen fixation -Free living and symbiotic nitrogen fixation.

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

Practical

Isolation and purification of important biopesticides: *Trichoderma* *Pseudomonas*, *Bacillus*, *Metarhyziometc.* and its production.

Identification of important botanicals.

Visit to biopesticidelaboratory in nearby area.

Field visit to explore naturally infected cadavers.

Identification of entomopathogenic entities in field condition.

Quality control of biopesticides.

Isolation and purification of *Azospirillum* , *Azotobacter*, *Rhizobium*, P-solubilizers and cyanobacteria. Mass multiplication and inoculum production of biofertilizers.

Course Title: Micro propagation Technologies

Course Code: ELCT-HOR-321

Credit Hours: 3(2+1)

Theory

Introduction, History, Advantages and limitations; Types of cultures (seed, embryo, organ, callus, cell), Stages of micropropagation, Axillary bud proliferation (Shoot tip and meristem culture, bud culture), Organogenesis (callus and direct organ formation), Somatic embryogenesis, cell suspension cultures, Production of secondary metabolites, Somaclonal variation, Cryopreservation

Practical

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

Course Title: Hi-tech. Horticulture

Course Code: ELCT-HOR-322

Credit Hours: 3(2+1)

Theory

Introduction & importance; Nursery management and mechanization; micro propagation of horticultural crops; Modern field preparation and planting methods, Protected cultivation: advantages, controlled conditions, method and techniques, Micro irrigation systems and its components; EC, pH based fertilizer scheduling, canopy management, high density orcharding, Components of precision farming: Remote sensing, Geographical Information System (GIS), Differential Geo-positioning System (DGPS), Variable Rate applicator (VRA), application of precision farming in horticultural crops (fruits, vegetables and ornamental crops); mechanized harvesting of produce.

Practical

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

