CHAUDHARY CHARAN SINGH UNIVERSITY, MEERUT

Faculty of Agriculture

B.Sc. (Ag)/B.Sc. (Ag) Hons.

{4 Year (8-Semester) Degree Course}

UNDER GRADUATE CURRICULA &SYLLABUS

AS PER NEP-2020

&

As per ICAR Vth Dean's Committee Report

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Departments/ Subjects

1. **Department of Agronomy**
2. **Department of Genetics and Plant Breeding**
3. **Department of Soil Science & Agricultural Chemistry**
4. **Department of Agricultural Economics**
5. **Department of Plant Pathology**
6. **Department of Entomology**
7. **Department of Horticulture**
8. **Department of Agricultural Engineering**
9. **Department of Agriculture Extension**
10. **Department of Soil Conservation**
11. **Department of Animal Husbandry and Dairying**
12. **Department of Statistics & Computer Application**

Preamble

1. Student (s) leaving the course after completion of their One year (I & II semester) in above programme shall be awarded **'Certificate course in B.Sc. (Ag)'** from CCS University, Meerut.
2. Student (s) leaving the course after completion of their Two year (I & II semester and III & IV semesters) in above programme shall be awarded **'Diploma in B.Sc. (Ag)'** from CCS University, Meerut.
3. Student (s) leaving the course after completion of their Three year (I & II, III & IV and V & VI semesters) in above programme shall be awarded **'B.Sc. (Ag)' degree'** from CCS University, Meerut.
4. **B.Sc. (Ag)Hons.** ' degree shall be awarded to those students who will successfully able to complete all 8-semesters (4 year) as per prescribed syllabai.

Prof. S. S. GAURAV
DEAN
Faculty of Agriculture
Ch. Charan Singh University
Meerut-250004 (UP) India

Ch. Charan Singh University, Meerut

Faculty of Agriculture

B. Sc. (Ag)/B.Sc. (Ag) Hons.

Curricula/Syllabus for 4-year UG Degree (8-Semester System)Programme

As per NEP-2020 &

ICAR Vth Dean's Committee Recommendations

W.e.f. academic session 2021-22

Semester wise distribution of Courses

Semester-I

Paper	Course Code	Course Title	Credit Hours
Paper-1	AG-101	Fundamentals of Agronomy	3 (2+1)
Paper-2	AG-102	Fundamentals of Genetics	3 (2+1)
Paper-3	AG-103	Fundamentals of Soil Science	3 (2+1)
Paper-4	AG-104	Fundamentals of Horticulture	2(1+1)
Paper-5	AG-105	Rural Sociology & Educational Psychology	2(1+1)
Paper-6	AG-106	Introduction to Forestry	2 (1+1)
Paper-7	AG-107	Introductory Animal Husbandry	3 (2+1)
Paper-8	AG-108	Comprehension & Communication Skills in English	2(1+1)
Paper-9	AG-109	Agricultural Heritage(*Remedial Course)	1 (1+0)
		***Remedial Courses (Opt any one of following)**	
Paper-10	AG-110A	General Agriculture-I (*Remedial Course)	2(1+1)
	AG-110B	Introductory Biology (*Remedial Course)	2 (1+1)
		***Remedial Courses (Opt any one of following)**	
Paper-11	AG-111A	General Agriculture-II (*Remedial Course)	2(1+1)
	AG-111B	Elementary Mathematics(*Remedial course)	2 (2+0)
		****Non-Gradial Courses** (Opt any one of the following)	
Paper-12	AG-112A	NSS (National Service Scheme)	2(0+2)
	AG-112B	NCC (National Cadet Corps)	2(0+2)
	AG-112C	Physical Education & Yoga Practices	2(0+2)
		Total Credit Hours (Th.+ Pr)	27

Note: *AG-112A/AG-112B/AG-112C papers/ courses will be taught as per the instruction given in detailed syllabi under* **Non-Gradial Courses****

Semester-II

Paper-1	AG-201	Fundamentals of Crop Physiology	3 (2+1)
Paper-2	AG-202	Fundamentals of Plant Biochemistry	3 (2+1)
Paper-3	AG-203	Fundamentals of Entomology-I	3 (2+1)
Paper-4	AG-204	Fundamentals of Agricultural Economics	2 (1+1)
Paper-5	AG-205	Principles of Organic Farming	2 (1+1)
Paper-6	AG-206	Fundamentals of Plant Pathology	4 (3+1)
Paper-7	AG-207	Production Technology of Vegetables & Spices	2(1+1)
Paper-8	AG-208	Fundamentals of Agricultural Extension Education	3 (2+1)

Paper-9	AG-209	Food Processing & Safety Issues	3(2+1)
Paper-10	AG-210	Human Values & Ethics (**Non-gradial Course)	1 (1+0)
		Total Credit Hours (Th.+ Pr)	**26**
	Semester-III		
Paper-1	AG-301	Crop Production Technology-I (Kharif crops)	2 (1+1)
Paper-2	AG-302	Practical Crop Production-I (Kharif crops)	2 (0+2)
Paper-3	AG-303	Fundamentals of Plant Breeding	3 (2+1)
Paper-4	AG-304	Agricultural Microbiology	2(1+1)
Paper-5	AG-305	Agriculture Finance & Co-operation	3 (2+1)
Paper-6	AG-306	Farm Machinery & Power	3 (2+1)
Paper-7	AG-307	Principles of Integrated Disease Management	3(2+1)
Paper-8	AG-308	Environmental Studies & Disaster Management	2 (1+1)
Paper-9	AG-309	Statistical Methods	2(1+1)
Paper-10	AG-310	Fundamental of Soil & Water Conservation	2(1+1)
Paper-11	AG-311	Dairy Science	3(2+1)
Paper-12	AG-312	Fundamentals of Entomology-II	2(1+1)
		Total Credit Hours (Th.+ Pr)	**29**
	Semester-IV		
Paper-1	AG-401	Crop Production Technology-II (Rabi crops)	2 (1+1)
Paper-2	AG-402	Practical Crop Production-II (Rabi crops)	2 (0+2)
Paper-3	AG-403	Principle of Seed Technology	3 (2+1)
Paper-4	AG-404	Problematic Soil & Their Management	2 (1+1)
Paper-5	AG-405	Fundamentals of Plant Biotechnology	3 (2+1)
Paper-6	AG-406	Renewable Energy & Green Technology	2 (1+1)
Paper-7	AG-407	Production Technology of Ornamental Crops & MAPs and Landscaping	2 (1+1)
Paper-8	AG-408	Entrepreneurship Development &Business Communication	2 (1+1)
Paper-9	AG-409	Introductory Agro-meteorology & Climate Change	2 (1+1)
Paper-10	AG-410	Agri-informatics	2 (1+1)
Paper-11	AG-411	Poultry Production & Management	3(2+1)
		Total Credit Hours (Th.+ Pr)	**25**
	Semester-V		
Paper-1	AG-501	Rainfed & Dry land Agriculture	2 (1+1)
Paper-2	AG-502	Crop Improvement-I(Kharif Crops)	2 (1+1)
Paper-3	AG-503	Pests of Crops and Store Grain &their Management	3 (2+1)
Paper-4	AG-504	Agriculture Marketing, Trade & Prices	3 (2+1)
Paper-5	AG-505	Protected Structure& Secondary Agriculture	3 (2+1)
Paper-6	AG-506	Diseases of Field & Horticultural Crops and their Management-I	3 (2+1)
Paper-7	AG-507	Production Technology of Fruits & Plantation Crops	2 (1+1)
Paper-8	AG-508	Communication Skills and Personality Development	2 (1+1)
Paper-9	AG-509	Intellectual Property Rights (IPR)	1 (1+0)
Paper-10	AG-510	Principles of Food Science & Nutrition	3(2+1)
Paper-11	AG-511	Geo-informatics & Nanotechnology	2 (1+1)

		Elective Courses (To be opted any One of the following)	
Paper-12	AGE-51	Agri-business Management	3 (2+1)
	AGE-52	Agrochemicals	3 (2+1)
	AGE-53	Commercial Plant Breeding	3 (2+1)
	AGE-54	Landscaping	3 (2+1)
	AGE-55	Food Safety & Standards	3 (2+1)
	AGE-56	Bio-pesticides & Bio-fertilizers	3 (2+1)
		Total Credit Hours (Th.+Pr.)	**29**
	Semester-VI		
Paper-1	AG-601	Farming System, Precision Farming & Sustainable Agriculture	2 (1+1)
Paper-2	AG-602	Crop Improvement-I(Rabi Crops)	2 (1+1)
Paper-3	AG-603	Manures, Fertilizers & Soil Fertility Management	3 (2+1)
Paper-4	AG-604	Farm Management, Production & Resource Economics	2 (1+1)
Paper-5	AG-605	Diseases of Field & Horticultural Crops and their Management-II	3 (2+1)
Paper-6	AG-606	Post-harvest Management and Value Addition of Fruits & Vegetables	2 (1+1)
Paper-7	AG-607	Watershed and Wasteland Management	2 (1+1)
Paper-8	AG-608	Beneficial Insects and Pests of Horticultural Crops & their Management	3 (2+1)
Paper-9	AGT-99	Educational Tour (** Non-Gradial Course)	2 (0+2)
		Elective Courses (To be opted any One of the following)	
Paper-10	AGE-61	Protected Cultivation	3 (2+1)
	AGE-62	Hi-tech Horticulture	3 (2+1)
	AGE-63	Weed Management	3 (2+1)
	AGE-64	System Simulation & Agro-advisory	3 (2+1)
	AGE-65	Agriculture Journalism	3 (2+1)
	AGE-66	Management of Fish-cum- Duck, Quail and Rabbit Farming	3 (2+1)
		Total Credit Hours (Th.+Pr.)	**24**

Semester-VII

Rural Agricultural Work Experience and Agro-Industrial Attachment (RAWE &AIA)			
S.No.	**Activities**	**Number of weeks**	**Credit Hours**
1	General orientation & On campus training by different faculties	02	16
2	Village attachment	10	
	Unit attachment in University/College / KVK / Research Station Attachment	04	
3	Plant clinic	01	01
	Agro-Industrial Attachment	02	03
4	Project Report Preparation, Presentation and Evaluation	01	

	Total weeks of RAWE and AIA	20	-------
	Total Credit hours		20
	Note: Out of **total 20 credits**, maximum **02 credit work load** will be allotted to each Department/subject of Agriculture faculty.		

A. RAWE component-I

Village Attachment Training Programme (VATP)

S.No.	Activity	Duration
1	Orientation and Survey of Village	1 week
2	Agronomical Interventions	1 week
3	Plant Protection Interventions	1 week
4	Soil Improvement Interventions(Soil sampling and testing)	1 week
5	Fruit, Vegetable& Flower production interventions	1 week
6	Food Processing and Storage Interventions	1 week
7	Animal& Cattle Production Interventions	1 week
8	Crop Improvement & Seed Production interventions	1 week
9	Agro-economics & Analysis interventions	1 week
10	Extension and Transfer of Technology interventions	1 week

B. RAWE Component–II

1. Agro Industrial Attachment:

- Students shall be placed in Agro-and Cottage industries and Commodities Boards for 02 weeks.
- Industries include Seed/Sapling production, Pesticides-Insecticides, Postharvest-processing value addition, Agri-finance institutions, etc.

2. 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

Semester-VIII

Experimental Learning Programme (ELP)

(Modules for Skill Development and Entrepreneurship)

Every student must registered and complete minimum two **modules** each of **0+10** credits **(Total 0+20 credits)** from the package of following 14 modules in the VIII **semester**. Each module must be opted from different department.

Sl. No.	Title of the module	Credits	Concerned Dept/Subject
1	Production Technology for Bio-agents and	0+10	Entomology

	Bio-fertilizers		
2	Seed Production Technology & Testing	0+10	Genetics & Plant Breeding
3	Mushroom Cultivation Technology	0+10	Plant Pathology
4	Soil, Plant and Water Analysis	0+10	Soil Science & Agri. Chemistry
5	Commercial Beekeeping	0+10	Entomology
6	Poultry Production Technology	0+10	AH & Dairying
7	Commercial Horticulture	0+10	Horticulture
8	Floriculture and Landscaping	0+10	Horticulture
9	Food Processing	0+10	AH & Dairying
10	Agriculture Waste Management	0+10	Soil Science & Agri. Chemistry
11	Organic Production Technology	0+10	Agronomy
12	Commercial Sericulture	0+10	Entomology
13	Water Harvesting	0+10	Agri. Engineering
14.	Audio-Visual Aids & Agro-Informatics	0+10	Agri. Extension
	To be opted any One Two Modules	**Total Credits (10+10)=20**	

Evaluation of Experiential Learning Programme

S. No.	Parameters	Maximum 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**

Note: 1. Evaluation & assessment of each Module (total **02 modules**) will be done by concerned Department /subject who has offered the modules with MM 50.

2. Among Two modules, each will carry Maximum 50 marks; Total= (50+50=100 marks)

Summary of Semester wise Credit Hours

Summary of Semester wise Credit Hours		
		Total Credit Hour (Theory +Practical)
I Year	**Semester-I**	**27**
	Semester-II	**26**
II Year	**Semester-III**	**29**
	Semester-IV	**25**
III Year	**Semester-V**	**29**
	Semester-VI	**24**
IV Year	**Semester-VII**	**20**
	Semester-VIII	**20**
Grand Total of Credit Hours:		**200**

ELECTIVE COURSES

For Students of Agriculture Faculty and Student (s) from Other Faculty (A student can Select/Opt maximum two Elective Courses-**One in Vth Semester and One in VIth semester** among the following group of Elective Courses)

Sl. No.	Course Code	Course Title	Credit Hours	Allotted to Dept/Subject	Eligibility for Opting Elective Course for Student(s) from other Faculty
	Paper/Course Group for Opting in Vth Semester				
1.	AGE-51	Agri-business Management	3 (2+1)	Agri. Economics	Faculty of Arts(B.A., B.Com., BBA)
2	AGE-52	Agrochemicals	3 (2+1)	Soil Science & Agri. Chemistry	Faculty of Science B. Sc. (Bio/Maths)
3	AGE-53	Commercial Plant Breeding	3 (2+1)	Genetics & Plant Breeding	Faculty of Science B.Sc.(Bio./Biotech)
4	AGE-54	Landscaping	3 (2+1)	Horticulture	Faculty of Science B.Sc.(Bio.)
5	AGE-55	Food Safety & Standards	3 (2+1)	AH & Dairying	Faculty of Science B.Sc.(Bio./Biotech.)
6	AGE-56	Bio-pesticides & Bio-fertilizers	3 (2+1)	Entomology	Faculty of Science B.Sc.(Bio./Biotech.)
	Paper/Course Group for Opting in VIth Semester				
7	AGE-61	Protected Cultivation	3 (2+1)	Horticulture	Faculty of Science B.Sc.(Biology)
8	AGE-62	Hi-tech Horticulture	3 (2+1)	Horticulture	Faculty of Science B.Sc.(Biology)
9	AGE-63	Weed Management	3 (2+1)	Agronomy	Faculty of Science B.Sc.(Biology)
10	AGE-64	System Simulation & Agro-advisory	3 (2+1)	Agri. Engineering	Faculty of Science B.Sc.(Bio./ Maths/ Biotech./Chemistry/ Microbial./ BCA)
11	AGE-65	Agriculture Journalism	3 (2+1)	Agri. Extension	Faculty of Arts(B.A., B.Com., BBA, BJMC, B.Lib.)
12	AGE-66	Management of Fish-cum- Duck, Quail and Rabbit Farming	3 (2+1)	AH& Dairying	Faculty of Science B.Sc.(Biology)

Examination & Evaluation

- Each paper/course will be of maximum100 marks, of which 75% (MM 75) will be from Theory and 25% (MM 25) will be from Practical portion of the same course/paper.
- MM 75 of Theory will be divided in two parts- **MM 25** (Continuous Internal Evaluation-CIE) and **MM 50** (External Evaluation through University Exam-UE)

➢ **Continuous Internal Evaluation (CIE):**

- Continuous internal evaluation will be performed by the teacher concerned.
- It is proposed that CIE be kept at present, at 25% of total assessment in a Theory paper.
- The practical papers in all semesters will have 25% CIE and 75% UE, conducted at the end of the semester by **one internal examiner and one external examiner** appointed by the University.

➢ **Marking system:** As per the guidelines of NEP-2020

Abbreviations:

Sl. No.	Abbreviation	Full Form
1	C	Credits
2	L	No. of Lectures/ periods (One hour Lecture for theory & two hours lab for practicals)
3	CIE	Continuous Internal Evaluation (Internal Exams)
4	UE	University Exam (External Exams)
5	Th	Theory paper
6	P (Prac)	Practical paper
7	RAWE	Rural Agricultural Work Experience
8	VATP	Village Attachment Training Programme
9	AIA	Agro-Industrial Attachment
10	ELP	Experimental Learning Programme
11	SDE	Skill Development and Entrepreneurship
12	UG	Under Graduation
13	PG	Post Graduation
14	MM	Maximum marks
15.	POs	Programme Outcomes
16	PSOs	Programme Specific Outcomes
17	COs	Course Outcome
18	R	Research project/Field Work/Industrial Training/Survey Work/Internship

Ch. Charan Singh University, Meerut (UP) India

Faculty of Agriculture

Discipline/Department wise Summary of Credit Hours of Core Courses

Sl. No.	Discipline/Department	Credit Hours
1	Agronomy	17
2	Genetics & Plant Breeding	20
3	Soil Science & Agricultural Chemistry	15
4	Agricultural Economics	10
5	Plant Pathology	13
6	Entomology	11
7	Horticulture	10
8	Agricultural Engineering	08
9	Agricultural Extension	09
10	Soil Conservation	10
11	Animal Husbandry & Dairying	15
12	Statistics & Computer Application	0 4
13	English	02
14	Remedial Courses*	05 (Bio./Math.)/ 05 (Agriculture)
15	NSS/NCC/Physical Education & Yoga Practices** (any one)	02
16	HumanValues and Ethics**	01
17	Educational Tour**	02
	Total	**144 (Main)+ 5*(Remedial) + 5** (Non-gradial)+6(Elective) =160 Credits**
	RAWE & AIA	**20**
	Modules (ELP)	**20**
	Grand Total	**160+20+20=200**

Remedial Courses** * Non-gradial Courses**

Ch. Charan Singh University, Meerut

Discipline/Department-wise summary of courses & credit hours

	CourseCode	Course Title	Credit Hours
		Department of Agronomy	
1	AG-101	Fundamentals of Agronomy	3(2+1)
2	AG205	Principles of Organic Farming	2(1+1)
3	AG-301	Crop Production Technology-I (Kharif crops)	2(1+1)
4	AG-302	Practical Crop Production-I (Kharif crops)	2 (0+2)
5	AG-401	Crop Production Technology-II (Rabi crops)	2 (1+1)
6	AG-402	Practical Crop Production-II (Rabi crops)	2(0+2)
7	AG-501	Rainfed &Dryland Agriculture	2 (1+1)
8	AG-601	Farming System, Precision Farming & Sustainable Agriculture	2 (1+1)
		Total Credit Hrs (Core Courses)	17 (7+10)
9	AGE-63	Weed Management (Elective Course-VI Sem)	3(2+1)
10	-----	RAWE & AIA(VII Semester)	02
11	--------	Module &ELP: Organic Production Technology (VIII Semester)	0+10
		Department of Soil Conservation	
1	AG-106	Introductory Forestry	2 (1+1)
2	AG-308	Environmental Studies & Disaster Management	2 (1+1)
3	AG-310	Fundamental of Soil & Water Conservation	2(1+1)
4	AG-409	Introductory Agro-meteorology & Climate Change	2 (1+1)
5	AG-607	Watershed and Wasteland Management	2 (1+1)
		Total Credit Hrs (Core Courses)	10 (5+5)
6	------	RAWE & AIA (VII Semester)	02
		Genetics and Plant Breeding	
1	AG-102	Fundamentals of Genetics	3 (2+1)
2	AG-201	Fundamentals of Crop Physiology	3 (2+1)
3	AG-303	Fundamentals of Plant Breeding	3 (2+1)
4	AG-403	Principles of Seed Technology	3 (2+1)
5	AG-405	Fundamentals of Plant Biotechnology	3 (2+1)
6	AG-502	Crop Improvement-I (Kharif Crops)	2 (1+1)
7	AG-509	Intellectual Property Rights (IPR)	1 (1+0)
8	AG-602	Crop Improvement-II (Rabi Crops)	2 (1+1)
		Total Credit Hrs (Core Courses)	20 (13+7)
9	AG-110B	Introductory Biology (*Remedial Course)	2 (1+1)
10	AGE-53	Commercial Plant Breeding (Elective course-V Sem)	3(2+1)
11	-----	RAWE & AIA (VII Semester)	02
12	------	Module& ELP: Seed Production Technology & Testing (VIII Semester)	0+10
		Soil Science and Agricultural Chemistry	
1	AG-103	Fundamentals of Soil Science	3 (2+1)
2	AG-202	Fundamentals of Plant Biochemistry	3 (2+1)
3	AG-304	Agricultural Microbiology	2(1+1)

4	AG-404	Problematic Soils & their Management	2 (1+1)
5	AG-511	Geo-Informatics & Nanotechnology	2 (1+1)
6	AG-603	Manures, Fertilizers & Soil Fertility Management	3 (2+1)
		Total Credit Hrs (Core Courses)	**15 (9+6)**
7	AGE-52	Agro-chemicals **(Elective course-V Sem)**	3(2+1)
8	-------	**RAWE & AIA (VII Semester)**	02
9	-------	**Module& ELP: Soil, Plant and Water Analysis (VIII Semester)**	0+10
10	-------	**Module& ELP: Agriculture Waste Management (VIII Semester)**	0+10

Agricultural Economics

1	AG-204	Fundamentals of Agricultural Economics	2 (2+0)
2	AG-305	Agriculture Finance & Co-operation	3 (2+1)
3	AG-504	Agriculture Marketing, Trade & Prices	3 (2+1)
4	AG-604	Farm Management, Production & Resource Economics	2 (1+1)
		Total Credit Hrs (Core Courses)	**10 (7+3)**
5	AGE-52	Agri-business Management **(Elective Course-V Sem)**	3 (2+1)
6	--------	**RAWE & AIA (VII Semester)**	01

Plant Pathology

1	AG-206	Fundamentals of Plant Pathology	4 (3+1)
2	AG-307	Principles of Integrated Disease Management	3(2+1)
3	AG-506	Diseases of Field & Horticultural Crops and their Management-I	3(2+1)
4	AG-605	Diseases of Field & Horticultural Crops and their Management-II	3 (2+1)
		Total Credit Hrs (Core Courses)	**13 (9+4)**
5	---------	**RAWE & AIA (VII Semester)**	02
6	----------	**Module & ELP: Mushroom Cultivation Technology (VIII Semester)**	0+10

Entomology

1	AG-203	Fundamentals of Entomology-I (Insect Morphology & Taxonomy)	3 (2+1)
2	AG-312	Fundamentals of Entomology-II (Insect Ecology& Concept of IPM)	2 (1+1)
3	AG-503	Pests of Field Crops, Stored Grains and their Management	3 (2+1)
4	AG-608	Beneficial Insects and Pests of Horticultural Crops & their Management	3(2+1)
		Total Credit Hrs (Core Courses)	**11 (7+4)**
5	AGE-56	Bio-pesticides & Bio-fertilizers **(Elective Course, V Semester)**	3 (2+1)
6	--------	**RAWE & AIA (VII Semester)**	02
7	--------	**Module& ELP: Production Technology of Bio-pesticides & Bio-fertilizers (VIII Semester)**	0+10
8	--------	**Module & ELP: Commercial Beekeeping (VIII Semester)**	0+10
9	----------	**Module & ELP: Commercial Sericulture (VIII Semester)**	0+10

Horticulture

1	AG-104	Fundamentals of Horticulture	2(1+1)
2	AG-207	Production Technology of Vegetables & Spices	2(1+1)
3	AG-407	Production Technology of Ornamental Crops &MAPs and Landscaping	2 (1+1)
4	AG-507	Production Technology of Fruits & Plantation Crops	2 (1+1)
5	AG-606	Post-harvest Management and Value Addition of Fruits & Vegetables	2 (1+1)
		Total Credit Hrs (Core Courses)	**10 (5+5)**

6	AGE-54	Landscaping (Elective Course, V Semester)	3 (2+1)
6	AGE-61	Protected Cultivation (Elective Course-VI Semester)	3 (2+1)
7	AGE-62	Hi-tech Horticulture (Elective Course-VI Semester)	3 (2+1)
8	--------	RAWE & AIA (VII Semester)	02
9	---------	Module & ELP: Commercial Horticulture(VIII Semester)	0+10
10	--------	Module & ELP: Floriculture & Landscaping (VIII Semester)	0+10
		Agricultural Engineering	
1	AG-306	Farm Machinery & Power	3(2+1)
2	AG-406	Renewable Energy & Green Technology	2(1+1)
3	AG-505	Protected Structure& Secondary Agriculture	3 (2+1)
		Total Credit Hrs (Core Courses)	8 (5+3)
5	AGE-64	System Simulation & Agro-advisory (Elective Course,VI sem.	3 (2+1)
6	--------	RAWE & AIA (VII Semester)	01
7	---------	Module & ELP: Water Harvesting (VIII Semester)	0+10
		Agricultural Extension	
1	AG-105	Rural Sociology & Educational Psychology	2(1+1)
2	AG-208	Fundamentals of Agricultural Extension Education	3 (2+1)
3	AG-408	Entrepreneurship Development & Business Communication	2 (1+1)
4	AG-508	Communication Skills & Personality Development	2 (1+1)
5		Total Credit Hrs (Core Courses)	9 (5+4)
6	AG-109	Agricultural Heritage (*Remedial course)	1 (1+0)
7	AG-210	Human Values & Ethics (**Non-gradial Course)	1 (1+0)
8	AGE-65	Agriculture Journalism (Elective Course, VI Semester	3 (2+1)
9	-------	RAWE & AIA (VII Semester)	02
10	------	Module & ELP: Audio-Visual Aids & Agro-informatics (VIII Semester)	0+10
		Animal Husbandry and Dairying	
1	AG-107	Introductory Animal Husbandry	3 (2+1)
2	AG-209	Dairy Processing & Safety Issues	3(2+1)
3	AG-311	Dairy Science	3(2+1)
4	AG-411	Poultry Production and Management	3 (2+1)
4	AG-510	Principles of Food Science & Nutrition	3(2+1)
5		Total Credit Hrs (Core Courses)	15 (10+5)
6			3 (2+1)
7	AGE-55	Food Safety & Standards (Elective Course, V Semester)	3 (2+1)
8	AGE-66	Management of Fish-*cum*-Duck, Quail and Rabbit Farming (Elective Course, VI Semester)	3 (2+1)
9	--------	RAWE & AIA (VII Semester)	02
10	---------	1. Module& ELP: Poultry Production Technology 2. Module& ELP :Food Processing (VIII Semester)	0+10 0+10
		Agricultural Statistics & Computer Application	
1	AG-309	Statistical Methods	2(1+1)

2	AG-410	Agri-Informatics	2 (1+1)
		Total Credit Hrs (Core Courses)	**4 (2+2)**
3	AG-111B	Elementary Mathematics **(*Remedial Course)**	2 (1+1)
		English	
1	AG-108	Comprehension & Communication Skills in English	2(1+1)
		Total Credit hours (Core Courses)	**2 (1+1)**
		***Remedial Courses**	
1	AG-109	**Agricultural Heritage,** (Allotted to Dept. of Agri. Extension)	1 (1+0)
2	AG-110A	**General Agriculture-I** (Concerned Subjects/Dept.: -Agronomy, Soil Science, Horticulture, Plant Pathology)	2 (1+1)
3	AG-110B	**Introductory Biology** (Allotted to Dept. of Genetics & Plant Breeding)	2 (1+1)
5	AG-111A	**General Agriculture-II** (Concerned Subjects/ Dept.:- Ag. Engineering, AH & Dairying, Ag. Economics)	2 (1+1)
5	AG-111B	**Elementary Mathematics** (Allotted to Dept. of Agri. Statistics)	2 (2+0)
		****Non-Gradial Courses**	
		NSS/NCC/Physical Education & Yoga Practices (Any One)*	
1	AG-112A	**NSS (National Service Scheme)**	2 (0+2)
	AG-112B	**NCC (National Cadet Corps)**	2 (0+2)
	AG-112C	**Physical Education & Yoga Practices**	2 (0+2)
2.	AG-210	**Human Values & Ethics,** (Allotted to Agri. Extension department)	1 (1+0)
3.	AGT-99	**Educational Tour**	2 (0+2)
		Total Credit hours of Core courses= 144	**Grand Total =200**
		Total Credit hours of Elective courses= 06	
	Total Credit hours of Remedial courses = 05		
	Total Credit hours of Non-gradial courses = 05		
	Total Credit hours of RAWE & AIA =20		
	Total Credit hours of Modules & ELP =20		

Note:

1. Among ****Non-gradial courses,** a total of 05 credits hours must be opted by all students.
2. Among NSS (AG-112A)/NCC (AG-112B)/Physical Education & Yoga Practices (Ag-112C) **any one course** must be opted by a student.
3. Human Values & Ethics (AG-210) and Educational Tour (AGT-99), ****non-gradial** courses, are compulsory.
4. Among Remedial courses, a total of **05** credit hours will must be study to all students.
5. Agriculture Heritage (AG-109), a***Remedial course, is compulsory.**
6. Among ****Remedial courses,** General Agriculture-I (AG-110A) or Introductory Biology (AG-110B) and General Agriculture-II (AG-111A) or Elementary Mathematics (AG-111B) may be chosen.
7. This is also noted that **students from PCM background** shall be given **Introductory Biology (AG-110 B)** and **General Agriculture-II (AG-111 A),** while those from **Agriculture & PCB background** shall be admitted to **Elementary Mathematics (AG-111B)** and **General Agriculture-I (AG-110A)**

Ch. Charan Singh University, Meerut
Faculty of Agriculture

Department of Agronomy

Scope of Agronomy

Agronomy is the core subject in the field of agricultural science dealing with resources management and crop production. Basic concepts of soil management, nutrient and water management, agro-techniques and crop husbandry are covered along with the theoretical and practical aspects; production of important kharif and rabi season crops to make the students confident about the crop raising in the field. The emerging field of organic farming will also be covered with basic concepts, production aspects, registration and certification. The significance of dryland and rainfed farming in the present scenario with various land and crop management issues will be highlighted. The modern innovations of precision farming, farming systems and sustainable farming will be dealt to inculcate the recent developments in the minds of agricultural students. Weeds constitute a major limitation for crop yield and monetary returns under diverse cropping systems. Various aspects of weed biology, management practices in different crops and the latest innovations in weed management will be highlighted.

Semester wise Courses & Syllabus

Course Code	Course Title	Credit Hours
AG-101	Fundamentals of Agronomy	3(2+1)
AG-205	Principles of Organic Farming	2(1+1)
AG-301	Crop Production Technology-I (*Kharif* Crops)	2(1+1)
AG-302	Practical Crop Production-I (*Kharif* Crops)	2(0+2)
AG-401	Crop Production Technology-II (*Rabi* Crops)	2(1+1)
AG-402	Practical Crop Production-II (*Rabi* Crops)	2(0+2)
AG-501	Rainfed and Dryland Agriculture	2(1+1)
AG-601	Farming System, Precision Farming and Sustainable Agriculture	2(1+1)
	AGE-63 Sem.VI Weed Management **(Elective Course)**	3 (2+1)
---	Sem. VII Rural Agricultural Work Experience (RAWE)& Agro-industrial Attachment (AIA):	02
Modules for Skill Development and Entrepreneurship		
	Sem.VIII **Organic Production Technology**	0+10

Syllabus

1. Fundamentals of Agronomy **3(2+1) AG-101**

Theory

Agronomy and its scope, agro-climatic zones of India, seeds and sowing, tillage and tilth, crop density and geometry, crop nutrition, manures and fertilizers, nutrient use efficiency, water resources, soil-plant-water relationship, crop water requirement, water use efficiency, irrigation-scheduling criteria and methods, quality of irrigation water. 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, harvesting and threshing of crops.

Practical

Identification of crops, seeds, fertilizers, pesticides and tillage implements. Identification of weeds in crops, Methods of herbicide and fertilizer application. Study of yield contributing characters and yield estimation. Numerical exercises on fertilizer requirement, plant population, herbicides and water requirement, Study of soil moisture measuring devices, Measurement of irrigation water.

Suggested Readings:

1. Massey, J.X. and Somani, L.L. 2017. ***Fundamentals of Agronomy***. Agrotech Publishing Academy, Udaipur.
2. Reddy, S.R. 2019. ***Fundamentals of Agronomy***. Kalyani Publishers, New Delhi.
3. Sahu, A.P. and Panigrahi, B. 2020. ***Introduction Soil and Water Conservation Engineering***. Kalyani Publishers, New Delhi.
4. Gopal Chandra De. 2019. ***Fundamentals of Agronomy***. 2nd Edition. Oxford & IBH Publishing, New Delhi.
5. Singh, Satybhan, Singh, Virendra and Thenua, O.V.S. 2021. ***Fundamentals of Agronomy*** (In Hindi). S.R. Scientific Publications, Agra.

2. Principles of Organic Farming **2(1+1) AG-205**

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 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. Certification process and standards of organic farming.

Practical

Visit to organic farms to study various components and their utilization, Preparation of enriched compost, vermi-compost and study of production technology of green manure crops, Indigenous

technical knowledge (ITK) for nutrient, insect, pest disease and weed management, Cost of organic production system; Quality aspect, grading, packaging and handling.

Suggested Readings:

1. Bansal, M. 2020. **Basics of Organic Farming.** CBS Publishers and Distributors Pvt. Ltd. Delhi.
2. Maliwal, P.L. 2020. **Principles of Organic Farming**: Textbook. Scientific Publishers, Jodhpur.
3. Reddy, S.R. 2017. ***Principles of Organic Farming***. Kalyani Publishers, New Delhi.
4. Kalpana, R, Marali Arthanari, P. And Chelvi Ramessh. 2019. ***Text Book on Organic Farming***.
    a. Kalyani Publishers, New Delhi.
5. Joshi, Mukund. 2015. ***Sustainability through Organic Farming***. Kalyani Publishers, Delhi.

3. Crop Production Technology-1 (*Kharif* Crops) **2(1+1) AG-301**

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 brief knowledge of finger millet, proso millet, barnyard millet, kodo millet and foxtail millet; Pulses - pigeonpea, mungbean and urdbean; Oilseeds- til, groundnut and soybean; Fibre crops - cotton and jute; Forage crops - sorghum, cowpea, cluster-bean and napier.

Practical

Rice nursery preparation, transplanting of rice, sowing of soybean, pigeonpea and mungbean, effect of seed size on germination of maize, groundnut and cotton, effect of sowing depth on germination of *kharif* crops, identification and preparation of herbaria of weeds and their seeds in *kharif* season crops, top dressing and foliar feeding of nutrients, numerical problems on seed and fertilizer requirement of *kharif* crops, study of yield contributing characters and yield calculation of *kharif* season crops, study of crop varieties and important agronomic experiments at experimental farm, visit to research centers related to crops.

Suggested Readings:

1. Rajendra Prasad. 2015. ***Textbook of Field Crops Production: Foodgrain Crops Vol.*** 1. ICAR, New Delhi.
2. Rajendra Prasad. 2015. ***Textbook of Field Crops Production: Commercial Crops Vol. 2.*** ICAR, New Delhi.
3. Rathore, P.S. 2014. ***Techniques and Management of Field Crop Production***. Agrobios (India). Jodhpur.
4. Pratik Sanodiya. 2020. ***Crop Production Technology of Kharif Crops***. Kalyani Publishers, New Delhi.
5. Naresh, R.K., Dhaliwal, S.S., Vivek, Gupta, S.K., Singh, S.P. and Kumar, A. 2020. ***Techniques for Sustainable Crop Production***. Jaya Publishing House, Rohini, New Delhi.

4. Practical Crop Production-I (*Kharif* Crops) **2(0+2) AG-302**

Practical

Crop planning, raising field crops in multiple cropping systems, field preparation, seed treatment, nursery raising, sowing, nutrient, water and weed management, management of insect-pests and 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 and net return per ha and per student. A sizeable area of land (minimum 1000 m^2) shall be allocated to a team comprising of 10 students for raising crops at agricultural farm of college.

Suggested Readings:

1. Rajendra Prasad. 2015. ***Textbook of Field Crops Production***: Foodgrain Crops Vol. 1. ICAR,New Delhi.
2. Rajendra Prasad. 2015. ***Textbook of Field Crops Production***: Commercial Crops Vol. 2. ICAR, New Delhi.
3. Rathore, P.S. 2014. ***Techniques and Management of Field Crop Production***. Agrobios (India). Jodhpur.
4. Das, P.C. 2014. ***Oil Seed Crops of India. Kalyani Publishers***, New Delhi.
5. Das, P.C. 2013. ***Pulse Crops of India***. Kalyani Publishers, New Delhi.

5. Crop Production Technology-II (*Rabi* crops) **2(1+1) AG-401**

Theory

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *rabi* crops. Cereals -wheat, barley and oat; Pulses- chickpea, lentil and peas; Oilseeds - rapeseed-mustard, linseed and sunflower; Sugar crop- sugarcane; Tuber crop- potato; Forage crops-berseem, lucerne and oat.

Practical

Sowing methods of wheat and sugarcane, identification and preparation of herbaria of weeds and their seeds in *rabi* season crops. Numerical problems on seed requirement and fertilizer requirement of *rabi* crops. Study of yield contributing characters and yield estimation of *rabi* season crops, study of important agronomic experiments of *rabi* crops at experimental farms. Study of *rabi* forage experiments, visit to research stations of related crops.

Suggested Readings:

1. Rajendra Prasad. 2015. ***Textbook of Field Crops Production***: Foodgrain Crops Vol. 1. ICAR, New Delhi.
2. Rajendra Prasad. 2015. ***Textbook of Field Crops Production***: Commercial Crops Vol. 2. ICAR, New Delhi.
3. Rathore, P.S. 2014. ***Techniques and Management of Field Crop Production***. Agrobios (India). Jodhpur.

4. Das, P.C. 2010. ***Crops and their Production Technology under Different Conditions.*** Kalyani Publishers, New Delhi.
5. Das, P.C. 2013. ***Pulse Crops of India.*** Kalyani Publishers, New Delhi.

6. Practical Crop Production-II (*Rabi* Crops) **2(0+2) AG-402**

Practical

Crop planning, raising field crops in multiple cropping systems, field preparation, seed treatment, nursery raising, sowing,; nutrient, water and weed management, management of insect-pests and disease 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 and net return per ha and per student. A sizeable area of land (minimum 1000 m^2) shall be allocated to a team comprising of 10 students for raising crops at agricultural farm of

Suggested Readings:

1. Rajendra Prasad. 2015. ***Textbook of Field Crops Production***: Foodgrain Crops Vol. 1. ICAR, New Delhi.
2. Rajendra Prasad. 2015. ***Textbook of Field Crops Production***: Commercial Crops Vol. 2. ICAR, New Delhi.
3. Rathore, P.S. 2014. ***Techniques and Management of Field Crop Production.*** Agrobios (India). Jodhpur.
4. Pratik Sanodiya. 2020. ***Crop Production Technology of Kharif Crops.*** Kalyani Publishers, New Delhi.
5. Reddy, S.R. 2016. ***Agronomy of Field Crops***, Kalyani Publishers, New Delhi.

7. Rainfed and Dryland Agriculture **2(1+1) AG-501**

Theory

Rainfed and dryland agriculture- Introduction, types and history; Problems and prospects of rainfed and dryland agriculture in India. Soil and climatic conditions prevalent in dryland areas. Drought: types, effect of water deficit on physio-morphological characteristics of the plants. Mechanism of crop adaptation under moisture deficit conditions. Efficient utilization of water through soil and crop management practices, management of crops in dryland areas. Contingent crop planning for aberrant weather conditions.

Practical

Studies on classifications climate, studies on rainfall pattern in rainfed areas of the country. Studies on cropping pattern of different dryland areas in the country and demarcation of dryland area on map of India. Interpretation of metrological data and scheduling of supplemental irrigations on the basis of evapo-transpiration demand of crops, effective rainfall and its calculations. Numerical problems on runoff and drainage co-efficient. Visit to rainfed/dryland research stations/ watersheds.

Suggested Readings:

1. Jat, M.L., Bhakar, S.R., Sharma, S.K. and Kothari, A.K. 2020. ***Dryland Technology. 2nd*** Edition. Scientific Publishers, Jodhpur.
2. Maliwal, G.L. and Somani, L.L. 2015. ***Textbook of Dryland Farming***. Agrotech Publishing Academy, Udaipur.
3. Maliwal, P.L. 2020. ***Textbook of Rainfed Agriculture and Watershed Management***. Scientific Publishers, Jodhpur.
4. Naresh, R.K., Dhaliwal, S.S., Vivek, Thenua, O.V.S., Gupta, S.K. and Sharma, V. 2021. ***Rainfed Agriculture and Watershed Management***. Jaya Publishing House, Rohini, New Delhi.
5. Reddy, S.R., Reddy, G. Prabhakaran. 2018. ***Rainfed Agriculture and Watershed Management***, Kalyani Publishers, New Delhi.

8. Farming System, Precision Farming and Sustainable Agriculture 2(1+1) AG-601

Theory

Farming system-scope, importance, and concept, types of farming systems and factors affecting types of farming, Farming system components and their maintenance, Cropping system and pattern, multiple cropping systems, Efficient cropping systems and their evaluation, Sustainable agriculture - problems and its impact on agriculture. Conservation agriculture and residue management, strategies of HEIA, LEIA and LEISA and their techniques for sustainability. Integrated farming system, components of IFS and its advantages, farming system and environment. Precision farming; concepts and techniques: their issues and concerns for Indian agriculture.

Practical

Tools for determining productions and efficiencies in cropping and farming systems; Indicators of sustainability of cropping and Farming systems; Site specific IFS models for different agro-climatic zones; Site specific nutrient management, real time nutrient management, Visit to IFS models in different agro-climatic zones of nearby state Universities/Institutes and farmer fields.

Suggested Readings:

1. Behera, U.K. 2014. ***A Textbook of Farming Systems***. Indian Books and Periodicals Publishers, New Delhi.
2. Dhaliwal, S.S., Naresh, R.K., Vivek, Sudhir Kumar,Vivak Kumar and Raj K. Setia 2020.***Precision Farming: Geoinformatics and Nanotechnology***. Jaya Publishing House, Delhi.
3. Meena, R.S. 2019. ***Sustainable Agriculture***. Scientific Publishers, Jodhpur.
4. Reddy, S.R. 2018. ***Farming System and Sustainable Agriculture***. Kalyani Publishers, New Delhi.
5. Rangasamy, A. And Annadurai, K. 2018. ***Farming System in the Tropics***, Kalyani Publishers, New Delhi.

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ELECTIVE COURSE OF AGRONOMY

1.Weed Management **3(2+1) AGE-63**

Theory

Introduction to weeds, characteristics of weeds their harmful and beneficial effects on ecosystem. Classification, reproduction and dissemination of weeds. Methods of weed control, Herbicide classification. concept of adjuvant, surfactant, herbicide formulation and their use, 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

Crop-weed competition studies and yield losses in field crops, Biology of important weeds *viz. Parthenium, Cyprus, Cynodon, Orobancheae, Phalaris* etc. Study of herbicide formulations and mixture of herbicide. Herbicide and agro-chemicals study. Shift of weed flora, study in long term experiments. Study of methods of herbicide application, spraying equipments. Calculation of herbicide doses, weed control efficiency and weed-index.

Suggested Readings:

1. Gupta, O.P. 2020. ***Weed Management***: ***Principles and Practices***. Agrobios (India), Jodhpur.
2. Rao, V.S. 2020. ***Principles of Weed Science***. CBS Publishers & Distributors Pvt. Ltd. New Delhi.
3. Yaduraju, N.T., Sharma, A.R. and Das, T.K. 2016. ***Weed Science and Management***. Indian Society of Weed Science, Jabalpur and Indian Society of Agronomy, New Delhi.
4. Subramaniam, S. *et.al.* 2011. ***All About Weed Control***. Kalyani Publishers, New Delhi.
5. Walia, U.S. 2018. ***Weed Management***. Kalyani Publishers, New Delhi.

VIIth Semester

Rural Agricultural Work Experience **(RAWE)** & Agro-industrial Attachment **(AIA)-subject related work.** **02 Credits**

VIIIth Semester

Module (s) for Skill Development & Entrepreneurship

1. Organic Production Technology **0+10 Credits**

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Chaudhary Charan Singh University, Meerut
Faculty of Agriculture

DEPARTMENT OF GENETICS AND PLANT BREEDING

Scope of Genetics and Plant Breeding

Genetics and Plant Breeding (GPB) is one of the most important and fascinating subjects in Agriculture Sciences. Through genetics and breeding we learn how to develop crop plants with better yield and other desirable properties. Expertise in these subjects is a prerequisite for the development of improved agriculture food crops. Improved crop varieties with better yield, quality, disease resistance, resistance to different abiotic stresses etc. are generally released by blending knowledge of genetics and skills of plant breeding.

With the scarcity of arable land and other natural resources, it is difficult to meet global food demand of agricultural crops. In this situation, a person with expertise in the subject of GPB can contribute significantly to the benefit of society by improving crop yield and other desirable traits using available resources and thus fulfilling growing food demand.

GPB course provides diverse career paths for students. Both public and private sector offers variety of job opportunities for successful graduates. Examples of some interesting jobs are: Plant/crop Scientist, plant breeder, plant pathologist, University or college teacher, researcher, consultant and many more. From time to time, various universities, research institutes and private sector companies offer job positions for GPB graduates. Aspirants bearing graduate/post graduate/doctorate in GPB/Agriculture may also appear for various competitive exams.

Semester wise Courses & Syllabus of Genetics and Plant Breeding Subject
B. Sc. (Ag) / B. Sc. (Ag) Hons.

Semester	Course Code	Course Title	Credit Hours
I Sem	AG-102	Fundamentals of Genetics	3(2+1)
II Sem	AG-201	Fundamentals of Crop Physiology	3(2+1)
III Sem	AG-303	Fundamentals of Plant Breeding	3(2+1)
IV Sem	AG-403	Principles of Seed Technology	3(2+1)
IV Sem	AG-405	Fundamentals of Plant Biotechnology	3(2+1)
V Sem	AG-502	Crop Improvement – I (Kharif Crops)	2(1+1)
V Sem	AG-509	Intellectual Property Rights (IPR)	1(1+0)
VI Sem	AG-602	Crop Improvement - II (Rabi Crops)	2(1+1)
			20 (13+7)

Elective Course			
V Sem	AGE-53	Commercial Plant Breeding	3(1+2)
		Total Cr. Hrs	**23 (14+9)**
VII Sem		**Rural Agricultural Work Experience and Agro-Industrial Attachment (RAWE & AIA)**	
VIII Sem		**Modules for Skill Development and Entrepreneurship**	
		Seed Production and Testing	**0+10**

SUBJECT: - GENETICS AND PLANT BREEDING

Syllabus

1. Fundamentals of Genetics 3 (2+1) AG-102

Theory

Pre and Post Mendelian concepts of heredity, Mendelian principles of heredity. Architecture of chromosome; special types of chromosomes. Chromosomal theory of inheritance; cell cycle and cell division - mitosis and meiosis. Chi-square test; Dominance relationships, Epistatic interactions; Multiple alleles, pleiotropism and pseudoalieles. Sex determination and sex linkage, sex limited and sex influenced traits, Genetics of Blood groups. 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 & CLB 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 (DNA). Protein synthesis. Transcription andtranslational mechanism in prokaryotes. Genetic Code and its properties. Gene concept: Gene structure, function and regulation.

Practical

Study of microscope. Study of cell structure. Mitosis and Meiosis cell division.Experiments on monohybrid, dihybrid, trihybrid. test cross and back cross, Experiments on epistatic interactions including test cross and back cross, Practice on mitotic and meiotic cell division. Experiments on probability and Chi-square test. Determination of linkage and cross-over analysis (through two-point test cross and three-point test cross data). Study on sex linked inheritance in Drosophila. Study of models on DNA and RNA structures.

References/Text books:

1. Gardner, E.J. and Snustad, D.P. 1991. ***Principles of Genetics***. John Wiley & Sons.
2. Strickberger, M.W. 2008. ***Genetics***. Pearson Education.
3. Tamarin, R.H. 1999. ***Principles of Genetics***. Wm. C. Brown Publs.
4. Snustad, D.P. and Simmons, M.J. 2006. ***Genetics***, 4th Ed, John Wiley & Sons
5. Gupta, P. K. ***Genetics***.
6. Singh BD: ***Genetics***. Kalyani Publishers.

2. Fundamentals of Crop Physiology 3 (2+1) AG-201

Theory

Introduction to crop physiology and its importance in Agriculture; Plant cell: an Overview: Diffusion and osmosis; Absorption of water, transpiration and Stomatal Physiology; Mineral nutrition of Plants: Functions and deficiency symptoms of nutrients, nutrient uptake mechanisms; Photosynthesis: Light and Dark reactions, C3. C4 and CAM plants; Respiration: Glycolysis. TCA cycle and electron transport chain; Fat Metabolism: Fatty acid synthesis and Breakdown; Plant growth regulators: Physiological roles and agricultural uses. Photoperiodism and vernalization. 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 photosyntheticpigments through paper chromatography, Rate of transpiration, photosynthesis. respiration, tissue test for mineral nutrients, estimation of relative water content, Measurement of photosynthetic CO2 assimilation by Infra Red Gas Analyser (IRGA).

References/text Books:

1. Taize L and Zeiger E (2006) ***Plant Physiology***. Sinauer Associates, Inc, Publishers, Sunderland, Massachusetts, USA.
2. Hopkins WG and Huner NPA (2004) ***Introduction to Plant Physiology***. John Wiley & Sons.
3. Oxlade Edwin (2010) Plant Physiology: ***The Structure of Plants Explained***. In-focus: Study mates.
4. Vanangamudi M and Purohit SN- ***Principles of Crop Physiology***
5. Jain VK ***Fundamentals of Plant Physiology***. S. Chand and Company
6. Pandey SN and Sinha's BK, ***Plant Physiology***. Vikas Publishers
7. Salisbury FB and Ross, CW (1986) ***Plant Physiology***, CBS Publishers & Distributors, New Delhi.

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3. Fundamentals of Plant Breeding 3 (2+1) AG-303

Theory

Historical development, concepts, nature and role of plant breeding, major achievementsand future prospects; Genetics in relation to plant breeding, modes of reproduction andapomixis, self-incompatibility and male sterility-genetic consequences. Domestication, Acclimatization and Introduction: Centres of origin and 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. 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; Widehybridization and pre-breeding; Polyploidy in relation to plant breeding. Mutation breeding- methods and uses; Breeding for important biotic and abiotic stresses.

Practical

Plant Breeder's kit, Study of germplasm of various crops. Study of floral structure of self-pollinated and cross-pollinated crops. To work out the mode of pollination in a given cropand

extent of natural out-crossing. Prediction of performance of double cross hybrids. 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 and their analysis in plant breeding experiments.

Reference/text books:

1. Allard, R.W. 1981. ***Principles of Plant Breeding***, John Wiley & Sons.
2. Chopra, V.L. 2001. ***Breeding Field Crops***. Oxford & IBH.
3. Chopra, V.L. 2004. ***Plant Breeding***. Oxford & IBH.
4. Roy, Darbeshwar. 2003. ***Plant Breeding, Analysis and Exploitation of Variation***. Narosa Publ. House.
5. Sharma, J.R. 2001. ***Principles and Practice of Plant Breeding***. Tata McGraw-Hill.
6. Simmonds, N.W. 1990. ***Principles of Crop Improvement***. English Language Book Society.
7. Singh, B.D. 2006. ***Plant Breeding***. Kalyani.
8. Snustad, D. P. and Simmons M.J. 006. ***Genetics***, 4th Ed. John Wiley & Sons.

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4. Principles of Seed Technology 3 (2+1) AG-403

Theory

Seed and seed production technology: introduction, definition and importance. Deterioration causes of crop varieties (sexsual & asexsual) and their control; Maintenance of genetic purity during seed production. Seed quality; Definition and Characters of good quality seed, different classesof seed. Foundation and certified seed production of important cereals, pulses. oilseeds, fodderand vegetables. Seed certification. phases of certification, procedure for seed certification, OECD, ISTA, fieldinspection. 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. History and development of Seed Industry in India. 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, Private and public sectors and their production and marketing strategies.

Practical

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

References/text books:

1. Agarwal, R.L. (2003). ***Seed Technology***. Oxford & I.B.H. Delhi.
2. Agrawal, P.K. (2002). ***Principles of Seed Technology***. ICAR, New Delhi.
3. Singhal, N. C. (2003). ***Hybrid Seed Production in Field Crops***. Kalyani Publishers, New Delhi
4. Khare, D. and Bhale, M. S. (2000). ***Seed Technology***. Scientific Publishers (India), Jodhpur
5. McDonald, M.B. and Copeland, L. O. (1995). ***Principles and practices of seed Production***. Chapman & Hall, London.

6. Desai, B.B., Kotecha, P.M. and Salunkhe, D.K. (1995). ***Principles and practices of seed production***. Chapman & Hall, New York.

5. Fundamentals of Plant Biotechnology 3 (2+1) AG-405

Theory

Conceptsand applicat ions of plant biotechnology. Biotechnological tools, PCR techniques and its appli ca tions; introduction to recombinant DNA method s: physical, chemical and Agrobacterium med iated gene transfe r methods ;Tra nsgenics and its importance in crop improvement; DNA markers and their application - RFLP, RAPD, AFLP, CAPS, SSR etc. Marker Assisted Breeding in crop improvement, Biotechnology regulations. Plant Cell and Tissue Culture - organ culture, embryo cultu re, cell suspension cultu re, callus culture, anther cul ture, pollen culture, ovule culture and their applicat ions; Micro-propagation methods; organogenesis and embryogenesis, Synthetic seeds and their significance; Embryo rescue and its significa nce. Soma tic hybrid izati on and cybrids. Somaclonal variation and itsuse in crop improvement. Cryo-preservation. Application of in-vitro techniques.

Practical

Preparation of sol uti on, pH and buffers. Sterilization techniques, Composit ion of var ious tissue culture med ia and preparat ion of stock solutions for MS nutri ent medium. Callus induct ion from various explants and plant regeneration. Mi cro-propaga tion, hard eni ng and acclimatization. Demonstration on isolati on of DNA and PCR tech nique. Demonstration of gel elect rophoresis techniques and DNA finger printing.

References/text books:

1. Gupta, P.K. 2010. ***Plant Biotechnoloy***. Rastogi Publications.
2. Trivedi, P. C. (2000). ***Plant Biotechnology: Recent Advances***. Panima Publishing Corporation, New Delhi
3. Chawla, H. S. (2000). ***Introduction to Plant Biotechnology***. Oxford & IBH Publishing CO. Ltd., New Delhi
4. Singh BD (2015) ***Plant Biotechnology***. Kalyani Publishers
5. Primrose, S. B., Twyman, R. M. and Old, R. W. (2001). ***Principles of Gene Manipulation***, 6/e. Blackwell Science
6. Dubey RC A. (2007) ***Textbook of Biotechnology***. S Chand and company

6. Crop Improvement - I (Kharif) 2 (1+1) AG-502

Theory

Centers of origin. distribution of species. wild relatives in different cereals (Rice, Maize, Sorghum and Pear[millet); pulses (Pigeonpea, Urdbean and Mungbean); oilseeds (Groundnut); fibre (Cotton). Important concepts of breeding self-pollinated and cross pollinated. 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 and quality (physical, chemical, nutritional); Hybrid seed production technology in Maize, Rice, Sorghum, Pearl millet and Pigeonpea.

Practical

Floral biology, emasculation and hybridization techniques in different crop species; viz., Rice, Maize, Sorghum, Pearl millet, Pigeonpea, Urdbean, Mungbean, Groundnut, Cotton crops.

Maintenance breeding of different kharif crops. Handling of gcrmplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods; Study offield techniques for seed production and hybrid seeds production in Kharif crops; Estimation of heterosis. Inbreeding depression and heritability; Layout of field experiments; Study of quality characters, donor parents for different characters; Visit to seed production plots; Visit to A1CRP plots of different field crops.

References/text books:

1. Chopra, V.L. and Shyam Prakash. 2002. ***Evolution and adaptation of cereal crops***. Oxford and IBH.
2. Singh BD: ***Plant Breeding.*** Kalyani Publishers,
3. Walden DB. 1978. ***Maize Breeding and Genetics***. John Wiley and Sons, New York.
4. Murty, D.S., Tabo, R. and Ajayl, O. 1994. ***Sorghum Hybrid Seed Production and Management***. ICRISAT, Patancheru
5. Gill, K.S. 1991. ***Pearl Millet and its Improvement***. Indian Council of Agricultural Research, New Delhi.
6. Jennings, P.R., Coffman, W.R. and Kauffman, H.E. 1979. ***Rice Improvement***. IRRI, Philippines. 186p.

7. Intellectual Property Rights 1 (1+0) AG-509

Theory

Introduction and meaning of intellectual property, brief introduction to GATT, WTO. TRIPS and WIPO, Treaties for I PR protection; Types of Intellectual Property and legislationscovering 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&FRAct of India, Plant breeder's rights, Registration of plant varieties under PPV&FR Act 2001, breeders, researcher and farmers rights. International treaty on plant genetic resources for foodand agriculture (ITPGRFA). Indian Biological Diversity Act, 2002 and its salient features, access and benefit sharing.

Reference/text Books:

1. Swaminathan MS (1996). ***Agrobiodiversity and Farmers Rights***. Konark Pub, New Delhi
2. Anuradha Singh (2016). ***Plant Genetic Resources: An Overview***, Aavishkar Publishers & Distributors In Chaura Rasta, Jaipur
3. Paroda RS and Arora RK (eds) (1991). ***Plant Genetic Resources: Conservation and Management***. IPPGR, Rome
4. Swaminathan MS and Jana S (eds) (1992). ***Biodiversity- Implications for Global Food Security***. McMillan India, New Delhi
5. Maxsted N, Ford-Lloyd BV and Hawkes JJ (eds) (1997). ***Plant Genetic Conservation***. Chapman and Hall, London

8. Crop Improvement - II (Rabi) 2 (1+1) AG-602

Theory

Centers of origin, distribution of species, wild relatives in different crops: cereal (Wheat); pulses (Chickpea, Pea); oilseeds (Rapeseed and Mustard, Sunflower); cash crop (Sugarcane); vegetable crop (Potato); Major breeding objectives and proceduresincluding conventional and

modem innovative approaches for development of hybrids and varieties for yield, adaptability, stability, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional); Hybrid seed production technology of rabi crops. Ideotype concept and climate resilient crop varieties for future.

Practical

Floral biology, emasculation and hybridization techniques in different crop species namely Wheat, Chickpea. pea, Rapeseed Mustard, Sunflower, Tomato: Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods; Study of field techniques for seed production and hybrid seeds production in Rub/ crops: Estimation of heterosis, inbreeding depression and heritability; Layout of field experiments: Study of quality characters, study of donor parents for different characters; Visit to seed production plots; Visit to AICRP plots of different field crops.

Reference/text books:

1. Chopra, V.L. and Shyam Prakash. 2002. ***Evolution and adaptation of cereal crops***. Oxford and IBH.
2. Singh, B.D. 2006. ***Plant Breeding***. Kalyani.
3. Agarwal, R.L. 1996. ***Identifying Characteristics of Crop Varieties***. Oxford & IBH Publishing Co Pvt Ltd.
4. Bahl, P.N. and Salimath, P.M. 1996. ***Genetics, Cytogenetics and Breeding of Crop Plants***. Vol 1 Pulses and Oilseeds. Oxford & IBH Publsihing Co Pvt Ltd, New Delhi.

Elective Course

9. Commercial Plant Breeding 3 (1+2) AGE-53

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 ofseeds, 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.

Reference/text books:

1. Allard, R.W. 1981. ***Principles of Plant Breeding***, John Wiley & Sons.
2. Chopra, V.L. 2001. ***Breeding Field Crops***. Oxford & IBH.
3. Chopra, V.L. 2004. ***Plant Breeding***. Oxford & IBH.
4. Sharma, J.R. 2001. ***Principles and Practice of Plant Breeding***. Tata McGraw-Hill.
5. Simmonds, N.W. 1990. ***Principles of Crop Improvement***. English Language Book Society.
6. Murty, D.S., Tabo, R. and Ajayi, O. 1994. ***Sorghum Hybrid Seed Production and Management***. ICRISAT, Patancheru
7. Jennings, P.R., Coffman, W.R. and Kauffman, H.E. 1979. ***Rice Improvement***. IRRI, Philippines. 186p.

VIIth Semester

Rural Agricultural Work Experience (RAWE) and Agro-industrial Attachment (AIA) **02**

VIIIth Semester

Module (s) for Skill Development & Entrepreneurship

Seed Production and Testing **0+10**

Chaudhary Charan Singh University, Meerut
Faculty of Agriculture

DEPARTMENT OF SOIL SCIENCE AND AGRICULTURAL CHEMISTRY

Scope of Soil Science & Agricultural Chemistry:

The courses included in NEP 2020-21 in Department of Ag, Chemistry and Soil Science are the basic and necessary in enlightening the knowledge of students in the field of Agricultural Sciences at Under Graduate level. The course content included in each course is relevant to the present as well as future needs ,as new technologies are emerging day by day in whole world. The content included in different courses also throw light on solving problems arising as such and creating new challenges. The knowledge of the subject will help the students in their holistic development and catering their job requirements. .

Semester wise Courses & Syllabus of Soil Science & Agric. Chemistry Subject

Semester	Course Code	Course Title	Credit Hours
I Sem	AG-103	Fundamentals of Soil Science	3 (2+1)
II Sem	AG-202	Fundamentals of Plant Biochemistry	3 (2+1)
III Sem	AG-304	Agricultural Microbiology	2 (1+1)
IV Sem	AG-404	Problematic Soils and their Management	2(1+1)
V Sem	AG-511	Geo-Informatics, Nano Technology	2 (1+1)
VI Sem	AG-603	Manures, Fertilizers and Soil Fertility Management	3 (2+1)
		Credit Hrs	**15 (9+6)**
		Elective course	
V Sem	AGE-52	Agro-chemicals	3 (2+1)
		Total Cr. Hrs	**18 (11+7)**
VII Sem	---------	Rural Agricultural Work Experience (RAWE)& Agro-industrial Attachment (AIA):	02
VIII Sem		Module for Skill Development & Entrepreneurship	
		1. Soil, Plant and Water Analysis	0+10
		Or	
		2. Organic Waste Management	0+10

Syllabus

1. Fundamentals of Soil Science 3(2+1) AG-103

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 of soils of India; Soil water retention, movement and availability; Soil air, composition, gaseous exchange and effect on plant growth. Soil temperature; source, amount and flow of heat in soil: effect on plant growth. Soil reaction- pH. EC, 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. Introduction to microbial world, 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 method. Determination of soil pH and electrical conductivity. Study of soil map. Estimation of organic matter content of soil. Estimation of carbonate and bicarbonate in soil and water.

Reference/Text Books

1. Nyle C. Brady : ***Nature and Properties of Soils***
2. Dilip Kumar Das : ***Introductory Soil Science***
3. Geeta Puri and Mark Ashmen: ***Essential Soil Science: A Clear and Concise Introduction to Soil Science***
4. H.D.Forth : ***Fundamentals of Soil Science***
5. Wishwas T. D. and Mukherjee : ***Text Book of Soil Science***
6. Hanuman Prasad Prewa : ***Mrida Vigyan Ke Mool Sidhant***
7. J.L.Sehgal : ***Introductory Pedology***

2. Fundamentals of Plant Biochemistry 3(2+1) AG-202

Theory

Biochemistry-introduction, scope and Importance in agriculture. Carbohydrate: Importance and classification of Monosaccharides, Disaccharides and Polysaccharides and properties monosaccharides. Lipid: Importance and classification; Structures and properties of fatty acids; lipids. Proteins: Importance of proteins and classification; Structural organization of proteins. Amino acid-definition,classification and important functions. Enzymes: General properties; Classification; Mechanism of action, Introduction to allosteric enzymes; vitamin :classification of structure role and its deficiency symptoms.. Nucleic acids: Importance, classification and Structure . Metabolism of carbohydrates: Glycolysis.

Practical

Qualitative tests of carbohydrates and amino acids. Quantitative estimation of glucose/ proteins. Titration methods for estimation of amino acids/lipids, Paper chromatography Monosaccharides. Estimation of reducing and non reducing in cane sugar and jaggary.

Reference/Text Books

1.S.K. Verma and Mohit Verma : **A Text Book Of Plant Physiology, Biochemistry and Biotechnology**

2. Biju Dharampalan: **Plant Biochemistry**: An Introduction
3. Caroline Bowshwe, Martin Steer and Allison Tobin : **Plant Biochemistry**
4. Hans Walter Heldt, Brigit Piechulla : **Plant Biochemistry**

3. Agricultural Microbiology 2(1+1) AG-304

Theory

Introduction of Microbial world: Prokaryotic and eukaryotic microbes. Bacteria: cell structure, chemoautotrophy, photo autotrophy, growth. Bacterial genetics: Genetic recombination - transformation, conjugation and transduction. plasmids, transposon. Role of microbes in soil fertility and crop production: Carbon, Nitrogen, Phosphorus and Sulphur cycles. Biological nitrogen fixation- symbiotic, associative and asymbiotic. Azolla, blue green algae and mycorrhiza. Rhizosphere and phyllosphere. Microbes in human welfare: biofertilizers, bio-pesticides, biofuel production and biodegradation. Microbial degradation of agricultural residues. Cellulose decomposing microbes for compost preparation & vermi compost.

Practical

Introduction to microbiology laboratory and its equipments; principles of microscopy. 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.

Reference/Text Books

1. Elder : Paul: ***Soil Microbiology,Ecology, Biochemistry***
2 Rao Subba Rao : *Soil Microbiology*
3. Ajit Verma and Ralf Oelmuiier: ***Advance Technique in Soil Microbiology***
4. L Take III : ***Soil Microbiology***
5. Suraja Kumar Nayle and B.B.Mishra : ***Frontiers in Soil and Environmental Microbiology***

4. Problematic Soils and their Management (New) 2(1+1) AG-404

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 use capability classification, land suitability classification. Problematic soils under different Agro-ecosystems.

Practical

Determination of pH & Ec in soil and water. Lime and gypsum requirement in soil, ESP and SAR in Soils. Application of remote sensing and GIS in delineating problematic soil in LIP. Visit problematic soil in U.P.

Reference/Text Books

1 R.R.Agrawal : ***Saline and Alkali Soils of India***

2.R. Chhabra: ***Soil Salinity and Water Quality***
3. I.P.Abrol and J.S.P.Yadav ***Salt Affected Soils and Their Management.***
4. Sanjay Arora , A.K.Singh and Y.P.Singh: ***Bio Remediation of Salt Affected Soils***
5.Zdenko Rengel: ***Hand Book of Soil Acidity***

5. Geo-informatics and Nanotechnology 2(1+1) AG-511

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; 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, Introduction to image processing software. Visual interpretation of remote sensing images. Generation of spectral profiles of different objects. Supervised and unsupervised classification and acreage estimation.. Multispectral remote sensing for soil mapping. Creation of thematic layers of soil fertility based on GIS. Creation of productivity and management zones. Fertilizers recommendations based of VRT and STCR techniques. Crop stress (biotic/abiotic) monitoring using geospatial technology. Use of GPS for agricultural survey. Formulation. characterization and applications of nanoparticles in agriculture. Projects formulation and execution related to precision farming.

Reference/Text Books

1.Basudeb Bhatta :***Remote Sensing And GIS***
2. Edited by S Kumars :***Basics of Remote Sensing and GIS***
3. M Anji Reddy: ***Text Book of Remote Sensing and GIS***
4. Jeorge Josef : ***Fundamentals of Remote Sensing***
5. Kalicharan Sahu: ***Text Book of Remote Sensing and GIS***

6. Manures, Fertilizers and Soil Fertility Management 3(2+1) AG-603

Theory

History of soil fertility and plant nutrition, 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., 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 applications to crops. Factor influencing nutrient use efficiency (NUE), methods of fertilizer application under rainfed and irrigated conditions.

Practical

Estimation of soil organic carbon, Estimation of available N available P, available K; available S available Ca and Mg in soils. Estimation of N. P & K in plants. manures and fertilizers. Elementary idea of determination micro nutrients- boron,Zinc and Iron.

Reference/Text Books

1. Harlin, Tisdale, Nelson and Beaten : ***Soil Fertility and Fertilizers***
2. Boyd G, Ellis and H.D.Forth : ***Soil Fertility***
3. R.K. Kaleeswari : ***A Hand Book of Soil Fertility***
4. A.K. Roy: ***Manures and Fertilizers***
5. B. Mishra : ***Mrida Urvarta Evem Urvarak***
6. J Benton Jones Jr: ***Plant Nutrition and Soil Fertility***

Elective Course

1. Agrochemicals 3(2+1) AGE-52

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. carbox in, oxycarboxin, Metalaxyl, Carbendazim. characteristics and use. Introduction and classification of insecticides: inorganic and organic insecticides Organochlorine, Organophosphates, Carbamates, Synthetic pyrethroids Neonicotinoids. Hiorationals. 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: Feed stocks 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 kin market Estimation of nitrogen in Urea. Estimation of water soluble P2O5 and citrate soluble P2O5 in single super phosphate. Estimation of potassium in-Muraite of Potash/ Sulphate of Potash by flame photometer. Determination of copper content in copper oxychloridc. Determination of sulphur content in sulphur fungicide. Determination of thiram. Determination of ziram content.

Reference/Text Books

1. P K Gupta : **Soil ,Plant ,Water and fertilizer analysis**
2. Amitava Rakshit, Priyankar Raha and Nirmal Day :***Manures ,Fertilizers and Pesticides***
3 .Edited by Richard P.Pohanish: ***Pesicides and Agricultural Chemicals.***
4 .Rajeev Pratap Singh : ***Organic Fertilizers: Types Production and Environmental Impact***

VIIth Semester

Rural Agricultural Work Experience (**RAWE**) & Agro-Industrial Attachment **(AIA)-subject related work.** **02 Credits**

VIIIth Semester

Module (s) for Skill Development & Entrepreneurship

1. Soil, Plant and Water analysis **0+10 Credits**
2. Agriculture Waste Management **0+10 Credits**

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Ch. Charan Singh University, Meerut

Faculty of Agriculture

Dept. of Agricultural Economics

Scope of Subject

Farming is the oldest profession in the world. At the time of independence in India the Indian farmers mostly followed traditional farming. The farmers were hardly able to fulfill their family needs from farming business and that's why India imported food grains until the onset of green revolution in mid-sixties. After the inception of green revolution, the Indian farmers are now not only able to meet their farm and family needs for food, but also supply bulk of food in the market. Agricultural economics has played an important role in the transformation of traditional approach of agriculture to market oriented approach. In the present meeting of Board of Studies, the course of Agricultural Economics are included at the UG level teaching in such a way that apart from providing basic economic principles to the field of agriculture, it also paves the way for increasing efficiency in agricultural production, marketing and financing.

Syllabus

1. Fundamentals of Agricultural Economies (2+0) AG-204

Theory:

Economics : meaning, scope and subject matter; Approaches to economic analysis : micro and macro economics, positive and normative analysis; Nature of economic theory, rationality assumption, concept of equilibrium; Basic concepts : goods and services, desire, want, demand, utility, costs and prices, wealth, capital, income and welfare.

Agricultural Economics : meaning and definition, characteristics of agriculture, importance and its role in economic development, difference between agricultural economics and industrial economics, agricultural planning and development in the country; Meaning, objectives and types of land reforms with special reference to U.P.

Demand : meaning, law of demand, demand schedule and demand curve, determinants of demand; Utility theory: law of diminishing marginal utility, law of equi-marginal utility. Consumer's equilibrium and derivation of demand curve, concept of consumer surplus; Elasticity of demand: concept and measurement of price elasticity of demand, income elasticity of demand and cross price elasticity of demand. Production process : factors of production; Supply : law of supply, supply schedule, supply curve, determinants of supply, elasticity of supply; Concepts of rent, wages, interest and profit.

National income: Meaning and importance, Gross National Product (GNP), Gross Domestic Product (GDP) Net National Product (NNP), Net Domestic Product (NDP) at market price and at factor cost. National income and welfare.

Population: population growth trend in India, population and economic growth, causes of rapid growth of population in India, current policies and programmes on population control.

Money: Barter system of exchange and its problems, evolution. meaning and functions of money, general price index, inflation and deflation; Taxes: meaning, direct and indirect taxes, agricultural taxation, VAT and GST.

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

Reference Books

1. S. S. Reddy, P. Raghuram, T. V. N. Sastry and I. Bhawani Devi, ***"Agricultural Economics"***, Oxford and IBH Publishing Company Pvt. Ltd., New Delhi
2. K. K. Dwett and A. Chand, ***"Modern Economic Theory"***, S. Chand and Company, Delhi
3. K. K. Dwett and J. B. Verma, ***"Elementary Economics"***, S. Chand and Company, Delhi
4. M. L. Jhingan, ***"Advanced Economic Theory"***, Vikas Publishing House, New Delhi
5. R. K. Lekhi and Joginder Singh, ***"Agricultural Economics"***, Kalyani Publishers, Ludhiana
6. Harsaran Das, ***"Krishi Arthshashtra"***, Rama Publishing House, Meerut

2. Agricultural Finance and Co-operation 3(2+1) AG-305

Theory:

Agricultural Finance : meaning, scope and significance, credit needs and its role in Indian agriculture. Agricultural credit: meaning, definition, need, classification and characteristics good agricultural credit. Recent developments in agricultural credit.

Credit analysis : Criteria for lending agricultural credit - 3 R's and 4 C's of credits, Cost of credit. Sources of agricultural finance : institutional and non institutional sources, commercial banks, social control and nationalization of commercial banks; Micro financing including KCC. Lead bank scheme, RRBs, Scale of finance and unit cost.

An introduction to higher financing institutions – RBI, NABARD, ADB, IMF, world bank, Insurance and Credit Guarantee Corporation of India.

Preparation and analysis of financial statements - Balance Sheet and Income Statement, basic guidelines for preparation of project reports - Bank norms, SWOT analysis.

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

Practical:

1. Analysis of progress and performance of commercial banks and RRBs using published data.
2. Visit to a commercial bank, cooperative bank and cooperative society to acquire firsthand knowledge of their management, schemes and procedures.
3. Estimation of credit requirement of farm business - A case study.
4. Preparation and analysis of balance sheet - A case study.
5. Preparation and analysis of income statement - A case study.
6. Appraisal of a loan proposal - A case study. Techno-economic parameters to be considered for preparation of projects.

7. Preparation of bankable agricultural projects and its value added products. Seminar on selected topics.

Reference Books

1. S. S. Reddy and P. Raghuram, ***"Agricultural Finance and Management"***, Oxford and IBH Publishing Company Pvt. Ltd., New Delhi
2. R. Muniraj, ***"Farm Finance for Development"***, Oxford and IBH Publishing Company Pvt. Ltd., New Delhi
3. Devendra Prasad, ***"Krishi Vitt, Vyavasay Prabandh avam Vyapar"***, Rama Publishing House, Meerut
4. A. S. Kahlon and Karam Singh, ***"Managing Agricultural Finance"***, Allied Publishers Private Limited, New Delhi
5. Warren F. Lee, Michael O. Boehlje, Aaron G. Nelson and William G. Murray, ***"Agricultural Finance"***, Kalyani Publishers, New Delhi
6. S. N. Ghoshal, ***"Agricultural Financing in India"***, Asia Publishing House, Bombay

2. Agricultural Marketing, Trade and Prices

3(2+1) AG-504

Theory:

Agricultural Marketing: Concepts and definitions of market, marketing, agricultural marketing, market structure, marketing mix and market segmentation. classification and characteristics of agricultural markets; demand, supply and producer's surplus of agricultural 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 agricultural commodities; cost based and competition based pricing.

Market promotion - advertising, personal selling, sales promotion and publicity - their meaning, merits & demerits; Marketing process and functions: Marketing process - concentration, dispersion and equalization; exchange functions - buying and selling; physical functions – storage, transport and processing; facilitating functions - packaging, branding, grading, quality control and labelling (Agmark).

Market functionaries and marketing channels: types and importance of agencies involved in agricultural marketing; meaning and definition of marketing channel; number of channel levels; marketing channels for different farm products.

Integration, efficiency, costs and price spread: meaning, definition and types of market integration; marketing efficiency; marketing costs, margins and price spread; factors affecting cost of marketing: reasons for higher marketing costs of farm commodities; ways of reducing marketing costs; Role of Govt. in agricultural marketing : public sector institutions - CWC, SWC, FCI, CACP & DMI : their objectives and functions; recent changes in farming laws including e – NAM, removal of stock limit and contract farming; cooperative marketing in India.

Risk in marketing : types of risk in marketing; speculation & hedging; an overview of futures trading; Agricultural prices and policy: meaning and functions of prices; administered prices; need for agricultural price policy.

Trade : concept of international trade and its needs, theories of absolute and comparative advantage. Present status and prospects of international trade in agricultural

commodities; GATT and WTO; Agreement on Agriculture (AoA) and its implications on Indian agriculture; IPR, GST.

Practical :

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

Reference Books

1. S. S. Acharya and A. N. Agarwal, ***"Agricultural Marketing in India"***, Oxford and IBH Publishing Company Pvt. Ltd., New Delhi
2. S. S. Acharya and A. N. Agarwal, ***"Agricultural Prices – Analysis and Policy"***, Oxford and IBH Publishing Company Pvt. Ltd., New Delhi
3. A. K. Rai and Devendra Prasad, ***"Krishi Vipanan, Niryat Aur Sahakarita"***, Rama Publishing House, Meerut
4. A. S. Kahlon, D. S. Tyagi, ***"Agricultural Price Policy in India"***, Allied Publishers Private Limited, New Delhi
5. A. S. Kulkarni, ***"Agricultural Marketing in India"***, the Co-operators Book Depot, Mumbai
6. C. B. Memoria and R. L. Joshi, ***"Principles and Practices of Marketing in India"***, Kitab Mahal, Allahabad
7. Bo Sodersten and Jeoffrey Reed, ***"International Trade"*** Mc Millan

4. Farm Management, Production and Resource Economics

2(1+1) AG-604

Theory:

Meaning and concept of farm management, objectives and relationships with other sciences. Meaning and definition of farms, its types and characteristics, factor determining types and size of farms.

Principles of farm management : concept of production function and its type, use of production function in decision-making on a farm, factor-product, factor-factor and product-product relationships, law of equi-marginal returns, principles of opportunity cost and law of comparative advantage.

Meaning and concept of cost, types of costs and their interrelationships, importance of cost in managing farm business and estimation of gross farm income, net farm income, family labour income and farm business income.

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

Importance of farm records and accounts in managing a farm, various types of farm records needed to maintain a farm, farm inventory, balance sheet, profit and loss accounts.

Meaning and importance of farm planning and budgeting, partial and complete budgeting, steps in farm planning and budgeting, linear programming, appraisal of farm resources, selection of crops and livestock enterprises.

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

Concepts of resource economics, differences between NRE and agricultural economics, unique properties of natural resources, positive and negative externalities in agriculture, inefficiency and welfare loss, their solutions, important issues in economics and management of common property resources of land, water, pasture and forest resources etc.

Practical:

1. Preparation of farm layout. Determination of cost of fencing of a farm. Computation of depreciation cost of farm assets.
2. Application of equi-marginal returns/opportunity cost principle in allocation of farm resources.
3. Determination of most profitable level of inputs use in a farm production process.
4. Determination of least cost combination of inputs.
5. Selection of most profitable enterprise combination.
6. Application of cost principles including CACP concepts in the estimation of cost of crop and livestock enterprises.
7. Preparation of farm plan and budget, farm records and accounts and profit & loss accounts.
8. Collection and analysis of data on various resources in India.

Reference Books

1. S. S. Johl and T. R. Kapur, ***"Fundamentals of Farm Business Management"***, Kalyani Publishers

2. V. T. Raju and D. V. S. Rao, ***"Economics of Farm Production and Ma***nagement ", Oxford and IBH Publishing Company Pvt. Ltd., New Delhi

3. Harsaran Das, ***"Krishi Prakritik Sansadhan Arthshashtra avam Prakshetra Prabandh ka Parichay"***, Rama Publishing House, Meerut

4. A. S. Kahlon and Karam Singh, " ***Economics of Farm Management in India***", Allied Publishers Private Limited, New Delhi
5. R. P. Singh and Buddh Singh, " ***Prakshetra Prabandh and Utpadan Arthshashtra***", Bharti Bhandar, Meerut
6. John M. Kerr, Dinesh K. Marothia, Katar Singh, C. Ramasamy and William R. Bentley, ***"Natural Resource Economics : Theory and Application in India***", Oxford and IBH Publishing Company Pvt. Ltd., New Delhi

Elective Course:

1. Agri - business Management 3(2+1) AGE-51

Theory :

Transformation of agriculture into agri-business, various stakeholders and components of agri-business systems, Importance of agri-business in the Indian economy and new agricultural policy, distinctive features of agri-business management.

Importance and needs of agro-based industries, classification of industries and types of agro-based industries; institutional arrangement, procedure to set up agro-based industries, Constraints to establishing agro-based industries.

Agri-value chain : understanding primary and support activities and their linkages, business environment : PEST and SWOT analysis, management functions roles and activities, organization culture.

Planning, meaning, definition and types of plans, purpose or mission, goals or objectives, strategies, policy procedures, rules, programmes and budget, components of a business plan, steps in planning and implementation.

Organization staffing, directing and motivation, ordering, leading, supervision, communication and control; capital management and financial management of agri-business, financial statements and their importance; marketing management : segmentation, targeting and positioning, marketing mix and marketing strategies, consumer behaviour analysis, Product Life Cycle (PLC), Sales and distribution management, pricing policy and various pricing methods.

Project management : definition, project cycle, identification, formulation, appraisal, implementation, monitoring and evaluation.

Practical:

1. Study of agri-inputs markets: seeds, fertilizers and pesticides.
2. Study of output markets: grains, fruits, vegetables and flowers.
3. Study product markets, retail trade commodity trading and value added products.
4. Study of financing institutions: cooperative societies, commercial banks, RRBs, agri-business finance ltd. and NABARD.
5. Preparation of projects and feasibility reports for agribusiness entrepreneurs.

6. Appraisal / evaluation techniques of identifying viable projects : non – discounting techniques, Net Present Worth and Internal Rate of Return – a case study of agro-based industries.
7. Trend and growth rate of prices of agricultural commodities.

Reference Books

1. G. L. Meena, S. S. Burak, D. C. Pant and Rajesh Sharma, ***"Fundamentals of Agribusiness Management"***, Agrotech Publishing Academy, Udaipur.
2. Shoji Lal Bairwa, ***"Fundamentals of Agribusiness Management"***, Kalyani Publishers, India.
3. Shoji Lal Bairwa, Lokesh Kumar Meena, Chandra Sen and Meera Kumari, ***"Agribusiness Management (Theory and Practices)"***, Write and Print Publisher, WAP, New Delhi.
4. S. Diwase, ***"Indian Agriculture & Agri-Business Management ",Scientific Publishers.***
5. A. C. Broadway, **"Agri Business management Paperback "**,Kalyani Publishers.
6. Talathi Naik, **"Introduction to Agricultural Economics and Agri-Business Management Paperback"**, ANE Books.
7. Frank J. Dooley, Freddie L. Barnard and Jay T. Akridge, ***"Agribusiness Management"***, Google Books.
8. V. S. Ramaswamy and S. Namakumari, ***"Marketing Management: Indian Context and Global Perspective"***, Sage Publication.
9. Pankaj Jain, ***"Marketing Management (Hindi) Hardcover"***, Sanjay Publications.
10. R. C. Aggarwal, ***"Marketing Management (विपणन प्रबन्ध)"***, SBPD Publishing House.
11. Philip Kotler, ***"Marketing cases in the Indian Context (Fifteenth Edition)"***, Pearson Education.
12. Philip T. Kotler, ***"Principles of Marketing: basic concepts of marketing"***, Pearson Education.
13. Stephen P. Robbins, ***"Organizational Behaviour (Eighteen Edition)"***, Pearson Education.
14. Sanjiv Marwah, ***"Project Management Paperback"***, Dreamtech Press.
15. Stephen P. Robbins, ***"Organizational Behaviour Paperback"***, Pearson Education.
16. Poornima M. Charantimath, ***"Total Quality Management"***,Pearson Education.
17. Prasanna Chandra, ***"Financial Management, Theory and Practice"***, McGraw-Hill.

VIIth Semester

Rural Agricultural Work Experience (RAWE) & Agro-Industrial Attachment (AIA)-subject related work. **01 Credit**

Chaudhary Charan Singh University, Meerut
Faculty of Agriculture

DEPARTMENT OF PLANT PATHOLOGY

Scope of Plant Pathology

Plant Pathology is a branch of agricultural science that deals with the study of fungi, bacteria, viruses, nematodes, and other microbes that cause diseases of plants. Plant diseases and disorders make plant to suffer, either kill or reduce their ability to survive/ reproduce. Any abnormal condition that alters the appearance or function of a plant is called plant disease. Plant Pathology is both science of learning and understanding the nature of disease and art of diagnosing and controlling the disease. Plant pathology also involves the study of pathogen identification, disease etiology, disease cycles, economic impact, plant disease epidemiology, plant disease resistance, how plant diseases affect humans and animals, pathosystem genetics, and management of plant diseases. The study of plant diseases is important as they cause loss to the plant as well as plant produce. The various types of losses occur in the field, in storage or any time between sowing and consumption of produce. The diseases are responsible for direct monitory loss and material loss. Plant diseases inflect suffering on untold millions of people worldwide. Both public and private sector institutions offer jobs for the plant pathology graduates. Successful plant pathology graduates can be employed as plant pathologist, University or college teacher, researcher, consultant etc.

Semester wise Courses & Syllabus of Plant Pathology
B. Sc. (Ag) / B. Sc. (Ag) Hons.

Semester	Course Code	Course Title	Credit Hours
II Sem	AG-206	Fundamentals of Plant Pathology	4(3+1)
III Sem	AG-307	Principles of Integrated Disease Management	3(2+1)
V Sem	AG-506	Diseases of Field and Horticultural Crops & their Management–I	3(2+1)
VI Sem	AG-605	Diseases of Field and Horticultural Crops & their Management-II	3(2+1)
		Total Cr. Hrs	**13(9+4)**
VII Sem		**Rural Agricultural Work Experience and Agro-Industrial Attachment (RAWE & AIA)**	
VIII Sem		**Modules for Skill Development and Entrepreneurship**	
		Mushroom cultivation Technology	**0+10**

SUBJECT: - PLANT PATHOLOGY

Syllabus

1. Fundamentals of Plant Pathology 4 (3+1) AG-206

Theory

Introduction: Importance of plant diseases, scope and objective of Plant Pathology. History of Plant Pathology with special reference to Indian work. Terms and concept in Plant Pathology. Pathogenesis. diseases triangle and tetrahedron and classification of plant diseases.Important Plant pathogenic organism fungi. bacteria. fastidious vesicular bacteria. Phytoplasmas, Spiroplasmas, viruses. viroids, algae. protozoa, phanerogamic parasite and nematodes with example of diseases caused by them. Diseases due to abiotic causes.

Fungi: general character, definition of fungus, somatic structures, type of fungus thalli, fungal tissues. modifications of thallus, reproduction (Asexual and Sexual). Nomenclature, Binomial system of nomenclature. rules of nomenclature, classification of fungi, key to divisions, sub-divisions. orders and classes.

Bacteria and mollicutes: general morphological characters, basic methods reproduction. **Viruses**: nature of properties, structure and transmission. Study of phanerogamicplant parasites.

Epidemiology: Factors affecting disease development.

Practical

Acquaintance with various laboratory equipments and microscopy. Preparation of media, isolation and koch's postulates. General study of different structure of fungi, study of symptoms of various plant diseases. Study of representative fungal genera. Staining and identification of plant pathogenic bacteria. Study of phanerogamic plant parasites. Identification of plant parasitic nematodes.

Reference/text books:

1. ***Introduction to principles of Plant pathology***. By R.S.Singh.
2. ***Fundamentals of Plant pathology*** By R.S.Mehrotra.
3. ***Introductory Plant pathology*** By H.S.Chaube
4. ***Introductory mycology***. By C.J.Alexopoulos.
5. ***Plant pathology***. By G.N.Agrios.

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2. Principles of Integrated Disease Management 3 (2+1) AG-307

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 and diseases. Calculation and dynamics of economic injury level and importance of Economic threshold level. Methods of control: Plant quarantine, physical, cultural, mechanical, biological, chemical and host plant resistance. Survey surveillance and forecasting of diseases. Safety issues in fungicide uses. Political, social and legal implication of IDM.

Practical

Methods of diagnosis and detection of plant diseases, Methods of plant disease measurement, Assessment of crop yield losses, calculations based on economics of IDM, Identification of biocontrol agents. Identification andnature of damage of important diseases and their management., crop monitoring attacked by diseases Farmers fields visit.

Reference/text books:

1. ***Principles of Plant disease management.*** By W.E.Fry.
2. ***Recent advances in Plant pathology.*** By A. Husain, A. Singh, K. Singh, and V. P. Agnihotri.
3. ***Fungicides in Plant disease control.*** By Y. L. Nene and P. N. Thapaliyal.
4. ***Plant disease management.*** By R. S. Singh.

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3. Diseases of Field and Horticultural Crops & their Management–I

3 (2+1) AG-506

Theory

Symptoms of plant diseases, Koch postulates. 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: downy mildew.; Sorghum: smuts; Bajra: downy mildew and ergot; Groundnut: early and leaf spots; Pigeonpea: Phytophthora blight, wilt and sterility mosaic; Green gram: Cercospora leaf spot, web blight and yellow mosaic; Tobacco: Mosaic. Horticultural Crops: Guava: wilt and anthracnose; Banana: Panamawilt, sigatoka and bunchy top; Papaya: foot rot and leaf curl.

Cruciferous vegetable: Alternaria leaf spot and black rot; Brinjal: phomopsis blight, sclerotinia and little leaf; Tomato: early and late blight, leaf curl and mosaic; Okra: Yellow Vein Mosaic; Beans: Anthracnose and bacterial blight: ginger: soft rot; Colocasia: Phytophthora blight.

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 10 pressed and well-mounted specimens.

Reference/text Books:

1. ***Plant diseases.*** By R.S. Singh.
2. ***Diseases of fruit crops.*** By V.N. Pathak.
3. ***Disease of field crops and their management.*** By Chaube and Pundir.
4. ***Diseases of fruit crops.*** By V.K. Gupta, and Sharma S.K.
5. ***Disease of field crops.*** By V.K. Gupta and Y.S. Paul.

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4. Diseases of Field and Horticultural Crops & their Management-II

3 (2+1) AG-605

Theory

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

Field Crops:

Wheat: Rusts, loose smut, karnal bunt, powdery mildew. Alternaria blight and ear cockle; Sugarcane: red rot, smut, wilt, grassy shoot and pokkah boeng. Sunflower: Alternaria blight: Mustard: Alternaria blight, white rust, downy mildew; Gram: wilt and Ascochyta blight; Lentil: Rust and wilt; Cotton: Vascular wilt and black arm; Pea: Downy mildew, powdery mildew and rust. Horticultural Crops: Mango: Black tip, Anthracnose, malformation, powdery mildew; Citrus: cankerand gummosis; Grape vine: Downy mildew powdery mildew; Peach: leaf curl; Cucurbits: downy mildew, powdery mildew and wilt; Onion and garlic: purple blotch and stemphylium blight; Chilli: anthracnose and leaf curl: Turmeric: leaf spot; Marigold: Botrytis blight; Rose: dieback. powdery mildew; Potato: Early and late blight, common scab. powdery scab, potato mosaic and black heart.

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 10 pressed and well- mounted specimens.

Reference/Text Books:

1. ***Plant pathology.*** By G.N.Agrios.
2. ***Plant diseases.*** By R.S.Singh.
3. ***Padap rog vigyan.*** By B.P.Singh.
4. ***Disease of Vegetable crops.*** By V.K.Gupta and Y.S.Paul.
5. ***Vegetable crop diseases.*** By G.R.Dixon

VIIth Semester

Rural Agricultural Work Experience (RAWE) and Agro-industrial Attachment (AIA) **02**

VIIIth Semester

Module (s) for Skill Development & Entrepreneurship

Mushroom Cultivation Technology **0+10**

Ch. Charan Singh University, Meerut
Faculty of Agriculture

DEPARTMENT OF ENTOMOLOGY

Scope of Entomology

Entomology is the integrated essential subject of B.Sc. (Ag.) Hons. degree programme. As we know that productivity of each crop reached to the plateau and to survive India's increasing population the only solution is to protect the losses caused by insects that may increase production up to 26%. Indian economy largely depends on agriculture. The knowledge of Entomology may enable students to protect their crops scientifically. After obtaining degree/diploma, the professionals can either run their Agri/Plant clinic. They may also set up commercial industry as apiculture sericulture and lack production. Apart from this, they may set up biological control laboratory to develop many biocontrol agents and biopesticides and they may be entrepreneur. Knowledge of Entomology may also have increasing scope in criminal investigation as forensic entomologist. Study of Entomology is also having great scope in the field of pesticide industry

Semester wise Courses & Syllabus

Sr. No.	Course code	Semester	Name of papers	Credit hrs.
1	AG-203	II	Fundamentals of Entomology-I (Insect Morphology and Taxonomy)	3 (2+1)
2	AG-312	III	Fundamentals of Entomology-II (Insect Ecology and concept of IPM)	2 (1+1)
3	AG-503	V	Pests of Field Crops & Stored Grain and Their Management	3 (2+1)
4	AG-608	VI	Beneficial insects and Pest ofHorticultural Crops and their Management	3 (2+1)
Elective Course				
1	AGE-56	V	Biopesticides & Biofertilizers	3 (2+1)

Module for Skill Development and Entrepreneurship				
1.		VIII	Production Technology for bio-agents and bio fertilizer	0+10
2.		VIII	Commercial Beekeeping	0+10
3.		VIII	Commercial sericulture	0+10

Note: 1. College shall offer any one module at a time

2. Syllabus of above modules may be adopted from **National Skill Development Corporation of India (NSDC)** so that colleges may be recognized as centre by the corporation for certificate courses also

1. Fundamentals of Entomology-I (Insect Morphology & Taxonomy) 3(2+1) AG-203

Theory:

Classification of phylum Arthropoda upto classes. Relationship of class Insecta with other classes of Arthropoda. Morphology: Structure and functions of Insect cuticle and moulting. Body segmentation. Structure of Head, thorax and abdomen. Structure and modifications of insect antennae, mouth parts, legs, wing venation, modifications and wing coupling apparatus, Structure of male and female genital organs. Metamorphosis and diapausein insects. Types of larvae and pupae. Structure and functions of digestive, circulatory, excretory, respiratory, nervous, secretary (Endocrine) and reproductive systems in insects. Types of reproduction in insects. Major sensory organs like simple and compound eyes and chemorcceptors. 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. Dictyoptera: Mantidae, Odonata; Isoptera: Termitidae; Thysanoptera: Thripidae; Hemiptera: Pentatomidae, Coreidae, Cimicidae, Pyrrhocoridae. Lygaeidae, Cicadellidae, Delphacidae, Aphididae, Coccidae, Lophophidae, Aleurodidae, Pseudococcidae; Neuroptera: Chrysopidae; Lepidoptera: Pieridae, Papiloinidae, Noctuidae, Sphingidae, Pyralidae, Gelechiidae, Arctiidae, Saturnidae, Bombycidae; Coleoptera: Coccinellidae, Chrysomelidae, Cerambycidae, Curculionidae, Bruchidae, Scarabaeidae; Hymenoptera: Tenthridinidae, Apidae. Trichogrammatidae, Ichneumonidae, Braconidae, Chalcididae; Diptera: Cecidomyiidae, Tachinidae, Agromyziidae, Culicidae, Muscidae, Tephritidae.

Practical:

Methods of collection and preservation of insects including immature stages; Externalfeatures 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 of agricultural importance; Orthoptera. Dictyoptera, Odonata, Isoptera, Thysanoptera, Hemiptera, Lepidoptera, Neuroptera, Coleoptera, Hymenoptera, Diptera.

Suggested Readings (References)

Chapman, R.F. 1988. *Insects*: **Structure and Function 3rd Edition**. Cambridge Univ. Press, UK.

Snodgrass, R.E. 2001. *Principles of Insect Morphology*. CBS Publishers & Distributors, Delhi.

Richards, O.W. and Davies, R.G. 1977. **Imm's General Text Book of Entomology** (Vol. I and II). Chapman and Hall, London.

Srivastava, P.D. and R.P.Singh. 1997. **An Introduction to Entomology**, Concept Publishing Company, New Delhi.

Srivastava, K.P. 2010. ***A Textbook of Applied Entomology***. Volume I. Kalyani Publishers, New Delhi.

2. Fundamentals of Entomology-II 2(1+1) AG-312

(INSECT ECOLOGY & CONCEPTS OF IPM)

Theory:

Insect Ecology: Introduction, Environment and its components. Effect of abiotic factors-temperature, moisture, humidity, rainfall, light, atmospheric pressure and air currents. Effect of biotic factors - food competition, natural and environmental resistance.

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, anti feed ants, hormones. attractants, gamma radiation. Insecticides Act 1968- Important provisions. Application techniques of spray fluids. Symptoms of poisoning, first aidand antidotes. Survey, surveillance and forecasting of insect pests. Safety issues of pesticides uses.

Practical:

Sampling techniques for estimation of insect population and damage. Insecticides and their formulations. Pesticide appliances and their maintenance.

Suggested Readings (References)

Dhaliwal, G.S. and Ramesh Arora. 2001. **Integrated Pest Management: Concepts and Approaches.** Kalyani Publishers, Ludhiana.

Metcalf, R.L. and Luckman, W.H. 1982. **Introduction to Insect Pest Management.** Wiley Inter Science Publishing, New York.

Pedigo, L.P. 1991. **Entomology and Pest Management,** Prentice Hall of India Private Ltd., New Delhi.

Pradhan, S. 1983. ***Agricultural Entomology and Pest Control*** – Indian Council of Agricultural Research, New Delhi, 267 p.

Gupta, H.C.L. 1999. **Insecticides: Toxicology and Uses.** Agrotech Publishers, Uaipur.

3. Pests of Field Crops, Stored Grains and Their Management 3(2+1) AG-503

Theory:

General account on nature and type of damage by following insect pests 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(mites) of various field crops. 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.

Paddy: *Leptocorisa varicornis, Hieroglyphus Spp., Nilaparvata lugens, Nephotetix spp., Mythimna separata*

Sorghum and **Maize:** *Chilo partel1us. Atherigona variasoccata, Scirpophaga excerpatalis. Chilo infuscatelles*

Sugarcane: *Top borer, Pyrilla, Early Shoot borer and white fly*

Cotton: *Pectinaphora gossypiella. Earias Spp, Sylepta derogata, Dysdercus Spp, Bemisiatabaci, Amrasca bigutulla*

Oilseeds: *Lipaphis erysimi, Athalia proxima, Bagrada cruciferum, Dasyneura lini*

Pulses: *Helicoverpa armigera Agrotis Spp., Etiella zinckenella*

Pests of Stored Grains: *Sitophilus oryzae, Trogoderma granarium, Sitotroga cerealella, Callosobruchus chinensis.*

Polyphagous pests: *Odontotermes obesus, Holotrichia consanguinea, Spilosoma obliqua, Spodoptera litura.*

Practical:

Identification of different types of damages. Identification and study of life cycle and seasonal history of various insect pests attacking field crops and their produce. 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 insecticidesapplication technique. Fumigation of grain store in 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.

Suggested Readings (References)

Vasantharaj David, B and Aanathakrishnan, T.N.. 2006. **General and Applied Entomology.** Tata McGraw-Hill Publishing House, New Delhi.

Panwar, V.P.S. 2014. **Agricultural Insect Pests of Crops and their Control.** Kalyani Publishers, Ludhiana.

Khare, B.P. 2006. **Stored Grain Pests and Their Management.** Kalyani Publishers, Ludhiana.

Atwal, A.S. and Dhaliwal, G.S. 2008. **Agricultural Pests of South Asia and Their Management.** Kalyani Publishers, New Delhi.

Mathur, Y.K. and Upadhyay, K.D. 2000. **A textbook of Entomology.** Aman Publishing House, Meerut.

4. Beneficial Insects and Pests of Horticultural Cropsand Their Management

3 (2+1) AG-608

Theory

Types of silkworm, voltinism and biology of silkworm. Mulberry cultivation, mulberry varieties, methods of harvesting and preservation of leaves. Rearing of mulberry silkworm, rearing appliances, mounting and harvesting of cocoons. Pests and diseases of silkworm, management, and methods of disinfection. Importance of beneficial insects. bee keeping, pollinating plants and their cycle, bee biology, commercial methods of rearing, equipment used and seasonal management. Bee pasturage. bee foraging and communication. Insect pests and diseases of honey bee. Species of lac insect, morphology, biology. host plant and lac production- Processing of lac - seed lac, button lac. shellac and lac- products. Identification of major parasitoids and predators commonly used in biological control. Scientific name, order, family, host range, distribution, biology, nature ofdamage, and management of major insect pests of following horticultural crops

Mango: *Drosicha Mangiferae, Amrtodus atkinsoni, Batocera rufomaculata*

Guava: *Bactrocera dorsalis*

Litchi: *Conopomorpha sinensis, Pletypeplus aprobola*

Citrus: *Papilio demeclius, Diaphorina citri, Phyllocnistis citrella*

Pomegranate: *Virechois isocrates.*

Appple: *Eriosoma lanigerum, Quadraspidiotus perniciosus*

Brinjal: *Leucinodes orbonalis, Epitachna viontioclopunctata*

Cucurbits: *Raphidoplapa fovelcollis, Dacus Cucurbitae,*

Cole crops: *Plutella xylostella, Pieris brassicae*

Polyphagous Pest: *Indarbela quadrinotata*

Practical:

Identification of different types of damage. Identification and study of life cycle and seasonal history of various insect pests attacking horticultural crops - vegetable crops, fruit crops(as mentioned in theory). Visit to orchards and gardens. Mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves. Types of silkworm, voltinism and biology and rearing of silkworm and equipment. Honey beespecies and castes of bees. Beekeeping appliances and seasonal management. Bee enemies and diseases. Bee pasturage, bee foraging and communication. Species of lac insect, host plant identification. Identification of other important pollinators, weed killers and scavengers. Visit to research and training institutions devoted to sericulture, beekeeping, lac culture and natural enemies.

Suggested Readings (References)

Mishra, R.C. 2013. **Honeybees and Their Management in India**. Indian Council of Agricultural Research, New Delhi.

Ganga, G. 2020. **An Introduction to Sericulture**. Oxford & IBH Publishing Co Pvt.Ltd., New Delhi.

Ghorai, N. 1995. **Lac-Culture in India**. International Books & Periodicals Supply Service, Delhi.

Panwar, V.P.S. 2014. **Agricultural Insect Pests of Crops and their Control**. Kalyani Publishers, Ludhiana.

Mathur, Y.K. and Upadhyay, K.D. 2000. **A textbook of Entomology**. Aman Publishing House, Meerut.

ELECTIVE COURSE

1. Biopesticides & Biofertilizers **3(2+1) AGE-56**

Theory:

History and concept of biopesticides. Importance. scope and potential of biopesticide. Definitions, concepts and classification of biopesticides viz. pathogen, botanical pesticides, and biorationales. Botanicals and their uses. Mass production technology of bio-pesticides. 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, Pseudomonas*. Rhizobium and Franicia; Cynobacterial biofertilizers- *Anabaena, Nostoc, Hapalosiphon* and fungal biofertilizers- AM mycorrhiza and ectomycorhiza. Nitrogen fixation -Free living and symbiotic nitrogen fixation. Mechanism of phosphate soluhilization and phosphate mobilization, K solubilization. Production technology: Strain selection, sterilization, growth and fermentation, mass production of carrier based and liquid biofertiizers. FCC) 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 biopcsticides: *Trichoderma Pseudomonas, Bacillus, Metarlozium* etc. and its production. Identification of important botanicals. Visit to biopesticide laboratory in nearby area. Field visit to explore naturally infected cadavers. Identification of entomopathogenic entities in field condition. Quality control of biopesticides. Isolation and purification of *Azaspirillum, Azotobacter, Rhizobium*. P-solubilizers and cyanobacteria. Mass

multiplication and inoculums production of biofertilizers. Isolation of AM fungi -Wet sieving method and sucrose gradient method. Mass production of AM inoculants.

Suggested Readings (References)

Dhaliwal, G.S. and Koul, O. 2007. ***Bio-pesticides and Pest Management: Conventional and Biotechnological Approach***. Panima Publishing Corporation, Delhi.

Parmar, B.S. and Devkumar, C. 1993. ***Botanicals and Biopesticides***. Westvill Publishing House, New Delhi.

Boucias, D.P. and Jacquelyn, C. 1998. ***Principles of Insect Pathology***. Kluwer Academic Publisher, Norwey.

Gaugler, R. (Ed). 2002. ***Entomopathogenic Nematology***. CABI Publ. Delhi.

Rai, M. 2008. ***Handbook of Microbial Biofertilizers***. CRC Press. (Online).

VIIth Semester

Rural Agricultural Work Experience **(RAWE)** & Agro-Industrial Attachment **(AIA)-subject related work.** **02 Credits**

VIIIth Semester

Module for Skill Development and Entrepreneurship				
1.		VIII	Production Technology for bio-agents and bio fertilizer	0+10
2.		VIII	Commercial Beekeeping	0+10
3.		VIII	Commercial sericulture	0+10

Chaudhary Charan Singh University, Meerut
Faculty of Agriculture

Department of Horticulture

Scope of Horticulture

Horticulture, a branch of Agricultural Science, can simply be defined as the art, technology, business, education and science of plants. As of today, horticulture is one of the fastest-growing sectors in agriculture and the demand for horticulturists is increasing day by day. And, in our country, there are various top-notch colleges and universities and institutes offering specialized Diploma/UG/PG/Ph.D. programmes for the same.

Being such a vast subject, this field is divided into four major branches, viz. **1. Floriculture & Landscaping** dealing with growing and marketing flowers/ornamental plants as well as landscaping the sites. The people associated with this field are called ***Floriculturists/Landscape Architect***, **2. Olericulture**, the science of growing vegetables & spices, storing, processing and marketing plants for culinary foods. The person practicing in this branch is called an ***Olericulturist***, **3.Pomology,** the science of producing and marketing of fruits & plantation crops. The person who practices in this field is known as ***Pomologist***, 4. Post-harvest Technology of Horticultural Crops, an inter-disciplinary "science and technique" applied to horticultural/agri-produce after harvest for its protection, conservation, processing, packaging, distribution, marketing, and utilization to meet the food and nutritional requirements as well as nutritional security of the people in relation to their needs.

In India or rather globally, COVID-19 has changed the outlook of people towards nature. They want to contribute in creating a healthy, greener and a better environment for themselves and all the humanity at large. These above goals may only be fulfilled through horticulture. Presently, our country is next to China in area and production of vegetables and fruits crops, producing 10 per cent of fruits and 14 per cent vegetables of the world production.

Horticulture is an extremely diversified field with limitless career opportunities in a variety of job settings. The level of training for the jobs may differ; it could range from a vocational to a proper college/university degree. Ideally, to grab a good job position in Horticulture, one must have a certified degree in this discipline. Having a proper degree acts as a bonus, as the person will have an in-depth knowledge of the field and will get offers at supervisory or managerial levels, while post-graduation and doctorate level degree will provide jobs in research and/or teaching.

The field of horticulture holds ample scope. Horticulturists can find jobs in institutes of horticulture, in plantations, vegetable farms as well as fruit groves. Advancement in horticultural technology, increasing product demands, and a growing export industry make this an extremely lucrative career option. Thus, there are so vast job/career opportunities for aspirants completing their study in horticulture or its any specialized branch. ***Floriculturists/Landscape Architects*** are specialized in planning and design of exterior/interior landscapes for parks, recreational areas, campuses, industrial sites, institutional grounds, shopping malls, and other large projects. ***Olericulturist*** can kick-start their career in almost every industry, research institutes, universities and other organizations at different levels. These personnel have more demand in the private sector as the vegetable growers have a good future, especially in the seed industry. ***Pomologists*** are well acquainted with breeding technology, tissue culture techniques, integrated nutrient management (INM), integrated pest management (IPM) technique and protected cultivation techniques of fruits. They hold a bright future in the ICAR, State Agricultural Universities and in other organizations.

One may be a Horticulturist/Floriculturist or Supervisor/Overseer (Landscape) in Industries, Hotels, Golf Courses and Construction Companies etc. For people with sufficient experience, marketing

Jobs are also offered by various pesticide and insecticide companies. With a graduation degree in Horticulture/Agriculture, it is quite easy to start an Agriculture clinic. One can also start their own Nursery and grow their fruit plants and ornamental plants by the plant material using various propagation techniques.

Aspirants bearing Graduate/Post Graduate/Doctorate in Horticulture/Agriculture may appear for competitive exams of UPSC/State PSCs for Civil Services cadre. For being Scientists- one has to take examinations organized by the ASRB, ICAR, New Delhi. Lecturer, Assistant Professor, Research/Training Associate or Technical/ Training Assistant in CAUs/SAUs, ICAR, DRDO and CSIR, Agricultural Colleges. A Graduate/Post-graduate in Horticulture/Agriculture can adorn his career as Horticulture/Food/Marketing Inspector/Agriculture Development Officer in different public/private departments.

Semester wise Courses & Syllabus of Horticulture Subject

Semester	Course Code	Course Title	Credit Hours
I Sem	AG-104	Fundamentals of Horticulture	2 (1+1)
II Sem	AG-207	Production Technology for Vegetable and Spices	2 (1+1)
IV Sem	AG-407	Production Technology for Ornamental Crops, MAPs and Landscaping	2 (1+1)
V Sem	AG-507	Production Technology for Fruit and Plantation Crops	2 (1+1)
VI Sem	AG-606	Post-harvest Management and value Addition of Fruits and Vegetables	2 (1+1)
		Credit Hrs	**10 (5+5)**
	Elective Courses		
V Sem	AGE-54	Landscaping (Elective)	3 (2+1)
VI Sem	AGE-61	Protected Cultivation (Elective)	3 (2+1)
	Or		
VI Sem	AGE-62	Hi-tech. Horticulture (Elective)	3 (2+1)
		Total Cr. Hrs	**19 (11+8)**
VII Sem		Rural Agricultural Work Experience (RAWE)& Agro-industrial Attachment (AIA): **Horticulture**	**02**
VIII Sem		**Module for Skill Development & Entrepreneurship**	
		1. Commercial Horticulture (Optional)	**0+10**
		OR	
		2. Floriculture & Landscaping (Optional)	**0+10**

Syllabus

1. Fundamentals of Horticulture 2(1+1) AG-104

Theory:

Horticulture-Its definition and branches, importance and scope; horticultural andbotanical classification; climate and soil for horticultural crops; Plant propagation-methods andpropagating structures;seed dormancy & germination; mother plant, root stock and stionic effect; rooting media and hormones; brief knowledge of micro-propagation and its types; principles of orchard establishment; planting

systems; protection from adverse weather conditions; Principles and methods of training and pruning;flower bud differentiation and bearing habit; unfruitfulness; pollination, pollinizers and pollinators; polyembryony and parthenocarpy; use of plant bio-regulators in horticulture; irrigation and fertilizers application-methods.

Practical

Identification of garden tools. Identification of horticultural crops. Preparation of seedbed/nursery bed. Practice of sexual andasexual methods of propagation. Use of growing media and hormones; Layout and planting of orchard. Training and pruning of fruit trees; Lifting, transplanting and care of nursery plants; Preparation of potting mixture, potting and repotting. Fertilizer application in different crops. Visits to commercial nurseries/orchard/research institutes.

Reference/Text Books

1. ***'Fundamentals of Horticulture'*** by J.B Edmond, T.L. Sen, F.S Andrews and R.G Halfacre. Publisher: Tata Mc Graw Hill Publishing Co., New; Language : English
2. ***'Introduction to Horticulture'*** by N. Kumar. Publisher: CBS Publishers and Distributors Pvt. Ltd. PVT LTD; Language: English
3. ***'Basic Horticulture'*** by Jitendra Singh. Publisher: Kalyani Publishers; Language : English
4. ***'Basics of Horticulture'*** by K V Peter. Publisher: New India Publishing Agency; Language: English
5. ***'Plant Propagation'*** by M.K Sadhu. Publisher: New Age International Publishers, New Delhi; Language: English

2. Production Technology for Vegetable and Spices 2 (1+1) AG-207

Theory

Importance of vegetables & spices in human nutrition and national economy; Classification of vegetables; types of vegetable gardening; brief about origin, area, climate and soil, improved varieties and cultivation practices such as time of sowing/nursery raising, transplanting, planting distance, fertilizer requirements, irrigation, weed management, harvesting and yield, physiological disorders, major diseases and pests of important vegetables and spicesviz. solanaceous crops(tomato, chilli, brinjal), cole crops (cauliflower, cabbage), cucurbitaceous crops (bottle gourd, pumpkin, watermelon, muskmelon, bitter gourd), leguminous crops (garden pea, french bean), root, tuber and bulb crops (carrot, radish, potato, onion, garlic), leafy vegetables (amaranth, spinach) and spices/condiments (ginger,turmeric, coriander, cumin, fennel); seed production of important vegetables (potato, tomato, cauliflower, cabbage, onion, okra,bottle guard and bitter guard) and spices/condiments (coriander, cumin,fennel).

Practical

Identification of vegetables & spice crops and their seeds. Direct seedsowing, nursery raisingand transplanting. Study of morphological characters of different vegetables & spices.Fertilizers application invegetables& spices crops, seed extraction of vegetables and spices. Harvesting & preparation for market. Economics of vegetables and spicescultivation.Visits to commercial nurseries /research institutes.

Reference/Text Books

1. ***'Modern Technology in Vegetable Production'*** by P. Hazra, A. Chattopadhyay, K. Karmakar and S. Dutta; Publisher: New India Publishing Agency, New Delhi; Language: English
2. ***'Hand Book of Vegetable Science'*** by N. Rai and B. S. Asati); Publisher: International Book Distributing Co, Lucknow; Language:English
3. ***'Modern Technology on Vegetable Production'*** by N. P. Singh, A.K. Bhardwaj, A. Kumar andK.M. Singh; Publisher: International Book Distributing Co, Lucknow; Language: English
4. ***'A Text Book of Vegetable Culture'*** by Prem Singh Arya; Publisher: Kalyani Publishers, New Delhi; Language: English
5. ***'Textbook of Vegetables, Tuber Crops and Spices'*** by S. Thamburaj and Narendra Singh (eds); Publisher: I.C.A.R., New Delhi; Language:

3. Production Technology for Ornamental Crops, MAPs and Landscaping

2(1+1) AG-407

Theory

Importance and scope of ornamental crops, medicinal and aromatic plants andlandscaping.Principles of landscaping.Landscape uses of ornamental trees, shrubs, climbers and seasonal flowers.Stylesand typeofgardening;hedge-edge, herbaceous & shrubbery borders;lawn making and maintenance. Production technology of important cut flowers like rose, gerbera, carnation and lilium 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 (Isabgol, Ashwagandha, Asparagus, Aloe) and aromatic plants (mint, lemongrass, citronella, palmarosa, ocimum, geranium and vetiver). Processing and value addition in ornamentalcrops 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.Planningand layout of borders & garden. Bed preparation and planting of MAPs. Protected structures-care and maintenance. Intercultural operations in flowers and MAPs.Harvesting and post-harvesthandling of cut-and loose flowers; extraction of essential oils.Visits to commercial nurseries, gardens/research institutes.

Reference/Text Books

1. ***'Floriculture and Landscaping'*** by T.K. Bose T.K.;Publisher: NayaPrakash, Kolkatta; Language: English
2. ***'Commercial Flowers'*** by T.K. Bose and L.P. Yadav; Publisher: NayaPrakash, Kolkatta; Language: English
3. ***'Commercial Floriculture'*** by S.K. Chattopadhyay; Publisher: Gene-Tech Books, New Delhi; Language: English
4. ***'Medicinal and Aromatic Plants'*** by H.C. Srivastava; Publisher: ICAR, New Delhi; Language: English
5. ***'Textbook of Production Technology for Ornamental Crops***, MAPs & Landscaping; by LaxmiLal; Publisher: ATPA Agrotech Publishing Agency, Udaipur; Language: English

4. Production Technology for Fruit and Plantation Crops 2(1+1) AG-507

Theory

Importance and scope of fruit and plantation crop industry in India; High densityplanting; Use of rootstocks; Production technologies for the cultivation of major fruits-mango, banana, citrus, grape, guava, litchi, aonla, papaya, apple, pear, peach, walnut and; minor fruits-pineapple, pomegranate, jackfruit, ber, strawberry. Plantation crops-coconut, arecanut, cashew, tea and coffee.Major problems of fruit and plantation crops.

Practical

Seed propagation. Scarification and stratification of seeds.Commercial propagation methods forfruit and plantation crops including micro- propagation. Lifting and transplanting of saplings.Description and identification of fruit and plantation crops.Practice of training and pruning of fruit trees.Preparation of plant bio-regulators and their application;acquaintance with pests, diseases and physiological disordersof above fruits and plantation crops. Visit to commercial orchards/research institutes.

Reference/Text Books

1. ***'Fundamentals and Production Technology of Fruit Crops in India'*** by Prakash P. Deshmukh; Publisher: Himalaya Publishing House; Language: English
2. ***'Production Technology of Fruits and Plantation Crops'*** by M. Kavino et al.; Publisher:Narendra Publications; Language: English
3. ***'Production Technology of Fruits, Nuts and Plantation Crop*** (Theory and Competitive Approach)' by S.K.

Singh and Ankur Sharma; Publisher: Jaya Publishing House, Delhi (India); Language: English
4. *'Production Technology of Fruits and Plantation Crops'* by R.K. Shukla and V.K. Tripathi; Publisher: Kalyani Publishers of India; Language: English
5. *'Textbook of Production Technology of Fruit Crops'* by S. Prasad & R L Bhardwaj; Publisher: Agrobios India); Language: English

5. Post-harvest Management and Value Addition of Fruits and Vegetables

2(1+1) AG-606

Theory

Importance and scope of post-harvest technology of fruits and vegetables.Extent and possible causes of post-harvest losses; Pre-harvest factors affecting postharvest quality, maturity and self-life of fruits and vegetables & spices. Ripening and changesoccurring during ripening; Respiration and factors affecting respiration rate; role of ethylene; post-harvest diseases and disorders; heat, chilling and freezing injury; harvesting and fieldhandling; 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. Tomatoproducts-Concepts and Standards; Drying/dehydration of fruits and vegetables-Concept andmethods, 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 ofjam, jelly, RTS, nectar, squash, osmotically dried products, fruit bar and candy and tomatoproducts, canned products. Quality evaluation of products– physico- chemical and sensory. Visit to processing units/ industry.

Reference/Text Books

1. *'Postharvest Management and Value Addition'* by A. K. Goel, R. Kumar and S.S. Mann; Publisher: Daya PublishingHouse, New Delhi; Language: Language: English
2. *'Preservation of Fruits and Vegetables'* by G. L. Tandon, G. S. Siddappa and GirdhariLal; Publisher:ICAR, New Delhi; Language: English
3. *'Fruit and Vegetable Preservation- Principles and Practices'*by R.P. Srivastava and S. Kumar; Publisher: ABS Publisher & Distributors Pvt. Ltd.; Language: English
4. *'Practical Manual on Post Harvest Management and Value Addition* of Fruits and Vegetables' byAnkur, M. Arya, T. Kumar, S. Chandra; Publisher: Jain Brothers. New Delhi; Language: English
5. *'A Handbook on Post-Harvest Management of Fruits and Vegetables'* by P Jacob John; Publisher: Daya Publishing House, New Delhi; Language: English

ELECTIVE COURSE

6. Landscaping

3(2+1) AGE-54

Theory

Importance and scope of landscaping. Principles of landscaping, garden styles and types. terrace gardening, vertical gardening. garden components and adornments; lawn making; rockery; water garden. walk-paths, bridges, other constructed features etc.; gardens for special purposes. Ornamental 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. Computer Aided Garden Design (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 garden tools and implements used in landscape design& gardening, 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.

Reference/Text Books

1. '***Floriculture and Landscaping***' by T.K. Bose, R.G. Maiti, R.S. Dhua and P.Das; Publisher: NayaPrakosh, Culcutta, Language: English
2. '***Floriculture in India***' by G.S. Randhawa and A. Mukhopadhyay; Publisher:Allied Publ.; Language: English
3. '***Floriculture-Fundamentals and Practices***'by A. Lauria and H. R.Victor; Publisher: Agrobios; Language: English
4. '***Design Elements of Landscape Gardening***' by KMP Nambisan; Publisher: Oxford & IBH; Language: English
5. '***Gardening in India***' by M.G. Woodrow; Publisher: Biotech Books; Language: English

ELECTIVE COURSE

7. Protected Cultivation **3 (2+1)** **AGE-61**

Theory

Protected cultivation- importance and scope, Status of protected cultivation in India and World types of protected growing 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, lilium, 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 qualityplanting material production, Bed preparation and planting of crop for production, Inter culturaloperations. Soil EC and pH measurement, Regulation of irrigation and fertilizers through drip,fogging and misting.

Reference/Text Books

1. '***A Text Book on Protected Cultivation and Secondary Agriculture***' by AmitDeogirikar; Publisher: Rajlaxmi Prakashan, Aurangabad; Language: English
2. '***Protected Cultivation of Vegetable Crops***' by Balraj Singh; Publisher: Kalyani Publishers; Language: English
3. '***Protected Cultivation of Horticultural Crops***' by D. K. Singh and K. V. Peter (Ed.); Publisher: New India Publishing Agency; Language: English
4. '***Advances in Protected Cultivation***' by Brahma Singh and Balraj Singh; Publisher: New India Publishing Agency; Language: English
5. '***Protected Cultivation of HorticultureCrops***' by M.K. Jha, S. S. Paikra and Manju R. Sahu; Publisher: Educreation Publishing; Language: English

ELECTIVE COURSE

8. Hi-tech Horticulture **3 (2+1)** **AGE-62**

Theory

Introduction & importance; Nursery management and mechanization; micropropagation ofhorticultural crops; Modern field preparation and planting methods.Protectedcultivation: advantages, controlled conditions, method and techniques; Micro-irrigationsystems 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 Rateapplicator (VRA), application of precision farming in horticultural crops (fruits, vegetables andornamental crops); mechanized harvesting of produce.

Practical

Types of poly-houses and shade net houses, Intercultural operations, tools and equipments-identification and application; Micro-propagation, Nursery pro-trays, micro-irrigation. EC, pH based fertilizer scheduling, canopymanagement; visit to hi-tech orchards/nursery.

Reference/Text Books

1. ***'Hi- tech Horticulture'*** by Singh DK; Publisher: Agrotech Publications, Udaipur; Language: English
2. ***'Hi-tech Horticulture'*** by S. Prasad, Dharm Singh and R.L. Bhardwaj; Publisher: Agrobios; Language: English
3. ***'Precision Farming in Horticulture***: Approaches and Strategies' by S.C. Swain; Publisher: Narendra Publishing House, New Delhi; Language: English
4. ***Precision Farming in Horticulture'*** by Jitendra Singh, S. K. Jain and L. K Dashora; Publisher: New India Publishing Agency; Language: English
5. ***'Precision Farming and Protected Cultivation-Concepts and Applications'*** by Sanjeev Kumar, S.N. Saravaiya and A.K. Pandey; Publisher: CRC Press; Language: English

VIIth Semester

Rural Agricultural Work Experience **(RAWE)** & Agro-industrial Attachment **(AIA)-Horticulture related work.** **02 Credits**

VIIIth Semester

Module (s) for Skill Development & Entrepreneurship

1. Commercial Horticulture **0+10 Credits**
2. Floriculture & Landscaping **0+10 Credits**

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Ch. Charan Singh University, Meerut
Faculty of Agriculture

DEPARTMENT OF AGRICULTURAL ENGINEERING

Scope of Agricultural Engineering

Agricultural engineering has assumed a significant role in the modern day agriculture owing to decline in human and animal energy and increased thrust for precision operations from sowing, crop management, and harvesting to post harvest operations. Various aspects of farm machineries and power,use of renewable and green energy sources for successful crop management and production with emphasis on cost reduction and sustainability of the production systems and round the year quality crop production under protected structures and value addition through processing has gained a lot of promise.The courses in agricultural engineering throw light on the recent advances in those areas

Semester wise Courses & Syllabus

Course Code	Core Course Title	Credit Hours
AG-306	Farm Machinery and Power	3(2+1)
AG-406	Renewable Energy and Green Technology	2(1+1)
AG-505	Protected Cultivation and Secondary Agriculture	3(2+1)
	Open Elective	
AGE-64	System Simulation & Agro Advisory	3(2+1)
	RAWE & AIA	

Syllabus

1. Farm Machinery and Power **2(1+1) AG-306**

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, machines for crop residues management.

Practical

Familiarization of different components of I.C. engines, Study of air and water cooling 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-board plough, disc plough and disc harrow. Familiarization with seed-cum-fertilizer drills, seed metering mechanism and calibration, planters and transplanters, Familiarization with different types of sprayers and dusters, Familiarization with different inter-cultivation equipment, Familiarization with harvesting and threshing machinery.

Suggested Readings:

1. Sanjay Kumar, 2018. ***Farm Power and Machinery***. Kalyani Publishers, New Delhi.
2. Dipankar Mandal, 2016. Concept of Farm Machinery and Power. Narendra Publishing House, New Delhi.
3. Surendra Singh, 2019. ***Farm Power and Machinery***. Brillion Publishing, New Delhi.
4. T.P., Ojha and Michael. 2018. ***Principles of Agricultural Engineering***. Jain Brothers, New Delhi.
5. Jagadeshwar, Sahay. 2006. ***Elements of Agricultural Engineering***. Standard Publishers, New Delhi.

2. Renewable Energy and Green Technology **2(1+1) AG-406**

Theory

Classification of energy sources, contribution of these of sources in agricultural sector, Familiarization with biomass utilization for bio-fuel production and their application, Familiarization with types of biogas plants and gasifiers, biogas, bioalcohol, biodiesel and bio-oil production and their utilization as bioenergy resources, 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, introduction of wind energy and their application.

Practical

Familiarization with renewable energy gadgets. Study of biogas plants, gasifier, production process of biodiesel, briquetting machine, Production process of bio-fuels. Familiarization with different solar energy gadgets, solar cooker, solar drying systems, [illegible].

Suggested Readings:

1. Amit Deogirikar and Atul Mohod. 2019. ***Text Book of Renewable Energy and Green Technology.*** M/s Shri Rajlakshi Prakashan, Aurngabad.
2. Bhatia, S.C. and Gupta, R.K. 2018. ***Textbook of Renewable Energy.*** 1st Edition. Woodhead Publishing India Pvt. Ltd. New Delhi.
3. Kothair, D.P., Singal, K.C. and Rakesh Ranjan. 2011. ***Renewable Energy Sources and Emerging Technologies.*** 2nd Edition. PHI Learning Private Limited, New Delhi.
4. Sanjay Kumar. 2017. Renewable Energy, Kalyani Publishers, New Delhi.
5. Chauhan, D.S. and Shrivastava, S.K. 2010. ***Non-conventional Energy Sources.*** New Age International Publications, Lucknow.

3. Protected Structure and Secondary Agriculture **3(2+1) AG-505**

Theory

Green house technology, 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; hydroponic farming and its structure. Important engineering properties such as physical, thermal, aero and hydrodynamic properties of cereals, pulses and oilseed, their application in PHT equipment and their operation. Drying and dehydration, moisture measurement, EMC, drying theory, various drying methods, commercial grain dryer *viz.* deep bed dryer, flat bed dryer, tray dryer, fluidized bed dryer. recirculatory dryer and solar dryer, Material handling equipments, conveyer and elevators, their principle, working and selection.

Practical

Study of different types of green houses based on shape, Determining the rate of air exchange in 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 and infrared moisture methods. Determination of engineering properties *viz.* shape, size, bulk density and porosity of biomaterials, Determination of moisture content of various grains by moisture meter, Field visit to seed processing plants.

Suggested Readings:

1. Adikant Pradha. 2019. ***Protected Cultivation.*** Satish Serial Publishing House, New Delhi.
2. Ratnesh Kumar, Suresh Chandra, Samsher. 2020. ***Practical Manual on Protected Cultivation and Secondary Agriculture.*** Jain Brothers, New Delhi.
3. Sanoj Kumar, Ashok Kumar and Satish Kumar. 2020. ***Protected Cultivation and Secondary Agriculture.*** Lambert Academic Publishing, Chisinau, Moldova.
4. Balraj Singh. 2005. ***Protected Cultivation of Vegetable Crops,*** Kalyani Publishers, New Delhi.
5. Brahm Singh. 2020. ***Advances in Protected Cultivation.*** Kalyani Publishers, New Delhi.

	Open Elective	
AGE-64	System Simulation & Agro Advisory- **Sem. VI**	3(2+1)
----------	Rural Agricultural Work Experience and Agro-Industrial Attachment **(RAWE & AIA)-Sem. VII**	01
----------	Modules for Skill Development and Entrepreneursh **Water Harvesting- Sem.-VIII**	0+10

Ch. Charan Singh University, Meerut
Faculty of Agriculture

Department of Agricultural Extension

Scope of Extension Education,

India has more than 6.25lack villages. The villager are not equal for some aspect like Religion Caste, and Socio-Economic conditions. But they are involved in Agricultural activities direct and indirect way. We want to desirable change like,-Knowledge, Attitude Understanding and working methods of rural people (behavioral change) so all changes can be possible by efficient and effective extension approaches with the help of Agricultural Innovation-New Seed, New Fertilizer, New Machines, New Practice and Methods the all facilities are necessary for adopting to farmers for increasing their Agricultural Production to aspects of successful agriculture and rural development to attain food security, poverty reduction, rural empowerment and environment management. The objective of agricultural extension should be taken as a key in assisting their clients to be capacitated in dealing with issues of sustainability and food security. It also encourages country to develop agricultural extension policies. The Agricultural policies to give important role in following aspect-1.Increasing efficiency in agricultural production. 2. Increasing efficiency in marketing, distribution and utilization of agricultural inputs and outputs. 3. Conservation, development and use of natural resources. 4. Proper farm and home management 5. Better family living.6. Youth development.7. Leadership development. 8. Community and rural development. 9. Improving public affairs for all round development.

Why Study Extension It is more important to lay emphasis on "How to teach" instead of on "What to teach" so that the people can be encouraged to adopt new research techniques easily. In other words, if a person is very knowledgeable of various methods and techniques but does not know how to explain them or express them, then his knowledge has no meaning. Therefore, the power to express knowledge and viewpoint also plays a crucial role. Extension Personnel should not only be aware of objectives the programme should also be aware of prevalent conditions, problems, requirements and circumstances. After analyzing, the situation then extension personnel should give information about scientific techniques, to their clients according to their needs and requirements. Therefore, the study of extension education is necessary for extension personnel, so that they can encourage the adoption of new techniques.

Course Code	Title of Course	Credit Hours
AG-105	Rural Sociology & Educational Psychology	2(1+1)
AG-208	Fundamentals of Agricultural Extension Education	3(2+1)
AG-408	Entrepreneurship Development and Business Communication	2(1+1)
AG-508	Communication Skills and Personality Development	2(1+1)
AG-109	Agricultural Heritage (*Remedial course)	1(1+0)
AG-210	Human Values & Ethics (**Non Gradial Course)	1(1+0)
AGE-65	Agricultural Journalism (Elective Course)	3(2+1)
----	RAWE & AIA: VII semester	02
------	Module for Skill development and Entrepreneurship *Audio-Visual Aids & Agro-informatics* : VIII semester.	0+10

Subject: Agricultural Extension

Syllabus

1. Rural Sociology & Educational Psychology 2(1+1) AG.-105

2. 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. Rural Leadership: concept and definition, types of leaders in rural context. Educational psychology: Meaning & its importance in agriculture extension. Behavior: Cognitive, affective. psychomotor domain, Personality, Learning, Motivation, Theories of Motivation, Intelligence.

Practical Socio-economic survey of village communities. Developing schedules and questionnaires. Visit and gaining of Practical knowledge about the working of basic rural institutions. Identification of important value systems in the rural setting as a means of social control. Identification of rural personality traits that affect the development of personality in rural situation.

Suggested Readings

1- Singh Arun Kumar 2010-"***An outline of Social Psychology***", Motilal Banarsidas Delhi
2 Tyagi B.D. 2005 –***Rural Sociology and Social Psychology***, Rama Publishing House, Meerut..
3. Morghan C.T.2019 -***Introduction to Psychology***, MC Grow Hill Education Delhi,
4-Chitamber J. B.2010 -***Introductory Rural Sociology***, New Age International Publisher,New Delhi.
5-Sharma R.K.1997, ***Rural Sociology***, Atlantic Publisher and Distributors, New, Delhi.

2. Fundamentals of Agricultural Extension Education

3 (2+1) AG.-208

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, Martbandam, 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. extension administration: meaning and concept, principles and functions. Monitoring and evaluation: concept and definition, 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.

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.

Suggested Readings

1- Reddy A. Adivi 2001. ***Extension Education***, Shree Lakshmi Press, Andhra Pradesh.
2.Ray G. L. 2019. ***Extension Communication and Management***, Kalyani Publication, N. Delhi
3- Chauhan Jitendra.2018."***Extension Education and Information System***", Esha Publication Agra
4- Khan P.M.2002. " ***Text Book of Extension Education,***" Himanshu Publication, Udaipur RaJ.
5- Dhama O.P.& Bhatnagar O.P.1987.***Education and Communication for Development***, Oxford & IBH Publishing CO. New Delhi

3. Entrepreneurship Development and Business Communication

2(1+1) AG.-408

Theory

Concept of Entrepreneur, Entrepreneurship Development, Characteristics of entrepreneurs; SWOT Analysis & achievement motivation, Government policy and programs and institutions for entrepreneurship development Impact of economic reforms on Agribusiness/ Agrienterprises, Entrepreneurial Development Process: Business Leadership Skills; Developing organizational skill (controlling, supervising, problem solving, monitoring & evaluation), Developing Managerial

skills, Business Leadership Skills (Communication, direction and motivation Skills), Problem solving skill, Supply chain management and Total quality management, Project Planning Formulation and report preparation; Financing of enterprise, Opportunities for agri-entrepreneurship and rural enterprise.

Practical

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

Suggested Readings

1. Chole R.R., Kapse P. S.2012. ***"Entrepreneurship Development and Communication Skill,*** Scientific Publisher India.

2- Mandal Sagar, and Ray G. L.2012. ***Text Book on Rural Development,Entrepreneurship and Communication Skill,*** Kalyani Publisher, New Delhi.

3-Narayan Sarju, Mandal Sagar 2921.**Entrepreneurship Development and Business Communication,** Kalyani Publisher, New Delhi.

4-Mandal Sagar2012.***Entrepreneurship and Business Communication,*** Kalyani Publisher, Delhi.

4. Communication Skills and Personality Development

2(1+1) AG-508

Theory

Communication: meaning and definition: Principles and process of communication. models and barriers to communication; Verbal and nonverbal communication. Communication Skills: 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. Diffusion and adoption of innovation: concept and meaning, process and stages of adoption, adopter categories.

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

Suggested Readings

1- Sandhu A.S.2019. ***Text Book on Agricultural Communication Process and Innovation,*** Oxford& IBHand CBS Publisher New Delhi.

2-Tyagi B.D.,Arun S.K.2019. ***Communication and Diffusion of Agriculture Innovation,*** Rama Publishing House,New Delhi.

2- Rohel B. S.2019. ***Communication and Diffusion of Agriculture Innovation,*** Bharti Publishing, Meerut.

4-Singh G.P, Tyagi B.D.2019. ***Communication Skill and Personality Development,*** Rama Publishing House, New Delhi.

5- Menon Gopa Kumar 2018. ***Soft Skill and Personality Development,*** Education Publishing, Chhatishgarh.

ELECTIVE COURSES

Agricultural Journalism

3(2+1) AGE-65

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 andartwork 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.

Suggested Readings

1- Shriwastava A.K, Narayan K.B & Other,2000.***Mass Communication Joirnalism***, Arihant Publication Meerut.

2-.Jana B.L & Mitra Kanai Prasad, 2010. ***Farm Journalism***, Agrotech Publishing Udaipur.

3- Boone Kristina, turkey Mark, and other, 2000. ***Communication change and challenges***, Wiley Blackwell, Publisher New Jersey.

4- Singh Rajesh 2010.***Krishi Patrika***, Sanjay Book Centre Varanasi U.P.

5-Bhaskaran C, N. Kishor Kumar &.Other 2013.***Farm Journalism Media*** Management, Agrotech Publishing Academy Udaipur.

VIIth Semester

RAWE & AIA

Rural Agricultural Work Experience (RAWE) & Agro-Industrial Attachment (AIA)-Village Attachment-Socio-economic, Educational and adoption of farm practice, Survey related work.

02 Credit

VIIIth Semester

Module (s) for Skill Development & Entrepreneurship

1. Audio-Visual Aids & Agro-informatics **0+10 Credit**

Ch. Charan Singh University, Meerut
Faculty of Agriculture

DEPARTMENT OF SOIL CONSERVATION

Scope of Soil Conservation

Soil is a basic natural resource for successful agriculture. The loss of top fertile soil through various means and creation of wastelands has created an alarming situation for sustainable agriculture systems for the future generations. The soil and water conservation through introduction of farm forestry, understanding the nuances of environmental aspects and disaster management practices keeping holistic picture of agriculture in view, conservation and judicious utilization of soil and water for sustainable agriculture, understanding the various concepts and practices related to agro-meteorology, climate change for the success of agriculture and efficient water harvesting, conservation and management in the form of watershed management will form the major focus in the soil conservation.

Semester wise Courses & Syllabus

Course Code	Course Title	Credit Hours
AG-106	Introductory Forestry	2(1+1)
AG-308	Environmental Studies and Disaster Management	2(1+1)
AG-310	Fundamental of Soil and Water Conservation	2(1+1)
AG-409	Introductory Agro-meteorology & Climate Change	2(1+1)
AG-607	Watershed and Wasteland Management	2(1+1)

Syllabus

1. Introductory Forestry 2(1+1) AG-106

Theory

Introduction and definitions of basic terms related to forestry, objectives of silviculture, forest classification, salient features of Indian Forest Policies. Forest regeneration, Natural regeneration, regeneration from seed and vegetative parts, coppicing, root suckers, Artificial regeneration - objectives, choice between natural and artificial regeneration, essential preliminary considerations, Crown classification, Tending operations - weeding, cleaning, Thinning - mechanical, ordinary, crown and advance thinning, Forest mensuration - objectives, diameter measurement, instruments used in diameter measurement, measurement of volume of felled and standing trees, age determination of trees, Agroforestry - definitions, importance, criteria of

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

Practical

Identification of tree-species, Diameter measurements using calipers and tape, Volume measurement of logs using various formulae, Nursery lay out, seed sowing, vegetative propagation techniques, Forest plantations and their management, Visit of nearby forest based industries.

Suggested Readings:

1. Parthiban, K.T. 2018. ***Introduction to Forestry and Agroforestry***. Scientific Publishers, Jodhpur.
2. Praveen Dhar, T. 2018. ***Introduction to Forestry***. Narendra Publishing House, New Delhi.
3. Reddy, S.R. and Nagamani, C. 2017. ***Introduction to Forestry***. Kalyani Publihser, New Delhi.
4. Satybhan, Singh; Virendra, Singh & O.V.S. Thenua. 2021. ***An Introduction to Forestry and Agroforestry***. S.R. Scientific Publications, Agra.
5. Sagwal, S.S. 2018. ***A Text Book of Silviculture, Kalyani Publishers***, New Delhi.

2. Environmental Studies and Disaster Management **2(1+1) AG-308**

Theory – Brief Idea

Multidisciplinary nature of environmental studies, definition, scope and importance, Natural resources: Renewable and non-renewable resources, Natural resources and associated problems, Forest resources: Use and over-exploitation, deforestation. case studies. Timber extraction, mining. dams and their effects on forest and tribal people. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams- benefits and problems. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture. Fertilizer- pesticide problems, water logging, salinity, case studies. Energy resources: Growing energy needs, renewable and nonrenewable energy sources, use of alternate energy sources, case studies. 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 forest ecosystem, grassland ecosystem, desert ecosystem, aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries), Biodiversity and its conservation. Introduction, definition, genetic, species and ecosystem diversity and biogeographical classification of India. Value of biodiversity, consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, national and local levels. India as a mega-diversity nation, Hot- sports of biodiversity, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity, *in-situ* and *ex-situ* conservation of biodiversity, Environmental pollution: definition,

cause, effects and control measures of air pollution, water pollution, soil pollution, marine pollution, noise pollution,thermal pollution, 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: Water conservation, rain water harvesting, watershed management. Environmental ethics: issues and possible solutions, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, Wasteland reclamation, consumerism and waste products. Environment protection act. Air (Prevention and control of pollution) Act. Water (Prevention and control of pollution) Act. Wildlife protection act. Forest conservation act. Issues involved in enforcement of environmental legislation, Public awareness. Human population and the environment: population growth, variation among nations, population explosion, Family welfare programme . Environment and human health: Human rights, Value education, HIV/AIDS,Women and child welfare. Role of information technology in environment and human health.

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, ozone depletion. Man made disasters- Nuclear disasters, chemical disasters, biological disasters. building fire, coal fire, forest fire, oil fire, air pollution, water pollution, deforestation, industrial waste, water pollution. Disaster management- Measures 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.

Practical

Pollution case studies, Field work, visit to a local area to document environmental assets *viz*. river, forest, grassland, hill/ mountain, visit to a local polluted sites- Urban, rural, industrial, agricultural, study of common plants, insects, birds and study of simple ecosystems-pond, river, hill slopes, etc.

Suggested Readings:

1. Gaur, R.C. 2018. ***Environmental Engineering and Disaster Management***. 1st Edition. New Age International (P) Ltd. Publishers, New Delhi.
2. Ponmani, S., Bharathi, V.S. and Balusamy, A. 2019. ***Environmental Studies and Disaster Management.*** Om Publications, New Delhi.
3. Sharma, M.R. 2016. ***An Introduction to Disaster Management and Environmental Sciences.*** Satya Prakashan, New Delhi.
4. Kukal, S.S. and Kingra, P.K. 2019. ***Introduction to Environment and Disaster Management,*** Kalyani Publishers, New Delhi.
5. Subramanian, R. 2018. ***Disaster Management***. Vikas Publishing House, New Delhi.

3. Fundamental of Soil and Water Conservation **3(2+1) AG-310**

Theory

Introduction to soil and water conservation, causes of soil erosion. Definition and agents of soil erosion, water erosion: Forms of water erosion. Gully classification and control measures. Soil loss estimation by universal Soil Loss Equation. Soil loss measurement techniques. Principles of erosion

control: Introduction to contouring, strip cropping, contour bunding, graded bunding and bench terracing. Grassed water ways and their design. Water harvesting and its techniques. Wind erosion: mechanics of wind erosion, types of soil movement. Principles of wind erosion control and its control measures.

Practical

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

Suggested Readings:

1. Gupta, S.K. 2020. ***Fundamentals of Soil and Water Conservation Engineering***. Daya Publishing House, New Delhi.
2. Gurmel Singh, Venkataramanan, G., Sastry, G. and Joshi, B.P. 2019. ***Manual of Soil and Water Conservation Practices.*** CBS Publishers and Distributers, Delhi.
3. Mukund Narayan, Satyendra Kumar and Biwalkar Nilesh. 2014. ***A Reference Manual of Soil and Water Conservation Engineering***. Biotech Books, New Delhi.
4. Naresh, R.K., Arun, Kumar, Chandra, M.S., Rajan, Bhatt, Thenua, O.V.S. and Gupta, S.K. 2021. ***Irrigation Management, Theory, Principles and Practices***. Jaya Publishing House, New Delhi.
5. Mal, B.C. and Pandey, A. 2019. ***Introductory Soil and Water Conservation Engineering***. Kalyani Publishers, New Delhi.

4. Introductory Agro-meteorology and Climate Change **2(1+1) AG-409**

Theory- Brief Idea

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

Practical

Visit to agrometeorological observatory, site selection for observatory, exposure to instruments and weather data recording. Measurement of total, shortwave and longwave radiation, and its

estimation using Planck's intensity law. Measurement of albedo and sunshine duration, computation of radiation intensity using ASS. Measurement of maximum and minimum air temperatures. its tabulation, trend and variation analysis. Measurement of soil temperature and computation of soil heat flux. Determination of vapor pressure and relative humidity. Determination of dew point temperature. Measurement of atmospheric pressure and analysis of atmospheric conditions. Measurement of wind speed and wind direction, preparation of wind rose charts. Measurement, tabulation and analysis of rain. Measurement of open pan evaporation and evapotranspiration. Computation of PET and AET.

Suggested Readings:

1. Alok Kumar Patra. 2020. ***Introduction of Agrometeorology and Climate Change.*** New India Publishing Agency, New Delhi.
2. Mavi, H.S. 2019. ***Introduction to Agrometeorology***. Oxford & IBH Publishing Co Pvt.Ltd. Delhi.
3. Reddy, S.R. 2020. ***Introductory Agrometeorology and Climate Change.*** Kalyani Publishers, New Delhi.
4. Mahi, G.S. and Kingra, P.K. 2018. ***Fundamentals of Agrometeorology and Climate Change,*** Kalyani Publishers, New Delhi.
5. Reddy, S.R. 2016. ***Fundamentals of Agronomy and Agrometeorology***, Kalyani Publishers, New Delhi.

5. Watershed and wasteland Management **2(1+1) AG-607**

Theory

Watershed management – Concept, definition, need, principles and components of watershed management integrated watershed management. Factors affecting watershed management runoff and soil loss management in a watershed, socio-economic concept of watershed. People's participation in watershed management. Policy approaches and management plan, problems of watershed management. Types of degraded and wastelands, Distribution and extent of watershed in India and Uttar Pradesh, factors responsible for land degradation, characteristics of different types of degraded and wastelands, Problems of degraded land in Uttar Pradesh. Appropriate techniques for management of different types of degraded and wastelands.

Practical

Characterization and delineation of a model watershed, Case study of a watershed, Field demonstration on soil and moisture conservation measures. Field demonstration on construction of water harvesting structures. Visit to rainfed research station and watershed.

Suggested Readings:

1. Murty, J.V.S. 2017. ***Watershed Management***. New Age International Publishers. New Delhi.
2. Rajesh Rajora. 2019. ***Integrated Watershed Management***: Field Manual for Equitable, Productive and Sustainable Development. Rawat Publications, New Deli.

3. Roy, A.K. and Verma, S.K. 2019. ***Wasteland Management and Environment***. Scientific Publishers, Jodhpur.
4. Naresh, R.K., Dhaliwal, S.S., Vivek, Thenua, O.V.S., Gupta, S.K. and Sharma, V. 2021. ***Rainfed Agriculture and Watershed Management***, Jaya Publishing House, New Delhi.
5. Das, D.K. 2019. Problematic Soils and their Management, Kalyani Publishers, New Delhi.

----------	Rural Agricultural Work Experience and Agro-Industrial Attachment **(RAWE & AIA)-Sem. VII**	02

Ch. Charan Singh University, Meerut
Faculty of Agriculture

Department of Animal Husbandry And Dairying

Scope of Animal Husbandry and Dairying

Animal husbandry or animal science is an agricultural practice of breeding and raising the livestock. Animal Husbandry plays an important role in rural areas because a large number of farmers depend upon it for their livelihood. The manure from animals provides a good source of organic matter for improving soil fertility and crop yields.India has been the world's largest milk producer since 1997.

Dairy plays a significant part in numerous aspects of Indian Economy. India is endowed with the largest livestock population in the world. It accounts for about 57.3 per cent of the world's buffalo population and 14.7 per cent of the cattle population. Thus, there is a tremendous scope/potential for increasing the milk production through profitable dairy farming. Milk and dairy products play an important role in a healthy, balanced diet. The scope of animal husbandry is quite good globally. There are many jobs in this field for example - supplying of milk, meat, egg, and wool etc.

After completing a degree or diploma in animal husbandry, the professionals can either run their own farms or can work in more specialized areas. There are full time as well as correspondence courses in animal husbandry in India. In addition, there are many Agriculture colleges in India for those willing to pursue a career in the field.

Dairy farming Information and in-depth knowledge about dairy farming is vital for a profitable dairy farming business. Dairy farming provides an excellent opportunity for self-employment of unemployed youth. It is also an important source of income generation to small/marginal farmers and agricultural labourers. The demand of milk & milk product is increasing rapidly. There is immense scope of dairy farming in our country.

India today is the one of the world's largest producer of eggs and broiler meat. The poultry industry in India has undergone a major shift in structure and operation during the last two decades transforming from a mere backyard activity into a major industry with the presence of a large number of integrated players. This transformation has involved a sizeable investment in breeding, hatching, rearing and processing activities. After pursuing courses in this field you can find jobs in various hatcheries, pharmaceutical concerns, feed millers, veterinary hospitals, feed production companies, feed analysis laboratories, etc. Those are specialist in Poultry can start their career in various fields such as education, business, management & research.

Semester wise Courses & Syllabus

Sr. No.	Course Code	Semester	Course Title	Credit Hours
1	AG-107	I	Introductory Animal husbandry	3(2+1)
2	AG-209	II	Dairy Processing and Safety Issues	3(2+1)
3	AG-311	III	Dairy Science	3(2+1)
4	AG-411	IV	Poultry production and management	3(2+1)
5	AG-510	V	Principles of Food Science and Nutrition	3(2+1)

Elective courses				
1	AGE-55	V	Food Safety and Standards	3(2+1)
2	AGE-66	VI	Management of Fish-cum- Duck, Quail and Rabbit Farming	3(2+1)

VIIth semester

RAWE and AIA			
1.	VIII	RAWE and AIA	02

VIIIth semester

Modules for Skill Development and Entrepreneurship			
1.	VIII	Poultry Production Technology	0+10
2.	VIII	Food Processing	0+10

Note:

1. College shall offer any one module at a time
2. Syllabus of above modules may be adopted from **National Skill Development Corporation of India (NSDC)** so that colleges may be recognized as centre by the corporation for certificate courses also.

Syllabus

1. INTRODUCTORY ANIMAL HUSBANDRY **3(2+1) AG-107**

THEORY:

GENERAL: Importance of livestock in Agriculture and Indian Economy, Dairying under specialized and mixed farming, Livestock and milk production statistics.

DAIRY CATTLE AND BUFFALOES MANAGEMENT: Cattle and buffalo Breeds, Housing for dairy animals, Digestive system of Ruminants, Feeds and feeding management, Conservation of fodders, Care and Management of pregnant and milch cows, Raising of calves, Management of heifers and bulls, Milking methods and principles, Clean milk production, Breeding methods & systems, Symptoms of heat in dairy animals, Artificial Insemination, Maintenance of livestock records.

PIG MANAGEMENT: Importance of Pig farming in India , Important breeds, Raising of piglets, General aspects of breeding, Care and management of sow and boar.

SHEEP AND GOAT MANAGEMENT: Importance of Sheep & Goat farming in India, Important breeds, Housing management of goats and sheep, Raising of kids and lambs, Feeding and Breeding Management of goats and sheep.

HEALTH MANAGEMENT: Common animal diseases of cattle, buffalo, goat, sheep and swine viz. Anthrax, BQ, HS, FMD, Metritis, Brucellosis, Mastitis, Milk fever, Bloat, Swine fever and Enterotoximea, Deworming, Vaccination schedule, Ecto and Endo-parasites and Tick borne diseases and their management.

PRACTICAL:

Study of external body parts of different livestock animals, Study of phenotypic and physiological differences between cow and buffaloes, Estimation of body weight ,Restraining and Casting, Identification of animals, Castration, Debudding/Dehorning, Grooming, Computation of ration for dairy animals, Scheme of fodder production round the year, Recording temperature, pulse rate and respiration rate of animals, Demonstration of Artificial Insemination, Estimation of cost of milk production.

Reference Books :

1. Pandey, D. N. 1995-96. **Animal Husbandry & Veterinary Science.** *15th Edition.* Pubished by: Jai Prakash Nath and Company, Meerut, 543p.
2. ICAR. 1990. ***Handbook of Animal Husbandry.*** *2nd Revised edition.* Published by Publications and Information Division ICAR, Krishi Anusandhan Bhavan, Pusa, New Delhi 110012, 821p.
3. Banergee, G. C. 1991. ***A Textbook of Animal Husbandry.*** *7th Edition.* Oxford & IBH Publishing CO. PVT. LTD. New Delhi, 854p.
4. Bhati, S. S., Singh, Rajveeer & Dahama, R. S. -. ***Livestock Production & Management.*** V. K. Prakashan Baraut, Meerut, 391p.
5. Sastri, N. S. R. and Thomas, C. K. 1976. ***Livestock Production & Management.*** Kalyani Publishers, New Delhi, 328p.

2. DAIRY PROCESSING AND SAFETY ISSUES 3(2+1) AG-209

THEORY:

GENERAL: Definition of food, Constituents of foods : Water, Carbohydrate, Fat, Protein, Vitamins and Minerals with reference to milk, Detailed composition of milk and colostrum.
DAIRY PROCESSING: Cooling and chilling of milk. Pasteurization, Sterilization, Bactofugation, Uperization, Stassanization. U.H.T. processing and Homogenization of milk, Neutralization of milk and Cream,
Manufacturing of common dairy product viz. Cream, Butter, Ghee, Dahi, Yoghurt, Shrikhand & Ice-cream.
Manufacturing of Khoa, Evaporated milk, condensed milk, WMP, SMP, Paneer, Cheese, Chhana, Cheddar cheese and. Mozzarella cheese (Pizza cheese).
FOOD SAFETY: Definition, Importance, Scope, Hazards and risks. Food safety management, HACCP, ISO Series, TQM-Concept and need for quality component of TQM. Basic water tests.

PRACTICAL:

a. Demonstration of Cream separation.
b. Preparation of Indigenous dairy products viz. Dahi. Chhana. Khoa, Paneer, Cream, Ghee, shrikhand.
c. Water quality analysis.
d. Problem on neutralization of milk and cream.
e. Preparation of plants for implementation of HACCP and ISO series,
f. Problems on over run.
g. Calculation of Ice cream mix.

Reference Books :-

1. Smit, G. 2003. ***Dairy Processing: Improving Quality***. Published by Woodhead Publishing Limited Abington Hall, Abington Cambridge CBI 6AH England, 532p.
2. Singh, T. B. and Shukla, S. G. -. ***Dairy Chemistry & Animal Nutrition***. Rama Publishing House, Delhi Rpad, Meerut, 456p.
3. Singh, T. B. -. ***Dairy Chemistry & Animal Nutrition***. Kukka Publishing House, Baraut, Meerut, 436p.
4. Eckles, C. H.; Combs, W. B. and Macy, H..2002. ***Milk and Milk Products***. *7th Reprint*, Tata McGraw-Hill Publishing Company Limited, New Delhi, 462p.
5. Chandan, R. C.; Kirala, A. and Shah, N. P. 2009. ***Dairy Processimg and Quality Assurance***. Wiley-Blackwell, A John Wiley & Sons Limited, Publication, 600p.

3. DAIRY SCIENCE **3(2+1) AG-311**

THEORY:

GENERAL: Concept of Dairying, Dairying in India, Dairy development in different five year plans, Dairy production statistics.

Dairy cooperatives and their functioning, AMUL model, White revolution, Objectives and achievements of operation flood, pricing policy of milk.

Milk and its secretion, Composition of milk, Quality of milk, Nutritive value of milk and milk product, Transportation and milk distribution, platform tests, Filtration, Straining and Clarification of milk, Standardization, Milk adulteration and its detection, Common preservatives of milk and their detection, Legal standards of market milk, Factors affecting the quality and quantity of milk, Cleaning and sanitization of dairy equipment.

Basic principles of refrigeration and cold storage of milk and milk product. Common adulterants of ghee, khoa and their detection.

PRACTICAL:

a. Sampling of milk.
b. C.O.B. Test
c. M.B.R. Test
d. Sediment test.
e. Specific gravity of milk by lactometer.
f. Fat test by Gerber's method.
g. T.S. & S.N.F. percentage by Richmond's scale and formula
h. Problems on Standardization.
i. Detection of adulterants viz. water, starch, sucrose, urea, detergent and refined oil
j. Problems on adulteration.
k. Detection of preservatives.
l. Alcohol test.
m. Acidity of milk.

Reference Books :

1. Bhati, S. S. and Lawaniya, G. S. 1990-91. ***Dairying***. V. K. Prakashan, Baraut (Meerut), 496p.
2. Jauhar, I. J. and Gupta, R. G. -. ***Dairy Technology and Quality Control***. Rama Publishing House, Meerut, 334p.
3. De Sukumar. 2004. ***Outlines of Dairy Technology***. *20th Impression*. Published by Manzar Khan, Oxford University Press YMCA Library Building, Jai Singh Road, New Delhi

110001, 539p.
4. Jauhar, I. J. and Gupta, R. G. 2013. ***Milk, Milk Processing and Human Nutrition***. Rama Publishing House, Delhi Road, Meerut, 216p.
5. Varnam, A. H. and Sutherland, J. P. 2001. ***Milk and milk Products Technology, Chemistry and Microbiology***. Aspen Publishers, Inc. 200 Orchard Ridge Drive Gaithersburg, MD 20878, 452p.

4. POULTRY PRODUCTION AND MANAGEMENT 3(2+1) AG-411

THEORY:

GENERAL : Historical and Importance of poultry industry in India, Poultry production and marketing status.

GENERAL MANAGEMENT: Establishment of a poultry farm, Housing and equipments, Incubation and hatching of eggs, Brooding management, Lighting schedule for poultry, Broiler and layer management.

BREEDING: Breeds and strains of broilers and layers of chicken, Male and female reproductive system of chicken, General aspects of breeding for better egg and meat production , Selection and culling of productive and unproductive birds, Artificial insemination in poultry.

FEEDS AND FEEDING: Digestion, Digestive system of chicken, Different kind of Feed ingredients of poultry feeds, Feed processing, Different types of poultry feeds viz. Starter, Grower, Layer, Finisher and Breeder ration, Importance of FCR, Nutritional deficiencies.

HEALTH MANAGEMENT: Common poultry diseases viz. Ranikhet, Marex, Chicken pox, Gumboro, Infectious Bronchitis, CRD and bird flu, Control of internal and external parasites, Vaccination schedule for poultry.

POULTRY PRODUCTS : Collection, preservation and storage of eggs, Grading of eggs, AGMARK standard of egg, egg powder, Slaughtering and processing of chicken, Marketing of poultry products,

Economics of broiler and layer farming.

PRACTICAL:

Study of external and internal body parts of poultry birds, structure of egg, Formulation of ration viz. Broiler starter ration, Broiler finisher ration, Chick starter ration, Grower ration, Layer ration and Breeder ration, Vaccination schedule for broiler and layers, Debeaking, Candling of eggs.

Reference Books :

Scanes, C. G.; Brant, G. and Ensminger, M. E. 2003. ***Poultry Science***. 4th *Revised edition*. Published by Prentice Hall Company, America, 512p.
2. Singh, I. B. 2000. ***Poultry, Fisheries, Bee-keeping & Sericulture in India***. Kushal Publications and Distributors, Varanasi, 237p.
3. Lawaniya, G. S. and Singh, P. P. 1991. ***Poultry Production, Bee-keeping & Fisheries***. V. K. Prakashan Baraut, Meerut, 356p.
4. Jauhar, I. J. and Gupta, R. G. -. ***Livestock and Poultry Management***. Rama Publishing House, Meerut, 495p.
5. Sreenivasaiah, P. V . 2015. ***Text Book of Poultry Science***. Published by Hitesh Mittal for write & print Publications, H. 13, Bali Nagar, New Delhi, 641p.

5. PRINCIPLES OF FOOD SCIENCE AND NUTRITION 3(2+1) AG-510

THEORY:

GENERAL: Definition of food and food science. Composition of food, Foods of animal origin, Chemistry and Function of Carbohydrate, Fat, Proteins, Minerals and Vitamins, their dietary requirements and bio-availability, Nutritional deficiency diseases.

Flavours and colours used in food. Food microbiology. Probiotics, prebiotics and synbiotics. Composition and processing of different livestock products, feed additives, antibiotics, enzymes and hormones.

PRACTICAL:

a. Microbiological study of Milk.
b. Water quality test.
c. Study of Nutritional deficient conditions.
d. Study of Nutritional disorders.
e. Quality parameters of different livestock products
f. Visit to food processing industry

Reference Books:-

Singh, V. -. ***Principles of Dairy Chemistry***. V. K. Prakashan, Baraut, Meerut, 148p.

2. Jenness, J, and Patton, S. 1959. ***Principles of Dairy Chemistry***. Published by New York; Johhn Wiley & Sons, Inc.; Lnndon: Chapman & Hall Ltd, 474p.
3. Fox, P. F.; Uniacke-Lowe, T.; McSweeney, P. L. H. and O'Mahony, J. A. 2015. ***Dairy Chemistry and Biochemistry***. Springer International Publishing Switzerland, 584p.
4. Ward, J. D. and Ward, L. T. 2007. ***Principles of Food Science and Nutrition***. Published by Goodheart-Willcox Company, 616p.
5. Vijayalaksi, D.; Ravindra, U. and Shamshad Begum, S. 2019. ***Principles of Food Science and Nutrition***. Published by International Books & Periodical Supply Service, 184p.

ELECTIVE COURSES

5. FOOD SAFETY AND STANDARDS 3(2+1) AGE-55

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, OMPs, 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, FSSA. 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. Preparation of plans for implementation of FSMS - HACCP, ISO: 22000. Visit to different food processing/NABL laboratories.

Reference Books :-

1. World Bank Group. 2020. ***Food Safety Handbook***. Published by The World Bank Group 1818 H Street NW, Washington, DC 20433, 422p.
2. Mathur, P. 2018. ***Food Safety and Quality Control***. Published by Orient Blackswan, 332p.
3. Jayakumar, V. and Raju, R. -. ***Total Quality Management***. Lakshmi PublicationsPlot No: 73, V.G.P. Gokul Nagar, 2nd Main Road, Perumbakkam Chennai-6001100. Tamil Nadu, India, 312p.
4. Halde, P. and Sharma, S. 2015. ***Objectives Food Science and Safety Standards***. Pulished by Jain Brothers 16/873,East Park Road, Karol Bagh, Near Dr. N.C. Joshi Hospital, New Delhi- 110005, 186p.
5. The BC Cook Articulation Committee 2015. ***Food Safety, Sanitation, and Personal Hygiene***. Published by BC Campus Victoria, B.C., 67p.

2. MANAGEMENT OF FISH-CUM DUCK, QUAIL AND RABBIT FARMING

3(2+1) AGE-66

THEORY:

Fish farming: Common terminologies, classification and characteristics of common fish. Present status of fishery in India. Preparation and management of fish pond, physical and chemical condition of water for fishery, feeds and feeding of fishes, breeding of fish, common diseases of fishes, Integrated fish-duck farming.

Duck farming: Common terminologies, Present status of duck farming in India. breeds and their common features and advantages, incubation and hatching, feeding of ducks, care and management of duckling, grower, layer/broiler ducks. Characteristics of duck eggs, common diseases and vaccination schedule.

Quail farming: Common terminologies, common features of quail farming and its advantages, breeds, incubation and hatching, feeding of quails. care and management of quail chick, grower/layer/broilers,common diseases and vaccination schedule.

Rabbit farming: Introduction, scope and advantages of rabbit farming, breeds, breeding, housing, care and management of young and adult rabbit. feeds and feeding for rabbits, common diseases of rabbit and their management. , fur and meat production

PRACTICAL:

- Visit of fishery units, demonstration of farm preparation, hatchery and brooding operation and report formulation.
- Identification of Different type of common fishes ,Candling and Grading Duck and Quail Egg
- Ration formulation for Duck, Quail. Rabbit and Fish.
- Preparation of different egg products .

Reference Books :

1. Holderread, D. 2001. ***Storey' Guide to Raising Ducks.*** *2nd Edition.* Storey Publishing 210 MASS MoCA Way North Adams, MA 01247, 357p.
2. Bennet, B. 2001. ***Storey's Guide to Raising Rabbits.*** *5th Edition.* Storey Publishing 210 MASS MoCA Way North Adams, MA 01247, 223p.
3. Cambel, I. H. 1994. ***Quail Production and Management.*** Published & Distributed by: REX Book Store, 356 Nicanor Reyes, Sr. St. Tel. Nos. 741-49-16*741-49-20, 197 C.M. Recto Avenue Tel. Nos. 741-49-56 *741-49-57 Manila, Philippines, 12p.
4. Singh, A. K. 2018. ***Machali Palan Kaise*** *Kare.* Daya Publishing House, Ansari Road; Darya Ganj, New Delhi-110002, 132p
5. Nuruzzaman, A. K. M. 1991. ***Integrated fish Farming System Holds Promise in Bagladesh.*** Publisher: Two Sistes, L. Zaman, F. M. Zaman. Publishhed: Digitized Author, 86p.

VIIth Semester

Rural Agricultural Work Experience **(RAWE)** & Agro-industrial Attachment **(AIA)-subject related work.** **02 Credits**

VIIIth semester

Modules for Skill Development and Entrepreneurship			
1.	VIII	Poultry Production Technology	0+10
2.	VIII	Food Processing	0+10

Chaudhary Charan Singh University, Meerut
Faculty of Agriculture

DEPARTMENT OF STATISTICS AND COMPUTER APPLICATION

Scope of Agricultural Statistics

Statistics are numerical statement of facts capable of analysis and interpretation as well as study of the methods used in collection, organization, presentation, analysis and interpretation of numerical data. At present times, statistics is used by almost all ministries or government departments. Scope of statistics include the area of Economics also. The statistical data and methods of statistics are used for understanding the- Research data analysis and findings, Graphical Representation of Data, Economic theories, Economic problems, Economic policy formulation, Economic planning, Budgeting, National income accounting etc. Statistics is helpful in understanding the intensity of the economic problem and deriving the solutions for the same on the basis of the data available.

Semester wise Courses & Syllabus of Agric. Statistics

Semester	Course Code	CourseTitle	Credit Hours
III Sem	AG-309	Statistical Methods	2 (1+1)
IV Sem	AG-410	Agri-informatics	2 (1+1)
		Total Credit Hrs (Core Courses)	**4 (2+2)**
I Sem	AG-111B	Elementary Mathematics **(*Remedial Course)**	**2 (2+0)**
		Total Cr. Hrs	**6 (3+3)**

Syllabus

1. Statistical Methods 2(1+1) AG-309

Theory

Introduction to Statistics and its Applications in Agriculture, Graphical Representation of Data., Measures of Central Tendency & Dispersion. Definition of Probability. Addition and Multiplication Theorem (without proof). Simple Problems Based on Probability. Binomial & Poisson Distributions, Definition of Correlation. Scatter Diagram. Karl Pearson's Coefficient of Correlation. Linear Regression Equations. Introduction to Test of Significance, One sample & two sample test t for Means. Chi-Square Test of Independence of Attributes in 2 x2 Contingency Table. Introduction to Analysis of Variance. Analysis of One Way Classification. Introduction to Sampling Methods. Sampling versus Complete Enumeration, Simple Random Sampling with and without replacement. Use of Random Number Tables for selection of Simple Random Sample.

Practical

Graphical Representation of Data. Measures of Central Tendency (Ungrouped data) with Calculation of Quartiles, Deciles & Percentiles. Measures of Central Tendency (Grouped data) with Calculation of Quartiles, Deciles & Percentiles. Measures of Dispersion (Ungrouped Data). Measures of Dispersion (Grouped Data). Moments, Measures of Skewness & Kurtosis (Ungrouped Data). Moments, Measures of Skewness & Kurtosis (Grouped Data). Correlation & Regression Analysis. Application of One Sample t-test. Application of Two Sample Fisher's t- test. Chi-Square test of Goodness of Fit. Chi-Square test of Independence of Attributes for 2x2 contingency table. Analysis of Variance One Way Classification. Analysis of Variance Two Way Classification. Selection of random sample using Simple Random Sampling.

Reference/Text Books

1. ***'A Textbook of Agricultural Statistics'*** by R. Rangaswamy; Publisher:New Age International (P) Limited; Edition: 2009
2. ***'Textbook of Agricultural Statistics' by*** S.K. Agarwal; Publisher: AITBS PUBLISHERS INDIA
3. ***'A Handbook of Agricultural Statistics'*** by SRS Chandel; Publisher: Publisher: IMPECT PUBLISHER

2. Agri-Informatics 2(1+1) AG-410

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 (WNW): 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.

Reference/Text Books

1. ***'Introductory Agri-Informatics'*** by Subrat K. Mahapatra, Subrata K Mohanty, Jwel Bhuiya and Jayashankar Pradhan; (2019); Publishers: Jain Brothers
2. ***'Information and Communication Technology for Agriculture and Rural Development'*** by R. Saravanan, Ed. 2011;
3. ***'Agro-Informatics'*** by G. Vanitha andM. Kalpana , (2011); Publisher: New India Publishing Agency,

Chaudhary Charan Singh University, Meerut
Faculty of Agriculture

DEPARTMENT OF ENGLISH

Scope of English

India is a country of mixed cultures, races, religions and languages. India has Hindi and English as its official languages. It is interesting that India, a multilingual nation, is the third-largest English-speaking country after the U.S. and U.K. It is seemingly difficult to come across an educated person, who can speak any Indian language without having to use English words. Our verbal, non- verbal communication are full of English words, even if we are conversing in languages other than English. English is not only important in getting a better job; it is everywhere in social interaction. If you can't speak it, you are a no body." This makes very clear the prestigious position the language holds in our country. People belonging to different language groups use English for interpersonal communication. Researches show that employees with English language communication skills have a better scope and progress faster in companies. It is also helpful to perform targeted tasks with ease.

Semester wise Courses & Syllabus of English

Semester	Course Code	CourseTitle	Credit Hours
I Sem	AG-108	Comprehension and Communication Skills in English	2 (1+1)
		Total Credit Hrs (Core Courses)	**4 (2+2)**

Syllabus

1. Comprehension and Communication Skills in English 2 (1+1) AG-108

Theory

War Minus Shooting- The sporting Spirit. A Dilemma- A layman looks at science Raymond B. Fosdick. You and Your English-Spoken English and broken English G.B. Shaw. Reading Comprehension, Vocabulary- Antonym, Synonym, Homophones, Homonyms. Often confused words. Exercises to Help the students in the enrichment of vocabulary based on TOEFL and other competitive examinations. Functional grammar: Articles, Prepositions, Verb, Subject verb Agreement, Transformation, Synthesis. Direct and Indirect Narration. Written Skills: Paragraph writing, Precise writing, Report writing and Proposal writing. The Style: Importance of professional writing. Preparation of Curriculum Vitae and Job applications. Synopsis Writing. Interviews: kinds. Importance and process.

Practical

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

Reference/Text Books

1. N. Krishnaswamy and T. Sriraman (1995). ***'Current English for Colleges'***, Macmillan India Ltd.,
2. Sethi, J. (2011). ***'Standard English and Indian Usage: Vocabulary and Grammar'***, PHI Learning Pvt. Ltd .
3. Wren and Martin, ***'High School English Grammar & Composition'***, S. Chand and Co.Publication.

*Remedial Courses

Syllabus

1. Agricultural Heritage **1(1+0)** **AG-109**

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.

2. General Agriculture-I **2 (1+1)** **AG-110A**

Agriculture of Intermediate standard including subjects o **Agronomy, Soil Science, Horticulture and Plant Pathology**

3. Introductory Biology **2 (1+1)** **AG-110B**

Theory

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

Practical

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

4. General Agriculture-II **2 (1+1)** **AG-111A**

Agriculture of Intermediate standard including subjects of Ag **Engg. Animal Husbandry and Economics**

5. Elementary Mathematics **2 (2+0)** **AG-111B**

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 parallelto axes, Slope-intercept form of equation of line, Slope-point form of equation of line. Twopoint form of equation of line, Intercept form of equation of line, Normal form of equation ofline, General form of equation of line, Point of intersection of two st. lines, Angles betweentwo st. lines, Parallel lines, Perpendicular lines, Angle of bisectors between two lines. Area oftriangle and quadrilateral. Circle: Equation of circle whose centre and radius is known, Generalequation of a circle, Equation of circle passing through three given points, Equation of circlewhose diameters is line joining two points (xj. yj) & (x2.y2)> Tangent and Normal to a givencircle at given point (Simple problems), Condition of tangency of a line y = nix + c to the givencircle x2 + y2 = a. **Differential Calculus**: Definition of function, limit and continuity, Simpleproblems on limit, Simple problems on continuity, Differentiation of xn, en, sin x &cos x fromfirst principle, Derivatives of sum, difference, product and quotient of two functions, Differentiation of functions of functions (Simple problem based on it), Logarithmicdifferentiation (Simple problem based on it), Differentiation by substitution method and simpleproblems based on it. Differentiation of Inverse Trigonometric functions. Maxima and Minimaof the functions of the form y=f (x) (Simple problems based on it).

Or

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 wellknowncurves (simple problems based on it). Matrices and Determinants: Definition ofMatrices, Addition. Subtraction, Multiplication. Transpose and Inverse up to 3rd order. Properties of determinants up to 3rd order and their evaluation.

**Non-gradial Courses

Syllabus

1. NSS/NCC/Physical Education & Yoga Practices (Any one)	2 (0+2)	AG-112A/AG-112B/AG-112C
2. Human Values & Ethics: during I semester	1 (1+0)	AG-210
3. Educational Tour: during VI Semester	2 (0+2)	AGT-99

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1. NSS/NCC/ Physical Education & Yoga Practices (Opt Any one) 2 (0+2)

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

1. NATIONAL SEVICE SCHEME (NSS)

Following activities are to be taken up under the NSS Programme/Course-

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

All the above activities related to the National Service Scheme course are distributed under four different courses viz. National Service Scheme-I, National Service Scheme-II, National Service Scheme-III, and National Service Scheme-IV having a total of Two Credit load (one credit during I year (I & II Semester) & one credit during II year (III & IV semester). The entire four courses should be offered continuously for two years (I to IV semester). A student enrolled in NSS course should put in at least 60 hours of social work in different activities in a semester other than five regular one day camp in a year and one special camp for duration of 7 days at any semester break period in the two year.

Different activities will include orientation lectures and practical works. Activities directed by the Central and State Government have to be performed by all the volunteers of NSS as per direction.

SYLLABUS

Semester-I

1. NATIONAL SERVICE SCHEME

Course Title: National Service Scheme (NSS) 2 (0+2) AG-112A

Introduction and basic Components of NSS:

1. **Orientation: History**, objectives, principles, symbol, badge; regular programmes under NSS, organizational structure of NSS, code of conduct for NSS volunteers, points to be considered by NSS volunteer's awareness about health.

2. **NSS programmes and activities**: Concept of regular activities, special camping, day camps, basis of adoption of village/slums, conducting survey, analyzing guiding financial patterns of scheme, youth programme/

schemes of GOI, coordination with different agencies and maintenance of diary.

3. **Understanding youth:** Definition, profile, categories, issues and challenges of youth; and opportunities for youth who is agent of the social change.

4. **Community mobilization:** Mapping of community stakeholders, designing the message as per problems and their culture; identifying methods of mobilization involving youth-adult partnership.

5. **Social harmony and national integration:** Indian history and culture, role of youth in nation building, conflict resolution and peace-building.

6. **Volunteerism and Shramdan:** Indian tradition of volunteerism, its need, importance, motivation and constraints; shramdan as part of volunteerism.

7. **Citizenship, constitution and human rights:** Basic features of constitution of India, fundamental rights and duties, human rights, consumer awareness and rights and rights to information.

8. **Family and society:** Concept of family, community (PRIs and other community based organisations) and society.

9. **Other** activities related to strengthening of social and cultural relations, environment, health & hygiene, National integration, Nation building, institutional strengthening, and discipline and duties of a good citizen, etc.

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2. NATIONAL CADET CORPS (NCC)

Course Title: National Cadet Corps (NCC) 2 (0+2) AG-112B

1. Aims, objectives, organization of NCC and NCC song. DG's cardinals of discipline.
2. Drill- aim, general words of command, attention, stands at ease, stand easy and turning.
3. Sizing, numbering, forming in three ranks, open and close order march and dressing.
4. Saluting at the halt, getting on parade, dismissing and falling out.
5. Marching, length of pace, and time of marching in quick/slow time and halt. Side pace, pace forward and to the rear.
6. Turning on the march and wheeling. Saluting on the march.
7. Marching time, forward march and halt.
8. Changing step, formation of squad and squad drill.
9. Command and control, organization, badges of rank, honors and awards.
10. Nation Building- cultural heritage, religions, traditions and customs of India. National integration.
11. Values and ethics, perception, communication, motivation, decision making, discipline and duties of good citizen.
12. Leadership traits, types of leadership. Character/personality development.
13. Civil defense organization, types of emergencies, firefighting, protection,
14. Maintenance of essential services, disaster management, aid during development projects.
15. Basics of social service, weaker sections of society and their needs, NGO's and their contribution; contribution of youth towards social welfare and family planning.
16. Structure and function of human body, diet and exercise, hygiene and sanitation.
17. Preventable diseases including AIDS, safe blood donation, first aid, physical and mental health.
18. Adventure activities.
19. Basic principles of ecology, environmental conservation, pollution and its control.
20. Precaution and general behavior of girl cadets, prevention of untoward incidents, vulnerable parts of the body, self-defense.
21. Other militarily/armed trainings & activities related to NCC.

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3. PHYSICAL EDUCATION AND YOGA PRACTICES

Course Title: Physical Education and Yoga Practices 2 (0+2) AG-112C

Part-I

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

situation (For girls teaching of Tennikoit).

3. Teaching of advance skills of Football-involvement of all the skills in game situation with teaching of rules of the game.
4. Teaching of skills of Basketball-demonstration, practice of the skills, correction of skills, involvement in game situation
5. Teaching of skills of Basketball-demonstration, practice of the skills, involvement in game situation.
6. Teaching of skills of Basketball-involvement of all the skills in game situation with teaching of rule of the Game.
7. Teaching of skills of Kabaddi- demonstration, practice of the skills, correction of skills, involvement in game situation
8. Teaching of skills of Kabaddi- demonstration, practice of the skills, correction of skills, involvement in game situation
9. Teaching of advance skills of Kabaddi- involvement of all the skills in game situation with teaching of rule of the game
10. Teaching of skills of Ball Badminton -demonstration, practice of the skills, correction of skills, involvement in game situation
11. Teaching of skills of Ball Badminton-involvement of all the skills in game situation with teaching of rule of the game
12. Teaching of some of Asanas- demonstration, practice, correction and practice.
13. Teaching of some more of Asanas- demonstration, practice, correction and practice.
14. Teaching of skills of Table Tennis- demonstration, practice of skills, correction and practice and involvement in game situation.
15. Teaching of skills of Table Tennis-demonstration, practice of skills, correction and practice and involvement in game situation
16. Teaching of skills of Table Tennis- involvement of all the skills in game situation with teaching of rule of the game.
17. Teaching -Meaning, Scope and importance of Physical Education.
18. Teaching- Definition, Type of Tournaments.
19. Teaching -Physical Fitness and Health Education.
20. Construction and laying out of the track and field (*The girls will have Tennikoit and Throw Ball).
21. Other activities related to Physical Education, Fitness, Games & sports and Yogas.

Part-II

1. Teaching of skills of Hockey- demonstration practice of the skills and correction.
2. Teaching of skills of Hockey- demonstration practice of the skills and correction. Involvement of skills in games situation.
3. Teaching of advance skills of Hockey- demonstration practice of the skills and correction. Involvement of all the skills in games situation with teaching of rules of the game.
4. Teaching of skills of Kho-Kho- demonstration practice of the skills and correction.
5. Teaching of skills of Kho-Kho- demonstration practice of the skills and correction. Involvement of the skills in games situation.
6. Teaching of advance skills of Kho-Kho – demonstration practice of the skills and correction.Involvement of all the skills in games situation with teaching of rules of the game.
7. Teaching of different track events - demonstration practice of the skills and correction.
8. Teaching of different track events -demonstration practice of the skills and correction.
9. Teaching of different track events- demonstration practice of the skills and correction with competition among them.
10. Teaching of different field events – demonstration practice of the skills and correction.
11. Teaching of different field events – demonstration practice of the skills and correction.
12. Teaching of different field events – demonstration practice of the skills and correction.
13. Teaching of different field events – demonstration practice of the skills and correction with competition Among them.

14. Teaching of different asanas – demonstration practice and correction.
15. Teaching of different asanas – demonstration practice and correction.
16. Teaching of different asanas – demonstration practice and correction.
17. Teaching of different asanas – demonstration practice and correction.
18. Teaching of weight training – demonstration practice and correction.
19. Teaching of circuit training – demonstration practice and correction.
20. Teaching of calisthenics – demonstration practice and correction.
21. Other activities related to Physical Education, Body Fitness, Games & Sports and Yoga practices.

Note:

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

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2. Human Values & Ethics **1 (1+0)** **AG-210**

Theory

Values and Ethics- An Introduction.Goal and Mission of Life.Vision of Life.Principles and Philosophy.SelfExploration.SelfAwareness.SelfSatisfaction.DecisionMaking.Motivation.Sensitivity.Success.SelflessService.Case Study of Ethical Lives.PositiveSpirit.Body, Mind and Soul.Attachment and Detachment.Spirituality Quotient. Examination.

3. Educational Tour: during VIth semester **2 (0+2)** **AGT-99**

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Elective Courses

A student must select/Opt **any two** from the following courses (**one** in Vth Semester and **one** in VIth semester):-

Vth Semester			VIth Semester		
Course Code	Course Title	Cr. Hrs	Course Code	Course Title	Cr. Hrs
AGE-51	Agri-business Management	3(2+1)	AGE-61	Protected Cultivation	3(2+1)
AGE-52	Agrochemicals	3(2+1)	AGE-62	Hi-tech Horticulture	3(2+1)
AGE-53	Commercial Plant Breeding	3(2+1)	AGE-63	Weed Management	3(2+1)
AGE-54	Landscaping	3(2+1)	AGE-64	System Simulation & Agro-advisory	3(2+1)
AGE-55	Food Safety & Standards	3(2+1)	AGE-65	Agriculture Journalism	3(2+1)
AGE-56	Bio-pesticides & Bio-fertilizers	3(2+1)	AGE-66	Management of Fish-cum- Duck, Quail and Rabbit Farming	3(2+1)

Note: Details of course contents are described in syllabi of concerned Department/Subject.

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