

GURU KASHI UNIVERSITY



Bachelor of Science (Agriculture)

Session: 2023-24

UG Studies in Agriculture

PROGRAMME OUTCOMES

1. Provide information on the productivity of agricultural systems now and under different climate impact scenarios, innovative and sustainable agricultural monitoring systems, methods and tools integrating geospatial.
2. Students will demonstrate the ability to communicate effectively both orally and in writing.
3. Students will demonstrate knowledge of the legal and ethical environment impacting agriculture organizations and exhibit an understanding and appreciation of the ethical implications of decisions.
4. Students will demonstrate an understanding of and appreciation for the importance of the impact of globalization and diversity in modern agriculture organizations.
5. Students will demonstrate an ability to engage in critical thinking by analyzing situations and constructing and selecting viable solutions to solve problems.
6. Students will demonstrate an ability to work effectively with others.
7. Students will understand and analyze the current events and issues that are occurring in agriculture and how they affect your future in agriculture.
8. Students will be able to recognize and examine the relationships between inputs and outputs in their agricultural field to make effective and profitable decisions.
9. Students will understand how all aspects of agriculture combine and are used by scientists, marketers, and producers.
10. Students will understand how employer characteristics and decision-making at various levels enhance the success of an agricultural enterprise.
11. Students will be able to demonstrate critical thinking and problem solving skills as they apply to a variety of animal and or plant production systems.
12. Students will demonstrate the ability to analyze data and draw appropriate statistical conclusions.

PROGRAMME SPECIFIC OUTCOMES

1. Imparting detailed knowledge of Agriculture and its allied branches
2. Facilitating detailed study of various principles and techniques of agriculture forestry, livestock and other allied branches required to raise the income of farmers.

Programme Structure

Semester: 1 st								
Sr. No.	Subject Code	Subject Name	Type of Subject T/P		(Hour Per Week)			No. of Credits
					L	T	P	
1.	BAG101	Fundamentals of Agronomy	Core	T	2	0	0	2
2.	BAG102	Fundamentals of Genetics	Core	T	2	0	0	2
3.	BAG103	Fundamentals of Soil Science	Core	T	2	0	0	2
4.	BAG104	Fundamentals of Horticulture	Core	T	1	0	0	1
5.	BAG105	Rural Sociology & Educational Psychology	Skill based	T	1	0	0	1
6.	BAG106	Introduction to Forestry	Core	T	1	0	0	1
7.	BAG107	Introductory Animal Husbandry	Core	T	2	0	0	2
8.	BAG110	Introductory Biology	ID	T	1	0	0	1
9.	BAG112	Elementary Mathematics	ID	T	2	0	0	2
10.	BAG114	Fundamentals of Agronomy Lab.	Skill Based	P	0	0	2	1
11.	BAG115	Fundamentals of Genetics Lab.	Skill Based	P	0	0	2	1
12.	BAG116	Fundamentals of Soil Science Lab.	Skill Based	P	0	0	2	1
13.	BAG117	Fundamentals of Horticulture Lab.	Skill Based	P	0	0	2	1
14.	BAG118	Rural Sociology & Educational Psychology Lab.	Skill based	P	0	0	2	1
15.	BAG119	Introduction to Forestry Lab.	Skill Based	P	0	0	2	1
16.	BAG120	Introductory Animal Husbandry Lab.	Skill Based	P	0	0	2	1
17.	BAG121	Introductory Biology Lab.	ID	P	0	0	2	1
18.	BAG123	Comprehension & Communication Skills in English Lab.	Ability Enhancement	P	0	0	2	1
19.	BAG124	NSS/NCC/Physical Education & Yoga Practices**	Ability Enhancement	P	0	0	2	1
Total No. of Credits								24

Semester: 2 nd								
Sr. No.	Subject Code	Subject Name	Type of Subject T/P		(Hours Per Week)			No. of Credits
					L	T	P	
1.	BAG201	Fundamentals of Crop Physiology	Core	T	2	0	0	2
2.	BAG202	Fundamentals of Plant Biochemistry	Core	T	2	0	0	2
3.	BAG203	Fundamentals of Entomology-I	Core	T	2	0	0	2
4.	BAG204	Fundamentals of Agricultural Economics	Core	T	2	0	0	2
5.	BAG205	Principles of Organic Farming	Core	T	1	0	0	1
6.	BAG206	Fundamentals of Plant Pathology	Core	T	3	0	0	3
7.	BAG207	Production Technology for Vegetables and Spices	Technical Skills	T	1	0	0	1
8.	BAG208	Fundamentals of Agricultural Extension Education	Ability Enhancement	T	2	0	0	2
9.	BAG209	Dairy Processing and Safety Issues	Technical Skills	T	2	0	0	2
10.	BAG210	Human Values & Ethics	Ability Enhancement	T	1	0	0	1
11.	BAG211	Fundamentals of Crop Physiology Lab.	Skill Based	P	0	0	2	1
12.	BAG212	Fundamentals of Plant Biochemistry Lab.	Skill Based	P	0	0	2	1
13.	BAG213	Fundamentals of Entomology-I Lab.	Skill Based	P	0	0	2	1
14.	BAG214	Principles of Organic Farming Lab.	Skill Based	P	0	0	2	1
15.	BAG215	Fundamentals of Plant Pathology Lab.	Skill Based	P	0	0	2	1
16.	BAG216	Production Technology for Vegetables and Spices Lab.	Technical Skills	P	0	0	2	1
17.	BAG217	Fundamentals of Agricultural Extension Education Lab.	Ability Enhancement	P	0	0	2	1
18.	BAG218	Dairy Processing and Safety Issues Lab.	Technical Skills	P	0	0	2	1
Total No. of Credits								26

Semester: 3 rd								
Sr. No.	Subject Code	Subject Name	Type of Subject T/P		(Hours Per Week)			No. of Credits
					L	T	P	
1.	BAG301	Crop Production Technology -1 (Kharif crops)	Core	T	1	0	0	1
2.	BAG302	Fundamentals of Plant Breeding	Core	T	2	0	0	2
3.	BAG303	Agricultural Microbiology	Core	T	1	0	0	1
4.	BAG304	Agricultural Finance and Co-Operation	Core	T	2	0	0	2
5.	BAG305	Farm Machinery and Power	Technical Skills	T	2	0	0	2
6.	BAG306	Principles of Integrated Disease Management	Core	T	2	0	0	2
7.	BAG308	Statistical Methods	Technical Skills	T	1	0	0	1
8.	BAG309	Fundamental of Soil and Water Conservation	Technical Skills	T	1	0	0	1
9.	BAG310	Dairy Science	Ability Enhancement	T	1	0	0	1
10.	BAG311	Fundamentals of Entomology-II	Core	T	1	0	0	1
11.	BAG312	Crop Production Technology -1 (Kharif crops) Lab.	Skill Based	P	0	0	2	1
12.	BAG314	Fundamentals of Plant Breeding Lab.	Skill Based	P	0	0	2	1
13.	BAG315	Agricultural Microbiology Lab.	Skill Based	P	0	0	2	1
14.	BAG316	Agricultural Finance and Co-Operation Lab.	Skill Based	P	0	0	2	1
15.	BAG317	Farm Machinery and Power Lab.	Technical Skills	P	0	0	2	1
16.	BAG318	Principles of Integrated Disease Management Lab.	Skill Based	P	0	0	2	1
17.	BAG320	Statistical Methods Lab.	Technical Skills	P	0	0	2	1
18.	BAG321	Fundamental of Soil and Water Conservation Lab.	Technical Skills	P	0	0	2	1
19.	BAG322	Dairy Science Lab.	Ability Enhancement	P	0	0	2	1
20.	BAG323	Fundamentals of Entomology-II Lab.	Skill Based	P	0	0	2	1
Total No. of Credits								24

Semester: 4th

Sr. No.	Subject Code	Subject Name	Type of Subject T/P		(Hours Per Week)			No. of Credits
					L	T	P	
1.	BAG401	Crop Production Technology -II (<i>Rabi Crops</i>)	Core	T	1	0	0	1
2.	BAG402	Principles of Seed Technology	Technical Skills	T	2	0	0	2
3.	BAG403	Problematic Soils and their Management	Core	T	2	0	0	2
4.	BAG404	Renewable Energy and Green Technology	Core	T	1	0	0	1
5.	BAG405	Production Technology for Ornamental Crops, MAP and Landscaping	Technical Skills	T	1	0	0	1
6.	BAG406	Entrepreneurship Development and Business Communication	Ability Enhancement	T	1	0	0	1
7.	BAG407	Introductory meteorology & Agro-Climate Change	Technical Skills	T	1	0	0	1
8.	BAG408	Agri- Informatics	Technical Skills	T	1	0	0	1
9.	BAG409	Poultry Production & Management	Ability Enhancement	T	2	0	0	2
10.	BAG420	Environmental Studies & Disaster Management	Ability Enhancement	T	1	0	0	1
11.	BAG410	Crop Production Technology -II (Rabi Crops) Lab.	Skill Based	P	0	0	2	1

12.	BAG412	Principles of Seed Technology Lab.	Technical Skills	P	0	0	2	1
13.	BAG413	Problematic Soils and their Management Lab.	Skill Based	P	0	0	2	1
14.	BAG414	Renewable Energy and Green Technology Lab.	Skill Based	P	0	0	2	1
15.	BAG415	Production Technology for Ornamental Crops, MAP Lab.	Technical Skills	P	0	0	4	2
16.	BAG416	Entrepreneurship Development and Business Lab.	Ability Enhancement	P	0	0	2	1
17.	BAG417	Introductory Agro-meteorology & Climate Change Lab.	Technical Skills	P	0	0	2	1
18.	BAG418	Agri- Informatics Lab.	Technical Skills	P	0	0	2	1
19.	BAG419	Poultry Production & Management Lab.	Ability Enhancement	P	0	0	2	1
Total No. of Credits								23

Semester:5 th								
Sr. No.	Subject Code	Subject Name	Type of Subject T/P		(Hours Per Week)			No. of Credits
					L	T	P	
1.	BAG501	Rainfed and Dryland Agriculture	Core	T	1	0	0	1
2.	BAG502	Crop Improvement-1 (<i>Kharif</i> crops)	Core	T	1	0	0	1
3.	BAG503	Pests of Crops and Stored Grain and their Management	Core	T	2	0	0	2
4.	BAG504	Agricultural Marketing, Trade & Prices	Technical Skills	T	2	0	0	2
5.	BAG505	Protected Cultivation and Secondary Agriculture	Technical Skills	T	2	0	0	2
6.	BAG506	Diseases of Field and Horticultural Crops and their Management-I	Core	T	2	0	0	2
7.	BAG507	Production Technology for Fruit and Plantation Crops	Core	T	1	0	0	1
8.	BAG510	Principles of Food Science & Nutrition	Core	T	2	0	0	2
9.	BAG511	Geo-informatics and Nanotechnology	Technical Skills	T	1	0	0	1
10.	Elective-I	Elective-1 (BAG512/ BAG513/ BAG514/ BAG515/ BAG516/ BAG517)	Technical Skills	T	2	0	0	2
11.	BAG518	Rainfed and Dryland Agriculture Lab.	Skill based	P	0	0	2	1
12.	BAG519	Crop Improvement-1 (<i>Kharif</i> crops) Lab.	Skill based	P	0	0	2	1
13.	BAG520	Pests of Crops and Stored Grain and their Management Lab.	Skill based	P	0	0	2	1
14.	BAG521	Agricultural Marketing Trade & Prices Lab.	Technical Skills	P	0	0	2	1
15.	BAG522	Lab-Protected Cultivation and Secondary Agriculture Lab.	Technical Skills	P	0	0	2	1
16.	BAG523	Diseases of Field and Horticultural Crops and their Management-I Lab.	Skill based	P	0	0	2	1
17.	BAG524	Production Technology for Fruit and Plantation Crops Lab.	Skill based	P	0	0	2	1
18.	BAG527	Geo-informatics and Nanotechnology Lab.	Technical Skills	P	0	0	2	1
19.	Elective-I Lab.	Lab-Elective-I (BAG528/ BAG529/ BAG530/ BAG531/ BAG532/ BAG533)	Technical Skills	P	0	0	2	1
Total No. of Credits								25

Elective Courses : A student can select one elective course (Theory and practical) out of the following in the 5th semester								
Sr. No.	Course Code	Courses	Type of Course		L	T	P	No. of Credits
1	BAG512	Agribusiness Management	Technical Skills	T	2	0	0	2
2	BAG513	Agrochemicals	Technical Skills	T	2	0	0	2
3	BAG514	Commercial Plant Breeding	Technical Skills	T	2	0	0	2
4	BAG515	Landscaping	Technical Skills	T	2	0	0	2
5	BAG516	Food Safety and Standards	Technical Skills	T	2	0	0	2
6	BAG517	Bio pesticides & Bio fertilizers	Technical Skills	T	2	0	0	2
7	BAG528	Agribusiness Management Lab.	Technical Skills	P	0	0	2	1
8	BAG529	Agrochemicals Lab.	Technical Skills	P	0	0	2	1
9	BAG530	Commercial Plant Breeding Lab.	Technical Skills	P	0	0	2	1
10	BAG531	Landscaping Lab.	Technical Skills	P	0	0	2	1
11	BAG532	Food Safety and Standards Lab.	Technical Skills	P	0	0	2	1
12	BAG533	Bio pesticides & Bio fertilizers Lab.	Technical Skills	P	0	0	2	1

Semester: 6 th								
Sr. No.	Subject Code	Subject Name	Type of Subject T/P		(Hours Per Week)			No. of Credits
					L	T	P	
1.	BAG601	Farming System, Precision Farming & Sustainable Agriculture	Core	T	1	0	0	1
2.	BAG602	Crop Improvement-II (Rabi crops)	Core	T	1	0	0	1
3.	BAG603	Manures, Fertilizers and Soil Fertility Management	Core	T	2	0	0	2
4.	BAG604	Farm Management, Production & Resource Economics	Technical Skills	T	1	0	0	1
5.	BAG605	Diseases of Field and Horticultural Crops and their Management-II	Core	T	2	0	0	2
6.	BAG606	Post-harvest Management and Value Addition of Fruits and Vegetables	Ability Enhancement	T	1	0	0	1
7.	BAG607	Watershed and Wasteland Management	Technical Skills	T	1	0	0	1
8.	BAG608	Beneficial Insects and Pest of Horticultural Crops and their Management	Core	T	2	0	0	2
9.	BAG629	Intellectual Property Rights	Ability Enhancement	T	1	0	0	1
10.	Elective-II	Elective-II (BAG609/BAG610/BAG611/ BAG612/ BAG613/ BAG614)	Technical Skills	T	2	0	0	2
11.	BAG615	Farming System, Precision Farming & Sustainable Agriculture Lab.	Skill based	P	0	0	2	1
12.	BAG616	Crop Improvement-II (Rabi crops) Lab.	Skill based	P	0	0	2	1
13.	BAG617	Manures, Fertilizers and Soil Fertility Management Lab.	Skill based	P	0	0	2	1
14.	BAG618	Farm Management, Production & Resource Economics Lab.	Technical Skills	P	0	0	2	1
15.	BAG619	Diseases of Field and Horticultural	Skill based	P	0	0	2	1

		Crops and their Management-II Lab.						
16.	BAG620	Post-harvest Management and Value Addition of Fruits and Vegetables Lab.	Ability Enhancement	P	0	0	2	1
17.	BAG621	Watershed and Wasteland Management Lab.	Technical Skills	P	0	0	2	1
18.	BAG622	Beneficial Insects and Pest of Horticultural Crops and their Management Lab.	Skill based	P	0	0	2	1
19.	Elective-II Lab.	Elective-II (BAG623/ BAG624/ BAGL626/ BAG628 Lab.	Technical Skills	P	0	0	2	1
20.		Educational Tour**	Technical Skills	P	0	0	4 (Non gradial)	2
Total No. of Credits								23

Elective Courses : A student can select one elective course (Theory and practical) out of the following in the 6th semester								
Sr. No.	New Course Code	Courses	Type of Course	L	T	P	No. of Credits	
1	BAG609	Protected Cultivation	Technical Skills	T	2	0	0	2
2	BAG610	Hi-tech. Horticulture	Technical Skills	T	2	0	0	2
3	BAG611	Weed Management	Technical Skills	T	2	0	0	2
4	BAG612	System Simulation and Agro-advisory	Technical Skills	T	2	0	0	2
5	BAG613	Agricultural Journalism	Technical Skills	T	2	0	0	2
6	BAG614	Composition cum Duck/ (and) Quail/(and) Rabbit culture.	Technical Skills	T	2	0	0	2
7	BAG623	Protected Cultivation Lab.	Technical Skills	P	0	0	2	1
8	BAG624	Hi-tech. Horticulture Lab.	Technical Skills	P	0	0	2	1
9	BAG625	Weed Management Lab.	Technical Skills	P	0	0	2	1
10	BAG626	System Simulation and Agro-advisory Lab.	Technical Skills	P	0	0	2	1
11	BAG827	Agricultural Journalism Lab.	Technical Skills	P	0	0	2	1
12	BAG628	Composition cum Duck/ (and) Quail/(and) Rabbit culture Lab.	Technical Skills	P	0	0	2	1

Programme name: B.Sc. Agriculture (Hons.) 4 year									
Programme structure: BAG									
7th Semester									
Rural Agricultural Work Experience and Agro-industrial Attachment (RAW & AIA)									
S.No.	Course Code	Activities	Type of Subject		No. of Weeks	L	T	P	No. of Credits
1	BAG701	General Orientation & On Campus Training by different Faculties	Ability Enhancement	P	1	NA	NA	NA	14
2	BAG702	Village Attachment	Ability Enhancement	P	8	NA	NA	NA	
3	BAG703	Unit Attachment in Univ. / College. KVK/Research Station Attachment	Ability Enhancement	P	5	NA	NA	NA	
4	BAG704	Plant Clinic	Ability Enhancement	P	2	NA	NA	NA	2
5	BAG705	Agro-Industrial Attachment	Ability Enhancement	P	3	NA	NA	NA	4
6	BAG706	Project Report Preparation, Presentation and Evaluation	Ability Enhancement	P	1	NA	NA	NA	
Total weeks for RAW & AIA					20				20

**RAW Component-I
Village Attachment Training Programme**

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

RAWE Component -II

Sr. No.	Activity
1	Agro Industrial Attachment
1a	Students shall be placed in Agro-and Cottage industries and Commodities Boards for 03 weeks.
1b	Industries include Seed/Sapling production, Pesticides-insecticides. Post-harvest- processing- value addition, Agri-finance institutions. etc.
2	Activities and Tasks during Agro- Industrial Attachment Programme
2a	Acquaintance with Industry and staff
2b	Study of structure, functioning, objective and mandates of the Industry
2c	Study of various processing units and hands- on trainings under supervision of Industry staff
2d	Ethics of industry
2e	Employment generated by the Industry
2f	Contribution of the Industry promoting environment
2g	Learning business network including outlets of the Industry
2h	Skill development in all crucial tasks of the Industry
2i	Documentation of the activities and task performed by the students
2j	Performance evaluation appraisal and ranking of students

Programme name: B.Sc. Agriculture (Hons.) 4 year**Programme structure: BAG****8th Semester**

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

Sr. No.	Course Code	Title of the module	Type of Course		L	T	P	Credits
1	BAG801	Production Technology for Bio agents and Bio fertilizer	Technical Skills	P	0	0	20	10
2	BAG802	Seed Production and Technology	Technical Skills	P	0	0	20	10
3	BAG803	Mushroom Cultivation Technology	Technical Skills	P	0	0	20	10
4	BAG804	Soil, Plant, Water and Seed Testing	Technical Skills	P	0	0	20	10
5	BAG805	Commercial Beekeeping	Technical Skills	P	0	0	20	10
6	BAG806	Poultry Production Technology	Technical Skills	P	0	0	20	10
7	BAG807	Commercial Horticulture	Technical Skills	P	0	0	20	10
8	BAG808	Floriculture and Landscaping	Technical Skills	P	0	0	20	10
9	BAG809	Food Processing	Technical Skills	P	0	0	20	10
10	BAG810	Agriculture Waste Management	Technical Skills	P	0	0	20	10
11	BAG811	Organic Production Technology	Technical Skills	P	0	0	20	10
12	BAG812	Commercial Sericulture	Technical Skills	P	0	0	20	10

Programme name: B.Sc. Agriculture (Hons.) 4 year

Programme structure: BAG

Evaluation of Experiential Learning Programme

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

Programme name: B.Sc. Agriculture (Hons.) 4 year		
Programme structure: BAG		
Discipline wise credits		
Sr. No.	Group	Credits
1	Agronomy	17
2	Genetics & Plant Breeding	16
3	Soil Science & Agricultural Chemistry	15
4	Entomology	11
5	Agricultural Economics	10
6	Agricultural Engineering	8
7	Plant Pathology	13
8	Horticulture	10
9	Agricultural Extension	9
10	Soil Conservation	10
11	Statistics, Computer Application and I.P.R.	5
12	Animal Husbandry and Dairying	15
13	English	2
12	Remedial Courses*	05 (Bio/Math); 05(Agriculture)
15	NSS/NCC/Physical Education & Yoga Practices**	2
16	Human Values and Ethics**	1
17	Educational Tour**	2
	Total	141+5*+5** +6 credits elective = 157
	RAWE	20
	ELP	20
	Grand Total	157+20+20=197
	* Remedial courses	
	** Non-gradual courses	

Evaluation Criteria for Theory Courses

- A. Continuous Assessment: [25 Marks]
 - Continuous Assessment 1: [10 Marks]
 - Continuous Assessment 2: [10 Marks]
 - Continuous Assessment 3: [05 Marks]

- B. Mid Semester Test-1: [30 Marks]
- C. Mid Semester Test-2: [20 Marks]
- D. End-Term Exam: [20 Marks]
- E. Attendance: [5 Marks]

For the CAs the teacher shall take surprised test/term paper/quiz/assignments

Evaluation Criteria for practical Courses

The syllabus of subject is divided into five experiments, each experiment is of 20 marks (10 lab performance, 5 *viva*, 5 lab record)- Total marks 100

Course Title: Fundamentals of Agronomy

Course Code: BAG-101

L	T	P	Credits
2	0	0	2

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Describe the role of physiological processes controlling plant growth and development. Understand the effect of environment and management on crop growth, rate of development, water and nutrient use efficiency. Use decision support system, Yield Propfit to understand probability of achieving various levels of productivity and the influence of water and nitrogen stress on predicted crop yield.
CO2	Describe the impact of latest crop management practices on crop productivity and resource use efficiency, Undertake sampling of plants and soils for routine analysis of soil water and crop growth and development
CO3	Interpret results of research on crop growth and development, radiation interception and radiation use efficiency; crop water use and water use efficiency.
CO4	Understand the behaviour of herbicides in the environment and evolution of herbicide resistance in weeds and their management.

Course contents

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

Weeds- importance, classification, crop-weed competition, concepts of weed management principles and methods, herbicides- classification, selectivity and resistance, allelopathy. Growth and development of crops, factors affecting growth and development, plant ideo types, crop rotation and its principles, adaptation and distribution of crops, crop management technologies in problematic areas, harvesting and threshing of crops.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Singh, Chhidda. 2022. Modern techniques of raising field corps. Oxford and IBH Publishing Co. Ltd., Bangalore.
2. Gopal Chandra De. 1980., Fundamentals of Agronomy. Oxford and IBH Publishing Co. Ltd., Bangalore.
3. Palaniappan, S.P. 2002. Cropping Systems in the tropics – Principles and Practices. Willey Eastern Ltd., New Delhi.
4. Panda, S.C., 2006. Agronomy Agribios Publication, New Delhi.

Course Outcomes: On successful completion of this course, the students will able to learn:

Courses contents

CO	Statement
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CO2	Describe the impact of latest crop management practices on crop productivity and resource use efficiency, Undertake sampling of plants and soils for routine analysis of soil water and crop growth and development
CO3	Interpret results of research on crop growth and development, radiation interception and radiation use efficiency; crop water use and water use efficiency.
CO4	Understand the behaviour of herbicides in the environment and evolution of herbicide resistance in weeds and their management.

Identification of crops, seeds, fertilizers, pesticides and tillage implements, study of agro-climatic zones of India, Identification of weeds in crops, Methods of herbicide and fertilizer application, Study of yield contributing characters and yield estimation, Seed germination and viability test, Numerical exercises on fertilizer requirement, plant population, herbicides and water requirement, Use of tillage implements-reversible plough, one-way plough, harrow, leveler, seed drill.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Singh, Chhidda. 2022. Modern techniques of raising field crops. Oxford and IBH Publishing Co. Ltd., Bangalore.
2. Gopal Chandra De. 1980., Fundamentals of Agronomy. Oxford and IBH Publishing Co. Ltd., Bangalore.
3. Palaniappan, S.P. 2002. Cropping Systems in the tropics – Principles and Practices. Willey Eastern Ltd., New Delhi.
4. Panda, S.C., 2006. Agronomy Agribios Publication, New Delhi.

Course Title: Fundamentals of Genetics
Course Code: BAG102

L	T	P	Credits
2	0	0	2

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	To understand basic structure and functions of DNA and chromosomes, basics of the molecular processes of DNA replication, transcription and translation.
CO2	To understand the basic laws of inheritance for qualitative and quantitative traits.
CO3	To understand basic biochemical pathways of Carbohydrate, lipids , proteins and other essential secondary metabolites.
CO4	Gene regulation.

Course Contents

Pre and Post Mendelian concepts of heredity, Mendelian principles of heredity. Architecture of chromosomes and their types. Chromosomal theory of inheritance, cell cycle and types of cell division. Probability and Chi-square. Dominant and recessive characters, epistatic interactions. Multiple alleles, pleio-tropism and pseudo alleles, Sex determination and sex linkage, Blood group genetics, Linkage and its estimation, crossing over mechanisms. Structural and numerical variations in chromosome and their implications, uses of haploids, diploids and doubled haploids in Genetics. Mutation, classification, Methods of inducing mutations & CIB technique, mutagenic agents and induction of mutation. Qualitative & Quantitative traits, Polygenes and continuous variations, multiple factor hypothesis, Cytoplasmic inheritance. Genetic disorders. Nature, structure & replication of genetic material. Protein synthesis, Transcription and translational mechanism of genetic material, Gene structure, function and regulation, LAC and TRP operons.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Gupta, P. K. 2005. *Cell and Molecular Biology*. Rastogi publications, Meerut, India. pp. 942
2. Gupta, P. K. 2009. *Genetics*. Rastogi publications, Meerut, India. pp. 628.
3. Singh, B.D. 2009. *Fundamentals of Genetics*. Kalyani Publishers, Ludhiana, India. pp. 825.
4. Snusted, D. P., Simmons, M. J. 2010. *Principles of Genetics*. John Wiley & Sons, New York. pp. 882.

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	To understand basic structure and functions of DNA and chromosomes, basics of the molecular processes of DNA replication, transcription and translation.
CO2	To understand the basic laws of inheritance for qualitative and quantitative traits.
CO3	To understand basic biochemical pathways of Carbohydrate, lipids , proteins and other essential secondary metabolites.
CO4	Gene regulation.

Course Content

Study of microscope. Study of cell structure. Mitosis and Meiosis cell division. Experiments on mono-hybrid, di-hybrid, tri-hybrid, 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.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Gupta, P. K. 2005. *Cell and Molecular Biology*. Rastogi publications, Meerut, India. pp. 942.
2. Gupta, P. K. 2009. *Genetics*. Rastogi publications, Meerut, India. pp. 628.
3. Singh, B.D. 2009. *Fundamentals of Genetics*. Kalyani Publishers, Ludhiana, India. pp. 825.
4. Snusted, D. P., Simmons, M. J. 2010. *Principles of Genetics*. John Wiley & Sons, New York. pp. 882.

Course Title: Fundamentals of Soil Science
Course Code: BAG103

L	T	P	Credits
2	0	0	2

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	To acquire knowledge about soil formation and classification.
CO2	To understand the physical and chemical properties of soil.
CO3	To understand the soil moisture dynamics in soil, understand the thermal properties, gaseous exchange of soil.
CO4	To acquire knowledge about soil organic method and biology of soil.

Course Content

Soil as a natural body, Pedological and edaphological concepts of soil; Soil genesis: soil forming rocks and minerals; weathering, processes and factors of soil formation; Soil Profile, components of soil; Soil physical properties: soil-texture, structure, density and porosity, soil colour, consistence and plasticity; Elementary knowledge of soil taxonomy classification and soils of India; Soil water retention, movement and availability; Soil air, composition, gaseous exchange, problem and plant growth, Soil temperature; source, amount and flow of heat in soil; effect on plant growth, Soil reaction-pH, soil acidity and alkalinity, buffering, effect of pH on nutrient availability; Soil colloids -inorganic and organic; silicate clays: constitution and properties; sources of charge; ion exchange, cation exchange capacity, base saturation; Soil organic matter: composition, properties and its influence on soil properties; Humic substances - nature and properties; soil organisms: macro and microorganisms, their beneficial and harmful effects; Soil pollution - behavior of pesticides and inorganic contaminants, prevention and mitigation of soil pollution.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. ISSS. 2009. *Fundamentals of Soil Science*. 2nd Ed. Indian Society of Soil Science, New Delhi- 110 012. pp. 728.
2. Das, D. K. 2011. *Introductory Soil Science*, 3rd revised and Enlarged Ed, Kalyani Publisher, Ludhiana. pp. 645.
3. Weil, R.R. and Brady, N. C. 2017. *The Nature and Properties of Soils*. 15th edition Publisher: Pearson Education, ISBN: 978-0133254488
4. Daji, J.A., Daji J A; Kadam, J.R. and Patil, N.D. 1996. *Textbook of Soil Science* Bombay Media Promoters and publishers Pvt. Ltd.
5. Biswas, T.D. and Mukherjee, S.K. 1995. *Text Book of Soil Science* 2nd sEd. Tata McGraw Hill Publisher, Delhi pp 433.
6. Mehara , R. K. 2004. *Text Book of Soil Science.*, ICAR, New Delhi.
7. Patil, V. D. and Mali C. V. 2007. *Fundamentals of Soil Science*, Aman Publication, Meerut.
8. Nirankari, L.S. 2000. *Text Book of Soil Science*. Aman Publication, Meerut.
9. Dahama , A. K. *Organic farming for sustainable agriculture*. 19, AgrobotanicaBinaker. pp 53-98 and 210-255.

Course Title: Lab. Fundamentals of Soil Science
Course Code: BAG116

L	T	P	Credits
0	0	2	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	To acquire basic concept, techniques and calculation of analytical chemistry.
CO2	To develop skill about collection of soil sample for various purpose.
CO3	To acquire knowledge about the determination of bulk density and particle density of soil.
CO4	To understand the mechanical analysis of soil.

Course Contents

Study of soil profile in field. Study of soil sampling tools, collection of representative soil sample, its processing and storage. Study of soil forming rocks and minerals. Determination of soil density, moisture content and porosity. Determination of soil texture by feel and Bouyoucos Methods. Determination of soil pH and electrical conductivity. Determination of cation exchange capacity of soil. Study of soil map. Determination of soil colour. Estimation of organic matter content of soil.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. ISSS. 2009. *Fundamentals of Soil Science*. 2nd Ed. Indian Society of Soil Science, New Delhi- 110 012. pp. 728.
2. Das D. K. 2011. *Introductory Soil Science*, 3rd revised and Enlarged Ed, Kalyani Publisher, Ludhiana. pp. 645.
3. Brady, N. C. 2016. *The Nature and Properties of Soils*. 15th edition Publisher: Pearson Education, ISBN: 978-0133254488
4. Daji J A; Daji J A; Kadam J R; Patil N D.1996. *Textbook of Soil Science* Bombay Media Promoters and publishers Pvt. Ltd.
5. Biswas, T.D.; Mukherjee, S.K.. 1995. *Text Book of Soil Science* 2nd sEd. Tata McGraw Hill Publisher, Delhi pp 433.
6. Mehara , R. K. 2004. *Text Book of Soil Science.*, ICAR, New Delhi.
7. Patil, V. D. and Mali C. V. 2007. *Fundamentals of Soil Science*, Aman Publication, Meerut.
8. Nirankari Lal Singh. 2000. *Text Book of Soil Science*. Aman Publication, Meerut.
9. Dahama , A. K. *Organic farming for sustainable agriculture*. 19, AgrobotanicaBinaker. Pp 53-98 and 210-255.

Course Title: Fundamentals of Horticulture
Course Code: BAG104

L	T	P	Credits
1	0	0	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Apply concepts of horticulture science to select, manage, and improve plants and their products, Describe social, spiritual, and cultural importance of plants to historical and contemporary communities of people
CO2	Demonstrate competence with laboratory and/or field-based technologies used in modern horticulture
CO3	Anticipate and recognize problems, identify causes of these problems, quantify potential impacts, analyze options, identify viable solutions, and evaluate actions and consequences of treatments and interventions
CO4	Understand how global issues including climate change, energy use, water availability, and/or food safety impact sustainability of horticultural systems locally, nationally, and globally

Course Contents

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

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Singh, S., Katyal, S.L. and Krishnamurthi, S. 1963. Fruit Culture in India, Government Publication, pp. 451
2. Chadda, K.L. 2001. Handbook of Horticulture, ICAR Publication, pp.1031.
3. Kunte, Y.N and Yawalkar, 2005. Principles of Horticulture and Fruit growing, Agro-Horticultural Publishing house, pp. 363.
4. Shanmugvelu, K.G. 1989. Production Technology of Fruit Crops, Oxford & IBH Publishing Company, pp. 930.

Course Title: Lab. Fundamentals of Horticulture

Course Code: BAG117

L	T	P	Credits
0	0	2	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Demonstrate competence with laboratory and/or field-based technologies used in modern horticulture.
CO2	Anticipate and recognize problems, identify causes of these problems, quantify potential impacts, analyze options, identify viable solutions, and evaluate actions and consequences of treatments and interventions
CO3	Understand how global issues including climate change, energy use, water availability, and/or food safety impact sustainability of horticultural systems locally, nationally, and globally
CO4	Identifies and applies, as appropriate, quantitative methods for defining and responding to horticultural problems.

Course contents

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

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Singh, S., Katyal, S.L. and Krishnamurthi, S. 1963. Fruit Culture in India, Government Publication, pp. 451
2. Chadda, K.L. 2001. Handbook of Horticulture, ICAR Publication, pp.1031.
3. Kunte, Y.N. and Yawalkar, 2005. Principles of Horticulture and Fruit growing, Agro-Horticultural Publishing house, pp. 363.
4. Shanmugvelu, K.G. 1989. Production Technology of Fruit Crops, Oxford & IBH Publishing Company, pp. 930.

Course Title: Rural Sociology & Educational Psychology
Course Code: BAG105

L	T	P	Credits
1	0	0	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Understand the meaning, scope and importance of sociology and psychology of rural areas.
CO2	Extend the education in rural areas to bridge gap between rural and urban societies.
CO3	Provide knowledge of social organization.
CO4	Know the scope and importance of education psychology in agricultural extension.
CO5	Attain knowledge about selection of leader, leadership and role of leader

Course contents

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

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested readings:

1. Ray, G.L. 2003. *Extension Communication and Management*. Kalyani Publishers. Fifth revised and enlarged edition. Vol. 5, 2003. pp 67-88
2. Dahama, O.P. and Bhatnagar, O.P. 2003. *Education and Communication for Development*. Oxford and IBH Publishing Co. Pvt. Ltd. Vol. 2, 2003. pp 77-110
3. Sandhu, A.S. 1993. *Textbook on Agricultural Communication: Process and Methods*. Oxford and IBH Publishing Co. Pvt. Ltd. Vol. 1, 1993. pp 256-290
4. Desai, A.R. 1978. *Rural Sociology in India*. Bombay, Popular Prakashan, 5th Rev. ed. Vol. 5, 1978. pp 267-288

Course Title: Lab. Rural Sociology & Educational Psychology
Course Code: BAG118

L	T	P	Credits
1	0	0	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Understand the meaning, scope and importance of sociology and psychology of rural areas.
CO2	Extend the education in rural areas to bridge gap between rural and urban societies.
CO3	Provide knowledge of social organization.
CO4	Know the scope and importance of education psychology in agricultural extension.
CO5	Attain knowledge about selection of leader, leadership and role of leader

Course contents

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.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested readings:

1. Ray, G.L. 2003. *Extension Communication and Management*. Kalyani Publishers. Fifth revised and enlarged edition. Vol. 5, 2003. pp 67-88
2. Dahama, O.P. and Bhatnagar, O.P. 2003. *Education and Communication for Development*. Oxford and IBH Publishing Co. Pvt. Ltd. Vol. 2, 2003. pp 77-110
3. Sandhu, A.S. 1993. *Textbook on Agricultural Communication: Process and Methods*. Oxford and IBH Publishing Co. Pvt. Ltd. Vol. 1, 1993. pp 256-290
4. Desai, A.R. 1978. *Rural Sociology in India*. Bombay, Popular Prakashan, 5th Rev. ed. Vol. 5, 1978. pp 267-288

Course Title: Introduction to Forestry

Course Code: BAG106

L	T	P	Credits
1	0	0	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Familiar with concept of agro forestry.
CO2	Models and design of agro forestry along with crops.
CO3	Merits of different type of agroforestry system.
CO4	Dinferisation and sustainable type of farming

Course Contents

Introduction – definitions of basic terms related to forestry, objectives of silvi culture, forest classification, salient features of Indian Forest Policies. Forest regeneration, Natural regeneration - natural regeneration from seed and vegetative parts, coppicing, pollarding, root suckers; Artificial regeneration – objectives, choice between natural and artificial regeneration, essential preliminary considerations. Crown classification. Tending operations – weeding, cleaning, thinning – mechanical, ordinary, crown and advance thinning. Forest mensuration – objectives, diameter measurement, instruments used in diameter measurement; Non instrumental methods of height measurement - shadow and single pole method; Instrumental methods of height measurement - geometric and trigonometric principles, instruments used in height measurement; tree stem form, form factor, form quotient, measurement of volume of felled and standing trees, age determination of trees. Agroforestry – definitions, importance, criteria of selection of trees in agroforestry, different agroforestry systems prevalent in the country, shifting cultivation, taungya, alley cropping, wind breaks and shelter belts, home gardens. Cultivation practices of two important fast growing tree species of the region.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings

1. Bridger Blakeney. 2012. *Handbook of Forestry*. Agrotech Press. pp. 300.
2. Khanna, L.S. 2015. *Principles and Practice of Silviculture*. Agrotech Press. pp. 484.
3. Singh, S.P. 2020. *Handbook of Agroforestry*. Agrotech Publication. pp. 207.
4. A.P. Dwivedi. 2019. *Agroforestry Principle and Practice*. Oxford & Ibh publication Co.Pvt.Ltd. pp. 380.
5. Namkoong, G.K., Hyun, C. and Buruard, J.S. 1988. *Tree breeding: principle and strategies*. Sprieger.pp. 180.

Course Title: Lab. Introduction to Forestry
Course Code: BAG119

L	T	P	Credits
0	0	2	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Familiar with concept of Agro forestry.
CO2	Models and design of agro forestry along with crops.
CO3	Merits of different type of agroforestry system.
CO4	Dinferisation and sustainable type of farming

Course contents

Identification of tree-species. Diameter measurements using calipers and tape, diameter measurements of forked, buttressed, fluted and leaning trees. Height measurement of standing trees by shadow method, single pole method and hypsometer. Volume measurement of logs using various formulae. Nursery lay out, seed sowing, vegetative propagation techniques. Forest plantations and their management. Visits of nearby forest based industries.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings

1. Bridger Blakeney. 2012. *Handbook of Forestry*. Agrotech Press. pp. 300.
2. Khanna, L.S. 2015. *Principles and Practice of Silviculture*. Agrotech Press. pp. 484.
3. Singh, S.P. 2020. *Handbook of Agroforestry*. Agrotech Publication. pp. 207.
4. A.P. Dwivedi. 2019. *Agroforestry Principle and Practice*. Oxford & Ibh publication Co.Pvt.Ltd. pp. 380.
5. Namkoong, G.K., Hyun, C. and Buruard, J.S. 1988. *Tree breeding: principle and strategies*. Sprieger.pp. 180.

Course Title: Introductory Animal Husbandry
Course Code: BAG107

L	T	P	Credits
1	0	0	1

1.

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Understanding Importance of livestock in agriculture and economy
CO2	To know about dairy cattle and buffaloes management
CO3	To know pig, sheep and goat management.
CO4	To know about Common animal diseases of cattle

Course Contents

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

DAIRY CATTLE AND BUFFALOES MANAGEMENT: Cattle and buffalo Breeds. Breeding methods & systems, Care and Management of pregnant and milch cow, Raising of calves, Management of heifers and bulls. Maintenance of livestock records, milking methods and principles, Clean milk production, Feeds and feeding, Conservation of fodder, Housing for dairy animals.

PIG MANAGEMENT: Importance, Important breeds, Raising of piglets up to age of slaughter, General aspects of breeding, Care of sow and boar.

SHEEP AND GOAT MANAGEMENT: Importance, Important breeds, raising of kids and lambs, Breeding, Feeding of goats and sheep.

HEALTH MANAGEMENT: Common animal diseases of cattle, buffalo, goat, sheep and swine viz. Anthrax. BQ, HS, Brucellosis, Mastitis, Milk fever. Bloat. Swine fever and Enterotoxaemia, vaccination schedule.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested References:

1. Jadhav, N.V. and Siddiqui, M.F. Handbook of Poultry Production and Management.
2. Charles, T. Burr and Homer, O. Stuart. Book on Commercial Poultry Farming.
3. Singh, R.A. Poultry Production.
4. Banerjee, G.C. A Textbook of Animal Husbandry.
5. Sastri, N.S.R., Thomas, C.K. and Singh, R.A. Livestock Production and Management.
6. Singh, R. Essentials of Animal Production and Management.
7. Anonymous A Handbook of Animal Husbandry, Indian Council of Agricultural Research.
8. Verma, R.N. A Textbook of Livestock Production Management in Tropics.

Course Title: Lab. Introductory Animal Husbandry
Course Code: BAG120

L	T	P	Credits
0	0	2	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Understanding Importance of livestock in Agriculture and Economy
CO2	To know about dairy cattle and buffaloes management
CO3	To know pig, sheep and goat management.
CO4	To know about Common animal diseases of cattle

Course Contents

Study of external body parts, Study of phenotypic and physiological difference between cow and buffaloes. Estimation of body weight by measurements, Identification of animals. Castration, Dehorning, Estimation of cost of milk production, Problems on computation of ration, casting and throwing, Grooming, Scheme of fodder production round the year, Recording temperature, pulse rate and respiration rate of animals.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested References:

1. Jadhav, N.V. and Siddiqui, M.F. Handbook of Poultry Production and Management.
2. Charles, T. Burr and Homer, O. Stuart. Book on Commercial Poultry Farming.
3. Singh, R.A. Poultry Production.
4. Banerjee, G.C. A Textbook of Animal Husbandry.
5. Sastri, N.S.R., Thomas, C.K. and Singh, R.A. Livestock Production and Management.
6. Singh, R. Essentials of Animal Production and Management.
7. Anonymous A Handbook of Animal Husbandry, Indian Council of Agricultural Research.
8. Verma, R.N. A Textbook of Livestock Production Management in Tropics

Course Title: Comprehension & Communication Skills in English

Course Code: BAG108

L	T	P	Credits
1	0	0	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Understanding grammar principles and transforming sentences.
CO2	Writing CVs, letters for jobs, complaints and emails, essays on select topics
CO3	Writing research projects and preparing technical reports.
CO4	Learning phonetic symbols, using correct sound, stress and intonations, Learning do's and don'ts for interviews, Enhanced communication ability in English

Course Contents

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 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: Paragraphwriting, 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. Translation from Hindi into English, Allied Grammar: Use of idioms, correction of incorrect sentences, etc.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Krishnaswamy, N and Sriraman, T. 1995. *Current English for Colleges*. Macmillan India Ltd. Madras. pp128
2. Balasubrmayam M. 1985. *Business Communication*. Vani Educational Books, New Delhi. pp 216
3. Naterop, Jean, B. and Rod Revell. 1997. *Telephoning in English*. Cambridge University Press, Cambridge.pp 135
4. Mohan Krishna and Meera Banerjee. 1990. *Developing Communication Skills*. Macmillan India Ltd. New Delhi. pp 230

Course Title: Lab. Comprehension &
Communication Skills in English

Course Code: BAG123

L	T	P	Credits
0	0	2	1

Course Outcomes: On successful completion of this course, the students will be able to learn:

CO	Statement
CO1	Understanding grammar principles and transforming sentences.
CO2	Writing CVs, letters for jobs, complaints and emails, essays on select topics
CO3	Learning phonetic symbols, using correct sound, stress and intonations. Learning do's and don'ts for interviews.
CO4	Writing research projects and preparing technical reports, Enhanced communication ability in English.

Course Contents

Listening Comprehension: Listening to short talk's 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.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Krishnaswamy, N and Sriraman, T. 1995. *Current English for Colleges*. Macmillan India Ltd. Madras. pp128
2. Balasubramanyam M. 1985. *Business Communication*. Vani Educational Books, New Delhi. pp 216
3. Naterop, Jean, B. and Rod Revell. 1997. *Telephoning in English*. Cambridge University Press, Cambridge. pp 135
4. Mohan Krishna and Meera Banerjee. 1990. *Developing Communication Skills*. Macmillan India Ltd. New Delhi. pp 230

Course Title: Agriculture Heritage

Course Code: BAG109

L	T	P	Credits
1	0	0	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	To perform input management and follow stock management in farm business, and to implement environment-friendly programs in business,
CO2	To evaluate input, techniques and technology used in agricultural production in view of the ecosystem, natural resources and environment,
CO3	Ancient Agricultural Practices & Its relevant to modern agriculture practices.
CO4	Traditional Technical Knowledge. • Our Journey (Developments) in Agriculture and Vision for the Future

Course Contents

Basic elements of crop production; Factors affecting crop production; History of Agricultural Development; Ancient India Agriculture in Civilization Era, Chronological Agricultural Technology development in India. Indian Agriculture: growth, contrasting food chains and diversity. Soil groups, marine, livestock and water; Liabilities: Soil factors, weather factors, Farming Systems approach, value addition, requirements in new technology; 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. Indian agricultural heritage: Ancient practices, Relevance of heritage to present day agriculture. Past and present status of agriculture and farmers in society; crop production and protection through the ages. Women in Agriculture: Nutritional and rural life standards, role in household design making, drudgery reduction for farm women, women friendly agricultural technology; Empowerment of women.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Randhawa, M.S. 1983. *History of Agriculture in India*, ICAR, New Delhi, Vol.: I, II & III.
2. Chandra, S. 1996. *Women in Agriculture*. ICAR, PAU, Ludhiana. Vol. 3, 1996. pp 168-173
3. Jayanthi, C., Devasenapathy, P. and Vennila, C. 2008. *Farming System: Principles & Practices*. Satish Serial Publishing House. pp 275
4. Jhabhavala, R. 1984. Unpaid family labour, *Social Welfare*, 31(2): 31-32.

Course Title: Introductory Biology
Course Code: BAG110

L	T	P	Credits
0	0	2	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Understanding to the living world and diversity and characteristics of life
CO2	To know about Cell and cell division
CO3	To know seed and seed germination.
CO4	To know about Role of animals in agriculture

Course Contents

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

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Gupta, P. K. 2005. *Cell and Molecular Biology*. Rastogi publications, Meerut, India. pp. 942.
2. Gupta, P. K. 2009. *Genetics*. Rastogi publications, Meerut, India. pp. 628.
3. Puri, P., 1980 *Bryophyta*, Atma & Sons, Delhi. pp 546
4. Sharma, O.P. 1990, *Text Book of Pteridophyta*, McMillan India Ltd. pp 416
5. Dube, H.C., 1990, *An Introduction to Fungi*, Vikas Publishing House Pvt. Ltd. Delhi. pp 40 ISBN-13978-8125914334
6. Sharma, O.P., 1992, *Text Book of Thallophytes*, McGraw Hill Publishing co. pp 416.
7. Sharma, P.D., 1991, *The Fungi*, Rastogi & Co. Meerut. pp 548

Course Title: Lab- Introductory Biology
Course Code: BAG121

L	T	P	Credits
0	0	2	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Understanding to the living world and diversity and characteristics of life
CO2	To know about Cell and cell division
CO3	To know seed and seed germination.
CO4	To know about Role of animals in agriculture

Course Contents

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 – Brassicaceae .Fabaceae and Poaceae.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Dutta, A.C. 1980. *A class- book of Botany*, Publisher- Oxford University press YMCA Library Building. 1 Jai Singh Road, New Delhi 110001, India. pp.656
2. James D. Mauseth. 1962. *Botany- An introduction to Plant Biology*, Publisher Continental Prakashan, Pune. pp 844
3. Ashok, M. Bendre & Kumar, Ashok .1996. *A Text book of Practical Botany-2*, Publisher- Rastogi Publications Shivaji Road, Meerut – 25002, India. pp 464

Course Title: Basic Agriculture-I
Course Code: BAG122

L	T	P	Credits
0	0	2	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Understanding basic concept of agriculture
CO2	To know about the various types of farming.
CO3	To know about the classification of soil
CO4	To know about the basic of plant pathology

Course Contents

Agriculture of Intermediate standard including Agronomy, Soil Science, Horticulture, Plant Pathology

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. ISSS. 2009. *Fundamentals of Soil Science*. 2nd Ed. Indian Society of Soil Science, New Delhi- 110 012. pp. 728.
2. Das D.K. 2011. *Introductory Soil Science*, 3rd revised and Enlarged Ed, Kalyani Publisher, Ludhiana. pp. 645.
3. Gopal, Chandra De. 1980., *Fundamentals of Agronomy*. Oxford and IBH Publishing Co. Ltd., Bangalore.
4. Palaniappan, S.P., *Cropping Systems in the tropics – Principles and Practices*. Willey Eastern Ltd., New Delhi.
5. Chadda, K.L. 2001. *Handbook of Horticulture*, ICAR Publication, pp.1031.
6. Kunte, Y.N and Yawalkar 2005. *Principles of Horticulture and fruit growing*, Agro-Horticultural Publishing house, pp. 363.
7. Singh, R.S. 2013. *Introduction to Principles of Plant Pathology*. Oxford and IBH Pub.Co.

Course Title: Elementary Mathematics
Course Code: BAG122

L	T	P	Credits
0	0	2	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Demonstrate an understanding of the foundations and history of mathematics.
CO2	Perform computations in higher mathematics, Read and understand middle-level proofs.
CO3	Write and understand basic proofs, Develop and maintain problem-solving skills.
CO4	Use mathematical ideas to model real-world problems

Course Contents

Straight lines: Distance formula, section formula (internal and external division), Change of axes (only origin changed). Equation of co-ordinate axes, Equation of lines parallel to axes, Slope-intercept form of equation of line, Slope- point form of equation of line. Two-point form of equation of line, Intercept form of equation of line, Normal form of equation offline, General form of equation offline, Point of intersection of two straight lines, Angles between two straight lines, Parallel lines, Perpendicular lines, Angle of bisectors between two lines. Area of triangle and quadrilateral. Circle: Equation of circle whose centre and radius is known, General equation of a circle, Equation of circle passing through three given points, Equation of circle whose diameters is line joining two points (x_1, y_1) & (x_2, y_2) > Tangent and Normal to a given circle at given point (Simple problems), Condition of tangency of given circle $x^2+y^2=a$. Differential Calculus: Definition of function, limit and continuity, Simple problem son limit Simple problems on continuity, Differentiation of $x^n, e^x, \sin x$ & $\cos x$ from first principle, Derivatives of sum, difference, product and quotient of two functions, Differentiation of functions of functions (Simple problem based on it), Logarithmic differentiation (Simple problem based on it), Differentiation by substitution method and simple problems based on it.

Differentiation of Inverse Trigonometric functions. Maxima and Minima of the functions of the form $y, f(x)$ (Simple problems based on it). Integral Calculus: Integration of simple functions, Integration of Product of two functions, Integration by substitution method, Definite Integral (simple problems based on it), Area under simple well known curves (simple problems based on it). Matrices and Determinants: Definition of Matrices, Addition. Subtraction, Multiplication. Transpose and Inverse upto 3rd order. Properties of determinants up to 3rd order and their evaluation.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion

Suggested Readings:

1. Rajput , A. K.,2017.Text Book of Mathematics, 11th Part-I and Part II (Publication Division).NCERT .pp:466
2. Pierpoint, A.E. 1925:Mensuration- I , Digital Library of India Item.Franklin Classics Trade Press.pp.187.
3. Chaudhari, A. A. 2017:A text book Agricultural Mathematics. Shri RajlaxmiPrakashan, Aurangabad.pp:312
4. Rajput, A. K. 2012: NCERT 12 Text Book of Mathematics, 12th Part-I .National Council of Education Research and Training. pp.286.

Course Title: Basic Agriculture-II
Course Code: BAG113

L	T	P	Credits
0	0	2	1

Course Outcomes: On successful completion of this course, the students will be able to learn:

CO	Statement
CO1	Demonstrate an understanding of the foundations and history of agricultural engineering.
CO2	To know about basic concept of animal husbandry
CO3	Write and understand basic concept of agricultural economics.
CO4	Use economics ideas to model real-world problems

Course Contents

Agriculture of Intermediate standard including Ag Engg. Animal Husbandry and economics

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion

Suggested readings:

1. Kaltschmitt, M., Streicher, W., & Wiese, A. (Eds.). 2007. *Renewable energy: technology, economics and environment*. Springer Science & Business Media.
2. Quaschnig, V. 2016. *Understanding renewable energy systems*. Routledge.
3. Nelson, V. C. 2011. *Introduction to renewable energy*. CRC press.
4. Da Rosa, A. V., & Ordonez, J. C. 2021. *Fundamentals of renewable energy processes*. Academic Press.
5. Srivastava, J.S, and R.C, Khera, 1960. *Textbook of Animal Husbandry* Indian Council of Agriculture Research , New Delhi.
6. Sastry, N.S.R. and Thomas, C.K. 2017. *Livestock Production Management*, Kalyani Publication, New Delhi.
7. Subba Reddy, S., Raghu Ram, P., Sastry, T.V.N. and Bhavani Devi, I. 2010. *Agricultural Economics*. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi. pp.697.
8. Nagpure S.C. and Patil E.R. 2014. *Principles of Agricultural Economics*. Agroment Publishers, Dharampeth, Nagpur, India. pp.334.

Course Title: Lab. NSS/NCC/Physical Education & Yoga Practices

Course Code: BAG124

L	T	P	Credits
0	0	2	4

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Students will understand the principles of lifetime fitness and will incorporate fitness activities into a healthy and active lifestyle.
CO2	Students will acquire knowledge and demonstrate skills to safely engage in physical activity.
CO3	Students will understand the basic principles of anatomy, physiology and/or biomechanics and apply the knowledge to movement activity.
CO4	Create self interest in various sports, Take leadership.

Course Contents

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

NSS programmes and activities

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

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

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

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

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

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

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

Physical Education and Yoga Practices

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 difficult 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 gamesituation.
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 difficult 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 advance 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 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 difficult 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 ThrowBall).

National Cadet Corps

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, paceforward and to the rear.
6. Turning on the march and wheeling. Saluting on the march.
7. Marking 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.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. *National Service Scheme*. 1961. *A Report*, by Khwaja Ghulam Saiyidain. Published by Ministry of Education, Govt. of India.
2. Kaikobad, N.F. and Kapil, Krishan K. 1971. *Training and consultancy needs in national service scheme*, Published by Tata Institute of Social Sciences,
3. Major R. D. 2003. *Hand Book of NCC*. Pub. Kanti Prakashan Etawah (UP)
4. Anonymous. 2007. *Cadets Hand Book*. Pub. Directorate of NCC. Govt. of India Press, New Delhi.
5. Anonymous. 1971. *National Service Scheme: guide-lines to project-masters*, Published by Dept. of Sociology & Social Work, Andhra University. pp 278

Course Title: Fundamentals of Crop Physiology

Course Code: BAG201

L	T	P	Credits
2	0	0	2

Course Outcomes: On successful completion of this course, the students will be able to learn:

CO	Statement
CO1	Understanding various plant metabolic processes, namely photosynthesis, respiration and translocation of metabolites.
CO2	Studies on plant growth and development, hormones and growth regulators, Physiology of seed and fruit development in plants, including germination and dormancy in seeds.
CO3	Plant water relationships, processes of osmosis and plasmolysis, water pressure –potential, Studying factors affecting water loss from plants.
CO4	Learning the physiological role of nutrients in plants.

Course Contents

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; Photo periodism and vernalization. Respiration: Glycolysis, TCA cycle and electron transport chain; Fat Metabolism: Fatty acid synthesis and Breakdown; Plant growth regulators: Physiological roles and agricultural uses, Physiological aspects of growth and development of major crops: Growth analysis, Role of Physiological growth parameters in crop productivity.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Galston, A.W. 1989. *Life Processes in Plants*. Scientific American Library, Springer-Verlag, New York,USA. Pp246
2. Hopkins, W.G. 1995. *Introduction to Plant Physiology*. John Wiley & Sons, Inc., New York,USA. Pp 450
3. Lea, P.J. and Leegood, R.C. 1999. *Plant Biochemistry and Molecular Biology*. John Wiley & Sons, Chelichester, England.pp 384
4. Mohr, H. and Schopfer, P. 1995. *Plant Physiology*. Springer-Verlag, Berlin,Germany. pp 629
5. Old, R.W. and Primrose, S.B. 1989. *Principles of Gene Manipulation*, Blackwell Scientific Publishers, Oxford, UK. pp 152

Course Title: Lab. Fundamentals of Crop Physiology

Course Code: BAG211

L	T	P	Credits
0	0	2	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Demonstrating mechanism of photosynthesis in plants.
CO2	Experimenting processes of respiration, osmosis, imbibition, plasmolysis, Measuring permeability of water and solutes in plants.
CO3	Conducting experiments on water transpiration, nutrient status and catalysis.
CO4	Studying impact of quality and quantity of light on seed germination and growth of plants.

Course Contents

Study of plant cells, structure and distribution of stomata, imbibitions, osmosis, plasmolysis, measurement of root pressure, rate of transpiration, Separation of photosynthetic pigments through paper chromatography, Rate of transpiration, photosynthesis: production of oxygen and utilization of CO₂, Moll's half-leaf experiment. Respiration: production of CO₂ during respiration, tissue test for mineral nutrients, estimation of relative water content, Measurement of photosynthetic CO₂ assimilation by Infra Red Gas Analyser (IRGA).

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Galston, A.W. 1989. *Life Processes in Plants*. Scientific American Library, Springer-Verlag, New York, USA. Pp246
2. Hopkins, W.G. 1995. *Introduction to Plant Physiology*. John Wiley & Sons, Inc., New York, USA. Pp 450
3. Lea, P.J. and Leegood, R.C. 1999. *Plant Biochemistry and Molecular Biology*. John Wiley & Sons, Chelichester, England. pp 384
4. Mohr, H. and Schopfer, P. 1995. *Plant Physiology*. Springer-Verlag, Berlin, Germany. pp 629
5. Old, R.W. and Primrose, S.B. 1989. *Principles of Gene Manipulation*, Blackwell Scientific Publishers, Oxford, UK. pp 152

Course Title: Fundamentals of Plant Biochemistry
Course Code: BAG202

L	T	P	Credits
2	0	0	2

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Structure and classification of bio-molecules for life origin vij., Carbohydrates, lipids and proteins etc.
CO2	Synthesis and metabolism of Carbohydrates, lipids, proteins etc.
CO3	Role of enzyme, vitamins and hormones in metabolism of Carbohydrates, lipids, proteins etc.
CO4	Structure of nucleic acid and their replication.

Course Contents

Importance of Bio chemistry, Carbohydrates: Importance and classification. Monosaccharides: Structure and properties of Monosaccharides, Mutarotation; Structure of Disaccharides and Poly saccharides. Lipids: Importance and classification; Structures and properties of fatty acids; storage lipids and membrane lipids. Structural organization of proteins. Enzymes: General properties; Classification; Mechanism of action; Metabolism of carbohydrates: Glycolysis, TCA cycle, Glyoxylate cycle, Electron transport chain. Metabolism of lipids: Beta oxidation, Biosynthesis of fatty acids. Nucleotides: DNA, RNA.

Concepts and applications of plant biotechnology: Scope, organ culture, embryo culture, cell suspension culture, callus culture, another culture, pollen culture and ovule culture and their applications; Micro-propagation methods; organogenesis and embryogenesis, Synthetic seeds and their significance; Embryo rescue and its significance; somatic hybridization and cybrids; Somaclonal variation and its use in crop improvement; cryo-preservation.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Jain, J.L. 2005. *Fundamentals of Biochemistry*, S. Chand & Company Ltd. New Delhi. pp:1-1248
2. Rastogi, S.C. 2003. *Biochemistry* Tata McGraw-Hill Education, New Delhi.pp:711
3. Jayaram, T. 1981. *Laboratory manual in biochemistry*, Wiley Estern Ltd. New Delhi.pp:1-178
4. Plummer, D.1988: *An Introduction to Practical Biochemistry*. 3rd ed. Tata McGraw Hill, New Delhi.pp:1-369

Course Title: Lab. Fundamentals of Plant Biochemistry
Course Code: BAG212

L	T	P	Credits
0	0	2	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Structure and classification of bio-molecules for life origin vij., Carbohydrates, lipids and proteins etc.
CO2	Synthesis and metabolism of Carbohydrates, lipids, proteins etc.
CO3	Role of enzyme, vitamins and hormones in metabolism of Carbohydrates, lipids, proteins etc.
CO4	Structure of nucleic acid and their replication.

Course Contents

Preparation of solution, pH & buffers, Qualitative tests of carbohydrates and amino acids. Quantitative estimation of glucose/ proteins. Titration methods for estimation of amino acids/lipids, Effect of pH, temperature and substrate concentration on enzyme action, Paper chromatography/ TLC demonstration for separation of amino acids/ Monosaccharides. Sterilization techniques. Composition of various tissue culture media and preparation of stock solutions for MS nutrient medium. Callus induction from various explants. Micro-propagation, hardening and acclimatization. Demonstration on isolation of DNA. Demonstration of gel electrophoresis techniques and DNA finger printing.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Jain, J.L. 2005. *Fundamentals of Biochemistry*, S. Chand & Company Ltd. New Delhi. pp:1-1248
2. Rastogi, S.C. 2003. *Biochemistry* Tata McGraw-Hill Education, New Delhi.pp:711
3. Jayaram, T. 1981. *Laboratory manual in biochemistry*, Wiley Estern Ltd. New Delhi.pp:1-178
4. Plummer, D.1988: *An Introduction to Practical Biochemistry*. 3rd ed. Tata McGraw Hill, New Delhi.pp:1-369

Course Title: Fundamentals of Entomology-I
Course Code: BAG203

L	T	P	Credits
2	0	0	2

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	To study the various aspects of insect ecology.To study the various abiotic and biotic factor.
CO2	Understand the effect of abiotic and biotic factors on insect ecology and agro-ecosystem.
CO3	To study various factor for the out/weak of insect-pest and pest surveillance and pest forecasting.
CO4	To study the classification of insects, the identification of pests and the various aspects of integrated pest management (IDM)

Course Contents

History of Entomology in India. Major points related to dominance of Insecta in Animal kingdom. Classification of phylum arthropoda upto classes. Relationship of class Insecta with other classes of arthropoda. Morphology: Structure and functions of insect cuticle and 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 organ. Metamorphosis and diapause in insects. Types of larvae and pupae. Structure and functions of digestive, circulatory, excretory, respiratory, nervous, secretary (Endocrine) and reproductive system, in insects. Types of reproduction in insects. Major sensory organs like simple and compound eyes, chemoreceptors.

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.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Chapman, R. F. 2012. *The Insects: Structure and Functions* 5th edition. Cambridge University Press. pp. 959.
2. Prasad, T.V. 2019. *Handbook of Entomology*. New Vishal Publications. Pp.496.
3. Nayar, K. K. Anathkrishanan T.N. and David, B.V. 2009. *General and Applied Entomology*. Tata McGraw-Hill. pp.589.

Course Title: Lab. Fundamentals of Entomology-I

Course Code: BAG213

L	T	P	Credits
0	0	2	1

Course Outcomes: On successful completion of this course, the students will be able to learn:

CO	Statement
CO1	To study the various aspects of insect ecology and the various abiotic and biotic factor. To study the various aspects of integrated pest management (IDM).
CO2	Understand the effect of abiotic and biotic factors on insect ecology and the agro-ecosystem.
CO3	To study various factor for the out/weak of insect-pest, pest surveillance and pest forecasting.
CO4	To study the classification and identification of pests and insects.

Course Contents

Methods of collection and preservation of insects including immature stages; External features of grasshopper/blister beetle; Types of insect antennae, mouthparts and legs; Wing venation, types of wings and wing coupling apparatus. Types of insect larvae and pupae; Dissection of digestive system in insects (Grasshopper); dissection of male and female reproductive systems in insects (grass-hopper); Visit to meteorological observatory / automatic weather reporting station; Study of terrestrial and pond ecosystems of insects; Studies on behaviour of insects and orientation; Insect surveillance and sampling techniques for the estimation of pest population and damage.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion

Suggested Readings:

1. Chapman, R. F. *The Insects: Structure and Functions* 5th edition, 2012. Cambridge University Press. Pp. 959.
2. Prasad, T.V. *Handbook of Entomology*, 2019. New Vishal Publications. Pp. 496.
3. Nayar, K. K. Anathkrishanan T.N. and B.V. David. 2009. *General and Applied Entomology*, Tata McGraw-Hill. Pp. 589.

Course Title: Fundamentals of Agricultural Economics

Course Code: BAG204

L	T	P	Credits
2	0	0	2

Course Outcomes: On successful completion of this course, the students will be able to learn:

CO	Statement
CO1	Determine and outline those conditions which give optimum use of resources in the production of crops and livestock.
CO2	Determine the extent to which the existing use of resources deviate from what is considered the optimal use level.
CO3	Analyse the forces which condition production patterns and resource use in relation to the existing opportunities
CO4	Explain the means and methods adaptable in moving from the existing levels to the optimum use of farm resources.

Course Contents

Economics: Meaning, scope and subject matter, definitions, activities, approaches to economic analysis; micro and macro economics, positive and normative analysis. Nature of economic theory; rationality assumption, concept of equilibrium, economic laws as generalization of human behaviour. Agricultural planning and development in the country. *Demand:* meaning, law of demand, schedule and demand curve, determinants, utility theory; law of diminishing marginal utility, equi-marginal utility principle. Laws of returns, Laws of costs and supplies. Market structure and Price determination, Distribution theory, National income. Population: Importance, Malthusian and Optimum population theories, natural and socioeconomic determinants, current policies and programmes on population control. Role of Money and Banking modern economy. Agricultural and public finance: meaning, micro v/s macro finance, need for agricultural finance, public revenue and public expenditure. *Tax:* meaning, direct and indirect taxes, agricultural taxation, VAT.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Jhingan, M.L.1990. *Advanced Economic Theory*. Vikas Publishing House, New Delhi. Pp.1842.
2. Subba Reddy, S., Raghu Ram, P., Sastry, T.V.N. and Bhavani Devi, I. 2010. *Agricultural Economics*. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi. pp.697.
3. Nagpure S.C. and Patil E.R. 2014. *Principles of Agricultural Economics*. Agroment Publishers, Dharampeth, Nagpur, India. pp.334.
4. Dewett, K.K. and Chand, A. 2009. *Modern Economic Theory*. S. Chand and Co., New Delhi. Pp. 1024.

Course Title: Principles of Organic Farming
Course Code: BAG205

L	T	P	Credits
1	0	0	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	To teach the principles and practices of organic farming for sustainable crop production.
CO2	To develop an alternative strategy over chemical farming which would be guideline for the working of biological process in natural eco system.
CO3	To make responsible use of energy and natural resources such as organic matter in soil for the increase of soil fertility.
CO4	To provide basic and applied knowledge of weed science to students.

Course contents

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

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Dahama , A. K. *Organic farming for sustainable agriculture*. 19, Agrobotica Binaker. Pp 53-98 and 210-255.
2. Gaur AC. 2003. A Manual of Rural Composting, FAO/UNDP Regional Project Document, FAO.
3. Lampin N. 1990. *Organic Farming*. Press Books, Ipswitch, UK.
4. Palaniappan SP & Anandurai K. 1999. *Organic Farming – Theory and Practice*. Scientific Publ.
5. Veeresh GK, Shivashankar K & Suiglachar MA. 1997. *Organic Farming and Sustainable Agriculture*. Association for Promotion of Organic Farming, Bangalore.
6. Woolmer PL & Swift MJ. 1994. *The Biological Management of Tropical Soil Fertility*. TSBF & Wiley.

Course Title:	Lab. Principles of Organic Farming	L	T	P	Credits
Course Code:	BAG214	0	0	2	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	To teach the principles and practices of organic farming for sustainable crop production.
CO2	To develop an alternative strategy over chemical farming which would be guideline for the working of biological process in natural eco system.
CO3	To make responsible use of energy and natural resources such as organic matter in soil for the increase of soil fertility.
CO4	To provide basic and applied knowledge of weed science to students.

Course Contents

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

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Dahama, A. K. *Organic farming for sustainable agriculture*. 19, Agrobotanica Binaker. Pp 53-98 and 210-255.
2. Gaur AC. 2003. A Manual of Rural Composting, FAO/UNDP Regional Project Document, FAO.
3. Lampin N. 1990. Organic Farming. Press Books, Ipswitch, UK.
4. Palaniappan SP & Anandurai K. 1999. Organic Farming – Theory and Practice. Scientific Publ.
5. Veeresh GK, Shivashankar K & Suiglachar MA. 1997. Organic Farming and Sustainable Agriculture. Association for Promotion of Organic Farming, Bangalore.
6. Woolmer PL & Swift MJ. 1994. The Biological Management of Tropical Soil Fertility. TSBF & Wiley.

Course Title: Fundamentals of Plant Pathology
Course Code: BAG206

L	T	P	Credits
3	0	0	3

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Introduce students to the basic principles and concepts of plant pathology, familiarize students with the basic vocabulary of plant pathology and plant disease management using flash cards with images and audio files.
CO2	Introduce and illustrate the major groups of organisms that cause plant diseases, enhance student's understanding of scientific research, especially as it applies to the science of plant pathology and the study of microorganisms.
CO3	Improve the written and oral communication skills of students through class, group and individual projects; prepare students for additional classes in Plant Pathology and related disciplines.
CO4	Provide a framework that students can use in their profession to best approach plant disease management.

Course Contents

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

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

Viruses: nature, structure, replication and transmission.

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

Dispersal and survival of plant pathogens. Types of parasitism and variability in plant pathogens. Pathogenesis; Role of enzymes, toxins and growth regulators in disease development. Defence mechanism in plants. Principles and methods of plant disease management. Chemical control; classification, mode of action and formulations of fungicides and antibiotics.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Agrios, G.N. 2010. *Plant Pathology*. Acad. Press.
2. Singh, R.S. 2013. *Introduction to Principles of Plant Pathology*. Oxford and IBH Pub.Co.
3. Dhingra, O.D. & Sinclair, J.B. 1986. *Basic Plant Pathology Methods*. CRC Press, London, Tokyo.

Course Title: Lab. Fundamentals of Plant Pathology

Course Code: BAG215

L	T	P	Credits
0	0	2	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Introduce students to the basic principles and concepts of plant pathology, familiarize students with the basic vocabulary of plant pathology and plant disease management using flash cards with images and audio files.
CO2	Introduce and illustrate the major groups of organisms that cause plant diseases, enhance student's understanding of scientific research, especially as it applies to the science of plant pathology and the study of microorganisms.
CO3	Improve the written and oral communication skills of students through class, group and individual projects; prepare students for additional classes in Plant Pathology and related disciplines.
CO4	Provide a framework that students can use in their profession to best approach plant disease management.

Course Contents

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

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Agrios, G.N. 2010. *Plant Pathology*. Acad. Press.
2. Singh, R.S. 2013. *Introduction to Principles of Plant Pathology*. Oxford and IBH Pub.Co.
3. Dhingra, O.D. & Sinclair, J.B. 1986. *Basic Plant Pathology Methods*. CRC Press, London, Tokyo.

Course Title: Production Technology for Vegetables and Spices
Course Title: Lab. Production Technology for Vegetables and Spices
Course Code: BAG207

L	T	P	Credits
2	0	0	2
L	T	P	Credits
0	0	2	1

Course Code: BAG216

Course

Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	To introduce the students to the vegetable and flower crops of different season.
CO2	Overview, national and international scenario, status and scope of vegetable crops and flower and its classification.
CO3	The student will also understand the principles and cultivation of temperate and tropical vegetable crops and also flowers.
CO4	This will help the students to understand the production systems of vegetables and flowers.

Course Contents

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

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Dhaliwal, M. S. 2017. *Handbook of Vegetable Crops*. Kalyani Publishers, India. pp 358
2. Singh, N. E. and Thamburaj, S. E. 2003. *Vegetables, Tuber Crops and Spices*. Directorate of Information and Publications of Agriculture, India. pp. 469.
3. Hazra, P. 2019. *Vegetable Science and Technology*. New India Publishing Agency, India. pp. 630.
4. Swarup, V. 2006. *Vegetable Science and Technology in India*. Kalyani Publishers, India. pp. 656

Course Title: Fundamentals of Agricultural Extension Education

Course Code: BAG208

L	T	P	Credits
2	0	0	2

Course

Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	To introduce the students to the vegetable and flower crops of different season.
CO2	Overview, national and international scenario, status and scope of vegetable crops and flower and its classification.
CO3	The student will also understand the principles and cultivation of temperate and tropical vegetable crops and also flowers.
CO4	This will help the students to understand the production systems of vegetables and flowers

Course Contents

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

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Dhaliwal, M. S. 2017. *Handbook of Vegetable Crops*. Kalyani Publishers, India. Pp 358
2. Singh, N. E. and Thamburaj, S. E. 2003. *Vegetables, Tuber Crops and Spices*. Directorate of Information and Publications of Agriculture, India. pp. 469.
3. Hazra, P. 2019. *Vegetable Science and Technology*. New India Publishing Agency, India. pp. 630.
4. Swarup, V. 2006. *Vegetable Science and Technology in India*. Kalyani Publishers, India. pp. 656

Course Title: Lab. Fundamentals of Agricultural Extension Education

Course Code: BAG217

L	T	P	Credits
0	0	2	1

Course Outcomes:

On successful completion of this course, the students will able to learn:

CO	Statement
CO1	List the theories and explain the practice of agricultural extension management: y Describe the basic concepts of extension programme management; and Describe the theories, principles, process and functions of a good manager.
CO2	Differentiate between approaches to management strategies or extension organisations: Describe the various extension approaches and elaborate on the implications for organisational management.
CO3	Explain what leadership is; y List the qualities of good leadership; y Explain how to motivate employees within your organisation, the groups dynamics to improve performance standards; Explain how to reduce conflicts within a group;
CO4	Explain how establish guidelines and consensus to improve teamwork, Explain the concept and relevance of leadership, motivation, and group dynamics in management

Course Contents

Extension Education- meaning, definition, scope and process; objectives and principles of Extension Education; Extension Programme planning in India. New trends in agriculture extension: privatization extension, cyber extension/ e-extension, market-led extension, farmer-led extension, expert systems, etc.

Rural Development: concept, meaning, definition; various rural development programmes launched by Govt. of India. Community Dev.-meaning, definition, concept & principles, Philosophy of C.D. Rural Leadership, extension administration, Monitoring and evaluation. ICT Applications in TOT (New and Social Media), media mix strategies; communication: meaning and definition; Principles and Functions of Communication, models and barriers to communication. Agriculture journalism; diffusion and adoption of innovation: concept and meaning, process and stages of adoption, adopter categories.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested readings:

1. Ray, G.L. 2003. *Extension Communication and Management*. Kalyani Publishers. Fifth revised and enlarged edition. Vol. 5, 2003. pp 67-88
2. Dahama, O.P. and Bhatnagar, O.P. 2003. *Education and Communication for Development*. Oxford and IBH Publishing Co. Pvt. Ltd. Vol. 2, 2003. pp 77-110
3. Sandhu, A.S. 1993. *Textbook on Agricultural Communication: Process and Methods*. Oxford and IBH Publishing Co. Pvt. Ltd. Vol. 1, 1993. pp 256-290
4. Desai, A.R. 1978. *Rural sociology in India*. Bombay, Popular Prakashan, 5th Rev. ed. Vol. 5, 1978. pp 267-288
- 5.

Course Outcomes: On successful completion of this course, the students will able

Course Title: Dairy Processing and Safety Issues	L	T	P	Credits
Course Code: BAG209	2	0	0	2

to learn:

CO	Statement
CO1	List the theories and explain the practice of agricultural extension management; y Describe the basic concepts of extension programme management; and Describe the theories, principles, process and functions of a good manager.
CO2	Differentiate between approaches to management strategies or extension organisations: Describe the various extension approaches and elaborate on the implications for organisational management.
CO3	Explain what leadership is; y List the qualities of good leadership; y Explain how to motivate employees within your organisation, the groups dynamics to improve performance standards; Explain how to reduce conflicts within a group;
CO4	Explain how establish guidelines and consensus to improve teamwork, Explain the concept and relevance of leadership, motivation, and group dynamics in management

Course Contents

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.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Dahama, O.P. and O.P Bhatnagar. 1980. *Education and Communication for Development*. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi. Pp.116.
2. Dudhani, C.M., Hirevenkatgoudar, L.V., Manjunath, L., Hanchinal, S.N. and Patil, S.L. 2004. *Extension Teaching Methods and Communication Technology*, UAS, Dharwad. Pp.654.
3. Kamat, M.G. 1985. *Writing for Farm Families*. Allied Publishers, New Delhi.pp.196.
4. Kelsey, L.D. and Hearne, G.C. 1963. *Cooperative Extension Work*. Comstar Publishing Associate, New York.pp. 453.
5. Mehta, D.S. 1981. *Mass Communication and Journalism in India*. Vikas Publication, New Delhi. Pp.424.

Course Outcomes: On successful completion of this course, the students will able to learn:

Course Title: Lab-Dairy Processing and Safety		L	T	P	Credits
Issues					
Course Code: BAG218		0	0	2	1
CO	Statement				
CO1	To know about breeding and inheritance of characters for hishee milk production, the knowledge regarding milk perception mechanism, composition and factors affecting milk yield.				
CO2	To be knowledgeable about the role of livestock towards national economy and becomefamiliar about different animal breeds and their genesis, understand the reproductive behaviour and parturition process and factors affecting fertility.				
CO3	To have the knowledge about nutrition, feeding and management of milch animals, familiarwith housing principles and space requirement for different animals.				

Course Contents

GENERAL: Definition of food, Constituents of foods: Water, Carbohydrate, Fat, Protein, Vitamins and Minerals with reference to milk, Detailed composition of milk and colostrum.

FOOD PROCESSING: Pasteurization, Sterilization, Bacto fugation, Uperization, Stassanization. U.H.T. pasteurization and Homogenization of milk, N realization of milk, Cream, Cooling and chilling of milk. Manufacturing of common dairy product viz. Cream, Butter, Ghee, Dahi, Yoghart, Shrikh and Ice-cream. Manufacturing of Khoa, Evaporated milk, condensed milk, WMP, SMP, Paneer, Cheese, Chhena, 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.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested readings:

1. Bains, B., Manohar, G.S. and Purohit, G.R. 2007. Livestock Production and Management.
2. Banergee, G.C. 2013. A Test Book of Animal Husbandry.
3. Kumar, S., Mishra, B.K. and Kumar, M. 2014. Advances in Livestock Production and Management.
4. Singh, R.A. 2009. Poultry Production and management.

Course Title: Human Values & Ethics
Course Code: BAG210

L	T	P	Credits
1	0	0	1

Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Understand the role of deliberation and debate in framing such values
CO2	Understand the ideas of values, ethics, and morality in a multicultural context
CO3	Understand and discuss the idea of moral relativism and the challenges it poses to universal values
CO4	Understand how universal values can be uncovered by different means, including scientific investigation, historical research, or public debate and deliberation (what some philosophers call a dialectic method)

Course Contents

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

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings

1. Tandon H. L. S. 1994: Recycling of crop, animal, human and industrial Wastes in Agriculture. FDCO, Delhi. pp 173

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

Course Code: BAG301

L	T	P	Credits
1	0	0	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	To develop more efficient production systems for major cereals and pulses, fulfilling the demands of commercial firms, farmers, industrials and consumers.
CO2	To enhance the quality & productivity of crop production, implement forage crop trials: fodder maize, sorghum, bajra.
CO3	To introduce new technologies in crop production: fertigation & new varieties maintain tight contact with farmers.
CO4	To understand different implements used in ploughing.

Course Contents

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

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested readings:

1. Das NR. 2007. Introduction to Crops of India. Scientific Publ.
2. Hunsigi G & Krishna KR. 1998. Science of Field Crop Production. Oxford & IBH.
3. Jeswani LM & Baldev B. 1997. Advances in Pulse Production Technology. ICAR.
4. Khare D & Bhale MS. 2000. Seed Technology. Scientific Publ.
5. Kumar Ranjeet & Singh NP. 2003. Maize Production in India: Golden Grain in Transition. IARI, New Delhi.

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

Course Code: BAG312

L	T	P	Credits
0	0	2	1

**Course Outcomes:
On successful completion**

of this course, the students will able to learn:

CO	Statement
CO1	To develop more efficient production systems for major cereals and pulses, fulfilling the demands of commercial firms, farmers, industrials and consumers.
CO2	To enhance the quality & productivity of crop production, implement forage crop trials: fodder maize, Sorghum, Bajra.
CO3	To introduce new technologies in crop production: fertigation & new varieties maintain tight contact with farmers.
CO4	To understand different implements used in ploughing.

Course contents

Rice nursery preparation. transplanting of rice, sowing of soybean, pigeon pea and mung bean, maize, groundnut and cotton. Effect of seed size on germination. Effect of sowing depth on germination of *kharif* crops, identification of weeds in *kharif* season crops. Topdressing and foliar feeding of nutrients, study of yield contributing characters and yield calculation of *kharif* season crops, study of crop varieties and important agronomic experiment at experimental farm. Visit to research centres related to crops.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings

1. Das NR. 2007. Introduction to Crops of India. Scientific Publ.
2. Hunsigi G & Krishna KR. 1998. Science of Field Crop Production. Oxford & IBH.
3. Jeswani LM & Baldev B. 1997. Advances in Pulse Production Technology. ICAR.
4. Khare D & Bhale MS. 2000. Seed Technology. Scientific Publ.
5. Kumar Ranjeet & Singh NP. 2003. Maize Production in India: Golden Grain in Transition. IARI, New Delhi.

Course Title: Fundamentals of Plant Breeding
Course Code: BAG302

L	T	P	Credits
2	0	0	2

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Classification, description and reproduction in plant.
CO2	Emasculation, selling, pollination, heterosis and hybrid seed production.
CO3	Breeding procedures under different modes of reproduction.
CO4	Determine breeding methodology appropriate for plants with different mating systems.

Course Contents

Historical development, concept. nature and role of plant breeding, major achievements and future prospects; Genetics in relation to plant breeding, modes of reproduction and apomixes, self- incompatibility and male sterility-genetic consequences. Domestication, Acclimatization and Introduction: Centres of origin/diversity, components of Genetic variation; Heritability and genetic advance; Genetic basis and breeding methods in self pollinated crops -mass and pure line selection, hybridization techniques and handling of segregating population; Multiline concept. Concepts of population genetics and Hardy-Weinberg Law; Genetic basis and methods of breeding cross pollinated crops. modes of selection; Population improvement Schemes-Ear to row method, Modified Ear to Row. recurrent selection. Heterosis and inbreeding depression. development of inbred lines and hybrids, composite and synthetic varieties; Breeding methods in asexually propagated crops. clonal selection and hybridization: Maintenance of breeding records and data collection; Wide hybridization and pre-breeding; Polyploidy in relation to plant breeding. mutation breeding methods and uses; Breeding for important biotic and abiotic stresses; Biotechnological tools-DNA markers and marker assisted selection.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings

1. Singh, B.D. 2018. *Plant Breeding Principles and methods*, Kalyani publishers, New Delhi. pp. 918.
2. Singh, P. 2017. *Fundamentals of Plant Breeding (Principles and methods)* , Kalyani publishers , New Delhi, pp : 327
3. Kumaresan, V. and Arumugam, N. 2017. *Fundamentals of Horticulture and Plant Breeding*. Saras publisher, Tamilnadu. pp. 524.
4. Singh, P. and Arumugam, N. 2016. *Essential of Plant Breeding*. Kalyani publisher, New Delhi. pp. 243.

Course Title: Lab. Fundamentals of Plant Breeding	L	T	P	Credits
Course Code: BAG314	0	0	2	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Classification, description and reproduction in plant.
CO2	Emasculation, selling, pollination, heterosis and hybrid seed production.
CO3	Breeding procedures under different modes of reproduction.
CO4	Determine breeding methodology appropriate for plants with different mating systems

Course contents

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 crop and extent of natural out-crossing. Prediction of performance of double cross hybrids. Emasculation and hybridization techniques in self & cross-pollinated crops. Consequences of in breeding 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.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings

1. Singh, B.D. 2018. Plant Breeding (Principles and methods), Kalyani publishers, New Delhi. pp. 918.
2. Singh, P. 2017. Fundamentals of Plant Breeding Principles and methods, Kalyani publishers, New Delhi, pp : 327
3. Kumaresan, V. and Arumugam, N. 2017. Fundamentals of Horticulture and Plant Breeding. Saras publisher, Tamilnadu. pp. 524.
4. Singh, P. and Arumugam, N. 2016. Essential of Plant Breeding. Kalyani publisher, New Delhi. pp. 243.

Course Title: Agricultural Microbiology

Course Code: BAG303

L	T	P	Credits
1	0	0	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Identify and describe the uses of basic apparatus and equipment used in a microbiology laboratory.
CO2	Carry out basics aseptic procedures used in the handling and study of microorganisms
CO3	Isolate or extract and culture microorganisms
CO4	Understand the general characteristics of different groups of microorganisms

Course contents

Introduction of Microbial world: Prokaryotic and eukaryotic microbes. Bacteria: cell structure, chemo autotrophy, 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 phyllo sphere. Microbes in human welfare: biofertilizers, biopesticides, biofuel production and biodegradation. Microbial degradation of organic matter in soil. Cellulose decomposing micros for compost preparation & vermicompost. Soil organisms: macro and microorganisms, their beneficial and harmful effects.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested readings:

1. Jain, Amita. 2018. *Manual of microbiology*. Elsevier India. pp 600
2. Naveen, Kango. 2019. *Textbook of microbiology*. Dream Tech Press. pp 436
3. Jain, Amita & Jain, Parul. 2019. *Essential of microbiology*. Elsevier India. pp 384

Course Title: Lab. Agricultural Microbiology
Course Code: BAG315

L	T	P	Credits
0	0	2	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Identify and describe the uses of basic apparatus and equipment used in a microbiology laboratory.
CO2	Carry out basics aseptic procedures used in the handling and study of microorganisms
CO3	Isolate or extract and culture microorganisms
CO4	Understand the general characteristics of different groups of microorganisms

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.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested readings:

1. Jain, Amita. 2018. *Manual of microbiology*. Elsevier India. pp 600
2. Naveen, Kango. 2019. *Textbook of microbiology*. Dream Tech Press. pp 436
3. Jain, Amita & Jain, Parul. 2019. *Essential of microbiology*. Elsevier India. pp 384

L	T	P	Credits
2	0	0	2

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	To impart knowledge on agricultural finance, its nature and scope, understand time value of money and its types in present view.
CO2	To impart knowledge on history of agriculture finance in India, know various rules, regulations, functions of various banks.
CO3	To study about commercial and co-operative banks in detail.
CO4	To acquaint the knowledge of higher financing agencies RBI, NABARD etc.

Course contents

Agricultural Finance- meaning, scope and significance, credit needs and its role in Indian agriculture. Agricultural credit: meaning, definition, need, classification. Credit analysis; 4 R's, and 3C's of credits. Sources of agricultural finance: institutional and non-institutional sources, commercial banks, social control and nationalization of commercial banks. Micro financing including KCC. Lead bank scheme, RRBs, Scale of finance and unit cost. An introduction to higher financing institutions - RBI. NABARD. ADB, IMF, world bank. Insurance and Credit Guarantee Corporation of India. Cost of credit. Recent development in agricultural credit. Preparation and analysis of financial statements - Balance Sheet and Income Statement. Basic guidelines for preparation of project reports- Bank norms - SWOT analysis. Agricultural Cooperation - Meaning, brief history of cooperative development in India, objectives, principles of cooperation, significance of cooperatives in Indian agriculture.

Agricultural Cooperation in India- credit, marketing, consumer and multi-purpose cooperatives, farmers' service cooperative societies, processing cooperatives, Farming cooperatives, cooperative warehousing; role of ICA, NCUI, NCDC, NAFED.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Ghosal, S.N. 1966. *Agricultural Financing in India*. Asia Publishing House, Bombay.pp.452
2. Johl, S.S. and Moore, C.V. 1970. *Essentials of Farm Financial Management*. Today and Tomorrow's Printers and Publishers, New Delhi.pp.586
3. Hampton, J. J. 1983. *Financial Decision Making: Concepts, Problems and Cases*. Prentice Hall of India, New Delhi.pp.384
- 4 Kenneth, D. D. 1979. *Principles of Management in Agribusiness*. Reston Publishing Company, Reston.pp.465.
- 5 Muniraj, R. 1987. *Farm Finance for Development*. Oxford & IBH Publishing, Company Private Ltd, New Delhi.pp.696.

Course Title: Lab. Agricultural Finance and Cooperation

Course Code: BAG316

L	T	P	Credits
0	0	2	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	To impart knowledge on agricultural finance, its nature and scope, understand time value of money and its types in present view.
CO2	To impart knowledge on history of agriculture finance in India, know various rules, regulations, functions of various banks.
CO3	To study about commercial and co-operative banks in detail.
CO4	To acquaint the knowledge of higher financing agencies RBI, NABARD etc.

Course content

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

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Ghosal, S.N. 1966. *Agricultural Financing in India*. Asia Publishing House, Bombay. pp.452
2. Johl, S.S. and Moore, C.V. 1970. *Essentials of Farm Financial Management*. Today and Tomorrow's Printers and Publishers, New Delhi. pp.586
3. Hamptron, J. J. 1983. *Financial Decision Making: Concepts, Problems and Cases*. Prentice Hall of India, New Delhi. pp.384
- 4 Kenneth, D. D. 1979. *Principles of Management in Agribusiness*. Reston Publishing Company, Reston. pp.465.
- 5 Muniraj, R. 1987. *Farm Finance for Development*. Oxford & IBH Publishing, Company Private Ltd, New Delhi. pp.696.

Course Title: Farm Machinery and Power
Course Code: BAG305

L	T	P	Credits
2	0	0	2

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	The students will be able to learn about different sources of farm power
CO2	To construction and functioning of CI and SI engines
CO3	IC engine fuels, Coolants
CO4	Anti freeze and anti corrosion materials

Course Contents

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.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Reading:

1. Hunt, D. 2008. Farm power and machinery management. Waveland Press.
2. Singh, T. P. 2016. Farm machinery. PHI Learning Pvt. Ltd.
3. Krutz, G., Thompson, L., & Claar, P. 1984. Design of agricultural machinery. John Wiley and Sons.
4. Smith, H. P. 2020. Farm machinery and equipment. Read Books Ltd.
5. Culpin, C. 2013. Farm machinery. Read Books Ltd.

Course Title: Lab. Farm Machinery and Power
Course Code: BAG317

L	T	P	Credits
0	0	2	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	The students will be able to learn about different sources of farm power
CO2	To construction and functioning of CI and SI engines
CO3	IC engine fuels, Coolants
CO4	Anti freeze and anti corrosion materials

Course Contents

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

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Reading:

1. Hunt, D. 2008. *Farm power and machinery management*. Waveland Press.
2. Singh, T. P. 2016. *Farm machinery*. PHI Learning Pvt. Ltd.
3. Krutz, G., Thompson, L., & Claar, P. 1984. *Design of agricultural machinery*. John Wiley and Sons.
4. Smith, H. P. 2020. *Farm machinery and equipment*. Read Books Ltd.
5. Culpin, C. 2013. *Farm machinery*. Read Books Ltd.

Course Title: Principles of Integrated Disease Management

Course Code: BAG306

L	T	P	Credits
2	0	0	2

Course Outcomes: On successful completion of this course, the students will able to learn:

1	Study importance of integrated disease management.
2	Understand the concept and tools of integrated disease management
3	Learn about the various components of integrated disease management, their limitations and implications
4	Study about the development of IDM for the control of diseases
5	Familiarize with the IDM adaptation in important crops, rice, wheat, cotton, sugarcane, chickpea, rapeseed mustard, pearl millet, Kharif pulses, vegetable and fruit crops

Course contents

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: Host plant resistance, cultural, mechanical, physical, legislative. biological and chemical control. Survey surveillance and forecasting of diseases. Safety issues in fungicide uses. Political, social and legal implication of IDM.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings

1. Tarr, S.A.J. 1964. *The Principles of Plant Pathology*. McMillan, London. pp 340
2. Vander Plank, J.E. 1975. *Principles of Plant Infection*. Acad. Press. pp 280
3. Verma, J.P., Varma, A. & Kumar, D. (Eds). 1995. *Detection of Plant Pathogens and their Management*. Angkor Publ., New Delhi. pp270
4. Mehrotra, R.S. & Aggarwal, A. 2003. *Plant Pathology*. 2nd Ed. Oxford & IBH. pp370
5. Dhingra, O.D. & Sinclair, J.B. 1986. *Basic Plant Pathology Methods*. CRC Press. pp260

Course Title: Lab. Principles of Integrated Disease Management

Course Code: BAG318

L	T	P	Credits
0	0	2	1

Course Outcomes: On successful completion of this course, the students will able to learn:

1	Study importance of integrated disease management.
2	Understand the concept and tools of integrated disease management
3	Learn about the various components of integrated disease management, their limitations and implications
4	Study about the development of IDM for the control of diseases
5	Familiarize with the IDM adaptation in important crops, rice, wheat, cotton, sugarcane, chickpea, rapeseed mustard, pearl millet, Kharif pulses, vegetable and fruit crops

Course Contents

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, different predators and natural enemies. Identification and nature of damage of important diseases and their management. Plan & assess preventive strategies (IDM module) and decision making, crop monitoring attacked by diseases Farmers fields visit.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Tarr, S.A.J. 1964. *The Principles of Plant Pathology*. McMillan, London. pp 340
2. Vander Plank, J.E. 1975. *Principles of Plant Infection*. Acad. Press. pp 280
3. Verma, J.P., Varma, A. & Kumar, D. (Eds). 1995. *Detection of Plant Pathogens and their Management*. Angkor Publ., New Delhi. pp270
4. Mehrotra, R.S. & Aggarwal, A. 2003. *Plant Pathology*. 2nd Ed. Oxford & IBH. pp370
5. Dhingra, O.D. & Sinclair, J.B. 1986. *Basic Plant Pathology Methods*. CRC Press. pp260

Course Title: Environmental Studies and Disaster Management

Course Code: BAG307

L	T	P	Credits
1	0	0	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Study the natural resources, ecosystem environmental pollution: cause and effects various environments.
CO2	Study about protection act.
CO3	Information helps in improving environment and human health, Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
CO4	Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.

Course Contents

Definition, scope and importance of environment. Natural resources and associated problems. a) Forest resources, water resources, mineral resources, food resources, food problems associated with agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies; Energy resources: growing energy needs, use of alternate energy sources. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Equitable use of resources for sustainable lifestyles.

Ecosystems: Concept of an ecosystem, Structure and functioning of various types of ecosystems (forests, grasslands, deserts and aquatic systems). Producers, consumers and decomposers, Energy flow in the ecosystem. Ecological succession, Food chains, food webs and ecological pyramids. Biodiversity, its conservation and bio-geographical classification of India. Hot spots of biodiversity and threats to biodiversity. Conservation of biodiversity. Environmental Pollution: definition, causes, types, effects and control measures. Nuclear hazards, Solid Wastes, prevention, and management. Environmental ethics: Issues and possible solutions. Public awareness and Environment Protection Acts (Water, soil, air and wildlife) and their enforcement. *Disaster Management*: Impact of various natural and man-made disasters, issues related with environment disasters. Concept of disaster management, role of NGOs, community-based organizations and media.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Bharucha, Erach. 2012. *Textbook of Environmental Studies for undergraduate courses* by

University Grants Commission, New Delhi. pp 288

2. Sharma, P.D. 2004. *Ecology and Environment* by Rastogi Publication. Meerut.pp280

3. S.S. Purohit, S.S., Shammi, Q.J. and Agrawal, A.K. 2006. *Environmental Sciences* by Student Edition, Jodhpur. pp 370

4. Prasanthrajan, M. and Mahendran, P.P. 2005. *A textbook on Ecology and Environmental Science* by Agrotch Publishing Academy, Udaipur-313002. pp370

Course Title: Lab. Environmental Studies and Disaster Management
Course Code: BAG319

L	T	P	Credits
0	0	2	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Study the natural resources, ecosystem environmental pollution: cause and effects various environments.
CO2	Study about protection act.
CO3	Information helps in improving environment and human health, Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
CO4	Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.

Course Contents

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

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Bharucha, Erach. 2012. *Textbook of Environmental Studies for undergraduate courses* by University Grants Commission, New Delhi. pp 288
2. Sharma, P.D. 2004. *Ecology and Environment* by Rastogi Publication. Meerut.pp280
3. S.S. Purohit, S.S., Shammi, Q.J. and Agrawal, A.K. 2006. *Environmental Sciences* by Student Edition, Jodhpur. pp 370
4. Prasanthrajan, M. and Mahendran, P.P. 2005. *A textbook on Ecology and Environmental Science* by Agrotch Publishing Academy, Udaipur-313002. pp370

Course Title: Statistical Methods
Course Code: BAG308

L	T	P	Credits
1	0	0	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	Statistical principles apply in all the areas of experimental work and they have a very important role in agriculture.
CO2	It is required at the national level and farm level for agriculture policy making, decision making, agriculture development and estimates agriculture and national income.
CO3	Statistics in agriculture are great importance in variety of area. One of the most important is to a certain the volume of crop that needs to be produced based on output and demand of previous year.
CO4	It is helpful in land utilization and irrigation including the net area sown gross cultivated area, current follow, cultivable waste.

Course Contents

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.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Panse, V.G. and Sukhatme, P.V. 1967. *Statistical methods for Agricultural workers*. Indian Council of Agricultural Research, New Delhi. pp. 361.
2. Gupta, S.C. and Kapoor, V.K. 2019. *Mathematical statistics*. Sultan Chand & Sons. pp. 1303.
3. Snedocor, G. W. and. Cochran, W. G .1967: *Statistical Methods 8th edition*. Iowa State University Press. pp. 524.
4. Gupta, S.C. and Kapoor, V.K. 2007. *Fundamentals of Applied Statistics*. Sultan Chand & Sons. pp.1303.
5. Cochran, G.W. and, Cox, G.W. 1986: *Experimental Designs 2nd edition*. John Wiley & Sons, New York. pp.617.

Course Title: Lab. Statistical Methods

Course Code: BAG320

L	T	P	Credits
0	0	2	1

Course

Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	Statistical principles apply in all the areas of experimental work and they have a very important role in agriculture.
CO2	It is required at the national level and farm level for agriculture policy making, decision making, agriculture development and estimates agriculture and national income.
CO3	Statistics in agriculture are of great importance in a variety of areas. One of the most important is to ascertain the volume of crop that needs to be produced based on output and demand of the previous year.
CO4	It is helpful in land utilization and irrigation including the net area sown, gross cultivated area, current fallow, and cultivable waste.

Course Contents

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.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

- 1) Panse, V.G. and Sukhatme, P.V. 1967. *Statistical methods for Agricultural workers*. Indian Council of Agricultural Research, New Delhi. pp. 361.
- 2) Gupta, S.C. and Kapoor, V.K. 2019. *Mathematical statistics*. Sultan Chand & Sons. pp. 1303.
- 3) Snedecor, G. W. and Cochran, W. G. 1967: *Statistical Methods 8th edition*. Iowa State University Press. pp. 524.
- 4) Gupta, S.C. and Kapoor, V.K. 2007. *Fundamentals of Applied Statistics*. Sultan Chand & Sons. pp. 1303.
- 5) Cochran, G.W. and Cox, G.W. 1986: *Experimental Designs 2nd edition*. John Wiley & Sons, New York. pp. 617.

Course Title: Fundamental of Soil and Water Conservation
Course Code: BAG309

L	T	P	Credits
1	0	0	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	The principles of soil and water conservation.
CO2	About the erosion control principles
CO3	Soil loss measurement techniques
CO4	About the grassed water ways and their design. Water harvesting and its techniques.

Course Contents

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 Loss Soil Equation. Soil loss measurement techniques. Principles of erosion control: Introduction to contouring. strip cropping. Contour bund. Graded bund 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.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Singh, P.K. 2000. Watershed Management. E Media Publications
2. Suresh, R. Soil and Water Engineering, Standard Publication House.
3. Sharma, V., Singh, Y.P., Gunjan P., Singh, P.K..2017. Effect of Different Level of Irrigation on Biometric Parameters and Estimation of Crop Water Requirement for Summer Rice Crop under Drip Irrigation in Tarai Region of Uttarakhand, Int. J Pure App. Biosci.5(6):730-739. doi: <http://dx.doi.org/10.18782/2320-7051.6050>
4. Sharma, V., Gunjan, P., Singh, Y.P. and Singh, P.K. 2019. Growth, Yield and Yield Contributing Factors of Rice Crop as Influenced by Different Level and Methods of Irrigation in Tarai Region of Uttarakhand, India. Int. J Curr.Microbiol.App.Sci. 8(04): 1088-1098. doi: <https://doi.org/10.20546/ijcmas.2019.804.126>
5. Sharma, V, Singh, P.K, Bhakar, S.R, Yadav, K.K. & Lakhawat, S.S. (2019). Integration of Soil Moisture Sensor Based Automated Drip Irrigation System for Okra Crop. Indian Journal of Pure and Applied Biosciences. 7(4), 277-282.

Course Title: Lab. Fundamental of Soil and Water Conservation

Course Code: BAG321

L	T	P	Credits
0	0	2	1

Course

Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Learn principles of soil-water and degradation of land and water resources.
CO2	About the erosion control principles and contour mapping
CO3	Soil loss measurement techniques
CO4	About the grassed water ways and their design. Water harvesting and its techniques.

Course Contents

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

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Singh, P.K. 2000. Watershed Management. E Media Publications
2. Suresh, R. 2012. Soil and Water Engineering, Standard Publication House.
3. Sharma, V., Singh, Y.P., Gunjan P., Singh, P.K..2017. Effect of Different Level of Irrigation on Biometric Parameters and Estimation of Crop Water Requirement for Summer Rice Crop under Drip Irrigation in Tarai Region of Uttarakhand, Int. J Pure App. Biosci.5(6):730-739. doi: <http://dx.doi.org/10.18782/2320-7051.6050>
4. Sharma, V., Gunjan, P., Singh, Y.P. and Singh, P.K. 2019. Growth, Yield and Yield Contributing Factors of Rice Crop as Influenced by Different Level and Methods of Irrigation in Tarai Region of Uttarakhand, India. Int. J Curr.Microbiol.App.Sci. 8(04): 1088-1098. doi: <https://doi.org/10.20546/ijcmas.2019.804.126>
5. Sharma, V, Singh, P.K, Bhakar, S.R, Yadav, K.K. & Lakhawat, S.S. (2019). Integration of Soil Moisture Sensor Based Automated Drip Irrigation System for Okra Crop. Indian Journal of Pure and Applied Biosciences. 7(4), 277-282.

Course Title: Dairy Science
Course Code: BAG310

L	T	P	Credits
2	0	0	2

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	To know about breeding and inheritance of characters for hishee milk production, the knowledge regarding milk perception mechanism, composition and factors affecting milk yield.
CO2	To be knowledgeable about Legal standards of milk. Factors affecting the quality and quantity of milk
CO3	To have the knowledge about nutrition, Milk and its secretion, Transportation and milk distribution, pricing policy of milk
CO4	To understand the basic principles of refrigeration and cold storage of milk and milk products

Course Contents

GENERAL : Concept of Dairying, Dairying in India, Dairy development in different Five year plans. Dairy production statistics. Cleaning and sanitization of dairy equipment. Dairy cooperatives, Functioning of dairy cooperative societies, Functioning of Anand Pattern, White revolution, Objectives and achievements of operation flood. Milk and its secretion, Transportation and milk distribution, pricing policy of milk. platform tests, Filtration. Straining and Clarification of milk. Standardization, Milk adulteration and its detection, Common preservatives of milk and their detection, Legal standards of milk. Factors affecting the quality and quantity of milk, Nutritive value of milk and milk product. Basic principles of refrigeration and cold storage of milk and milk product. Common adulterants of ghee, khoa and their detection.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Sukumar, De. 2006. Outlines of Dairy Technology. Oxford Univ. Press, New Delhi.
2. Henderson, J.L. 1971. Fluid milk industry. The AV Publ. Co. Inc. Westport Connecticut.
3. Robinson, R.K. 1986. Modern Dairy Technology Vol. 1. Elsevier Applied Science, London.
4. Harper, W.J. and Hall, C.W. 1981. Dairy Technology and Engineering.
5. Aneja, R.P., Mathur, B.N., Chandan, R.C. and Banerjee, A.K. 2002. Technology of Indian Milk Product.

Course Title: Lab. Dairy Science
Course Code: BAG322

L	T	P	Credits
0	0	2	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	To know about breeding and inheritance of characters for hishee milk production, the knowledge regarding milk perception mechanism, composition and factors affecting milk yield.
CO2	To be knowledgeable about Legal standards of milk. Factors affecting the quality and quantity of milk
CO3	To have the knowledge about nutrition, milk and its secretion, Transportation and milk distribution, pricing policy of milk
CO4	To understand the basic principles of refrigeration and cold storage of milk and milk product

Course Contents

Sampling of milk, C.O.B. Test, M.B.R. Test, Sediment test, Problems on Standardization, Detection of adulterants viz. water, starch, sucrose, urea, detergent and refined oil, Problems on adulteration, Hansa Test, Detection of preservatives, Alcohol test, Acidity of milk.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Anonymous.2015a. Analysis of Milk and Its Products A Lab Manual By Milk Industry Foundation.
2. Anonymous. 2015b. Manual of methods of analysis of foods food safety and standards authority of India, Ministry of health and family welfare government of India new Delhi 2015 milk and milk products.
3. Prasad, J. 2021. manual of methods of analysis of foods dairy and dairy products
4. Principles and practices of Dairy farm. File no. 1,1,01,4/07 /2021.-qa (e file 1789).
5. Anantakrishnan, C.P. and Padamanabhan, P.N.1991. The technology of milk processing. Publisher,Shri Lakshmi PustakBhandar,Madras.

Course Title: Fundamentals of Entomology II
Course Code: BAG311

L	T	P	Credits
2	0	0	2

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	To study the various aspects of insect ecology and study the various abiotic and biotic factor
CO2	Understand the effect of abiotic and biotic factors on insect ecology and study the agro-ecosystem
CO3	To study various factor for the outbreak of insect-pest, to study pest surveillance and pest forecasting.
CO4	To study the classification of insects and study the identification of pests, to study the various aspects of integrated pest management (IPM)

Course contents

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.

IPM: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 aid and antidotes. Survey, surveillance and forecasting of insect pests. Safety issues of pesticides uses.

Suggested Readings:

1. Nayar, K. K. Anathkrishanan T.N. and David, B.V. 2009. *General and Applied Entomology*. Tata McGraw-Hill.pp.589
2. Jayashree, K.V., Tharadevi, C.S and Arumugam, N..2014 Saras Publication.Pp.352
3. Prasad, T.V. 2019. Handbook of Entomology. New Vishal Publications.pp.496.

Course Title: Lab. Fundamentals of Entomology II
Course Code: BAG323

L	T	P	Credits
0	0	2	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	To study the various aspects of insect ecology and study the various abiotic and biotic factor
CO2	Understand the effect of abiotic and biotic factors on insect ecology and study the agro-ecosystem
CO3	To study various factor for the outbreak of insect-pest, to study pest surveillance and pest forecasting.
CO4	To study the classification of insects and study the identification of pests, to study the various aspects of integrated pest management (IPM)

Course Contents

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

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion

Suggested Readings

1. Nayar, K. K. Anathkrishanan T.N. and David, B.V. 2009. *General and Applied Entomology*, Tata McGraw-Hill. pp.589
2. Jayashree, K.V., Tharadevi, C.S and Arumugam, N. 2014 Saras Publication. pp.352
3. Prasad, T.V . 2019. Handbook of Entomology. New Vishal Publications. pp.496.

Course Title: Lab. Practical Crop Production– I (Kharif Crops)**Course Code:****BAG313**

L	T	P	Credits
0	0	4	2

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	To develop more efficient production systems for major cereals and pulses, fulfilling the demands of commercial firms, farmers, industrials and consumers.
CO2	To enhance the quality & productivity of crop production, implement forage crop trials: fodder maize, sorghum, bajra.
CO3	To introduce new technologies in crop production: fertigation& new varieties maintain tight contact with farmers.
CO4	To Understand different implements used in ploughing.

Course contents

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

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested readings:

1. Prasad, R. 2002. *Textbook of Field Crops Production*. Directorate of Information and Publication of Agriculture, Indian Council of Agricultural Research, New Delhi. pp. 821.
2. Singh, C. and Singh, R. 2020. *Modern Techniques of Raising Field Crops*. CBS Publishers & Distributors, New Delhi. pp. 496.
3. Reddy T. Y. and Reddy G. H. S. 2002. *Principle of Agronomy*. Kalyani Publishers, Ludhiana, Punjab. Pp.527

Course Title: Crop Production Technology –II (Rabi Crops)

Course Code: BAG401

L	T	P	Credits
1	0	0	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	To develop more efficient production systems for major field crops: wheat, gram, rapeseed & mustard, oat, barley.
CO2	To fulfilling the demands of commercial firms, farmers, industrials and consumers.
CO3	To enhance the quality & productivity of crop production.
CO4	To maintain tight contact with farmers, understand different implements used in ploughing

Course contents

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, peas. oilseeds-rapeseed, mustard, linseed and sunflower; sugar crops sugarcane; other crop-Potato. Forage crops-berseem, lucerne and oat.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Prasad, R. 2002. *Textbook of Field Crops Production*. Directorate, New Delhi. Pp. 821.
2. Singh, C. and Singh, R. 2020. *Modern Techniques of Raising Field Crops*. CBS Publishers & Distributors, New Delhi. Pp. 496.
3. Reddy T. Y. and Reddy G. H. S. 2002. *Principle of Agronomy*. Kalyani Publishers, Ludhiana, Punjab. Pp.527

**Course Title: Lab. Crop Production Technology –II
(Rabi Crops)**

Course Code: BAG410

L	T	P	Credits
0	0	2	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	To introduce the basic principles of quality of seed production.
CO2	To learn various conventional and non-conventional Hybrid Seed Production technologies.
CO3	To learn about the concepts and significance of seed quality control.
CO4	To know about various aspects related to seed certification

Course Contents

Seed and seed production technology: introduction, definition and importance. Deterioration causes of crop varieties and their control; Maintenance of genetic purity during seed production. Seed quality; Definition and Characters of good quality seed, different classes of seed. Foundation and certified seed production of important cereals, pulses, oilseeds, fodder and vegetables. Seed certification. phases of certification, procedure for seed certification, field inspection. Seed Act and Seed Act enforcement. Duty and powers of seed inspector, offences and penalties. Seeds Control Order 1983. Varietal identification through Grow Out Test. 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.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Prasad, R. 2002. *Textbook of Field Crops Production*. Directorate, New Delhi. Pp. 821.
2. Singh, C. and Singh, R. 2020. *Modern Techniques of Raising Field Crops*. CBS Publishers & Distributors, New Delhi. Pp. 496.
3. Reddy T. Y. and Reddy G. H. S. 2002. *Principle of Agronomy*. Kalyani Publishers, Ludhiana, Punjab. Pp.527

Course Title: Principles of Seed Technology
Course Code: BAG402

L	T	P	Credits
2	0	0	2

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Technologies for seed production of pure-line, synthetics, composites and hybrid varieties.
CO2	Parameters of quality control to maintain genetic purity of breeder, foundation and certified seeds
CO3	Grow-out tests for various field crops desired quality of seeds.

Course contents

Seed and seed technology: introduction, definition and importance. Deterioration causes of crop varieties and their control; Maintenance of genetic purity during seed production, seed quality; Definition, Characters of good quality seed, different classes of seed. Foundation and certified seeds. Seed production, seed certification procedure, Seed Act and Seed Act enforcement. Seeds Control Order 1983. Detection of genetically modified crops, Transgene contamination in non-GM crops, GM crops and organic seed production.

Seed drying, seed testing for quality assessment, seed treatment, seed packing and Seed storage. Measures for pest and disease control during storage. Seed marketing, Factors affecting seed marketing, Role of WTO and OECD in seed marketing. Private and public sectors and their production and marketing strategies.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested readings:

Suggested Readings

1. Singh, P. 2016. Principles of Seed technology , Kalyani publisher , New Delhi, pp: 340.
2. Aggarawal, R.L. 2018. Seed technology (2nd edition), Oxford & IBH publishing, Tamilnadu pp: 848.
3. Jain, B. 2021. Treasure of seed science and technology, Jain publishers, Ludhiana , pp: 160.
4. Jana, B. L. 2015. Principles of seed technology, Aavishkar publisher , distributors Jaipur, pp: 169.

Course Title: Lab. Principles of Seed Technology
Course Code: BAG412

L	T	P	Credits
0	0	2	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	To learn about the important testing methods with regards to physical purity, germination percentage, moisture content, vigour in seed.
CO2	To provide a comprehensive knowledge on all aspects of seed quality
CO3	To acquire knowledge on seed legislation and trading

Course Contents

Seed production in major cereals: wheat, rice, maize, sorghum, bajra and ragi. seed production in major pulses: urd bean, moong bean, pigeon pea, lentil, gram, field bean and peas. Seed production in major oilseeds: soybean, sunflower, rapeseed, groundnut and mustard. Seed production in important vegetable crops. Seed sampling and testing: Physical purity, germination, viability, etc. Seed and seedling vigour test. Genetic purity test: Grow out test and electrophoresis. Seed certification: Procedure, Field inspection, Preparation of field inspection report. Visit to seed production farms, seed testing laboratories and seed processing plant.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings

1. Singh, P. 2016. Principles of Seed technology , Kalyani publisher , New Delhi, pp: 340.
2. Aggarawal, R.L. 2018. Seed technology (2nd edition), Oxford & IBH publishing, Tamilnadu pp: 848.
3. Jain, B. 2021. Treasure of seed science and technology, Jain publishers, Ludhiana , pp: 160.
4. Jana, B. L. 2015. Principles of seed technology, Aavishkar publisher , distributors Jaipur, pp: 169.

Course Title: Problematic Soils and their Management
Course Code: BAG403

L	T	P	Credits
1	0	0	1

CO	Statement
CO1	To understand the concept of problem soils
CO2	To understand the diagnosis and reclamation of salt affected soils, acquire knowledge about the problems of salt affected soil
CO3	To understand the problems, diagnosis, and reclamation of acidic soils, understand the criteria for quality of irrigation water.
CO4	To acquire knowledge about the rational use of poor quality irrigation water.

Course contents

Soil quality and health, Distribution of waste land and problem soils in India. Their categorization based on properties. Reclamation and management of Saline and sodic soils, Acid soils. Acid Sulphate soils. Eroded and Compacted soils. Flooded soils, & Polluted soils. Irrigation water - quality and standards, utilization of saline water in agriculture. Remote sensing and GIS in diagnosis and management of problem soils. Multipurpose tree species, bio remediation through MPTs of soils. land capability and classification, land suitability classification. Problematic soils under different Agro-ecosystems.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Das, D. K. 2015. *Introductory Soil Science*. India: Kalyani Publishers.pp.879.
2. Reddy T. Y. and Reddy G. H. S. 2002. *Principle of Agronomy*. Kalyani Publishers, Ludhiana, Punjab. pp.527.
3. Reddy, S. R. 2007. *Principles of Agronomy*. Kalyani Publishers, Ludhiana. India. pp.611.
4. ISSS. 2009. *Fundamentals of Soil Science*. 2nd Ed. Indian Society of Soil Science, New Delhi- 110 012. pp. 728.
5. Das D. K. 2011. *Introductory Soil Science*, 3rd revised and Enlarged Ed, Kalyani Publisher, Ludhiana. pp. 645.
6. Weil, R.R. and Brady, N. C. 2017. *The Nature and Properties of Soils*. 15th edition Publisher: Pearson Education, ISBN: 978-0133254488

Course Title: Lab. Problematic Soils and their Management
Course Code: BAG413

L	T	P	Credits
0	0	2	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	To develop skill for diagnosis of saline, sodic, saline sodic and acid soils.
CO2	To develop skill for estimation of lime requirement of acidic soil.
CO3	To develop skill for estimation of gypsum requirement of sodic soils.
CO4	To develop skill for analysis of poor quality irrigation water.

Course contents

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 of problematic soils in Punjab.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings

1. Das, D. K. 2015. *Introductory Soil Science*. India: Kalyani Publishers.pp.879.
2. Reddy T. Y. and Reddy G. H. S. 2002. *Principle of Agronomy*. Kalyani Publishers, Ludhiana, Punjab. pp.527.
3. Reddy, S. R. 2007. *Principles of Agronomy*. Kalyani Publishers, Ludhiana. India. pp.611.
4. ISSS. 2009. *Fundamentals of Soil Science*. 2nd Ed. Indian Society of Soil Science, New Delhi- 110 012. pp. 728.
5. Das D. K. 2011. *Introductory Soil Science*, 3rd revised and Enlarged Ed, Kalyani Publisher, Ludhiana. pp. 645.
6. Weil, R.R. and Brady, N. C. 2017. *The Nature and Properties of Soils*. 15th edition Publisher: Pearson Education, ISBN: 978-0133254488

Course Title: Renewable Energy and Green Technology
Course Code: BAG404

L	T	P	Credits
1	0	0	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course, are described
CO2	Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area.
CO3	Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning.
CO4	Guidelines for writing Learning Outcomes

Course Contents

Classification of energy sources, contribution of these sources in agricultural sector, Familiarization with biomass utilization for bio-fuel production and their application, Familiarization with types of biogas plants and gasifiers. Bio-gas. Bio-alcohol, biodiesel and bio-oil production and their utilization as bio-energy resource. Introduction of solar energy, collection and their application, Familiarization with solar energy gadgets: solar cooker, solar water heater, application of solar energy: solar drying, solar pond, solar distillation, introduction of wind energy and their application.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested readings:

1. Twidell, J., & Weir, T. 2015. *Renewable energy resources*. Routledge.
2. Kaltschmitt, M., Streicher, W., & Wiese, A. (Eds.). 2007. *Renewable energy: technology, economics and environment*. Springer Science & Business Media.
3. Quaschnig, V. 2016. *Understanding renewable energy systems*. Routledge.
4. Nelson, V. C. 2011. *Introduction to renewable energy*. CRC press.
5. Da Rosa, A. V., & Ordonez, J. C. 2021. *Fundamentals of renewable energy processes*. Academic Press.

Course Title: Lab. Renewable Energy and Green Technology
Course Code: BAG414

L	T	P	Credits
0	0	2	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course, are described
CO2	Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area.
CO3	Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning.
CO4	Guidelines for writing Learning Outcomes

Course contents

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

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Twidell, J., & Weir, T. 2015. *Renewable energy resources*. Routledge.
2. Kaltschmitt, M., Streicher, W., & Wiese, A. (Eds.). 2007. *Renewable energy: technology, economics and environment*. Springer Science & Business Media.
3. Quaschnig, V. 2016. *Understanding renewable energy systems*. Routledge.
4. Nelson, V. C. 2011. *Introduction to renewable energy*. CRC press.
5. Da Rosa, A. V., & Ordonez, J. C. 2021. *Fundamentals of renewable energy processes*. Academic Press.

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

Course Code: BAG405

L	T	P	Credits
1	0	0	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	To enhance knowledge on the cultivation practices of various ornamental crops, beautification.
CO2	To impart knowledge about importance of ornamentals in Landscaping
CO3	To impart technical skills through practical approach required
CO4	To raise and manage ornamental crops

Course Contents

Importance and scope of ornamental crops. medicinal and aromatic plants and landscaping. Principles of landscaping. Landscape uses of trees, shrubs and climbers. Style of gardening and lawn making and maintenance. Production technology of important cut flowers like rose, gerbera, carnation, liliun and orchids under protected conditions and gladiolus, tube rose, chrysanthemum under open conditions. Package of practices for loose flowers like marigold and jasmine under open conditions. Production technology of important medicinal plants like- isabgol, ashwagandha, asparagus, aloe and aromatic plants like mint, lemongrass, citronella, palmarosa, ocimum, geranium, vetiver. Processing and value edition in ornamental crop and MAPs produce.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Bose, T.K., Maiti, R.G, Dhua, R.S. and Das P. 2002. Floriculture and Landscaping, Vol.1. Naya Udyog Publication, Kolkata. pp 508.
2. Singh, A. K. and Sisodia, A. Texbook of Floriculture and Landscaping. 2017. NIPA. pp 446.
3. Singh, R. and Singh, B. K. 2020. Introductory Ornamental Horticulture and Landscape gardening. Daya Publication. pp 229

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

Course Code: BAG415

L	T	P	Credits
0	0	4	2

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	To enhance knowledge on the cultivation practices of various ornamental crops.
CO2	To impart knowledge about importance of ornamentals in Landscaping and beautification.
CO3	To impart technical skills through practical approach required.
CO4	To raise and manage ornamental crops.

Course contents

Identification of Ornamental plants. Identification of Medicinal and Aromatic Plants. Nursery bed preparation and seed sowing. Training and pruning of Ornamental plants. Planning and layout of garden. Bed preparation and planting of MAP. Protected structures - care and maintenance. Intercultural operations in flowers and MAP. Harvesting and post harvest handling of cut and loose flowers extraction of essentials oils.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Bose, T.K., Maiti, R.G, Dhua, R.S. and Das P. 2002. Floriculture and Landscaping, Vol.1. Naya Udyog Publication, Kolkata. pp 508.
2. Singh, A. K. and Sisodia, A. Texbook of Floriculture and Landscaping. 2017. NIPA. pp 446.
3. Singh, R. and Singh, B. K. 2020. Introductory Ornamental Horticulture and Landscape gardening. Daya Publication. pp 229.

Course Title: Entrepreneurship Development and Business Communication

Course Code: BAG406

L	T	P	Credits
1	0	0	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	Acquire knowledge about entrepreneurship development in business environment of Indian economy.
CO2	To know the overview of Indian systems in decision making of entrepreneurs.
CO3	To know how to globalize entrepreneur business environment.
CO4	To know entrepreneur (activities in) managing and motivation of activities indevelopment.

Course Contents

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

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings

1. Akhouri, M.M.P., Mishra, S.P. and Sengupta, Rita, 1989. *Trainers Manual on Developing Entrepreneurial Motivation*, NIESBUD, New Delhi.pp:1-453
2. Mancuso's, Joseph, 1974. *The Entrepreneurs Handbook, Vol.I & II*, Artech House Inc. USA.pp:1-278
3. Singh, A.K., Singh, R.L. A.K. and Roy, B. 2006. *Dimensions of Agricultural Extension*, Aman Publishing House, Meerut.pp:1-456
4. Sagar, Mondal and Ray, G.L. 2009. *Text Book of Entrepreneurship and Rural Development*. Kalyani Publishers, Ludhiana. ISBN 978-81-272-5599-2
5. Gupta, C.B. and Khanka, S.S. 2010. *Entrepreneurship and Small Business Management*, 4th edition, New Delhi: Sultan Chand & Sons.pp:1-332

Course Title: Lab. Entrepreneurship Development and Business Communication
Course Code: BAG416

L	T	P	Credits
0	0	2	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	To learn about various Govt. schemes and incentives for promotion of Indian economy
CO2	Understand the detail view of contract farming, joint ventures, PPP
CO3	To develop various communication skills like reading, writing, listening.
CO4	To know entrepreneur (activities in) managing and motivation of activities indevelopment.

Course contents

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.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings

1. Akhouri, M.M.P., Mishra, S.P. and Sengupta, Rita, 1989. *Trainers Manual on Developing Entrepreneurial Motivation*, NIESBUD, New Delhi.pp:1-453
2. Mancuso's, Joseph, 1974. *The Entrepreneurs Handbook, Vol.I & II*, Artech House Inc. USA.pp:1-278
3. Singh, A.K., Singh, R.L. A.K. and Roy, B. 2006. *Dimensions of Agricultural Extension*, Aman Publishing House, Meerut.pp:1-456
4. Sagar, Mondal and Ray, G.L. 2009. *Text Book of Entrepreneurship and Rural Development*. Kalyani Publishers, Ludhiana. ISBN 978-81-272-5599-2
5. Gupta, C.B. and Khanka, S.S. 2010. *Entrepreneurship and Small Business Management*, 4th edition, New Delhi: Sultan Chand & Sons.pp:1-332

Course Title: Introductory Agro-meteorology & Climate Change
Course Code: BAG407

L	T	P	Credits
1	0	0	1

Course Outcomes: On successful completion of this course, the students will be able to learn:

CO	Statement
CO1	Weather knowledge for betterment of crops.
CO2	Understand earth atmosphere phenomena.
CO3	Measurement of weather element by different instruments.
CO4	Effect of weather elements on crop production, crop monitoring.

Course Contents

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

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Stigter, K. 2010. *Applied Agrometeorology*. Springer Berlin Heidelberg, Germany. pp. 1100
2. Prasada. R. G. 2008. *Agricultural Meteorology*.: PHI Learning, India. pp. 384.
3. Palmer, S. 2016. *Agrometeorology* : Scitus Academics LLC. pp. 264

Course Title: Lab. Introductory Agro-meteorology & Climate Change**Course Code: BAG417**

L	T	P	Credits
0	0	2	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Weather knowledge for betterment of crops, Understand earth atmosphere phenomena.
CO2	Measurement of weather element by different instructs.
CO3	Effect of weather elements on crop production.
CO4	Crop monitoring.

Course Contents

Visit of Agrometeorological Observatory, site selection of observatory, exposure of instruments and weather data recording. Measurement of total, shortwave and longwave radiation, and its estimation using Planck's intensity law. Measurement of albedo and sunshine duration, computation of Radiation Intensity using 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 windrose. Measurement. tabulation and analysis of rain. Measurement of open pan evaporation and evapotranspiration. Computation of PET and AET.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Stigter, K. 2010. *Applied Agrometeorology*. Springer Berlin Heidelberg, Germany. pp. 1100
2. Prasada. R. G. 2008. *Agricultural Meteorology*.: PHI Learning, India. pp. 384.
3. Palmer, S. 2016. *Agrometeorology*. : Scitus Academics LLC. pp. 264

Course Title: Agri- Informatics
Course Code: BAG408

L	T	P	Credits
1	0	0	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Making the students understand & learn basics of Computer.
CO2	Able to operate a Computer by knowing all parts & instructions of Computer.
CO3	Make use of Computer in our day to day Life.
CO4	Learn about DOS and its commands.

Course contents

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. Post harvest 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.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested readings:

1. Salaria, R. S. 2017. *Computer Fundamentals*. Daryaganj, New Delhi. pp. 486.
2. Manish, S. and Bhatt, A. 2016. *Computers in Agriculture: Fundamentals and Applications*. New India Publishing Agency. New Delhi. pp. 190.
3. Manjunath, B.E. 2010. *Computer Basics*. Vasan Publications, Bengaluru, Karnataka. pp. 356.

Course Title: Lab. Agri- Informatics

Course Code: BAG418

L	T	P	Credits
0	0	2	1

Course Outcomes:

On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Able to operate a Computer by knowing all parts & instructions of Computer.
CO2	Making the students understand & learn basics of Computer
CO3	Make use of Computer in our day to day Life.
CO4	Learn about DOS and its commands.

Course Contents

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.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested readings:

1. Salaria, R. S. 2017. *Computer Fundamentals*. Daryaganj, New Delhi. pp. 486.
2. Manish, S. and Bhatt, A. 2016. *Computers in Agriculture: Fundamentals and Applications*. New India Publishing Agency. New Delhi. pp. 190.
3. Manjunath, B.E. 2010. *Computer Basics*. Vasan Publications, Bengaluru, Karnataka. pp. 356.

Course Title: Poultry Production & Management
Course Code: BAG409

L	T	P	Credits
2	0	0	2

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	To know about poultry industry in India and production and marketing statistics of eggs and chicken
CO2	To be knowledgeable about the role of livestock towards national economy and become familiar about different animal breeds and their genesis. To understand the reproductive behaviour and parturition process and factors affecting fertility.
CO3	To have the knowledge about nutrition, feeding and management of chicks
CO4	To understand the management, treatment and control measure to prevent various diseases, knowledge of poultry breeds, rearing, feeding and management incubation, breeding, vaccination against diseases etc.

Course Contents

GENERAL: Importance of poultry industry in India, Poultry production and marketing statistics of eggs and chicken. Historical development in poultry birds potential.

BREEDING: Male and female reproductive system of chicken, Breeds and strains of broilers and layers of chicken. duck and quails, General aspects of breeding for better egg production and body weight gain. Selection and culling, Artificial insemination.

GENERAL MANAGEMENT: Establishment of poultry farm. Housing and equipment, incubation and hatching of eggs, Broiler and layer management. Lighting schedule for poultry. **FEEDS AND FEEDING:** Digestion, Digestive system of chicken. Feed ingredients, Availability of CP and ME in ingredients. Feed processing. Formulation of feed viz. Starter, Grower, Layer, Finisher and Breeder ration, FCR, CP ratio, Nutritional deficiency conditions. **HEALTH MANAGEMENT:** Vaccination schedule for poultry, Common poultry diseases, i.e. Ranikhet, Marex, Chicken pox, Gumboro, Infectious bronchitis and CRD. Control of internal and external parasites.

POULTRY PRODUCTS: Preservation and storage of eggs, Grading of eggs, AGMARK standard of egg. Egg powder, Slaughtering and processing of chicken, Marketing of poultry products.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion

Suggested References:

1. N.V. Jadhav and M.F. Siddiqui N.V. Jadhav and M.F. Siddiqui N.V. Jadhav and M.F. Siddiqui Handbook of Poultry Production and Management by
2. Book on Commercial Poultry Farming by T. Burr Charles and Homer O. Stuart
3. Poultry Production by R.A. Singh
4. A Textbook of Animal Husbandry – G.C. Benerjee
5. Livestock Production and Management – N.S.R. Sastri, C.K. Thomas, R.A. Singh
6. Essentials of Animal Production and Management – R. Singh
7. A Handbook of Animal Husbandry – ICAR
8. A Textbook of Livestock Production Management in Tropics – D.N. Verma

Course Title: Lab. Poultry Production & Management
Course Code: BAG419

L	T	P	Credits
0	0	2	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	To know about poultry industry in India and production and marketing statistics of eggs and chicken
CO2	To be knowledgeable about the role of livestock towards national economy and become familiar about different animal breeds and their genesis, understand the reproductive behaviour and parturition process and factors affecting fertility.
CO3	To have the knowledge about nutrition, feeding and management of chicks
CO4	To understand the management, treatment and control measure to prevent various diseases, knowledge of poultry breeds, rearing, breeding, vaccination against diseases etc.

Course Contents

Neat and clean diagram of hen showing external body parts. 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. Dissection of bird fir showing internal body parts.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion

Suggested References:

1. Jadhav, N.V. and Siddiqui, M.F. 2010. Handbook of Poultry Production and Management.
2. Charles, T. Burr and Stuart, Homer O. 2011. Book on Commercial Poultry Farming.
3. Singh, R.A. 2009. Poultry Production.
4. Benerjee, G.C. 2018. A Textbook of Animal Husbandry.
5. Sastri, N.S.R., Thomas, C.K. and Singh, R.A. 2017. Livestock Production and Management.
6. Singh, R. 2009. Essentials of Animal Production and Management.
7. Anonymous. 2002. A Handbook of Animal Husbandry – ICAR
8. Verma, D.N. 2005. A Textbook of Livestock Production Management in Tropics.

Course Title: Lab. Practical Crop Production –II (Rabi Crops)

Course Code: BAG411

L	T	P	Credits
0	0	4	2

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	To discuss about crop planning and raising field crops in multiple cropping systems.
CO2	To provide knowledge about cultivation practices of rabi crop as well as threshing, drying, winnowing, storage and marketing value of concern crops.
CO3	Preparation of balance sheet including cost of cultivation.
CO4	Elaborate to main winter crop which are provide more outcome.

Course Contents

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

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Prasad, R. 2002. *Textbook of Field Crops Production*. Directorate of Information and Publication of Agriculture, Indian Council of Agricultural Research, New Delhi. pp. 821.
2. Singh, C. and Singh, R. 2020. *Modern Techniques of Raising Field Crops*. CBS Publishers & Distributors, New Delhi. pp. 496.
3. Reddy T. Y. and Reddy G. H. S. 2002. *Principle of Agronomy*. Kalyani Publishers, Ludhiana, Punjab. pp.527

Course Title: Rainfed and dryland Agriculture
Course Code: BAG501

L	T	P	Credits
1	0	0	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	To study soil and climatic conditions prevalent in rainfed areas
CO2	To study effect of water deficiton physic-morphological characteristics of the plants
CO3	To enhance the quality & productivity of crop production.
CO4	To demonstrate the efficient utilization of water through soil and crop management practices

Course contents

Introduction: types and history, Problems & prospects of rainfed agriculture in India. Soil and climatic conditions prevalent in rainfed areas. Drought: types, effect of water deficiton physico morphological characteristics of the plants. Mechanism of crop adoption under moisture deficitconditions. Efficient utilization of water through soil and crop management practices, management of crops in rainfed areas. Contingentcrop planning for aberrant weather conditions. Precision agriculture; concepts and techniques: their issues and concerns for Indian agriculture.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Mohamed, A. M. O., & Paleologos, E. K. 2017. *Fundamentals of Geoenvironmental Engineering: understanding Soil, Water, and Pollutant Interaction and Transport*. Butterworth-Heineman
2. Das, G. 2008. *Hydrology and Soil Conservation Engineering: Including Watershed Management*. PHI Learning Pvt. Ltd.
3. Panda, S. C. 2007. *Soil water conservation and dry farming*. Jodhpur, India: Agrobios (India).
4. Coleman, D. C. & Crossley Jr, D. A. 2003. *Fundamentals of soil ecology*. Academic press.
5. Burden, D. S. 1999. *Fundamentals of Soil Science as Applicable to Management of Hazardous Wastes*. Superfund Technology Center for Ground Water

Course Title: Lab. Rainfed and Dryland Agriculture	L	T	P	Credits
Course Code: BAG518	0	0	2	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	To introduce new technologies in rainfall pattern in rainfed areas of the country
CO2	To maintain tight contact with farmers.
CO3	To Understand evapo-transpiration method to calculate effective rainfall
CO4	Compare the different methods used in rainfall calculations

Course contents

Studies on climatic classifications, studies on rainfall pattern in rainfed areas of the country. Studies on cropping pattern of different dryland areas in the country and demarcation of dry land area on map of India. Interpretation of metrological data and scheduling of supplemental irrigations based on the evapo-transpiration demand of crops effective rainfall land its calculations. Visit to rainfed researchstations/watersheds.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Mohamed, A. M. O., & Paleologos, E. K. 2017. *Fundamentals of Geo Environmental Engineering: understanding Soil, Water, and Pollutant Interaction and Transport*. Butterworth-Heineman
2. Das, G. 2008. *Hydrology and Soil Conservation Engineering: Including Watershed Management*. PHI Learning Pvt. Ltd.
3. Panda, S. C. 2007. *Soil water conservation and dry farming*. Jodhpur, India: Agrobios (India).
4. Coleman, D. C. & Crossley Jr, D. A. 2003. *Fundamentals of soil ecology*. Academic press.
5. Burden, D. S. 1999. *Fundamentals of Soil Science as Applicable to Management of Hazardous Wastes*. Superfund Technology Center for Ground Water

Course Title:	Crop Improvement-I (Kharif Crops)	L	T	P	Credits
Course Code:	BAG502	1	0	0	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	To understand cytogenetics relationship among the species of a genera
CO2	Controlled pollination techniques for hybridization in crop plants.
CO3	Estimation of Heterosis and inbreeding and their impacts on reproduction of crops
CO4	Breeding methodologies for crop improvement.

Course contents

Centres of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fibres; fodders and cash crops; vegetable and horticultural crops; Plant genetic resources, its utilization and conservation, study of genetics of qualitative and quantitative characters; Important concepts of breeding self pollinated, cross pollinated and vegetatively propagated crops; Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, adaptability, stability, abiotic and biotic stresstolerance and quality (physical, chemical, nutritional); Hybrid seed production technology in maize, rice, sorghum, pearl millet and pigeonpea, etc. Ideotype concept and climate resilient crop varieties for future.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings

1. Singh, B.D. 2018. *Plant Breeding (Principles and methods)*, Kalyani publishers, New Delhi. pp. 918.
2. Singh, P. 2017. *Fundamentals of Plant Breeding (Principles and methods)*, Kalyani publishers, New Delhi, pp : 327
3. Kumaresan, V. and Arumugam, N. 2017. *Fundamentals of Horticulture and Plant Breeding*. Saras publisher, Tamilnadu. pp. 524.
4. Singh, P. and Arumugam, N. 2016. *Essential of Plant Breeding*. Kalyani publisher, New Delhi. pp. 243.

Course Title: Lab. Crop Improvement-I (Kharif Crops)

Course Code: BAG519

L	T	P	Credits
0	0	2	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	Study Floral biology of different crops for controlled pollination
CO2	To be expert in controlled pollination for hybrid seed production
CO3	Handling of segregating material in advanced generations
CO4	Estimation of heterosis and inbreeding depression in open pollinated crops.

Course contents

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

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings

1. Singh, B.D. 2018. *Plant Breeding (Principles and methods)*, Kalyani publishers, New Delhi. pp. 918.
2. Singh, P. 2017. *Fundamentals of Plant Breeding (Principles and methods)*, Kalyani publishers, New Delhi, pp : 327
3. Kumaresan, V. and Arumugam, N. 2017. *Fundamentals of Horticulture and Plant Breeding*. Saras publisher, Tamilnadu. pp. 524.
Singh, P. and Arumugam, N. 2016. *Essential of Plant Breeding*. Kalyani publisher, New Delhi. pp. 243.

Course Title: Pests of Crops and Stored Grain and their Management**Course Code: BAG503**

L	T	P	Credits
2	0	0	2

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	To differentiate insects and pests along with examples
CO2	Study of different insect pests of field crops, horticultural and vegetable crop
CO3	Diagnosing symptoms of damage by major insect pests of crops
CO4	Studying the role various biotic and abiotic factors of environment on pest Incidence

Course contents

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

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings

1. Atwal, A.S. and Dhaliwal, G.S. 2015. *Agricultural Pests of South Asia and their Management*. Kalyani Publishers.pp.616.
2. David, B.V. and Rammurthy, V.V. 2016. *Elements of Economic Entomology*. Brillion Publishing.pp.412.
3. Manishekharan and Sudarrajan. 2018. *Pest Management in Field Crops*. Agrobios (India). pp.450
4. Prasad, T.V. 2019. *Handbook of Entomology* . New Vishal Publications.pp.496

Course Title: Lab. Pests of Crops and Stored Grain and their Management**Course Code: BAG520**

L	T	P	Credits
0	0	2	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	Collection and identification of major insect pests of field crops, horticultural and vegetable crops
CO2	Diagnosing symptoms of damage by major insect pests of crops
CO3	To study extent of pest losses in kharif and rabi crops
CO4	Fumigation of stores to protect food grains and their products

Course contents

Identification of different types of damage. Identification and study of life cycle and seasonal history of various insect pests attacking crops and their produce: (a) Field Crops; (b) Vegetable Crops; (c) Fruit Crops; (d) Plantation, gardens, Narcotics, spices & condiments. Identification of insect pests and Mites associated with stored grain. Determination of insect infestation by different methods. Assessment of losses due to insects. Calculations on the doses of insecticides application technique. Fumigation of grain store / godown. Identification of rodents and rodent control operations in godowns. Identification of birds and bird control operations in godowns. Determination of moisture content of grain. Methods of grain sampling under storage condition. Visit to Indian Storage Management and Research Institute, Hapur and Quality Laboratory, Department of Food., Delhi. Visit to nearest FCI godowns.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Atwal, A.S. and Dhaliwal, G.S. 2015. *Agricultural Pests of South Asia and their Management*. Kalyani Publishers.pp.616.
2. David, B.V. and Rammurthy, V.V. 2016. *Elements of Economic Entomology*. Brillion Publishing.pp.412.
3. Manishekharan and Sudarrajan. 2018. *Pest Management in Field Crops*. Agrobios (India). pp.450
4. Prasad, T.V. 2019. *Handbook of Entomology*. New Vishal Publications.pp.496

Course Title: Agricultural Marketing, Trade and Prices

Course Code: BAG504

L	T	P	Credits
2	0	0	2

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates s will be able to:
CO1	Planning and designing criteria of agricultural marketing.
CO2	Knowledge regarding choice of nature and determinants of demand and supply of farm products.
CO3	Will get the idea about the types and importance of agencies involved in agricultural marketing
CO4	We get the knowledge of Agricultural prices and policy.

Course contents

Agricultural Marketing: Concepts and definitions of market. marketing. Agricultural marketing, market structure, marketing mix and market segmentation. classification and characteristics of agricultural markets; demand, supply and producer's surplus of Agri-commodities: nature and determinants of demand and supply of farm products. producer's surplus- meaning and its types, market able and marketed surplus, factors affecting marketable surplus of Agri- commodities; cost based and competition-based pricing; market promotion -advertising, personal selling, sales promotion and publicity - their meaning and merits & demerits; marketing process and functions:

Marketing process-concentration, dispersion and equalization; exchange functions - buying and selling; physical functions -storage. Transport and processing; facilitating functions - packaging, branding. grading. quality control and labeling (Agmark) ;Market functionaries and marketingchannels: Types and importance of agencies involved in agricultural marketing; meaning anddefinition of marketingchannel; number of channel levels; marketing channels for different farm products; Integration, efficiency, costs and price spread: Meaning, definition and types of market integration; marketing efficiency; marketing costs, margins and price spread; factors affecting cost of marketing: reasons for higher marketing costs of farm commodities; ways of reducing marketing costs:Role of Govt. in agricultural marketing: Public sector institutions- CWC, SWC, FCI, CACP & DMI -their objectives and functions; cooperative marketing in India; Risk in marketing: Types of risk inmarketing; speculation & hedging; an overview of future strading;

Agricultural prices and policy: Meaning and functions of price; administered prices; need for agricultural price policy; Trade: Concept of International Trade and its need, theories of absolute and comparative advantage. Present status and prospects of international trade in agri- commodities; GATT and WTO; Agreement on Agriculture (AoA) and its implications on Indian agriculture; IPRGST.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Acharya, S.S. and Agarwal, N.L. 2006. *Agricultural Marketing in India*. Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi. Vol. 4. pp 37-78
2. Kahlon, A.S and Tyagi, D S, 1983. *Agricultural Price Policy in India*. Allied Publishers Pvt. Ltd., New Delhi. Vol. 2. pp 367-388
3. Kulkarni, K R.1964. *Agricultural Marketing in India*. The Co-operators Books Depot, Mumbai. Vol. 1. pp 111-193
4. Mamoria, C.B. and Joshi. R L.1995. *Principles and Practices of Marketing in India*, Kitab Mahal, Allahabad. pp 167-208

Course Title: Lab. Agricultural Marketing, Trade and Prices**Course Code: BAG521**

L	T	P	Credits
0	0	2	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates s will be able to:
CO1	Planning and designing criteria of agricultural marketing.
CO2	Knowledge regarding choice of nature and determinants of demand and supply of farm products.
CO3	Will get the idea about the types and importance of agencies involved in agricultural marketing
CO4	We get the knowledge of Agricultural prices and policy.

Course contents

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

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Acharya, S.S. and Agarwal, N.L. 2006. *Agricultural Marketing in India*. Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi. Vol. 4. pp 37-78
2. Kahlon, A.S and Tyagi, D S, 1983. *Agricultural Price Policy in India*. Allied Publishers Pvt. Ltd., New Delhi. Vol. 2. pp 367-388
3. Kulkarni, K R.1964. *Agricultural Marketing in India*. The Co-operators Books Depot, Mumbai. Vol. 1. pp 111-193
4. Mamoria, C.B. and Joshi. R L.1995. *Principles and Practices of Marketing in India*, Kitab Mahal, Allahabad. pp 167-208

Course Title: Protected Cultivation and Secondary Agriculture**Course Code: BAG505**

L	T	P	Credits
2	0	0	2

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates s will be able to:
CO1	Planning and designing criteria of different protected structures like green house, shrdevets etc.
CO2	Knowledge regarding choice of crops suitable for greenhouse cultivation.
CO3	Will get the idea about the need and requirement of growing crops under protected structure and scope of protected cultivation.
CO4	We get the knowledge and maintenance of thresher winnowing and other field machines.

Course contents

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

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

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Warade, S.D. 2003. Protected cultivation of Horticulture crops. CAFT (fruits), MPKV, Rahuri. pp 306
2. Singh, B. 2005. *Protected cultivation of vegetable crops*. Kalyani publishers, New Delhi. pp 180
3. Dhaliwal, M.S. 2008. Handbook of vegetable crops.. Kalyani publishers, Ludhiana. pp 389

Course Title: Lab. Protected Cultivation and Secondary Agriculture**Course Code: BAG522**

L	T	P	Credits
0	0	2	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	Planning and designing criteria of different protected structures like green house.
CO2	Knowledge regarding choice of crops suitable for green house cultivation.
CO3	Will get the idea about the need and requirement of growing crops under protected structure and scope of protected cultivation.
CO4	Will get the knowledge and maintenance of thresher, winnowing and other field machines.

Course contents

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

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Warade, S.D. 2003. Protected cultivation of Horticulture crops. CAFT (fruits), MPKV, Rahuri. pp 306
2. Singh, B. 2005. *Protected cultivation of vegetable crops*. Kalyani publishers, New Delhi. pp 180
3. Dhaliwal, M.S. 2008. Handbook of vegetable crops. Kalyani publishers, Ludhiana. pp 389

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

Course Code: BAG506

L	T	P	Credits
2	0	0	2

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	To study the Economic Importance of diseases of Horticultural Crops.
CO2	To study the symptoms of diseases of Horticultural Crops.
CO3	To understand the causes of diseases of Horticultural Crops.
CO4	To study and understand the disease cycle of Horticultural Crops.

Course contents

Symptoms, aetiology, disease cycle and management of following diseases: Symptoms, etiology, disease cycle and management of major diseases of following crops: Field Crops: Rice: Blast, Brown spot, Bacterial Blight. Sheath blight, false smut, Khaira and tungro; Maize: stalk rots, downy mildew.; 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: Panama wilt, 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.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Agrios, G.N. 2010. *Plant Pathology*. Acad. Press.
2. Singh, R.S. 2013. *Introduction to Principles of Plant Pathology*. Oxford and IBH Pub.Co.
3. Dhingra, O.D. & Sinclair, J.B. 1986. *Basic Plant Pathology Methods*. CRC Press, London, Tokyo

Course Title: Lab. Diseases of Field and Horticultural Crops and their Management-I
Course Code: BAG523

L	T	P	Credits
0	0	2	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	To study economic importance of various field crops.
CO2	To study the identification of symptom and sign of field crops in field and lab.
CO3	To study the various pathogens cause the diseases of field crops.
CO4	Understand the nature of different pathogens to cause various types of field crop diseases.

Course contents

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.

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

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Agrios, G.N. 2010. *Plant Pathology*. Acad. Press.
2. Singh, R.S. 2013. *Introduction to Principles of Plant Pathology*. Oxford and IBH Pub.Co.
3. Dhingra, O.D. & Sinclair, J.B. 1986. *Basic Plant Pathology Methods*. CRC Press, London, Tokyo

Course Title: Production Technology for Fruit and Plantation Crops**Course Code: BAG507**

L	T	P	Credits
1	0	0	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Acquire knowledge of classification of plants and the peculiar requirements of desert, tropical, sub-tropical and temperate
CO2	Study about irrigation system, planting, maintaining, water schedules and fertilizers of fruit and plantation crops
CO3	Learn about canopy management of different fruit crops
CO4	Understand the importance of plantation crops for the industry

Course contents

Importance and scope of fruit and plantation crop industry in India; Importance of rootstocks; Production technologies for the cultivation of major fruits-mango, banana, citrus, grape, guava, litchi, papaya, sapota, apple, pear, peach, walnut, almond, several minor fruits and plantation crops, like coconut, are canut, cashew, tea, coffee & rubber.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion

Suggested Readings:

1. Anonymous 2001. Handbook of Horticulture 10th edition. ICAR publication, Indian Council of Agricultural Research, New Delhi. pp. 1069.
2. Bose, T. K., Mitra, S. K. and Sanyal, D. 2001. Fruits: Tropical and Subtropical, Volume 1, 3rd edition. Naya Udyog. pp. 721.
3. Katyal, [S.L.](#), Krishnamurthi, S. and Singh, [Sham](#) 1963. Fruit Culture in India. [Indian Council of Agricultural Research, New Delhi](#). pp. 451.
4. Singh, R. 1969. Fruits. National Book Trust, India. pp. 213.
5. Singh, A. 2003. Physiology of Fruit Production 5th edition. Kalyani Publishers. pp. 574.
6. Kumar, N. 2018, Introduction to spices and Plantation crops, 2nd edition. Oxford & IBH Publishing Co. Pvt. Ltd. pp. 492.
7. Peter. K.V. 2013. Plantation Crops. National Book Trust. pp. 332.

Course Title: Lab. Production Technology for Fruit and Plantation Crops**Course Code: BAG524**

L	T	P	Credits
0	0	2	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	To have a knowledge of classification of plants and the peculiar requirements of desert, tropical, sub-tropical and temperate.
CO2	To Profound knowledge of all irrigation system, planting, maintaining, water schedules and fertilizers, Propagated, cultivated, fertilized, pruned, arranged, displayed transplanted various plant materials.
CO3	To have good knowledge of methods, techniques and procedures used in physical and chemical analysis of soil plant life and methods and materials used in proper planting care and maintenance of plants; types of plants best suited for specific area and projects.
CO4	To operates all equipment's used on a golf course.

Course Contents

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

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Anonymous 2001. Handbook of Horticulture 10th edition. ICAR publication, Indian Council of Agricultural Research, New Delhi. pp. 1069.
2. Bose, T. K., Mitra, S. K. and Sanyal, D. 2001. Fruits: Tropical and Subtropical, Volume 1, 3rd edition. Naya Udyog. pp. 721.
3. Katyal, [S.L.](#), Krishnamurthi, [S.](#) and Singh, [Sham.](#) 1963. Fruit Culture in India. [Indian Council of Agricultural Research, New Delhi.](#) pp. 451.
4. Singh, R. 1969. Fruits. National Book Trust, India. pp. 213.
5. Singh, A. 2003. Physiology of Fruit Production 5th edition. Kalyani Publishers. pp. 574.
6. Kumar, N. 2018, Introduction to spices and Plantation crops, 2nd edition. Oxford & IBH Publishing Co. Pvt. Ltd. pp. 492.
7. Peter. K.V. 2013. Plantation Crops. National Book Trust. pp. 332.

Course Title: Communication Skills and Personality Development
Course Code: BAG508

L	T	P	Credits
1	0	0	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Understanding grammar principles and transforming sentences.
CO2	Writing research projects and preparing technical reports.
CO3	Learning phonetic symbols, using correct sound, stress and intonations. Learning do's and don'ts for interviews.
CO4	Enhanced communication ability in English.

Course Contents

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

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested readings

1. Spitzberg, B., Barge K & Morreale, Sherwyn P. 2006. *Human Communication: Motivation, Knowledge & Skills*. Wadsworth. pp 512.
2. Verma, K.C. 2013. *The Art of Communication*. Kalpaz. pp 245.
3. Bhatnagar, Mamatha and Bhatnagar, Nitin. 2011. *Effective Communication and Soft Skills*. Person Education. pp 448.
4. Raman, Meenakshi and Sharma, Sangeeta.2016. *Technical Communication Principles and Practice* Harold Wallace and Ann Masters. Personality Development. Cengage Publishers. pp 516.

Course Title: Lab. Communication Skills and Personality Development

Course Code: BAG525

L	T	P	Credits
0	0	2	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Writing CVs, letters for jobs, complaints and emails, essays on select topics.
CO2	Writing research projects and preparing technical reports.
CO3	Learning phonetic symbols, using correct sound, stress and intonations. Learning do's and don'ts for interviews.
CO4	Enhanced communication ability in English.

Course Contents

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.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested readings

1. Spitzberg, B., Barge K & Morreale, Sherwyn P. 2006. *Human Communication: Motivation, Knowledge & Skills*. Wadsworth. pp 512.
2. Verma, K.C. 2013. *The Art of Communication*. Kalpaz. pp 245.
3. Bhatnagar, Mamatha and Bhatnagar, Nitin. 2011. *Effective Communication and Soft Skills*. Person Education. pp 448.
4. Raman, Meenakshi and Sharma, Sangeeta. 2016. *Technical Communication Principles and Practice* Harold Wallace and Ann Masters. Personality Development. Cengage Publishers. pp 516.

Course Title: Intellectual Property Rights

Course Code: BAG509

L	T	P	Credits
1	0	0	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	The main objective of the IPR is to make the students aware of their rights for the protection of their invention done in their project work.
CO2	To get registration in our country and foreign countries of their invention, designs and thesis or theory written by the students during their project work and for this they must have knowledge of patents, copy right, trademarks, designs and information Technology Act.
CO3	Further teacher will have to demonstrate with products and ask the student to identify the different types of IPR's.
CO4	Analyse ethical and professional issues which arise in the intellectual property law context

Course contents

Introduction and meaning of intellectual property, brief introduction to GATT, WTO, TRIPs and WIPO, Treaties for IPR protection. Types of Intellectual Property and legislations covering IPR in India:-Patents, Copyrights, Trademark, Industrial design, Geographical indications, Integrated circuits, Trade secrets. Patents Act 1970 and Patent system in India, patentability, process and product patent procedure. Patent Cooperation Treaty, Patent search and patent database. Protection of plant varieties under UPOV and PPV & FR Act of India, Plant breeders rights, Registration of plant varieties under PPV&FR Act 2001, breeders, researcher and farmers rights. Traditional knowledge-meaning and rights of TK holders.

Convention on Biological Diversity, International treaty on plant genetic resources for food . access and benefit sharing.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested reading:

1. Pandey, Neeraj and Dharmi, Khushdeep. 2020. A Text Book of Intellectual Property Rights,
2. Singh, Mayank. 2021. A Text Book of Intellectual Property Rights,
3. Sarkar, Suvrashis. 2020. A Text Book of Intellectual Property Rights.
4. Ramakrishna B. and Anil Kumar H.S 2018. .A Text Book of Intellectual Property Rights,

Course Title: Principles of Food Science and Nutrition
Course Code: BAG510

L	T	P	Credits
2	0	0	2

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	To supply wholesome, safe, nutrition's and acceptable food to consumers throughout the year.
CO2	Generate both urban and rural employment.
CO3	Develop new value added products.
CO4	Reduce fruit and vegetable losses.

Course contents

Concepts of Food Science (definitions, measurements, density, phase change, pH, osmosis, surface tension, colloidal systems etc.); Food composition and chemistry (water, carbohydrates, proteins, fats, vitamins, minerals, flavours, colours, miscellaneous bioactives, important reactions); Food microbiology (bacteria, yeast, moulds, spoilage of fresh & processed foods, Production of fermented foods); Principles and methods of food processing and preservation (use of heat, low temperature, chemicals, radiation, drying etc.); Food and nutrition, Malnutrition (over and under nutrition), nutritional disorders; Energy metabolism (carbohydrate, fat, proteins); Balanced/ modified diets, Menu planning, New trends in food science and nutrition.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Fennema, Owen R. 1996. Food Chemistry, 3rd Ed. Marcel Dekker, Inc., New York, USA.
2. Rahman, M. Shafiur. 2007. Handbook of Food Preservation, 2nd Ed. CRC Press, Boca Raton, FL, USA.
3. Brennan, James G.. 2006. Food Processing Handbook. Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim, Germany.
4. Berdanier, Carolyn D., Feldman, Elaine B. and Dwyer, Johanna. 2008. Handbook of Nutrition and Food, 2nd Ed. CRC Press, Boca Raton, FL, USA.
5. Zeuthen, Peter and Leif Bugh-Sørensen. 2003. Food Preservation Techniques. CRC Press LLC, Boca Raton, FL, USA.
6. Joshi V.K. and Pandey, Ashok. 1999. Biotechnology: Food Fermentation – Microbiology, Biochemistry and Technology, Vol. II. Educational Publishers & Distributors, New Delhi.

Course Title: Lab. Principles of Food Science and Nutrition
Course Code: BAG526

L	T	P	Credits
0	0	2	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	To study about food nutrients and their importance.
CO2	Address the Food microbiology.
CO3	Study Principles and methods of food processing and preservation
CO4	New trends in food science and nutrition

Course Contents

Sampling of milk, Specific gravity of milk by lactometer, Water quality test, Study of Nutritional deficient conditions, Study of Nutritional disorders., Quality parameters for egg, meat and chicken, Fattest by Gerber's method, T.S.& S.N.F. percentage by Richmond's scale and formula.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Fellow,s P. 2000. Food Processing Technology: Principles and Practice, 2nd Ed. CRC Press, Boca Raton, FL, USA.
2. George, J. Banwart. 1989. Basic Food Microbiology, 2nd Ed. Chapman & Hall, New York, USA.
3. Kalia, M. and Sood, S. 2010. Food Preservation and Processing. Revised Edition, Kalyani Publishers, New Delhi.
4. Swaminathan, M. 1999. Food Science, Chemistry and Experimental Foods. 2nded. The Bangalore Printing and Publishing Co., Bangalore.
5. Frazier, William C. and & Westhoff, Dennis C. 1987. Food Microbiology, 4th Ed. Tata McGraw- Hill Education, New Delhi.

Course Title: Geo-informatics and Nanotechnology and Precision Farming

Course Code: BAG511

L	T	P	Credits
1	0	0	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	To develop an agriculture web map service
CO2	Associate and apply tools and techniques of geo informatics farming.
CO3	Extend and apply tools and techniques of geo informatics in nanotechnology.
CO4	Evaluate the role of geo informatics in agriculture.

Course Contents

Geo-informatics- definition, concepts, tool and techniques; their use in Precision Agriculture. Crop discrimination and Yield monitoring, soil mapping; fertilizer recommendation using geospatial technologies; Spatial data and their management in GIS; Remote sensing concepts and application in agriculture; Image processing and interpretation; Global positioning system (GPS), components and its functions; Introduction to crop Simulation Models and their uses for optimization of Agricultural Inputs; STCR approach for precision agriculture; Nanotechnology, definition, concepts and techniques, brief introduction about nanoscale effects, nano-particles, nano-pesticides, nano-fertilizers, nano-sensors, Use of nanotechnology in seed, water, fertilizer, plant protection for scaling-up farm productivity. Precision agriculture: concepts and techniques; their issues and concerns for Indian agriculture;

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Elangovan, K. 2006. GIS : Fundamentals, Applications & Implementations –New India publishing Agency, New Delhi.
2. Abbasi, Tasneem and Abbasi, S.A. 2010. Remote sensing , GIS and wet land management.

Course Title: Lab. Geo-informatics and Nanotechnology and Precision Farming
Course Code: BAG527

L	T	P	Credits
0	0	2	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	To develop an agriculture web map service.
CO2	Associate and apply tools and techniques of geo informatics farming.
CO3	Extend and apply tools and techniques of geo informatics in nanotechnology.
CO4	Evaluate the role of geo informatics in agriculture.

Course contents

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

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion

Suggested Readings:

1. Elangovan, K. 2006. GIS : Fundamentals, Applications & Implementations –New India publishing Agency, New Delhi.
2. Abbasi, Tasneem and Abbasi, S.A. 2010. Remote sensing , GIS and wet land management.

ELECTIVE-1

Course Title: Agri-business Management

Course Code: BAG512

Credits

2

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	To develop business management in agriculture.
CO2	Classification of industries and types of agro based industries
CO3	To study the Management functions.
CO4	Evaluate the role of project management.

Course contents

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

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Nagpure, S. and Deshmukh, R.G. 2004. *Agribusiness Management*. AGROMET Publishers, Nagpur.pp.481.
2. Diwase, S. 2017. *Indian Agriculture & Agri-Business Management*. Scientific Publishers, Jodhpur. pp.208.
3. Reddy, S.S. and Ram, P.R. 1996. *Agricultural Finance and Management by Agricultural Finance & Management*. Oxford IBH Publishing Co. Pvt. Ltd., New Delhi.pp.279.
4. Amarnath, J.S. and Samvel, A.P.V. 2010. *Agri-Business Management*. Satish Serial Publishing House, Delhi.pp.416

Course Title: Lab. Agri-business Management

Course Code: BAG528

Credits

1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	To develop an agriculture web map service
CO2	Associate and apply tools and techniques of geo informatics farming.
CO3	Extend and apply tools and techniques of geo informatics in nanotechnology.
CO4	Evaluate the role of geo informatics in agriculture.

Course contents

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

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Nagpure, S. and Deshmukh, R.G. 2004. *Agribusiness Management*. AGROMET Publishers, Nagpur.pp.481.
2. Diwase, S. 2017. *Indian Agriculture & Agri-Business Management*. Scientific Publishers, Jodhpur.pp.208.
3. Reddy, S.S. and Ram, P.R. 1996. *Agricultural Finance and Management by Agricultural Finance & Management*. Oxford IBH Publishing Co. Pvt. Ltd., New Delhi.pp.279.
4. Amarnath, J.S. and Samvel, A.P.V. 2010. *Agri-Business Management*. Satish Serial Publishing House, Delhi.pp.416

Course Title: Agro chemicals

Course Code: BAG513

Credits

2

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	To study an agrochemicals and role in agriculture
CO2	Associate and apply tools and techniques of to use fertilizers.
CO3	Extend and apply tools and techniques for sustainable agriculture.
CO4	Evaluate the merits and demerits of their uses in agriculture management of agro chemicals for sustainable agriculture.

Course contents

An introduction to agro chemicals, 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 -Dithio carbamates-characteristics, preparation and use of Zineb and maneb.

Systemic fungicides Benomyl, carboxin, oxycarboxin, Metalaxyl, Carbendazim. characteristics and use. Introduction and classification of insecticides: inorganic and organic insecticides Organochlorine, Organophosphates, Carbamates, Synthetic pyrethroids Neonicotinoids. Hio rational. Insecticide Act and rules, Insecticides banned, withdrawn and restricted use, Fate of insecticides in soil & plant. IGRs Bio pesticides, Reduce drisk insecticides, Botanicals, plant and animal systemic insecticides their characteristics and uses.

Fertilizers and their importance. Nitrogenous fertilizers: Feed stocks and anufacturing 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 micro nutrient mixtures. Complex fertilizers: Manufacturing of ammonium phosphates, nitro phosphates and NPK complexes. Fertilizer control order. Fertilizer logistics and marketing. Plant bio-pesticides for ecological agriculture, Bio-insect repellent.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Rakshit A. 2015. Manures Fertilizers and Pesticides Paperback – Import. CBS Publishing; 1ST edition, pp. 266.
2. Havlin, John L, Tisdale, Samuel L., Nelson Werner L. and Beaton, James D. 2004. Soil Fertility and Fertilizers (8th Edition). Published July 23rd 2004 by Prentice Hall. pp. 528.
3. Havlin, John L. (2004) Soil Fertility and Fertilizers: An Introduction to Nutrient Management Published July 23rd 2004 by Prentice Hall. pp. 528.
4. Das D. K. (2011) Introductory Soil Science, 3rd revised and Enlarged Ed, Kalyani Publisher, Ludhiana. pp. 645.

Course Title: Commercial Plant Breeding	Credits	Credits
Course Code: Lab. Agro chemicals BAG529 BAG514	1	2

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	To study an agrochemicals and role in agriculture
CO2	Associate and apply tools and techniques of to use fertilizers.
CO3	Extend and apply tools and techniques for sustainable agriculture.
CO4	Evaluate the merit and demerits of their uses in agriculture management of agro chemicals for sustainable agriculture.

Course contents

Sampling of fertilizers and pesticides. Pesticides application technology to study about various pesticides appliances. Quick tests for identification of common fertilizers. Identification of anion and cation in fertilizer. Calculation of doses of insecticides to be used. To study and identify various formulations of insecticide available in market Estimation of nitrogen in Urea. Estimation of water soluble P_2O_5 and citrate soluble P_2O_5 in single super phosphate. Estimation of potassium in-Murite of Potash/Sulphate of Potash by flame photometer. Determination of copper content in copperoxy chloridc. Determination of sulphur content in Sulphur fungicide. Determination of thiram. Determination of ziram content.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Rakshit A. 2015. Manures Fertilizers and Pesticides Paperback – Import. CBS Publishing; 1ST edition, pp. 266.
2. Havlin, John L, Tisdale, Samuel L., Nelson Werner L. and Beaton, James D. 2004. Soil Fertility and Fertilizers (8th Edition). Published July 23rd 2004 by Prentice Hall. pp. 528.
3. Havlin, John L. (2004) Soil Fertility and Fertilizers: An Introduction to Nutrient Management Published July 23rd 2004 by Prentice Hall. pp. 528.
4. Das D. K. (2011) Introductory Soil Science, 3rd revised and Enlarged Ed, Kalyani Publisher, Ludhiana. pp. 645.

Course Title: Commercial Plant Breeding
Course Code: BAG514

Credits

2

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	To develop modes of plant reproduction
CO2	Associate and apply tools and techniques of optimizing hybrid.
CO3	Extend and apply tools for hybrid seed production.
CO4	Evaluate the understanding the difficulties in hybrid seed production

Course contents

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

Alternative strategies for the development of the line and cultivars: haploid inducer, tissue culture techniques and biotechnological tools. IPR issues in commercial plant breeding: DUS testing and registration of varieties under PPV & FR Act. Variety testing, release and notification systems in India Principles and techniques of seed production, types of seeds, quality testing in self and cross pollinated crops.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Singh, B. D. 1997. *Plant Breeding Principles and Methods* Kalyani Publication New Delhi.pp 380
2. Singh,P. 2001. *Essentials of Plant Breeding* Kalyani Publication New Delhi pp430
3. Sharma, J.R. 2004. *Principles and Practices Plant Breeding* McGraw Hill Publishing company Limited, New Delhi. pp 400
4. Chopra, V.L. 2000. *Plant Breeding Theory and Practices* Oxford and IBH. Publishing Company, New Delhi.pp700

Course Title: Lab. Commercial Plant Breeding
Course Code: BAG530

Credits

1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	1. To develop Floral biology in self- and cross-pollinated species.
CO2	2. Associate and apply tools and techniques of optimizing hybrid.
CO3	3. Extend and apply tools for hybrid seed production.
CO4	4. Evaluate the understanding the difficulties in hybrid seed production

Course contents

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, Tool sand 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.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion

Suggested Readings:

1. Singh, B. D. 1997. *Plant Breeding Principles and Methods* Kalyani Publication New Delhi. pp 380
2. Singh, P. 2001. *Essentials of Plant Breeding* Kalyani Publication New Delhi pp430
3. Sharma, J.R. 2004. *Principles and Practices Plant Breeding* McGraw Hill Publishing company Limited, New Delhi. pp 400
4. Chopra, V.L. 2000. *Plant Breeding Theory and Practices* Oxford and IBH. Publishing Company, New Delhi. pp700
5. Ram, H. 2019. *Crop Breeding and Biotechnology*. Kalyani Publication, New Delhi. Pp:483

Course Title: Landscaping
Course Code: BAG515

Credits
2

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	To develop an agriculture web map service
CO2	Associate and apply tools to identify the implements used in landscape design.
CO3	Extend and apply tools and techniques of landscape design for special effects
CO4	Evaluate the role of computer software, visit to important gardens/parks/institutes.

Course contents

Importance and scope of landscaping. Principles of landscaping, garden styles and types. terrace gardening, vertical gardening. garden components, adornments, lawn making. rockery. water garden. walk-paths, bridges, other constructed features etc. gardens for special purposes. Trees: selection. propagation. planting schemes, canopy management, shrubs and herbaceous perennials: selection. propagation, planting schemes, architecture. Climber and creepers: importance, selection, propagation, planting. Annuals: selection, propagation, planting scheme. Other garden plants: palms, ferns, grasses and cacti succulents. Pot plants: selection. arrangement, management. Bio-aesthetic planning: definition. need, planning: landscaping of urban and rural areas, Peri-urban landscaping, Landscaping of schools, public places like bus station, railway station, townships, riverbanks, hospitals, playgrounds, airports. Industries, institutions. Bonsai: principles and management, lawn: establishment and maintenance. CAD application.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Bose, T.K., Maiti, R.G, Dhua, R.S. and Das P. 2002. Floriculture and Landscaping, Vol.1. Naya Udyog Publication, Kolkata. pp 508.
2. Singh, A. K. and Sisodia, A. 2017. Textbook of Floriculture and Landscaping. NIPA. pp 446.
3. Singh, R. and Singh, B. K. 2020. *Introductory Ornamental Horticulture and Landscape gardening*. Daya Publication. pp 229.

Course Title: Lab. Landscaping

Course Code: BAG531

Credits

1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	To develop an agriculture web map service
CO2	Associate and apply tools to identify the implements used in landscape design.
CO3	Extend and apply tools and techniques of landscape design for special effects
CO4	Evaluate the role of computer software, visit to important gardens/parks/institutes.

Course contents

Identification of trees, shrubs, annuals, pot plants; Propagation of trees, shrubs and annuals, care and maintenance of plants. potting and repotting, identification of tools and implements used in landscapedesign, training and pruning of plants for special effects, lawn establishment and maintenance, layoutof 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.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Bose, T.K., Maiti, R.G, Dhua, R.S. and Das, P. 2002. Floriculture and Landscaping, Vol.1. Naya Udyog Publication, Kolkata. pp 508.
2. Singh, A. K. and Sisodia, A. 2017. Textbook of Floriculture and Landscaping. NIPA. pp 446.
3. Singh, R. and Singh, B. K. 2020. *Introductory Ornamental Horticulture and Landscape gardening*. Daya Publication. pp 229.

Course Title: Food Safety and Standards

Course Code: BAG516

Credits

2

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	To develop food safety ideas.
CO2	Associate and apply tools and techniques of food storage and their safety measures.
CO3	Extend and apply tools and techniques to check the Standards for food products.
CO4	Evaluate the laws and standards related to food.

Course contents

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 TOM. Kaizen. Risk Analysis. Accreditation and Auditing. Water Analysis, Surface Sanitation and Personal Hygiene. Food laws and Standards- Indian Food Regulatory Regime, FSSAI. Global Scenario CAC. Other laws and standards related to food. Recent concerns- New and Emerging Pathogens. Packaging, Product labeling and Nutritional labeling. Genetically modified foods \transgenics. Organic foods. Newer approaches to food safety. Recent Outbreaks. Indian and International Standards for food products.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings: -

1. Schmidt, Ronald H. and Rodrick, Gary E. Gary E. 2003. *Food Safety Handbook*. John Wiley & Sons, Inc., Hoboken. New Jersey, USA.
2. Hester, R.E. and Harrison, R.M..2001. *Food Safety and Food Quality*. Royal Society of Chemistry, Cambridge, UK.

Course Title: Lab. Food Safety and Standards
Course Code: BAG532

Credits
1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	To develop food safety ideas.
CO2	Associate and apply tools and techniques of food storage and their safety measures.
CO3	Extend and apply tools and techniques to check the Standards for food products.
CO4	Evaluate the laws and standards related to food.

Course contents

Water quality analysis physico-chemical and microbiological. Preparation of different type 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.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings: -

1. Schmidt, Ronald H. and Rodrick, Gary E. Gary E. 2003. *Food Safety Handbook*. John Wiley & Sons, Inc., Hoboken. New Jersey, USA.
2. Hester, R.E. and Harrison, R.M..2001. *Food Safety and Food Quality*. Royal Society of Chemistry, Cambridge, UK.

Course Title: Bio pesticides & Bio fertilizers
Course Code: BAG517

Credits

2

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	To develop Isolation and purification of important bio pesticides
CO2	Identification of entomo pathogenic entities in field condition
CO3	Study Mass production of AM inoculants.
CO4	Evaluate the Isolation and purification of Azaspirillum

Course contents

History and concept of bio pesticides. Importance. scope and potential of bio pesticide. Definitions, concepts and classification of bio pesticides viz. pathogen, botanical pesticides, and bio rationales. Botanical sand their uses. Mass production technology of bio-pesticides. Virulence, pathogenicity and symptoms of entomo pathogenic pathogens and nematodes. Methods of application of bio pesticides. Methods of quality control and Techniques of bio pesticides. Impediments and limitation in production and use of bio pesticide.

Bio fertilizers- Introduction. Status and scope. Structure and characteristic features of bacterial bio fertilizers- Azospirillum, Azotobacter, Pseudomonas. Rhizobium and FranIcia; Cyno bacterial bio fertilizers- Anabaena. Nostoc, Hapalosiphon and fungal bio fertilizers- 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 bio fertilizers. FCC) specifications and quality control of bio fertilizers. Application technology for seeds', seedlings, tubers, sets etc. Bio fertilizers - Storage, shelf life, quality control and marketing. Factors influencing the efficacy of bio fertilizers.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Arshad, A. 2021. *Biopesticides and Bioagents Novel Tools for Pest Management*. Apple Academic Press. Pp. 11 Color & 4 B/W Illustrations
2. Santhakumari, & Vijayasree 2012. *Biological control of crop pests in india*. Kalyani Publishers. Pp: 140.
3. Bhagat, D.V. 2010. *Encyclopaedia of Biological Control of Insect and Pest*. Pp:1-332

Course Title: Lab. Bio pesticides & Bio fertilizers	Credits
Course Code: BAG533	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	To develop Isolation and purification of important bio pesticides
CO2	Identification of entomo pathogenic entities in field condition
CO3	Study Mass production of AM inoculants.
CO4	Evaluate the Isolation and purification of Azaspirillum

Course contents

Isolation and purification of important bio pesticides: *Trichoderma Pseudomonas, Bacillus, Metarozium* etc. and its production. Identification of important botanicals. Visit to bio pesticide laboratory in nearby area. Field visit to explore naturally infected cadavers. Identification of entomo pathogenic entities in field condition. Quality control of bio pesticides. Isolation and purification of Azaspirillum, Azotobacter, Rhizobium. P-solubilizers and cyanobacteria. Mass multiplication and inoculums production of bio fertilizers. Isolation of AM fungi-Wet sieving method and sucrose gradient method. Mass production of AM inoculants.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Arshad, A. 2021. *Biopesticides and Bioagents Novel Tools for Pest Management*. Apple Academic Press. Pp. 11 Color & 4 B/W Illustrations
2. Santhakumari, & Vijayasree 2012. *Biological control of crop pests in india*. Kalyani Publishers. Pp: 140.
3. Bhagat, D.V. 2010. *Encyclopaedia of Biological Control of Insect and Pest*. Pp:1-332

Course Title: Lab. Bio pesticides & Bio fertilizers

Credits

Course Title: Farming System, Precision Farming & Sustainable Agriculture
Course Code: BAG601

L	T	P	Credits
1	0	0	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	Higher Yield
CO2	Improved Quality
CO3	Maturity Duration
CO4	Agriculture impact

Course Contents

Farming System scope, importance, and concept, Types and systems of farming system and factors affecting types of farming, Farming system components and their maintenance, Cropping system and pattern, multiple cropping system, Efficient cropping system and the reevaluation, Sustainable agriculture- problems and its impact on agriculture. Conservation agriculture strategies. HEIA, LELA and LEISA and its techniques for sustainability, Integrated farming system components of IFS and its advantages, farming system and environment.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Anonymous. 2020. *Sustainable Agriculture: Advances in Technological Interventions..* Apple Academic Press, United States. pp 580.
2. Clark, S., 2016. *Sustainable Agriculture-Beyond Organic Farming.* MDPI AG, Switzerland. pp. 356
3. Anonymous. 2017. *Farming System and Sustainable Agriculture: As Per New ICAR Syllabus.* India: Kalyani Publishers. pp. 118
4. Nanwal, R. K. 2019. *Farming System and Sustainable Agriculture.* India: New India Publishing Agency. pp. 224

Course Title: Lab. Farming System, Precision Farming & Sustainable Agriculture
Course Code: BAG615

L	T	P	Credits
0	0	2	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	Production and efficiency
CO2	Varieties for a New Season
CO3	Modeling
CO4	Photo and Thermo Insensitivity

Course Contents

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

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Anonymous. 2020. *Sustainable Agriculture: Advances in Technological Interventions..* Apple Academic Press, United States. pp 580.
2. Clark, S., 2016. *Sustainable Agriculture-Beyond Organic Farming.* MDPI AG, Switzerland. pp. 356
3. Anonymous. 2017. *Farming System and Sustainable Agriculture: As Per New ICAR Syllabus.* India: Kalyani Publishers. pp. 118
4. Nanwal, R. K. 2019. *Farming System and Sustainable Agriculture.* India: New India Publishing Agency. pp. 224

Course Title: Crop Improvement-II (Rabi crops)

Course Code: BAG602

L	T	P	Credits
1	0	0	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	Higher Yield
CO2	Improved Quality
CO3	Maturity Duration
CO4	Photo and Thermo Insensitivity

Course Contents

Centres of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fodder crops and cash crops; vegetable and horticultural crops; Plant genetic resources, its utilization and conservation; study of genetics of qualitative and quantitative characters; Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, adaptability, stability, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional); Hybrid seed production technology of *rabi* crops. Ideotype concept and climate resilient crop varieties for future.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Singh, B.D. 2018. *Plant Breeding (Principles and methods)*, Kalyani publishers, New Delhi. Pp. 918.
2. Singh, P. 2017. *Fundamentals of Plant Breeding (Principles and methods)*, Kalyani publishers, New Delhi, pp : 327
3. Kumaresan, V. and Arumugam, N. 2017. *Fundamentals of Horticulture and Plant Breeding*. Saras publisher, Tamilnadu. Pp. 524.
4. Singh, P. and Arumugam, N. 2016. *Essential of plant breeding*. Kalyani publisher, New Delhi. Pp. 243.

Course Title: Lab. Crop Improvement-II (*Rabi*
crops)
Course Code: BAG616

L	T	P	Credits
0	0	2	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	Disease and Pest Resistance
CO2	Varieties for a New Season
CO3	Dormancy
CO4	Photo and Thermo Insensitivity

Course Contents

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

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings :-

1. Singh, B.D. 2018. *Plant Breeding (Principles and methods)*, Kalyani publishers, New Delhi. Pp. 918.
2. Singh, P. 2017. *Fundamentals of Plant Breeding (Principles and methods)*, Kalyani publishers , New Delhi, pp : 327
3. Kumaresan, V. and Arumugam, N. 2017. *Fundamentals of Horticulture and Plant Breeding*. Saras publisher, Tamilnadu. Pp. 524.
4. Singh, P. and Arumugam, N. 2016. *Essential of plant breeding*. Kalyani publisher, New Delhi. Pp. 243.

Course Title: Manures, Fertilizers and Soil Fertility Management**Course Code:****BAG617**

L	T	P	Credits
2	0	0	2

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	To study about various organic sources of fertilizers
CO2	To understand manufacturing processes and properties of chemical fertilizers.
CO3	To acquire knowledge about fertilizer control order and fertilizer storage.
CO4	To understand about soil water testing and fertilizer use efficiency.

Course Contents

Introduction and importance of organic manures, properties and methods of preparation of bulky and concentrated manures. Green/leaf manuring. Fertilizer recommendation approaches. Integrated nutrient management. Chemical fertilizers: classification, composition and properties of major nitrogenous, phosphatic, potassic fertilizers, secondary & micronutrient fertilizers, Complex fertilizers, nano fertilizers Soil amendments, Fertilizer Storage, Fertilizer Control Order.

History of soil fertility and plant nutrition. criteria of essentiality. role, deficiency and toxicity symptoms of essential plant nutrients, Mechanisms of nutrient transport to plants, factors affecting nutrient availability to plants. Chemistry of soil nitrogen, phosphorus, potassium, calcium, magnesium, sulphur and micronutrients. Soil fertility evaluation, Soil testing. Critical levels of different nutrients in soil. Forms of nutrients in soil, plant analysis, rapid plant tissue tests. Indicator plants. Methods of fertilizer recommendations to crops. Factor influencing nutrient use efficiency (NUE), methods of application under rainfed and irrigated conditions.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. ISSS. 2009. *Fundamentals of Soil Science*. 2nd Ed. Indian Society of Soil Science, New Delhi- 110 012. pp. 728.
2. Das D. K. 2011. *Introductory Soil Science*, 3rd revised and Enlarged Ed, Kalyani Publisher, Ludhiana. pp. 645.
3. Weil, R.R. and Brady, N. C. 2017. *The Nature and Properties of Soils*. 15th edition Publisher: Pearson Education, ISBN: 978-0133254488
4. Daji J A; Daji J A; Kadam J R; Patil N D.1996. *Textbook of Soil Science* Bombay Media Promoters and publishers Pvt. Ltd.
5. Biswas, T.D.; Mukherjee, S.K.. 1995. *Text Book of Soil Science* 2nd sEd. Tata McGraw Hill Publisher, Delhi pp 433.
6. Mehara , R. K. 2004. *Text Book of Soil Science.*, ICAR, New Delhi.

Course Title: Lab. Manures, Fertilizers and Soil Fertility Management**Course Code: BAG617**

L	T	P	Credits
0	0	2	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	To study about various organic sources of fertilizers
CO2	To acquire knowledge about adulteration of fertilizer
CO3	To acquire knowledge about the compatibility between various fertilizer and pesticides.
CO4	To understand about soil water testing and fertilizer use efficiency.

Course contents

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

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion

Suggested Readings:

1. ISSS. 2009. *Fundamentals of Soil Science*. 2nd Ed. Indian Society of Soil Science, New Delhi- 110 012. pp. 728.
2. Das D. K. 2011. *Introductory Soil Science*, 3rd revised and Enlarged Ed, Kalyani Publisher, Ludhiana. pp. 645.
3. Brady, N. C. 2016. *The Nature and Properties of Soils*. 15th edition Publisher: Pearson Education, ISBN: 978-0133254488
4. Daji J A; Daji J A; Kadam J R; Patil N D.1996. *Textbook of Soil Science* Bombay Media Promoters and publishers Pvt. Ltd.
5. Biswas, T.D.; Mukherjee, S.K.. 1995. *Text Book of Soil Science* 2nd sEd. Tata McGraw Hill Publisher, Delhi pp 433.
6. Mehara , R. K. 2004. *Text Book of Soil Science.*, ICAR, New Delhi.
7. Patil, V. D. and Mali C. V. 2007. *Fundamentals of Soil Science*, Aman Publication, Meerut.
8. Nirankari Lal Singh. 2000. *Text Book of Soil Science*. Aman Publication, Meerut.
9. Dahama , A. K. 1997. *Organic farming for sustainable agriculture*. 19, AgrobotanicaBinaker. Pp 53-98 and 210-255.

Course Title: Farm Management, Production & Resource Economics
Course Code: BAG604

L	T	P	Credits
1	0	0	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	Determine and outline those conditions which give optimum use of resources in the production of crops and livestock.
CO2	Determine the extent to which the existing use of resources deviate from what is considered the optimal use level.
CO3	Analyse the forces which condition production patterns and resource use in relation to the existing opportunities.
CO4	Explain the means and methods adaptable in moving from the existing levels to The optimum use of farm resources.

Course contents

Meaning and concept of farm management, objectives and relationship with other sciences. 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 relationship, law of equi-marginal/or principles of opportunity cost and law of comparative advantage. Meaning and concept of cost, types of costs and their interrelationship, importance of cost in managing farm business and estimation of gross farm income, net farm income, family labour income and farm business income. Farm business analysis, Meaning and importance of farm planning and budgeting, appraisal of farm resources, selection of crops and livestock's enterprises. Concept of risk and uncertainty occurs in agriculture production, nature and sources of risks and its management strategies, Crop/livestock/machinery insurance – weather based crop insurance, features, determinants of compensation. Concepts of resource economics, differences between NRE and agricultural economics, unique properties of natural resources. Positive and negative externalities in agriculture.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Heady, E. O. 1964. *Economics of Agricultural Production and Resource Use*. Prentice Hall of India, Private Limited, New Delhi.pp.431.
2. Bishop, C.E. and Toussaint, W.D. 1958. *Introduction to Agricultural Economic Analysis*. John Wiley and Sons, Inc., London.pp.258.
3. Johl, S.S. and Kapur, J.R. 2019. *Fundamentals of Farm Business Management*. Kalyani Publishers, New Delhi.pp.452.
4. Subba Reddy, S., Raghuram, P., Neelakanta Sastry, T.V. and Bhavani Devi, I. 2006. *Agricultural Economics*. Oxford and IBH Publishing Company, Private Limited, New Delhi.pp.588.
5. Heady, E.O. and Jenson, H.R. 1954. *Farm Management Economics*. Prentice Hall, New Delhi. Pp.645.

Course Title: Lab. Farm Management, Production & Resource Economics**Course Code: BAG618**

L	T	P	Credits
0	0	2	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	Determine and outline those conditions which give optimum use of resources in the production of crops and livestock.
CO2	Determine the extent to which the existing use of resources deviate from what is considered the optimal use level.
CO3	Analyse the forces which condition production patterns and resource use in relation to the existing opportunities.
CO4	Explain the means and methods adaptable in moving from the existing levels to the optimum use of farm resources.

Course Contents

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

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Heady, E. O. 1964. *Economics of Agricultural Production and Resource Use*. Prentice Hall of India, Private Limited, New Delhi.pp.431.
2. Bishop, C.E. and Toussaint, W.D. 1958. *Introduction to Agricultural Economic Analysis*. John Wiley and Sons, Inc., London.pp.258.
3. Johl, S.S. and Kapur, J.R. 2019. *Fundamentals of Farm Business Management*. Kalyani Publishers, New Delhi.pp.452.
4. Subba Reddy, S., Raghuram, P., Neelakanta Sastry, T.V. and Bhavani Devi, I. 2006. *Agricultural Economics*. Oxford and IBH Publishing Company, Private Limited, New Delhi.pp.588.
5. Heady, E.O. and Jenson, H.R. 1954. *Farm Management Economics*. Prentice Hall, New Delhi. Pp.645.

Course Title: Diseases of Field and Horticultural Crops and their Management-II
Course Code: BAG605

L	T	P	Credits
2	0	0	2

Course Outcomes: On successful completion of this course, the students will be able to learn:

CO	Agricultural graduates will be able to:
CO1	To study the Economic Importance of diseases of Horticultural Crops.
CO2	To study the symptoms of diseases of Horticultural Crops.
CO3	Understand the causes of diseases of Horticultural Crops.
CO4	To study and Understand the disease cycle of Horticultural Crops.

Course contents

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

Field Crops: Wheat: rusts, loose smut, karnal bunt, powdery mildew, alternaria blight, and ear cockle; Sugarcane: red rot, smut, wilt, grassy shoot, ratoon stunting and PokkahBoeng;

Sunflower: Sclerotinia stem rot and Alternaria blight; Mustard: Alternaria blight, white rust, downy mildew and Sclerotinia stem rot; Gram: wilt, grey mould and Ascochyta blight; Lentil: rust and wilt; Cotton: anthracnose, vascular wilt, and black arm; Pea: downy mildew, powdery mildew and rust.

Horticultural Crops: Mango: anthracnose, malformation, bacterial blight and powdery mildew; Citrus: canker and gummosis; Grape vine: downy mildew, Powdery mildew and anthracnose; Apple: scab, powdery mildew, fire blight and crown gall; Peach: leaf curl. Strawberry: leaf spot
 Potato: early and late blight, black scurf, leaf roll, and mosaic;

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

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion

Suggested Readings:

1. Agrios, G.N. 2010. *Plant Pathology*. Acad. Press.
2. Singh, R.S. 2013. *Introduction to Principles of Plant Pathology*. Oxford and IBH Pub.Co.
3. Dhingra, O.D. and Sinclair, J.B.. 1986. *Basic Plant Pathology Methods*. CRC Press, London, Tokyo

Course Title: Lab. Diseases of Field and Horticultural Crops and their Management-II
Course Code: BAG619

L	T	P	Credits
0	0	2	1

to learn:

Course Outcomes: On successful completion of this course, the students will able

CO	Agricultural graduates will be able to:
CO1	To study economic importance of various field crops.
CO2	To study the identification of symptom and sign of field crops in field and lab.
CO3	To study the various pathogens cause the diseases of field crops.
CO4	Understand the nature of different pathogens to cause various types of field crop diseases.

Course contents

Identification and histo-pathological studies of selected diseases of field and horticultural crops covered in theory. Field visit for the diagnosis of field problems. Collection and preservation of plantdiseased specimens for herbarium.

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

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion

Suggested Readings:

1. Agrios, GN. 2010. *Plant Pathology*. Acad. Press.
2. Singh RS. 2013. *Introduction to Principles of Plant Pathology*. Oxford and IBH Pub.Co.
3. Dhingra OD & Sinclair JB. 1986. *Basic Plant Pathology Methods*. CRC Press, London, Tokyo

Course Title: Post-harvest Management and Value Addition of Fruits and Vegetables II
Course Code: BAG606

L	T	P	Credits
1	0	0	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agriculture graduate will be able to:
CO1	Proper handling, packaging, transportation and storage reduces the post harvest losses of fruit and vegetables for every.
CO2	Processing and preservation technology helps to save excess fruit and vegetables during the gleet season (off season).
CO3	The technology has become a necessity to improve the food safety and strengthen nations food security.
CO4	The technology helps to boost export of agricultural commodities in the form of preserved and value added products

Course contents

Importance of post-harvest processing of fruits and vegetables, extent and possible causes of post-harvest losses. Pre-harvest factors affecting postharvest quality, maturity, ripening a changes occurring during ripening; Respiration and factors affecting respiration rate; 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. Tomato products- Concepts and Standards; Drying/ Dehydration of fruits and vegetables – Concept and methods, osmotic drying. Canning – Concepts and Standards, packaging of products.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Sethi, V. and Sethi, S. 2006. *Processing of Fruits and Vegetables for Value Addition*. Indus Publication. pp 176.
2. Rahman, M.S. 1999. *Handbook of Food Preservation, Food Science and Technology*. CRC Press, Florida, US. pp 809.
3. Rajarathnam, S. 2011. *Advances in Preservation and Processing Technologies of Fruits and Vegetables*. New Indian Publishing Agency-NIPA, Ahemdabad, Gujarat. pp 758

Course Title: Lab. Post-harvest Management and Value Addition of Fruits and Vegetables II
Course Code: BAG620

L	T	P	Credits
0	0	2	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agriculture graduate will be able to:
CO1	Proper handling, packaging, transportation and storage reduces the post harvest losses of fruit and vegetables for every.
CO2	Processing and preservation technology helps to save excess fruit and vegetables during the gleet season (off season).
CO3	The technology has become a necessity to improve the food safety and strengthen nations food security.
CO4	The technology helps to boost export of agricultural commodities in the form of preserved and value added products

Course Contents

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

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Sethi, V. and Sethi, S. 2006. *Processing of Fruits and Vegetables for Value Addition*. Indus Publication. pp 176.
2. Rahman, M.S. 1999. *Handbook of Food Preservation, Food Science and Technology*. CRC Press, Florida, US. pp 809.
3. Rajarathnam, S. 2011. *Advances in Preservation and Processing Technologies of Fruits and Vegetables*. New Indian Publishing Agency-NIPA, Ahemdabad, Gujarat. pp 758

Course Title: Water shed and wasteland Management
Course Code: BAG607

L	T	P	Credits
1	0	0	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	Concept need, principles & components of water shed management Integrated water shed management
CO2	Factors effecting watershed management
CO3	The technology has become a necessity to improve the food safety and strengthen nations food security.
CO4	Appropriate techniques for management of different types of degraded & wasteland

Course Contents

Water shed Management-Concept need, principles & components of water shed management, integrated water shed management. Factors effecting watershed management, runoff & soil loss management in a watershed socio-economic concept of watershed. Peoples participation in watershed management. Policy approaches & management plan, problems of water shed management. Wasteland Management-Definition, concept & types of degraded & wasteland. Distribution & extent of watershed in India & Uttar Pradesh. Factors responsible for land degradation, characteristics of different types of degradation & wasteland. Problems of degraded land in Uttar Pradesh. Appropriate techniques for management of different types of degraded & wasteland.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Mohamed, A. M. O., & Paleologos, E. K. 2017. *Fundamentals of geo environmental engineering: understanding soil, water, and pollutant interaction and transport*. Butterworth-Heineman
2. Das, G. 2008. *Hydrology and Soil Conservation Engineering: Including Watershed Management*. PHI Learning Pvt. Ltd.
3. Panda, S. C. 2007. *Soil water conservation and dry farming*. Jodhpur, India: Agrobios (India).
4. Coleman, D. C., and Crossley Jr, D. A. 2003. *Fundamentals of soil ecology*. Academic press.
5. Burden, D. S. 1999. *Fundamentals of soil science as applicable to management of hazardous wastes*. Superfund Technology Center for Ground Water

Course Title: Lab. Water shed and wasteland
Management
Course Code: BAG621

L	T	P	Credits
1	0	0	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	Concept need, principles & components of water shed management Integrated water shed management
CO2	Factors effecting watershed management
CO3	The technology has become a necessity to improve the food safety and strengthen nations food security.
CO4	Appropriate techniques for management of different types of degraded & wasteland

Course Contents

Characterization and delineation of model watershed. Field demonstration on soil & moisture conservation measures. Field demonstration on construction of water harvesting structures. Visit to rain fed research station/watershed.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Mohamed, A. M. O., & Paleologos, E. K. 2017. *Fundamentals of geo environmental engineering: understanding soil, water, and pollutant interaction and transport*. Butterworth-Heineman
2. Das, G. 2008. *Hydrology and Soil Conservation Engineering: Including Watershed Management*. PHI Learning Pvt. Ltd.
3. Panda, S. C. 2007. *Soil water conservation and dry farming*. Jodhpur, India: Agrobios (India).
4. Coleman, D. C., and Crossley Jr, D. A. 2003. *Fundamentals of soil ecology*. Academic press.
5. Burden, D. S. 1999. *Fundamentals of soil science as applicable to management of hazardous wastes*. Superfund Technology Center for Ground Water

Course Title: Beneficial insects and Pest of Horticultural Crops and their Management
Course Code: BAG608

L	T	P	Credits
2	0	0	2

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	Concept need, principles & components of Horticultural Crops and their Management
CO2	Importance of beneficial insects
CO3	Insect pests and diseases of honeybee
CO4	Identification of major parasitoid sand predators commonly used in biological control

Course Contents

Types of silkworm, voltinism and biology of silk worm. 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 parasitoid sand predators commonly used in biological control.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Rahman, Atur. 2019. *Text Book on Beekeeping*. Kalyani Publishers. pp.347
2. Alford, D,V. 2019. *Beneficial Insects*. CRC Press. pp.400
3. Prasad, T.V 2019. *Handbook of Entomology*. New Vishal Publications. pp.496.

Course Title: Beneficial insects and Pest of Horticultural Crops and their Management
Course Code: BAG622

L	T	P	Credits
1	0	0	1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	Concept need, principles & components of Horticultural Crops and their Management
CO2	Importance of beneficial insects
CO3	Insect pests and diseases of honeybee
CO4	Identification of major parasitoid sand predators commonly used in biological control

Course Contents

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, plantation gardens, narcotics, spices & condiments. Visit to orchards and gardens. Mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves. Types of silkworm, voltin is mand biology and rearing of silkworm and equipment. Honey bee species and castes of bees. Bee keeping 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.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Rahman, Atur. 2019. *Text Book on Beekeeping*. KalyaniPublishers.pp.347
2. Alford, D,V. 2019. *Beneficial Insects*. CRC Press. pp.400
3. Prasad, T.V 2019. *Handbook of Entomology*. New Vishal Publications.pp.496.

ELECTIVE-2

Course Title: Protected Cultivation
Course Code: BAG609

Credits

2

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	To develop intercultural operations
CO2	Bed preparation and planting of crop for production
CO3	Regulation of irrigation and fertilizers through drip, fogging and misting
CO4	Evaluate the role of geo informatics in agriculture.

Course contents

Protected cultivation- Importance and scope, Status of protected cultivation in India and World types of protected structure based on site and climate. Cladding material involved in green house/poly house. Green house 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. Green house cultivation of important horticultural crops- rose, carnation, chrysanthemum, gerbera, orchid, anthurium, liliun, tulip, tomato, bell pepper, cucumber, strawberry, pot plants, etc. Cultivation of economically important medicinal and aromatic plants. Off season production of flowers and vegetables. Insect pest and disease management.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Warade, S.D. 2003. *Protected cultivation of Horticulture crops*. CAFT (fruits), MPKV, Rahuri. pp 306.
2. Singh, B. 2005. *Protected cultivation of vegetable crops*. Kalyani publishers, New Delhi. Pp 180.
3. Dhaliwal, M.S. 2008. *Handbook of vegetable crops*. Kalyani publishers, Ludhiana. pp 389.

Course Title: Lab. Protected Cultivation
Course Code: BAG623

Credits

1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	To develop intercultural operations
CO2	Bed preparation and planting of crop for production
CO3	Regulation of irrigation and fertilizers through drip, fogging ad misting
CO4	Evaluate the role of geo informatics in agriculture.

Course contents

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

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Warade, S.D. 2003. *Protected cultivation of Horticulture crops*. CAFT (fruits), MPKV, Rahuri. pp 306.
2. Singh, B. 2005. *Protected cultivation of vegetable crops*. Kalyani publishers, New Delhi. Pp 180.
3. Dhaliwal, M.S. 2008. *Handbook of vegetable crops*. Kalyani publishers, Ludhiana. pp 389.

Course Title: Hi-tech. Horticulture
Course Code: BAG610

Credits

2

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	To study micro propagation of horticultural crops
CO2	Modern field preparation
CO3	Application of precision farming in horticultural crops
CO4	Nursery-pro trays, micro-irrigation. EC, pH, fertilizer scheduling, Canopy management.

Course contents

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

Protected cultivation: advantages, controlled conditions, method and techniques, Micro irrigation systems and its components; EC. pH, fertilizer scheduling, canopy management, high density or charding. Components of precision fanning: Remote sensing. Geographical Information System (GIS), Differential Geo-Positioning System (DGPS), Variable Rate applicator (VRA), application of precision farming in horticultural crops (fruits, vegetables and ornamental crops); mechanized harvesting of produce. Practical Types of polyhouses and shade net houses, intercultural operations, tools and equipment's identification and application, Micro propagation, Nursery-pro trays, micro-irrigation. EC, pH, fertilizer scheduling, canopy management, visit to hi-tech orchard/nursery.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Hartman, H.T., Kester, D.E., Davies, F.T. and Geneve, R.L. 2015. Plant propagation principles and practices. Pearson Education India. pp.928.
2. Sandhu, M.K. 2020. Plant Propagation. New age international Ltd. pp.296.
3. Sharma, R.R. 2019. Propagation of Horticultural crops. Kalyani Publishers.pp.304.
4. More, T.A. 2005. Hi-tech Horticulture- MPKV,Rahuri Balraj Singh,2005: Protected cultivation of vegetable crops. Kalyani publication.
5. Patil M.T. and Patil, P.V.,2004 Commercial Protected Floriculture. MPKV, Rahuri.
6. Prasad, S., Singh, D. and Kumar, U.2022. Commercial floriculture. Published by Agribios,India.
7. Nelson, Paul V. 2011. Greenhouse operation & Management.

Course Title: Lab. Hi-tech. Horticulture
Course Code: BAG624

Credits

1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	To study Micro propagation of horticultural crops
CO2	Modern field preparation
CO3	Application of precision farming in horticultural crops
CO4	Nursery-pro trays, micro-irrigation. EC, pH, fertilizer scheduling, Canopy management.

Course contents

Micro propagation of horticultural crops; Modern field preparation and planting methods. Protected cultivation: method and techniques, Micro irrigation systems and its components; EC. pH, fertilizer scheduling, canopy management, high density orcharding. Components of precision fanning: Remote sensing. Geographical Information System (GIS), Differential Geo-positioning System (DGPS), Variable Rate applicator (VRA), application of precision farming in horticultural crops (fruits, vegetables and ornamental crops); mechanized harvesting of produce. Practical Types of polyhouses and shade net houses, intercultural operations, tools and equipment's identification and application, Micro propagation, Nursery-pro trays, micro-irrigation. EC, pH, fertilizer scheduling, canopy management, visit to hi-tech orchard/nursery.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Hartman, H.T., Kester, D.E., Davies, F.T. and Geneve, R.L. 2015. Plant propagation principles and practices. Pearson Education India. pp.928.
2. Sandhu, M.K. 2020. Plant Propagation. New age international Ltd. pp.296.
3. Sharma, R.R. 2019. Propagation of Horticultural crops. Kalyani Publishers.pp.304.
4. More, T.A. 2005. Hi-tech Horticulture- MPKV, Rahuri.
5. Singh, Balraj. 2005: Protected cultivation of vegetable crops. Kalyani publication.
6. Patil M.T. and Patil, P.V.,2004 Commercial Protected Floriculture. MPKV, Rahuri.
7. Prasad, S., Singh, D. and Kumar, U.2022. Commercial floriculture. Published by Agribios,India.
8. Nelson, Paul V. 2011. Greenhouse operation & Management.

Course Title: Weed Management
Course Code: BAG611

Credits
2

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	To study weed preservation
CO2	To study herbicide and agro- chemicals
CO3	To use spraying equipment's
CO4	To calculate efficiency and weed index

Course contents

Introduction to weeds, characteristics of weeds their harmful and beneficial effects on ecosystem. Classification, reproduction and dissemination of weeds. Herbicide classification. Concept of adjuvant, surfactant, herbicide formulation and their use. Introduction to mode of action of herbicides and selectivity. Allelopathy and its application for weed management. Bio-herbicides and their application in agriculture. Concept of herbicide mixture and utility in agriculture. Herbicide compatibility with agro-chemicals and their application. Integration of herbicides with non-chemical methods of weed management. Herbicide resistance and its management.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Aldrich, R.J. and Kramer, R.J. 1997. *Principles in Weed Management*. pp.472.
2. Gupta, O.P. 2007. *Weed management Principles and Practices*. Publisher: Bio-Green Books. pp.336.
3. Gupta, O.P. 2008. *Modern Weed Management*. Publisher: Bio-Green Books. pp.637.
4. Rao, V.S. 2006. *Principles of Weed Science*. CRC Press; 2nd edition. pp.566

Course Title: Lab. Weed Management
Course Code: BAG625

Credits

1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	To study weed preservation
CO2	To study herbicide and agro- chemicals
CO3	To use spraying equipment's
CO4	To calculate efficiency and weed index

Course contents

Techniques of weed preservation. Weed identification and their losses study. Biology of important weeds. 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 equipment's. Calculations of herbicide doses and weed control efficiency and weed index.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Aldrich, R.J. and Kramer, R.J. 1997. *Principles in Weed Management*. pp.472.
2. Gupta, O.P. 2007. *Weed management Principles and Practices*. Publisher: Bio-Green Books. pp.336.
3. Gupta, O.P. 2008. *Modern Weed Management*. Publisher: Bio-Green Books. pp.637.
4. Rao, V.S. 2006. *Principles of Weed Science*. CRC Press; 2nd edition.pp.566

Course Title: System Simulation and Agro-advisory	Credits
Course Code: BAG612	2

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	To study the representation of soil-plant-atmospheric continuum
CO2	To study Modelling techniques for their estimation of crop production
CO3	To know Weather forecasting
CO4	To know regarding Agro-advisory.

Course contents

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

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Bishnoi, O.P. 2010. Applied Agroclimatology by Oxford Book Company, Jaipur, India- 302108, Edition.
2. Wallach, D., Makowshi, D. and Jones, J. W. 2006. Working with Dynamic crop models, Evaluation, Analysis, Parametrization and Applications by Elsevier Oxford U.K, First edition.
3. Sahoo, D.D. and Solanki, R.M. 2008. Remote Sensing Techniques in Agriculture by Agrobios (India), Jodhpur.
4. Varshneya, M.C. and Salunke. S.S. 1998. Compendium on Crop Moddeling, A short Term Training Programme organized by Centre of Advance Studies in Agril. Meteorology, College of Agriculture, Pune-411005 during 14th Sep., - 12th Oct., 1998, Published by MPKV, Rahuri MPKV/EDN./PUB No. 10(99).
5. Ramkrishnan, R.and Gehrke, Johannes.2014. Database Management Systems by M.C. Grawhill Education (India) Pvt. Ltd, New Delhi, Indian Edition.
6. Mavi, H.S. 1994. Introduction to Agrometeorology (Second Edition) Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
7. Text book of Agril. Meteorology by M.C. Varshneya, P. Balakrishna Pillai, ICAR New Delhi, 2003.
8. Basic Principles of Agril. Meteeorology by V.Radhakrishna Murthy, BS Publication,

Hyderabad,2002

Course Title: Lab. System Simulation and Agro-
advisory
Course Code: BAG626

Credits
1

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	To study the representation of soil-plant-atmospheric continuum
CO2	To study modelling techniques for their estimation of crop production
CO3	To know weather forecasting
CO4	To know Agro-advisory.

Course contents

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

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Bishnoi, O.P. 2010. Applied Agroclimatology by Oxford Book Company, Jaipur, India- 302108, Edition.
2. Wallach, D., Makowshi, D. and Jones, J. W. 2006. Working with Dynamic crop models, Evaluation, Analysis, Parametrization and Applications by Elsevier Oxford U.K, First edition.
3. Sahoo, D.D. and Solanki, R.M. 2008. Remote Sensing Techniques in Agriculture by Agrobios (India), Jodhpur.
4. Varshneya, M.C. and Salunke. S.S. 1998. Compendium on Crop Moddeling, A short Term Training Programme organized by Centre of Advance Studies in Agril. Meteorology, College of Agriculture, Pune-411005 during 14th Sep., - 12th Oct., 1998, Published by MPKV, Rahuri MPKV/EDN./PUB No. 10(99).
5. Ramkrishnan, R.and Gehrke, Johannes.2014. Database Management Systems by M.C. Grawhill Education (India) Pvt. Ltd, New Delhi, Indian Edition.
6. Mavi, H.S. 1994. Introduction to Agrometeorology (Second Edition) Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
7. Text book of Agril. Meteorology by M.C. Varshneya, P. Balakrishna Pillai, ICAR New Delhi, 2003.
8. Basic Principles of Agril. Meteorology by V.Radhakrishna Murthy, BS Publication, Hyderabad,2002

Credits
2

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	1. To develop scope of agricultural journalism
CO2	2. Associate and apply tools for gathering agricultural information.
CO3	3. Extend and apply tools and techniques to learn agricultural journalism.
CO4	4. Evaluate the laws and standards related to journalism.

Course contents

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, head line and title writing, proof reading, lay outing to food safety. Recent Outbreaks. Indian and International Standards for food products.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested readings:

1. Ray, G.L. 2003. *Extension Communication and Management*. Kalyani Publishers. Fifth revised and enlarged edition. Vol. 5. pp 67-88
1. Dahama, O.P. and Bhatnagar, O.P. 2003. *Education and Communication for Development*. Oxford and IBH Publishing Co. Pvt. Ltd. Vol. 2. pp 77-110
3. Sandhu, A.S. 1993. *Textbook on Agricultural Communication: Process and Methods*. Oxford and IBH Publishing Co. Pvt. Ltd. Vol. 1. pp 256-290
4. Desai, A.R. 1978. *Rural Sociology in India*. Bombay, Popular Prakashan, 5th Rev. ed. Vol. 5. pp 267-288

Course Title : Lab. Agricultural Journalism
Course Code: BAG627

Credits
1

Course

Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	To develop scope of agricultural journalism
CO2	Associate and apply tools for Gathering agricultural information.
CO3	Extend and apply tools and techniques to learn agricultural journalism.
CO4	Evaluate the laws and standards related to journalism.

Course contents

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

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested readings:

1. Ray, G.L. 2003. *Extension Communication and Management*. Kalyani Publishers. Fifth revised and enlarged edition. Vol. 5. pp 67-88
2. Dahama, O.P. and Bhatnagar, O.P. 2003. *Education and Communication for Development*. Oxford and IBH Publishing Co. Pvt. Ltd. Vol. 2. pp 77-110
3. Sandhu, A.S. 1993. *Textbook on Agricultural Communication: Process and Methods*. Oxford and IBH Publishing Co. Pvt. Ltd. Vol. 1. pp 256-290
4. Desai, A.R. 1978. *Rural Sociology in India*. Bombay, Popular Prakashan, 5th Rev. ed. Vol. 5. pp 267-288

Course Title: : Lab. Composition cum Duck/ (and) Quail/(and) Rabbit culture
Course Code: BAC662B

Credits
2
1

Course

Outcomes: On successful completion of this course, the students will able to learn:

CO	Agricultural graduates will be able to:
CO1	To develop fishery units
CO2	Identification and report formulation of Fishery units
CO3	To study preparation ration for duck.
CO4	To evaluate the Preparation of different products from eggs

Course contents

Fishery: Definition, common characteristics and position of fish in Animal Kingdom, fishery stastics preparation and management of fish pond, physical and chemical condition of water for fishery, feed sand feeding of fishes, breeding of fish, diseases and enemies of fishes, use of Duck/quality beats on fish feeds.

Duckry: Definition, common features and advantages, breeds, incubation and hatching feeding of ducks, care and managements of ducking, grower, layer/broiler ducks. Characteristics of duck eggs, common diseases and vaccination schedule, duckry statistics. Quail: Definition, common features of quail farming, advantages, breeds, incubation and hatching, feeding of quails. Care and managements of quail chick, grower/layer/broilers. Quail product technology, common diseases and vaccination schedule.

Rabbitry: Introduction, scope and advantages of rabbit farming, breeds, breeding, housing, care and management of young and adult rabbit. feed sand feeding for rabbits, common problems of rabbitry including vaccination schedule, fur and meat production technology.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Course Outcomes: On successful completion of this course, the students will able to learn:

Course Title: ELP II. General orientation & On campus training by different faculties
Course Code: BAG701

Credits
14

CO	Agricultural graduates will be able to:
CO1	To develop Fishery units
CO2	Identification and report formulation of Fishery units
CO3	To study preparation ration for duck.
CO4	To evaluate the preparation of different products from eggs

Course contents

Fishery units, visit, Demonstration and report formulation, Different type of fishes, deep water, middle water, and surface water, Evaluation of Duck Egg (candling) and Grading, Vaccination schedule for duck and Quail, Preparation Ration for Duck, Quail. Rabbit and Fish, Preparation of different products from eggs.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Understanding of the RAWE programme, development of team work.
CO2	Changed attitude towards learning, handling practical work and solving management problems.
CO3	Building confidence as an individual, building competence
CO4	Knowledge of research experimental techniques, disclosure of recent advancement in training and research, Knowledge of collection, compilation, and analysis of experimental data

Course Title : RAWE & AIA: Village Attachment
Course Code: BAG702

Credits

14

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Field experience, understanding real-life.
CO2	Understanding the gap between the rural and urban people.
CO3	Ability to plan out strategy.
CO4	Understanding the mundane work & problems.

Course contents

After the completion of course work, the students of B.Sc. Agri. (Hons.) will receive training under the compulsory RAWE programme for 20 weeks. The students will attend the one-day orientation each in electives: (a) Crop production; (b) Crop Protection. (c) Horticulture; (d) Plant Breeding, and Genetics (e) Post Harvest Technology and Value addition (f) Agri-business Management. The students will attend three weeks Village Attachment Training. Further, they will undergo 12 weeks on-campus training in: (a) Bee-keeping; (b) Mushroom cultivation; (c) Plant Clinic Activities (d) Seed/Nursery Production; (e) Food Processing & Preservation; and (f) Biotechnological Tools in Crop Improvement (g) Soil Testing. Students will also attend 4-week off-campus training in different elective-wise activities. During the last week of the training, the students will submit the report whose evaluation will be done by the concerned teachers on the basis of their performance in orientation, village attachment, on and off-campus training.

RAWE Component-I Village Attachment Training Programme

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

Course Title : RAWE & AIA: Plant clinic
Course Code: BAG704

Credits
2

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Field experience, understanding real-life.
CO2	Understanding the gap between the rural and urban people
CO3	Ability to plan out strategy
CO4	Understanding the mundane work & problems

Course Title :RAWE & AIA: Agro-Industrial Attachment	Credits 4
Course Code: BAG705	

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Field experience, understanding real-life.
CO2	Understanding the gap between the rural and urban people
CO3	Ability to plan out strategy
CO4	Understanding the mundane work & problems

Course contents

After the completion of course work, the students of B.Sc. Agri. (Hons.) will receive training under the compulsory RAWE programme for 20 weeks. The students will attend the one day orientation each in electives: (a) Crop production; (b) Crop Protection. (c) Horticulture; (d) Plant Breeding, and Genetics (e) Post Harvest Technology and Value addition (f) Agri-business Management. The students will attend three weeks Village Attachment Training. Further, they will undergo 12 weeks on-campus training in: (a) Bee-keeping; (b) Mushroom cultivation; (c) Plant Clinic Activities (d) Seed/Nursery Production; (e) Food Processing & Preservation; and (f) Biotechnological Tools in Crop Improvement (g) Soil Testing . Students will also attend 4-week off-campus training indifferent elective-wise activities. During the last week of the training, the students will submit the report whose evaluation will be done by the concerned teachers on the basis of their performance in orientation, village attachment, on and off-campus training.

RAWE Component –II Agro Industrial Attachment

1. Students shall be placed in Agro-and Cottage industries and Commodities Boards for 03 weeks.

Industries include Seed/Sapling production, Pesticides-insecticides, Post harvest-processing Value addition, Agri-finance institutions, etc.

Activities and Tasks during Agro-Industrial Attachment Programme

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

RAWE Component- II	
	Agro Industrial Attachment
	Students shall be placed in Agro-and Cottage industries and Commodities Boards for 03 weeks.
	Industries include Seed/Sapling production, Pesticides-insecticides. Post-harvest-processing- value addition, Agri-finance institutions. etc.
	Activities and Tasks during Agro-Industrial Attachment Programme
	Acquaintance with industry and staff
	Study of structure, functioning, objective and mandates of the industry
	Study of various processing units and hands-on trainings under supervision of industry staff
	Ethics of industry
	Employment generated by the industry
	Contribution of the industry promoting environment
	Learning business network including outlets of the industry
	Skill development in all crucial tasks of the industry
	Documentation of the activities and task performed by the students
	Performance evaluation appraisal and ranking of students

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

Course Title: Production Technology for Bio agents and Bio fertilizer (non credit)**

Course Code: BAG801

L	T	P	Credits
0	0	1	10

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	To study the classical biological control scenarios in agricultural pest management.
CO2	To Understand economic importance of different categories of beneficial insects and useful insects in agricultural pest management.
CO3	To Evaluate efficacy of various bio pest control agents, mass production of natural enemies of pest insects. To understand about organic manures, their preparation and application.
CO4	To understand manufacturing processes and properties of bioagents and biofertilizers.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Arshad,A. 2021. *Biopesticides and Bioagents Novel Tools for Pest Management*. Apple Academic Press. pp. 11.
2. Santhakumari, P. and Vijay Sree. 2012. *Biological control of crop pests in india*. Kalyani Publishers. pp: 140.
3. Bhagat, D.V. 2010. *Encyclopaedia of Biological Control of Insect and Pest*. pp:1-332

Course Title: Seed Production and Technology (non credit)**

Course Code: BAG802

L	T	P	Credits
0	0	1	5

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	To introduce the basic principles of quality seed production.
CO2	To learn various conventional and non-conventional Hybrid Seed Production technologies.
CO3	To learn about the concepts and significance of seed quality control.
CO4	To know about various aspects related to seed certification.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Cas based study and Group discussion.

Suggested Readings:

1. Singh, B.D. 2018. *Plant Breeding (Principles and methods)*, Kalyani publishers, New Delhi. pp. 918
2. Singh, P. 2017. *Fundamentals of Plant Breeding (Principles and methods)*, Kalyani publishers , New Delhi, pp : 327
3. Kumaresan, V. and Arumugam, N. 2017. *Fundamentals of Horticulture and Plant Breeding*. Saras publisher, Tamilnadu. pp. 524
4. Singh, P. and Arumugam, N. 2016. *Essential of plant breeding*. Kalyani publisher, New Delhi. pp. 243

**Course Title: Mushroom Cultivation Technology
(non credit)****

Course Code: BAG803

L	T	P	Credits
0	0	1	10

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Understanding mushrooms, types (edible & poisonous) and mushroom production.
CO2	Learning cultivation of different edible mushrooms.
CO3	Building knowledge on diseases and pests of mushroom and their management. Knowing harvesting and post harvesting processes of mushroom.
CO4	Learning value added products preparation from mushroom. Having the prospects of commercial mushroom production.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion

Suggested Readings:

1. Krishnamurthy, A.S., Marimuthu, T., Mohan,S. and Jayarajan, R. et al. (1991). *Oster Mushroom*. Department of Plant Pathology. Tamil Nadu Agricultural University, Coimbatore.
2. Nita, Bhal. 2000. *Handbook on Mushrooms*. 2nd ed. Vol. I and II. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi
3. Pandey, R.K.and Ghosh, S.K. 1996. *A Hand Book on Mushroom Cultivation*. Emkey Publications.
4. Pathak, V. N. and Yadav, N. 1998. *Mushroom Production and Processing Technology*. Agrobios, Jodhpur.

Course Title: Soil, plant, water and seed testing (non credit)**

Course Code: BAG804

L	T	P	Credits
0	0	1	10

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	After completion of the course students are able to: - demonstrate insight into how to tackle practical analytical chemical problems, apply methods of instrumental chemical analysis to natural materials and (eco)systems.
CO2	Demonstrate understanding of the basic theory and relevant parameters in analytical chemistry.
CO3	Demonstrate awareness of the limitations of the various methods, report about experimental chemical analytical results and draw correct conclusions.
CO4	Discuss chemical analytical aspects relevant for the selection of proper analytical techniques for real-life problem situations.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. ISSS. 2009. *Fundamentals of Soil Science*. 2nd Ed. Indian Society of Soil Science, New Delhi-110 012. pp. 728.
2. Das, D.K. 2011. *Introductory Soil Science*, 3rd revised and Enlarged Ed, Kalyani Publisher, Ludhiana. pp. 645.
3. Weil, R.R. and Brady, N. C. 2017. *The Nature and Properties of Soils*. 15th edition Publisher: Pearson Education, ISBN: 978-0133254488
4. Daji, J.A., Daji, J.A., Kadam, J.R. and Patil, N.D. 1996. *Textbook of Soil Science* Bombay Media Promoters and publishers Pvt. Ltd.
5. Biswas, T.D.; Mukherjee, S.K. 1995. *Text Book of Soil Science* 2nd sEd. Tata McGraw Hill Publisher, Delhi pp 433.
6. Mehara , R. K. 2004. *Text Book of Soil Science.*, ICAR, New Delhi.
7. Patil, V.D. and Mali, C.V. 2007. *Fundamentals of Soil Science*, Aman Publication, Meerut.
8. Nirankari, Lal Singh. 2000. *Text Book of Soil Science*. Aman Publication, Meerut.
9. Dahama , A. K. 1997. *Organic farming for sustainable agriculture*. 19, AgrobotanicaBinaker. Pp 53-98 and 210-255.

Course Title: Commercial Beekeeping (non credit)**
Course Code: BAG805

L	T	P	Credits
0	0	1	10

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Explain what they need in order to get started in beekeeping Describe the laws around beekeeping in Vancouver
CO2	Discuss the responsibilities of urban beekeepers.
CO3	Identify where to purchase equipment and demonstrate how to assemble it.
CO4	Name and identify major parts of the honeybee such as the stinger or mandibular parts.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Rahman, Atur. 2019. *Text Book on Beekeeping*. Kalyani Publishers.pp.347.
2. Alford, D.V. 2019. *Beneficial Insects*. CRC Press. pp.400.
3. Prasad, T.V. 2019. *Handbook of Entomology*. New Vishal Publications.pp.496.

Course Title: Poultry Production Technology (non credit)**

Course Code: BAG806

L	T	P	Credits
0	0	1	10

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Introduction to egg or broiler production. Apply health management Practices for poultry.
CO2	Study the biosecurity practices in poultry production.
CO3	Utilize feed and water management strategy in poultry production.
CO4	Production of poultry broilers. Handle collection and storage of table eggs on the farm.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Singh, Harban and Moore, E. N. 1968. Livestock and poultry Production.
2. Banergee, G. C. 1999. Text Book of Animal Husbandry –9th ed Oxford and IBH Publishers, New Delhi.
3. Singh, Harbans and Earl N. Moore. 1982.Livestock and Poultry Production, New Delhi.
4. Sastry, N.S.R. and Thomas, C.K. 2017. Livestock Production Management, Kalyani Publication, New Delhi.

Course Title: Commercial Horticulture
Course Code: BAG807

L	T	P	Credits
0	0	1	10

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Commercial Nursery & Greenhouse Crop Production.
CO2	Detailed study about recent advances in horticulture. Aware with the mechanism of Pest and Disease Management of Horticultural Crops.
CO3	Awareness created about general principles of fruits and vegetables preservation.
CO4	Study the best management practices to enhance economic, environmental, and community sustainability.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Anonymous, 2001. Handbook of Horticulture 10th edition. ICAR publication, Indian Council of Agricultural Research, New Delhi. pp.1069.
2. Bose, T. K., Mitra, S. K. and Sanyal, D. 2001. Fruits: Tropical and Subtropical, Volume 1, 3rd edition. Naya Udyog. pp.721.
3. Katyal, S.L, Krishnamurthi, S. and Singh, Sham. 1963. Fruit Culture in India. India Republic of India. Indian Council of Agricultural Research, New Delhi. pp.451.
4. Singh, Ranjit. 1969. Fruits. National Book Trust, India. pp.213.

Course Title: Floriculture and Landscaping (non credit)**

Course Code: BAG808

L	T	P	Credits
0	0	1	10

Course

Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Study of importance and export potential in floriculture.
CO2	Practicing various techniques of plant propagation, disease and pest of cut flowers.
CO3	Principles and practice of landscaping e.g. home gardens, small parks etc.
CO4	Raising nursery plants for commercial floriculture.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Bose, T.K., Maiti, R.G, Dhua, R.S. and Das P. 2002. *Floriculture and Landscaping*, Vol.1. Naya Udyog Publication, Kolkata. pp 508.
2. Singh, A. K. and Sisodia, A.2017. *Textbook of Floriculture and Landscaping*. 2017. NIPA. pp 446.
3. Singh, R. and Singh, B. K. 2020. *Introductory Ornamental Horticulture and Landscape gardening*. Daya Publication. pp 229.

Course Title: Food Processing (non credit)**
Course Code: BAG809

L	T	P	Credits
0	0	1	10

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	To supply wholesome, safe, nutrition's and acceptable food to consumers throughout the year.
CO2	Generate both urban and rural employment.
CO3	Develop new Value-added products and reduce fruit and vegetable losses.
CO4	How the prevent the fruits from spoilage, decay at the time of harvesting, transportation and storage.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion

Suggested Readings:

1. James G. Brennan. 2006. Food Processing Handbook. Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim, Germany.
2. Fellows, P. 2000. Food Processing Technology: Principles and Practice, 2nd Ed. CRC Press, Boca Raton, FL, USA

Course Title: Agriculture Waste Management (non credit)**

Course Code: BAG810

L	T	P	Credits
0	0	1	10

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	To study the various methods of agricultural waste management for eco-friendly energy and manure production.
CO2	To study methods and biochemistry of composting. Determination of bio-energy potential of agro-waste.
CO3	Various eco-friendly methods for agricultural waste management.
CO4	Nutritive value and energy production potential of agro wastes.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Bhatia, H.S. 2019. A comprehensive book on solid waste management with application.
2. Gupta, D.D.C. 2020. Solid waste management.
3. Khan, I.H. 2017. Text Book of solid waste management
4. Singh, Digvijay, Bhat, Rouf Ahmad, Geelanim, Syed Maqbool. 2021. Agricultural Waste: Sources, Implications, and Sustainable Management.

Course Title: Organic Production Technology (non credit)**

Course Code: BAG811

L	T	P	Credits
0	0	1	10

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Understand the concept and the importance of organic farming (OF) in Portugal, in India and in the world; distinguish the different streams of sustainable agriculture (SA) and meet the obligations associated with each difference.
CO2	Maintain and preserve existing ecosystems and promote the maintenance of the balance of the recommended farming system.
CO3	Have relevant knowledge of agricultural technology for the fertilization of the land mobilization and composting.
CO4	Have relevant knowledge of agricultural technology for crop protection in organic farming (OF). Know legislation rules on livestock in OF and the specific technologies of different species as well as preventive and curative therapies recommended in OF.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Dahama, A.K. 2010. *Organic Farming for Sustainable Agriculture*. Agrobios Publication. pp 430.
2. Ranjan, Kumar Biswas. 2014. *Organic Farming in India*. N D Publisher. pp400
3. Bansal M .2020. *Basics of Organic Farming*. CBS. pp 230
4. Peter, V. Fossil. 2007. *Organic Farming: Everything You Need to Know*. Voyageur Press. pp 380
5. Hunsen. Ann Larkin. 2010. *Organic farming manual*. pp 320

Course Title: Commercial Sericulture (non credit)**

Course Code: BAG812

L	T	P	Credits
0	0	1	10

Course Outcomes: On successful completion of this course, the students will able to learn:

CO	Statement
CO1	Study about rearing, reeling, twisting, propagation skills and disease identification.
CO2	Discuss the responsibilities of urban sericulturist.
CO3	Study about the production planning, extension, costing and management strategy.
CO4	To study silk weaving, dying and printing technology.

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion.

Suggested Readings:

1. Alford, D.V. 2019. Beneficial Insects. CRC Press.pp.400
2. Prasad, T.V. *Handbook of Entomolog* . New Vishal Publications.Pp.496.