

**GURU KASHI UNIVERSITY**



**Bachelor of Science (Agriculture)**

**Session: 2024-25**

**UG Studies in Agriculture**

## **Graduate Attributes**

Apply comprehensive knowledge and proficiency in different techniques of crop production and optimum resource utilization in field. Ability to inculcate rational thinking for introducing high-tech approaches in areas of consumption, production and distribution. Intellectual competence to anticipate implications of soil, water, and agricultural practices on crop production vis-à-vis future environmental challenges. Scholarly responsible citizens and professionals equipped with critical and ethical thinking regarding global food, natural resource management and sustainable agriculture. Leadership readiness with good entrepreneurial and communication skills to share knowledge and ideas in communities.

## **PROGRAMME OUTCOMES**

- Imbibing coherent knowledge in plant and animal world for developing effective management tools.
- Developing ability for characterization, identification, and diagnosis of plant health issues.
- Analyzing data of plant and animal production systems for appropriate conclusions.
- Finding relationships between inputs and outputs in agriculture for making profitable and effective decisions.
- Updation regarding different scenarios in agriculture- climate, sustainability in monitoring and geospatial integrating.
- Integrating different aspects of agriculture for an economic growth of human populations.
- Developing ability to be competent professionally with ethical responsibility and reasoned decision-making at various levels.
- Understanding legal and ethical issues impacting agricultural organizations.
- Analysing the impact globalization and diversification in agriculture.
- Demonstrating ability to engage in critical thinking by analyzing situations and finding solutions to problems.
- Understanding and analyzing existing issues in agriculture and future planning.

GURU KASHI UNIVERSITY							
B. Sc. AGRICULTURE (HONS) -4 Year					Batch: 2024		
Study Scheme							
Semester: 1st							
Sr.	Subject Code	Subject Name	Type of Subject T/P	(Hours Per Week)			No. of Credits
				L	T	P	
1.	BAG101	Fundamentals of Agronomy	T	2	0	0	2
2.	BAG114	Lab. Fundamentals of Agronomy	P	0	0	2	1
3.	BAG102	Fundamentals of Genetics	T	2	0	0	2
4.	BAG115	Lab. Fundamentals of Genetics	P	0	0	2	1
5.	BAG103	Fundamentals of Soil Science	T	2	0	0	2
6.	BAG116	Lab. Fundamentals of Soil Science	P	0	0	2	1
7.	BAG104	Fundamentals of Horticulture	T	1	0	0	1
8.	BAG117	Lab. Fundamentals of Horticulture	P	0	0	2	1
9.	BAG105	Rural Sociology & Educational Psychology	T	1	0	0	1
10.	BAG118	Lab. Rural Sociology & Educational Psychology	P	0	0	2	1
11.	BAG106	Introduction to Forestry	T	1	0	0	1
12.	BAG119	Lab. Introduction to Forestry	P	0	0	2	1
13.	BAG107	Introductory Animal Husbandry	T	2	0	0	2
14.	BAG120	Lab. Introductory Animal Husbandry	P	0	0	2	1
15.	BAG125	Comprehension & Communication Skills in English	T	1	0	0	1
16.	BAG123	Lab. - Comprehension & Communication Skills in English	P	0	0	2	1
17.	BAG126	Agricultural Heritage (*Remedial course)	T	1	0	0	1
<b>Select one, either (BAG110 &amp; BAG121) OR (BAG111 &amp; BAG122)</b>							
18.	BAG110	Introductory Biology (*Remedial course)	T	1	0	0	1
19.	BAG121	Lab- Introductory Biology	P	0	0	2	1
20.	BAG111	Basic Agriculture-I (*Remedial course)	T	1	0	0	1
21.	BAG122	Lab-/Basic Agriculture-I	P	0	0	2	1
<b>Select one, either BAG112 OR BAG113</b>							
22.	BAG112	Elementary Mathematics (*Remedial course)	T	2	0	0	2
23.	BAG113	Basic Agriculture-II (*Remedial course)	T	2	0	0	2
24.	BAG124	Lab. NSS/NCC/Physical Education & Yoga Practices**	P	0	0	4	2
Total No. of Credits							27

**Semester: 2<sup>nd</sup>**

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

**Semester: 3rd**

Sr.	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)	T	1	0	0	1
2	BAG312	Lab-Crop Production Technology -1 ( Kharif crops)	P	0	0	2	1
3	BAG302	Fundamentals of Plant Breeding	T	2	0	0	2
4	BAG314	Lab-Fundamentals of Plant Breeding	P	0	0	2	1
5	BAG303	Agricultural Microbiology	T	1	0	0	1
6	BAG315	Lab-Agricultural Microbiology	P	0	0	2	1
7	BAG304	Agricultural Finance and Co-operation	T	2	0	0	2
8	BAG316	Lab-Agricultural Finance and Co-Operation	P	0	0	2	1
9	BAG305	Farm Machinery and Power	T	2	0	0	2
10	BAG317	Lab-Farm Machinery and Power	P	0	0	2	1
11	BAG306	Principles of Integrated Disease Management	T	2	0	0	2
12	BAG318	Lab-Principles of Integrated Disease Management	P	0	0	2	1
13	BAG324	Environmental Studies & Disaster Management	T	1	0	0	1
14	BAG325	Lab-Environmental Studies & Disaster Management	P	0	0	2	1
15	BAG308	Statistical Methods	T	1	0	0	1
16	BAG320	Lab-Statistical Methods	P	0	0	2	1
17	BAG309	Fundamentals of Soil and Water Conservation	T	0	0	2	1
18	BAG321	Lab-Fundamental of Soil and Water Conservation	P	0	0	2	1
19	BAG310	Dairy Science	T	2	0	2	2
20	BAG322	Lab-Dairy Science	P	0	0	2	1
21	BAG311	Fundamentals of Entomology-II	T	1	0	1	1
22	BAG323	Lab-Fundamentals of Entomology-II	P	0	0	2	1
23	BAG326	Lab-Practical Crop Production -1 (Kharif crops)	P	0	0	4	2
Total No. of Credits							27

Semester: 4 <sup>th</sup>							
Sr.	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> )	T	1	0	0	1
2	BAG410	Lab-Crop Production Technology –II (Rabi Crops)	P	0	0	2	1
3	BAG402	Principles of Seed Technology	T	2	0	0	2
4	BAG412	Lab-Principles of Seed Technology	P	0	0	2	1
5	BAG403	Problematic soils and their Management	T	1	0	0	1
6	BAG413	Lab-Problematic soils and their Management	P	0	0	2	1
7	BAG421	Fundamentals of Biotechnology	T	1	0	0	1
8	BAG422	Lab-Fundamentals of Biotechnology	P	0	0	2	1
9	BAG404	Renewable Energy and Green Technology	T	1	0	0	1
10	BAG414	Lab-Renewable Energy and Green Technology	P	0	0	2	1
11	BAG405	Production Technology for Ornamental Crops, MAP and Landscaping	T	1	0	0	1
12	BAG415	Lab-Production Technology for Ornamental Crops, MAP	P	0	0	4	2
13	BAG406	Entrepreneurship Development and Business Communication	T	1	0	0	1
14	BAG416	Lab-Entrepreneurship Development and Business	P	0	0	2	1
15	BAG407	Introductory Agro-meteorology & Climate Change	T	1	0	0	1
16	BAG417	Lab-Introductory Agro-meteorology & Climate Change	P	0	0	2	1
17	BAG408	Agri- Informatics	T	1	0	0	1
18	BAG418	Lab- Agri- Informatics	P	0	0	2	1
19	BAG409	Poultry Production & Management	T	2	0	0	2
20	BAG419	Lab-Poultry Production & Management	P	0	0	2	1
21	BAG423	Lab-Practical Crop Production - II (Rabi crops)	P	0	0	2	1
Total No. of Credits							24

Semester: 5th							
Sr.	Subject Code	Subject Name	Type of Subject T/P	(Hours Per Week)			No. of Credits
				L	T	P	
1	BAG501	Rainfed and dryland Agriculture	T	1	0	0	1
2	BAG518	Lab-Rainfed and dryland Agriculture	P	0	0	2	1
3	BAG502	Crop Improvement-1 (Kharif crops)	T	1	0	0	1
4	BAG519	Lab-Crop Improvement-1 (Kharif crops)	P	0	0	2	1
5	BAG503	Pests of Crops and Stored Grain and their Management	T	2	0	0	2
6	BAG520	Lab-Pests of Crops and Stored Grain and their Management	P	0	0	2	1
7	BAG504	Agricultural Marketing, Trade & Prices	T	2	0	0	2
8	BAG521	Lab- Agricultural Marketing Trade & Prices	P	0	0	2	1
9	BAG505	Protected Cultivation and Secondary Agriculture	T	2	0	0	2
10	BAG522	Lab-Protected Cultivation and Secondary Agriculture	P	0	0	2	1
11	BAG506	Diseases of Field and Horticultural Crops and their Management-I	T	2	0	0	2
12	BAG523	Lab-Diseases of Field and Horticultural Crops and their Management-I	P	0	0	2	1
13	BAG507	Production Technology for Fruit and Plantation Crops	T	1	0	0	1
14	BAG524	Lab-Production Technology for Fruit and Plantation Crops	P	0	0	2	1
15	BAG534	Communication Skills and Personality Development	T	1	0	0	1
16	BAG535	Lab-Communication Skills and Personality Development	P	0	0	2	1
17	BAG536	Intellectual Property Rights	T	1	0	0	1
18	BAG510	Principles of Food Science & Nutrition	T	2	0	0	2
19	BAG537	Lab-Principles of Food Science & Nutrition	P	0	0	2	1
20	BAG511	Geo-informatics and Nanotechnology	T	1	0	0	1
21	BAG527	Lab- Geo-informatics and Nanotechnology	P	0	0	2	1
22	<b>Elective-I</b>	Elective-1 (BAG512/ BAG513/ BAG514/ BAG515/ BAG516/ BAG517)	T	2	0	0	2
23	<b>Elective-I Lab.</b>	Lab-Elective-I (BAG528/ BAG529/ BAG530/ BAG531/ BAG532/ BAG533)	P	0	0	2	1
Total No. of Credits							29

Semester: 6 <sup>th</sup>							
Sr.	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	T	1	0	0	1
2	BAG615	Lab- Farming System, Precision Farming & Sustainable Agriculture	P	0	0	2	1
3	BAG602	Crop Improvement-II (Rabi crops)	T	1	0	0	1
4	BAG616	Lab-Crop Improvement-II (Rabi crops)	P	0	0	2	1
5	BAG603	Manures, Fertilizers and Soil Fertility Management	T	2	0	0	2
6	BAG617	Lab-Manures, Fertilizers and Soil Fertility Management	P	0	0	2	1
7	BAG604	Farm Management, Production & Resource Economics	T	1	0	0	1
8	BAG618	Lab-Farm Management, Production & Resource Economics	P	0	0	2	1
9	BAG605	Diseases of Field and Horticultural Crops and their Management-II	T	2	0	0	2
10	BAG619	Lab-Diseases of Field and Horticultural Crops and their Management-II	P	0	0	2	1
11	BAG606	Post-harvest Management and Value Addition of Fruits and Vegetables	T	1	0	0	1
12	BAG620	Lab- Post-harvest Management and Value Addition of Fruits and Vegetables	P	0	0	2	1
13	BAG607	Watershed and Wasteland Management	T	1	0	0	1
14	BAG621	Lab-Watershed and Wasteland Management	P	0	0	2	1
15	BAG608	Beneficial insects and Pest of Horticultural Crops and their Management	T	2	0	0	2
16	BAG622	Lab-Beneficial insects and Pest of Horticultural Crops and their Management	P	0	0	2	1
17	<b>Elective-II</b>	Elective-II (BAG609/ BAG610/ BAG611/ BAG612/ BAG613/ BAG614)	T	2	0	0	2
18	<b>Elective-II Lab.</b>	Lab-Elective-II (BAG623/ BAG624/ BAG625/ BAG626/ BAG627/ BAG628)	P	0	0	2	1
19		Educational Tour (**Non gradial course)	P	0	0	4	2
Total No. of Credits							24



<b>Programme name: B.Sc. Agriculture (Hons.) 4 year</b>								
<b>Programme structure: BAG</b>								
<b>7th Semester</b>								
<b>Rural Agricultural Work Experience and Agro-industrial Attachment (RAWE &amp; AIA)</b>								
<b>Credit Hours</b>	<b>Course Code</b>	<b>Activities</b>	<b>Type of Subject</b>	<b>No. of Weeks</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>No. of Credits</b>
1	BAG701	General orientation & On campus training by different faculties	P	1	NA	NA	NA	14
2	BAG702	Village attachment	P	8	NA	NA	NA	
3	BAG703	Unit attachment in Univ. / College. KVK/Research Station Attachment	P	5	NA	NA	NA	
4	BAG704	Plant clinic	P	2	NA	NA	NA	2
5	BAG705	Agro-Industrial Attachment	P	3	NA	NA	NA	4
6	BAG706	Project Report Preparation, Presentation and Evaluation	P	1	NA	NA	NA	
<b>Total weeks for RAWE &amp; AIA</b>				<b>20</b>				<b>20</b>

**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	1 Week
7	Animal Production Interventions	1 Week
8	Extension and Transfer of Technology activities	1 Week
9.	Crop improvement & seed production interventions	1 Week
10	Agro-economics & analysis interventions	1 Week

**RAWE Component -II**

Sr. No.	Activity
1	<b>Agro Industrial Attachment</b>
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	<b>Activities and Tasks during Agro- Industrial Attachment Programme</b>
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****8<sup>th</sup> Semester**

**Modules for Skill Development and Entrepreneurship:** every student must register and complete two modules of 0+10 credits, totaling 0+20 credits from the package of following 14 modules in the VIII sem. Each module must be opted from different department

<b>S. No.</b>	<b>New Course Code</b>	<b>Title of the module</b>	<b>Type of Course</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
1	BAG801	Production Technology for Bioagents and Biofertilizer	P	0	0	20	0+10
2	BAG802	Seed Production and Technology	P	0	0	20	0+10
3	BAG803	Mushroom Cultivation Technology	P	0	0	20	0+10
4	BAG804	Soil, Plant, Water and Seed Testing	P	0	0	20	0+10
5	BAG805	Commercial Beekeeping	P	0	0	20	0+10
6	BAG806	Poultry Production Technology	P	0	0	20	0+10
7	BAG807	Commercial Horticulture	P	0	0	20	0+10
8	BAG808	Floriculture and Landscaping	P	0	0	20	0+10
9	BAG809	Food Processing	P	0	0	20	0+10
10	BAG810	Agriculture Waste Management	P	0	0	20	0+10
11	BAG811	Organic Production Technology	P	0	0	20	0+10
12	BAG812	Commercial Sericulture	P	0	0	20	0+10
13	BAG813	Water Harvesting	P	0	0	20	0+10
14	BAG814	Audio-visual aids & agro informatics	P	0	0	20	0+10

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

**Programme structure: BAG**

**Evaluation of Experiential Learning Programme**

<b>S. No.</b>	<b>Parameters</b>	<b>Max. Marks</b>
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
	<b>Total</b>	<b>100</b>

<b>Programme name: B.Sc. Agriculture (Hons.) 4 year</b>		
<b>Programme structure: BAG</b>		
<b>Discipline wise credits</b>		
<b>S. No.</b>	<b>Group</b>	<b>Credits</b>
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	NSSINCC/Physical Education & Yoga Practices**	2
16	16 Human Values and Ethics**	1
17	17 Educational Tour**	2
	<b>Total</b>	141+5*+5** +6 credits elective = 157
	<b>RAWE</b>	20
	<b>ELP</b>	20
	<b>Grand Total</b>	<b>157+20+20=197</b>
	* Remedial courses	
	** Non-gradual courses	

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

**Programme structure: BAG**

**Elective Courses : A student can select one elective course (Theory and practical) out of the following in the 5<sup>th</sup> semester**

<b>S. No.</b>	<b>New Course Code</b>	<b>Courses</b>	<b>Type of Course</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>No of Credits</b>
1	BAG512	Agribusiness Management	T	2	0	0	2
2	BAG528	Lab Agribusiness Management	P	0	0	2	1
3	BAG513	Agrochemicals	T	2	0	0	2
4	BAG529	Lab Agrochemicals	P	0	0	2	1
5	BAG514	Commercial Plant Breeding	T	2	0	0	2
6	BAG530	Lab Commercial Plant Breeding	P	0	0	2	1
7	BAG515	Landscaping	T	2	0	0	2
8	BAG531	Lab Landscaping	P	0	0	2	1
9	BAG516	Food Safety and Standards	T	2	0	0	2
10	BAG532	Lab Food Safety and Standards	P	0	0	2	1
11	BAG517	Biopesticides & Biofertilizers	T	2	0	0	2
12	BAG533	Lab Biopesticides & Biofertilizers	P	0	0	2	1

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

**Programme structure: BAG**

**Elective Courses : A student can select one elective course (Theory and practical) out of the following in the 6<sup>th</sup> semester**

<b>S. No.</b>	<b>New Course Code</b>	<b>Courses</b>	<b>Type of Course</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>No of Credits</b>
1	BAG609	Protected Cultivation	T	2	0	0	2
2	BAG623	Lab Protected Cultivation	P	0	0	2	1
3	BAG610	Hi-tech. Horticulture	T	2	0	0	2
4	BAG624	Lab Hi-tech. Horticulture	P	0	0	2	1
5	BAG611	Weed Management	T	2	0	0	2
6	BAG625	Lab Weed Management	P	0	0	2	1
7	BAG612	System Simulation and Agro-advisory	T	2	0	0	2
8	BAG626	Lab System Simulation and Agro-advisory	P	0	0	2	1
9	BAG613	Agricultural Journalism	T	2	0	0	2
10	BAG627	Lab Agricultural Journalism	P	0	0	2	1
11	BAG614	Management of Fish cum duck, quail and rabbit farming	T	2	0	0	2
12	BAG628	Management of Fish cum duck, quail and rabbit farming	P	0	0	2	1

## **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: [30 Marks]**

### **C. End-Term Exam: [40 Marks]**

### **D. Attendance: [5 Marks]**

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

## **Evaluation Criteria for practical Courses**

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



**Course Title: Fundamentals of Agronomy**  
**Course Code: BAG101**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
2	0	0	2

**Total hours-30**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 Attain knowledge about tillage practices and nutrient use efficiency
- 2 Acquire knowledge about soil-water an plant relationsheep
- 3 Carryout about weed control strategies and herbicide resistance
- 4 To know about factors affecting plant growth and development and harvesting and threshing of crops

**Course contents**

**Theory**

**UNIT I**

**8 Hours**

Agronomy and its scope, seeds and sowing, tillage and tilth, crop density and geometry, Cropnutrition,manures and fertilizers,nutrient use efficiency,

**UNIT II**

**8 Hours**

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

**UNIT III**

**7 Hours**

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

**UNIT IV**

**7 Hours**

Growth and development of crops, factors affecting growth and development, plant ideotypes, crop rotation andits principles, adaptation and distribution of crops, crop management technologies in problematic areas,harvesting and threshing of crops.

**Course Title: Lab-Fundamentals of Agronomy**  
**Course Code: BAG 114**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**Practical contents**

**30 Hours**

- Identification of crops, seeds, fertilizers, pesticides and tillage implements.study of agro-climaticzones 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.

**Suggested Readings:**

1. Singh, Chhidda. 2022. *Modern techniques of raising field corps.* Oxford and IBH Publishing Co. Ltd. Bangalore.
2. Panda, S.C., 2006.*Agronomy Agribios Publication, New Delhi.*

**Transaction Method:**

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

**Course Title: Fundamentals of Genetics**  
**Course Code: BAG102**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
2	0	0	2

**Total hours-30**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 Basic structure and functions of DNA and chromosomes, basics of the molecular processes of DNA replication, transcription and translation.
- 2 Basic laws of inheritance for qualitative and quantitative traits.
- 3 Basic biochemical pathways of Carbohydrate, lipids, proteins and other essential secondary metabolites.
- 4 Gene regulation.

**Course Contents**

**Theory**

**Unit-I**

**8 Hours**

Pre and Post Mendelian concepts of heredity, Mendelian principles of heredity, Architecture of chromosome; special types of chromosomes, Chromosomal theory of inheritance; cell cycle and cell division - mitosis and meiosis, Chi-square test; Dominance relationships, pistatic interactions; Multiple alleles, pleiotropism and pseudoalleles.

**Unit-II**

**8 Hours**

Sex determination and sex linkage, sex limited and sex influenced traits, Blood group genetics, Linkage and its estimation, crossing over mechanisms, chromosome mapping, Structural and numerical variations in chromosome and their implications, use of haploids, dihaploids and doubled haploids in Genetics.

**Unit-III**

**7 Hours**

Mutation, classification, Methods of inducing mutations & CLB technique, mutagenic agents and induction of mutation, Qualitative & Quantitative traits, Polygenes and continuous variations and multiple factor hypothesis.

**Unit-IV**

**7 Hours**

Cytoplasmic inheritance, Genetic disorders, Nature, structure & replication of genetic material (DNA). Protein synthesis, Transcription and translational mechanism of genetic material and Gene concept: Gene structure, function and regulation.

**Course Title: Lab-Fundamentals of Genetics**  
**Course Code: BAG115**

L	T	P	Credits
0	0	2	1

**Practical Contents**

**30 hours**

1. Study of microscope.
2. Study of cell structure.
3. Mitosis and Meiosis cell division.
4. Experiments on monohybrid, dihybrid, trihybrid. test cross and back cross,
5. Experiments on epistatic interactions including test cross and back cross,
6. Practice on mitotic and meiotic cell division.
7. Experiments on probability and Chi-square test.
8. Determination of linkage and crossover analysis (through two-point test cross and three-point test cross data).
9. Study on sex linked inheritance in *Drosophila*.
10. Study of models on DNA and RNA structures.

**Suggested Readings:**

1. Singh, B.D. 2009. *Fundamentals of Genetics*. Kalyani Publishers, Ludhiana, India. pp. 825.
2. Snusted, D. P., Simmons, M. J. 2010. *Principles of Genetics*. John Wiley & Sons, New York. pp. 882.

**Transaction Method:**

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

**Course Title: Fundamentals of Soil Science**

**Course Code: BAG103**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
2	0	0	2

**Total hours-30**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 To acquire knowledge about soil formation and classification.
- 2 To understand the physical and chemical properties of soil.
- 3 To understand the soil moisture dynamics in soil, understand the thermal properties, gaseous exchange of soil.
- 4 To acquire knowledge about soil organic method and biology of soil.

**Course Contents**

**Theory**

**Unit I**

**8 Hours**

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.

**Unit II**

**8 Hours**

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,

**Unit III**

**7 Hours**

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;

**Unit IV**

**7 Hours**

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.

**Course Title: Lab-Fundamentals of Soil Science**  
**Course Code: BAG116**

L	T	P	Credits
0	0	2	1

### **Practical Contents**

**30 Hours**

1. Study of soil profile in field.
2. Study of soil sampling tools,
3. Collection of representative soil sample, its processing and storage.
4. Study of soil forming rocks and minerals.
5. Determination of soil density, moisture content and porosity.
6. Determination of soil texture by feel and Bouyoucos
7. Methods. Determination of soil pH and electrical conductivity.
8. Determination of cation exchange capacity of soil
9. Study of soil map. Determination of soil colour.
10. Estimation of organic matter content of soil.
11. Analysis of irrigation water.

### **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. C. E. Millar and L. M. Turk. *Fundamentals of Soil Science. 2002. Daya Books.*

### **Transaction Method:**

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

**Course Title: Fundamentals of Horticulture**  
**Course Code: BAG104**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
1	0	0	1

**Total hours- 15**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 Identify various horticultural crops like fruits, vegetable, flower seeds, plant types in their natural existence.
- 2 Categorize crops grown in different agro-climatic conditions with their classification according to various physiological and morphological features.
- 3 Identifies and applies methods for defining and responding to horticultural problems
- 4 Practice techniques involved in management of different horticultural crops

**Course Contents**

**Theory**

**UNIT-I**

**4 Hours**

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

**UNIT-II**

**3 Hours**

Plant propagation-methods and propagating structures; principles of orchard establishment

**UNIT-III**

**4 Hours**

Principles and methods of training and pruning, juvenility and flower bud differentiation; unfruitfulness; pollination, pollinizers and pollinators.

**UNIT-IV**

**4 Hours**

Fertilization and parthenocarpy; use of plant bioregulators in horticulture, irrigation and fertilizers applications-method and quality.

**Course Title: Lab-Fundamentals of Horticulture**

**Course Code: BAG117**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**Practical contents**

**30 Hours**

1. Identification of garden tools.
2. Identification of horticultural crops.
3. Preparation of seed bed/ nurserybed.
4. Practice of sexual and asexual methods of propagation including micro-propagation.
5. Layout and planting of orchard.
6. Training of fruit trees.
7. Pruning of fruit trees
8. Preparation of potting mixture.
9. Fertilizer application in different crops.
10. Visits to commercial nurseries/orchard.

**Suggested Readings:**

1. Chadda K.L 2001. *Handbook of Horticulture*, ICAR Publication, pp.1031.
2. Kunte Y.N and Yawalkar 2005. *Principles of Horticulture and fruit growing*, Agro-Horticultural Publishing house, pp. 363.
3. Jitendra Singh, 2002. *Basic Horticulture*. Kalyani Publishers, Hyderabad.
4. K.V. Peter, 2009. *Basics Horticulture*. New India Publishing Agency
5. Kausal Kumar Misra and Rajesh Kumar, 2014. *Fundamentals of Horticulture*. Biotech Books
6. D.K. Salunkhe and S.S. Kadam, 2013. *A handbook of Fruit Science and Technology*. CRC Press.

**Transaction Method:**

Lecture, Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts and Group discussion.



**CourseTitle: Rural Sociology & Educational Psychology****Course Code: BAG105**

L	T	P	Credits
1	0	0	1

**Total hours- 15**

After completion of course, the students will be able to:

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

**Theory contents****Unit I****4 Hours**

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.

**Unit II****3 Hours**

Rural Leadership: concept and definition, types of leaders in rural context.

**Unit III****4 Hours**

Educational psychology: Meaning & its importance in agriculture extension. Behavior: Cognitive, affective. psychomotor domain, Personality.

**Unit IV****4 Hours**

Learning, Motivation, Theories of Motivation, Intelligence.

**Course title: Lab -Rural Sociology & Educational Psychology**

**Course Code: BAG118**

L	T	P	Credits
0	0	2	1

**Practical contents**

**30 Hours**

1. Socio-economic survey of village communities.
2. Developing schedules and questionnaires.
3. Visit and gaining of Practical knowledge about the working of basic rural institutions.
4. Identification of important value systems in the rural setting as a means of social control.
5. 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

**Total hours- 15**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 Familiar with concept of agro-forestry.
- 2 Models and design of agro forestry along with crops.
- 3 Merits of different type of agro forestry system.
- 4 Dinferisation and sustainable type of farming

**Course Contents**

**Theory**

**Unit -I**

**3 Hours**

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

**Unit-II**

**4 Hours**

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

**Unit-III**

**4 Hours**

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

**Unit-IV**

**4 Hours**

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 shelterbelts, home gardens. Cultivation practices of two important fastgrowing trees pecies of the region.

**Course Title: Lab – Introduction to Forestry**  
**Course Code: BAG119**

L	T	P	Credits
0	0	2	1

**Practical contents**

**30 Hours**

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

**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.*

**Transaction Method:**

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

**Course Title: Introductory Animal Husbandry**  
**Course Code: BAG107**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
2	0	0	2

**Total hours- 30**

**Course Outcomes:** After completion of course, the students will be able to:

- 1 Understanding Importance of livestock in agriculture and economy
- 2 To know about dairy cattle and buffaloes management
- 3 To know pig, sheep and goat management.
- 4 To know about Common animal diseases of cattle

### **Course Contents**

#### **Theory**

#### **Unit I**

**7 Hours**

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

#### **Unit II**

**7 Hours**

**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.

#### **Unit III**

**8 Hours**

**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.

#### **Unit IV**

**8 Hours**

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

**Course Title: Lab – Introductory Animal Husbandry**  
**Course Code: BAG120**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	1	2

**Practical Contents**

**30 Hours**

1. Study of external body parts.
2. Study of phenotypic and physiological difference between cow and buffaloes.
3. Estimation of body weight by measurements.
4. Identification of animals.
5. Castration, Dehorning, casting or throwing and grooming.
6. Estimation of cost of milk production.
7. Problems on computation of ration.
8. Scheme of fodder production round the year.
9. Recording temperature, pulse rate and respiration rate of animals.

**Suggested Readings**

1. *Banerjee, G.C. A Textbook of Animal Husbandry.*
2. *Sastri, N.S.R., Thomas, C.K. and Singh, R.A. Livestock Production and Management.*
3. *Singh, R. Essentials of Animal Production and Management.*

**Transaction Method:**

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

**Course Title: Comprehension & Communication Skills in English**

**Course Code: BAG125**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
1	0	0	1

**Total hours- 15**

**Course Outcomes:** After completion of course, the students will be able to:

- 1 Understanding grammar principles and transforming sentences.
- 2 Understand and practice different techniques of communication.
- 3 Writing research projects and preparing technical reports.
- 4 Develop knowledge, skills, and judgement around human communication that facilitate their ability to work collaboratively.

## **Content**

### **Unit-I**

**4 Hours**

War Minus Shooting- The sporting Spirit. A Dilemma- A layman looks at science Raymond B. Fosdick. You and Your English – Spoken English and broken English G.B. Shaw.

### **Unit-II**

**4 Hours**

Reading Comprehension, Vocabulary- Antonym, Synonym, Homophones, Homonyms, often confused words. Exercises to Help the students in the enrichment of vocabulary based on TOEFL and other competitive examinations.

### **Unit-III**

**4 Hours**

Functional grammar: Articles, Prepositions, Verb, Subject verb Agreement, Transformation, Synthesis, Direct and Indirect Narration. Written Skills: Paragraph writing, Precise writing, Report writing and Proposal writing.

### **Unit-IV**

**3 Hours**

The Style: Importance of professional writing. Preparation of Curriculum Vitae and Job applications. Synopsis Writing. Interviews: kinds, Importance and process.

**Course Title: Lab-Comprehension & Communication Skills  
in English**

**Course Code: BAG123**

L	T	P	Credits
0	0	2	1

**Total hours- 30**

**Course Outcomes:** After completion of course, the students will be able to:

- 1 Understanding grammar principles and transforming sentences.
- 2 Understand and practice different techniques of communication.
- 3 Writing research projects and preparing technical reports.
- 4 Develop knowledge, skills, and judgement around human communication that facilitate their ability to work collaboratively.

**Practical Content**

**Total hours- 30**

1. Listening Comprehension: Listening to short talk's lectures, speeches (scientific, commercial and general in nature).
2. Oral Communication: Phonetics, stress and intonation, Conversation practice
3. Conversation: rate of speech, clarity of voice,
4. Speaking and Listening, politeness & Reading skills: reading dialogues, rapid reading, intensive reading, improving reading skills.
5. Mock Interviews: test initiative, team spirit, leadership, intellectual ability.
6. Group Discussions.

**Suggested Readings:**

1. *Krishnaswamy, N and Sriraman, T. 1995. Current English for Colleges. Macmillan India Ltd. Madras. pp 128*
2. *Balasubramanyam M. 1985. Business Communication. Vani Educational Books, New Delhi. pp 216*

**Transaction Method:**

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



**Course Title: Agricultural Heritage (\*Remedial course)**

**Course Code: BAG126**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
1	0	0	1

**Total Hours-15**

**Course Outcomes:** After completion of course, the students will be able to:

- 1 Understanding of Agricultural History
- 2 Appreciation of Traditional Farming Methods.
- 3 Awareness of Agricultural Biodiversity.
- 4 Recognition of Indigenous Agricultural Knowledge.

## **Contents**

### **Unit-I**

**4 Hours**

Introduction of Indian agricultural heritage; Ancient agricultural practices, Relevance of heritage to present day agriculture; Past and present status of agriculture and farmers in society;

### **Unit-II**

**4 Hours**

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

### **Unit-III**

**4 Hours**

Crop voyage in India and world; Agriculture scope; Importance of agriculture and agricultural resources available in India; Crop significance and classifications;

### **Unit-IV**

**3 Hours**

National agriculture setup in India; Current scenario of Indian agriculture; Indian agricultural concerns and future prospects.

**Course Title: Introductory Biology**

**Course Code: BAG110**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
1	0	0	1

**Total hours- 15**

### **Course Outcomes**

After completion of course, the students will be able to:

- 1 Understanding to the living world and diversity and characteristics of life
- 2 To know about Cell and cell division
- 3 To know seed and seed germination.
- 4 To know about Role of animals in agriculture

### **Course Contents**

#### **Theory**

#### **Unit-I**

**3 Hours**

Introduction to the living world, diversity and characteristics of life, origin of life,

#### **Unit-II**

**4 Hours**

Evolution and Eugenics. Binomial nomenclature and classification Cell and cell division.

#### **Unit-III**

**4 Hours**

Morphology of flowering plants. Seed and seed germination.

#### **Unit-IV**

**4 Hours**

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

**Course Title: Lab- Introductory Biology**

**Course Code: BAG121**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**Practical**

**30 Hours**

1. Morphology of flowering
2. Plants - root, stem and leaf and their modifications.
3. Inference, flower and fruits. Cell, tissues& cell division.
4. Internal structure of root, stem and leaf.
5. Study of specimens and slides.
6. Description of plants - Brassicacae. Fabaceac and Poaceae.

**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. *Jamesh D. Mauseth.1962. Botany- An introduction to Plant Biology, Publisher Continental Prakashan, Pune. pp 844*
4. *Ashok, M. Bendre& Kumar, Ashok. 1996.A Text book of Practical Botany-2, Publisher- Rastogi Publications Shivaji Road, Meerut – 25002, India. pp 464*

**Transaction Method:**

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

**Course Title: Basic Agriculture - I**  
**Course Code: BAG127**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
1	0	0	1

**Total Hours 15**

### **Course Outcomes**

After completion of course, the students will be able to:

- 1 Understanding of Agricultural Principles
- 2 Practical Skills Development
- 3 Critical Thinking and Problem Solving.
- 4 Awareness of Agricultural Sustainability

### **Course Content**

#### **Unit-I**

**4 Hours**

Introduction to Agriculture: Definition and scope of agriculture. Historical development of agriculture. Importance of agriculture in national economy. Branches of agriculture and their significance. Agricultural Meteorology: Climate and weather parameters influencing agriculture.

#### **Unit -II**

**4 Hours**

Soil Science: physical properties. Soil fertility and nutrient management. Agronomy: Principles of crop production and management practices. Crop rotations, cropping patterns, and intercropping. Basic Horticulture: Principles of fruit and vegetable production. Orchard management practices.

#### **Unit III**

**4 Hours**

Principles of Plant Protection: Plant diseases: Causes, symptoms, and management. Introduction to Agricultural Economics: Basic economic concepts and their application in agriculture. Farm management principles and decision-making.

#### **Unit IV**

**3 Hours**

Extension Education: Objectives and principles of agricultural extension. Role of extension in disseminating agricultural technologies.

**Course Title: Lab- Basic Agriculture - I**  
**Course Code: BAG128**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**Total Hours 30**

**Practicals**

1. Soil sampling techniques and soil profile description.
2. Identification of major field crops and their growth stages.
3. Identification of fruit, vegetable, and ornamental plants.
4. Field identification of common plant diseases, insect pests, and weeds.
5. Analysis of soil samples for pH, EC (Electrical Conductivity), and nutrient content.
6. Visits to agricultural research stations, experimental farms, and extension centers.
7. Interaction with farmers and agricultural experts to learn about local farming systems and innovations.

**Suggested Readings**

1. Principles of Agronomy" by Reddy and Reddy (2010)
2. "Introductory Soil Science" by D.K. Das (2015)
3. "Fundamentals of Horticulture" by Arora (2006)
4. Introduction to Agricultural Economics" by John B. Penson, Jr. and Oral Capps, Jr. (2007)
5. Extension Education and Rural Development" by N.S. Raghuwanshi and D.P. Thakur (2014).

**Transaction Method:**

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

**Course Title: Elementary Mathematics**  
**Course Code: BAG112**

L	T	P	Credits
2	0	0	2

**Total hours- 30**

### Course Outcomes

After completion of course, the students will be able to:

- 1 Demonstrate an understanding of the foundations and history of mathematics.
- 2 Perform computations in higher mathematics, Read and understand middle-level proofs.
- 3 Write and understand basic proofs, Develop and maintain problem-solving skills.
- 4 Use mathematical ideas to model real- world problems

### Course Contents

#### Theory

#### Unit-I

**Hours- 7**

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 and Intercept form of equation of line.

#### Unit II

**Hours- 7**

Normal form of equation of line, General form of equation of line, 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 diameter 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  $x^2+y^2=a$ .

#### Unit-III

**Hours- 8**

Differential Calculus: Definition of function, limit and continuity, Simple problems on limit, Simple problems on continuity, Differentiation of  $x^n$ ,  $e^x$ ,  $\sin x$  &  $\cos x$  from first principle, Derivatives of sum, difference, product and quotient of two functions, Differentiation of functions of functions (Simple problem based on it), Logarithmic differentiation (Simple problem based on it), Differentiation by substitution method and simple problems based on it. Differentiation of Inverse Trigonometric functions. Maxima

and Minima of the functions of the form  $f(x)$  (Simple problems based on it).

#### **Unit-IV**

**Hours- 8**

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 3<sup>rd</sup> order. Properties of determinants up to 3<sup>rd</sup> order and their evaluation.

#### **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.*

#### **Transaction Method:**

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

**Course Title: Basic Agriculture - II**  
**Course Code: BAG129**

L	T	P	Credits
2	0	0	2

**Total Hours 30**

### **Course Outcomes**

After completion of course, the students will be able to:

- 1 Understanding of Agricultural Principles
- 2 Practical Skills Development
- 3 Critical Thinking and Problem Solving.
- 4 Awareness of Agricultural Sustainability

### **Course Content**

#### **Unit-I**

**8 Hours**

Basics of plant breeding: Selection methods. Crop Production Techniques: Crop rotation, crop diversification, and precision farming. Organic farming principles.

#### **Unit II**

**8 Hours**

Soil Management and Fertility: Soil fertility and nutrient management: Soil testing, fertilizer application, and nutrient cycling. Water Management in Agriculture: Irrigation methods and scheduling: Surface irrigation, sprinkler irrigation, and drip irrigation.

#### **Unit III**

**8 Hours**

Crop Protection Strategies: Integrated pest management (IPM): Pest monitoring, biological control, cultural practices, and chemical control. Extension education principles: Communication strategies. Field trips to agricultural research stations, demonstration farms, and progressive farmers' fields.

#### **Unit IV**

**7 Hours**

Livestock Production and Management: Basics of animal husbandry: Breeding, feeding, and housing of livestock. Health management: Disease prevention, vaccination, and veterinary care.

### **Suggested Readings**

1. Principles of Agronomy" by Reddy and Reddy (2010)
2. "Introductory Soil Science" by D.K. Das (2015)
3. "Fundamentals of Horticulture" by Arora (2006)
4. Introduction to Agricultural Economics" by John B. Penson, Jr. and Oral Capps, Jr. (2007)
5. Extension Education and Rural Development" by N.S. Raghuwanshi and D.P. Thakur (2014).

### **Transaction Method:**

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



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

**Course Code: BAG124**

L	T	P	Credits
0	0	4	2

**Total hours- 60**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 Students will understand the principles of life time fitness and will incorporate fitness activities in to a healthy and active life style.
- 2 Students will acquire knowledge and demonstrate skills to safely engage in physical activity.
- 3 Students will understand the basic principles of anatomy, physiology and/ or biomechanics and apply the knowledge to movement activity.
- 4 Create self interest in various sports, Take leadership.

**Practical Contents**

**Hours- 60**

**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 these 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 Basket-ball–demonstration, practice of the skills, correction of skills, involvement in game situation.
5. Teaching of skills of Basketball– demonstration, practice of the skills, involvement in game situation.
6. Teaching of skills of Basketball–involvement of all the skills in game situation with teaching of rule of the game.
7. Teaching of skills of Kabaddi–demonstration, practice of these 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 TableTennis– demonstration, practice of skills, correction and practice and involvement in game situation.
16. Teaching of skills of Table Tennis– involvement of all the skills in game situation with teaching of rule of the game.
17. Teaching–Meaning, Scope and importance of Physical Education.
18. Teaching–Definition, Type of Tournaments.
19. Teaching– Physical Fitness and Health Education.
20. Construction and laying out of the track and field (\*The girls will have Tennikoit and Throw Ball).

### **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, pace forward 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, fire fighting, 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. KantiPrakashanEtawah(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**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
2	0	0	2

**Total hours- 30**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 Various plant metabolic processes, namely photosynthesis, respiration and translocation of metabolites.
- 2 Plant growth and development, hormones and growth regulators, physiology of seed and fruit development in plants
- 3 Plant water relationships, processes of osmosis and plasmolysis
- 4 The physiological role of nutrients in plants.

**Theory**

**Unit-I**

**Hours- 7**

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

**Unit-II**

**Hours- 8**

Mineral nutrition of Plants: Functions and deficiency symptoms of nutrients, nutrient uptake mechanisms; Photosynthesis: Light and Dark reactions, C<sub>3</sub>, C<sub>4</sub> and CAM plants; Photoperiodism and vernalization.

**Unit-III**

**Hours- 7**

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

**Unit-III**

**Hours- 8**

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.

**Course Title: Lab- Fundamentals of Crop Physiology**

**Course Code: BAG211**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**Practical contents:**

**Hours- 30**

1. Study of plant cells, structure and distribution of stomata.
2. Study of imbibitions, osmosis, plasmolysis, measurement of root pressure, rate of transpiration.
3. Separation of photosynthetic pigments through paper chromatography.
4. Rate of transpiration, photosynthesis: production of oxygen and utilization of CO<sub>2</sub>.
5. Moll's half-leaf experiment.
6. To study production of CO<sub>2</sub> during respiration.
7. Study tissue test for mineral nutrients, estimation of relative water content.
8. Measurement of photosynthetic CO<sub>2</sub> assimilation by Infra Red Gas Analyser (IRGA).

**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*

**Transaction Method:**

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

**Course Title: Fundamentals of Plant Biochemistry**

**Course Code: BAG202**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
2	0	0	2

**Total hours- 30**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 Structure and classification of bio-molecules for life origin viz., Carbohydrates, lipids and proteins etc.
- 2 Synthesis and metabolism of Carbohydrates, lipids, proteins etc.
- 3 Role of enzyme, vitamins and hormones in metabolism of Carbohydrates, lipids, proteins etc.
- 4 Structure of nucleic acid and their replication.

**Course Contents**

**Theory**

**Unit-I**

**Hours- 8**

Importance of Biochemistry; Carbohydrates: Importance and classification, Monosaccharides: Structure and properties of Monosaccharides, Mutarotation; Structure of Disaccharides and Polysaccharides, Lipids: Importance and classification; Structures and properties of fatty acids; storage lipids and membrane lipids.

**Unit-II**

**Hours- 8**

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.

**Unit-III**

**Hours- 7**

Concepts and applications of plant biotechnology; Scope, organ culture, embryo culture, cell suspension culture, callus culture, anther culture, pollen culture and ovule culture and their applications,

**Unit-IV**

**Hours- 7**

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.

**Course Title: Lab- Fundamentals of Plant Biochemistry**  
**Course Code: BAG212**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**Practical Contents:**

**Hours-30**

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

**Suggested Readings:**

1. Jain, J.L. 2005. *Fundamentals of Biochemistry*, S. Chand & Company Ltd. New Delhi. pp:1-1248

**Transaction Method:**

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

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

L	T	P	Credits
2	0	0	2

**Total hours- 30**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 To study the various aspects of insect ecology. To study the various abiotic and biotic factors.
- 2 Understand and the effect of abiotic and biotic factors on insect ecology and agro-ecosystem.
- 3 To study various factors for the outbreak/weakness of insect-pest and pest surveillance and pest forecasting.
- 4 To study the classification of insects, the identification of pests and the various aspects of integrated pest management (IPM)

**Course Contents**

**Unit-I**

**Hours- 8**

Theory Classification of phylum Arthropoda up to 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.

**Unit-II**

**Hours- 7**

Structure of male and female genital organs. Metamorphosis and diapause in insects. Types of larvae and pupae. Structure and functions of digestive, circulatory, excretory, respiratory, nervous, secretory (Endocrine) and reproductive systems in insects. Types of reproduction in insects.

**Unit-III**

**Hours- 8**

Major sensory organs like simple and compound eyes and chemoreceptors. Systematics: Taxonomy- importance, history and development and binomial nomenclature. Definitions of Biotype, Sub-species, Species, Genus, Family and Order. Classification of class Insecta up to Orders, basic groups of present day insects with special emphasis to orders and families of Agricultural importance like Orthoptera: Acrididae. Dictyoptera: Mantidae, Odonata; Isoptera: Termitidae; Thysanoptera: Thripidae;

**Unit-IV**

**Hours- 7**

Hemiptera: Pentatomidae, Coreidae, Cimicidae, Pyrrhocoridae. Lygaeidae, Cicadellidae, Delphacidae, Aphididae, Coccidae, Lophophidac, Alcurodidac, Pseudococcidae; Neuroptera: Chrysopidae; Lepidoptera: Pieridae, Papilionidae, Noctuidae, Sphingidae, Pyralidae, Gelechiidae, Arctiidae, Saturnidae, Bombycidae; Coleoptera: Coccinellidae, Chrysomelidae, Cerambycidae, Curculionidac, Bruchidae, Scarabaeidae; Hymenoptera: Tenthredinidae, Apidae.



Trichogrammatidae, Ichneumonidae, Braconidae, Chalcididae; Diptera: Cecidomyiidae, Tachinidae, Agromyziidae, Culicidae, Muscidae, Tephritidae.

**Course Title: Lab- Fundamentals of Entomology-I**

**Course Code: BAG213**

L	T	P	Credits
0	0	2	1

**Practical Contents**

**Hours- 30**

- 1 Methods of collection and preservation of insects including immature stages
- 2 External features of grasshopper/blister beetle
- 3 Types of insect antennae, mouthparts and legs
- 4 Wing venation, types of wings and wing coupling apparatus
- 5 Types of insect larvae and pupae
- 6 Dissection of digestive system in insects (Grasshopper); dissection of male and female reproductive systems in insects (grass-hopper)
- 7 Study of characters of orders Orthoptera, Dictyoptera, Odonata, Isoptera, Thysanoptera, Hemiptera, Lepidoptera
- 8 Study of characters of Neuroptera, Coleoptera, Hymenoptera, Diptera and their families of agricultural importance.

**Suggested Readings:**

1. Chapman, R. F. 2012. *The Insects: Structure and Functions* 5<sup>th</sup> 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.

**Transaction Method:**

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

**Course Title: Fundamentals of Agricultural Economics**  
**Course Code: BAG204**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
2	0	0	2

**Total hours- 30**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 Determine and outline those conditions which give optimum use of resources in the production of crops and livestock.
- 2 Determine the extent to which the existing use of resources deviate from what is considered the optimal use level.
- 3 Analyse the forces which condition production patterns and resource use in relation to the existing opportunities
- 4 Explain the means and methods adaptable in moving from the existing levels to the optimum use of farm resources.

**Course Contents**

**Unit I**

**Hours- 7**

Economics Meaning, scope and subject matter, definitions, activities, approaches to economic analysis; micro and macro economics, positive and normative analysis. Nature of economic theory: rationality assumption, concept of equilibrium, economic laws as generalization of human behavior. Basic concepts: Goods and services, desire, want. demand, utility, cost and price, wealth, capital, income and welfare.

**Unit II**

**Hours- 7**

Agricultural economics: meaning, definition, characteristics of agriculture, importance and its role in economic development. Agricultural planning and development in the country. Demand meaning, law of demand, demand schedule and demand curve, determinants, utility theory: law of diminishing marginal utility, equimarginal utility principle. Consumer's equilibrium and derivation of demand curve, concept of consumer surplus.

**Unit III**

**Hours- 8**

Elasticity of demand: concept and measurement of price elasticity, income elasticity and cross elasticity. Production: process, creation of utility, factors of production. input output relationship. Supply: Stock Ws supply, law of supply, supply schedule, supply curve, determinants of supply, elasticity of supply. Concepts of rent, wage, interest and profit, National income' Meaning and importance, circular flow, concepts of national income accounting and approaches to measurement, difficulties in measurement.

**Unit IV**

**Hours- 8**

Population: Importance. Malthusian and Optimum population theories, natural and socioeconomic determinants, current policies and programmes on population control. Money: Barter system of exchange and its problems, evolution. meaning and functions of money, classification of money, money supply, general price index, inflation and deflation, public revenue and public expenditure. Tax: meaning. direct and indirect taxes, agricultural taxation, VAT. Economic systems: Concepts of economy and its functions, important features of capitalistic, socialistic and mixed economies, elements of economic planning.

**Suggested Readings:**

1. *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.*
2. *Jhingan, M.L.1990. Advanced Economic Theory. Vikas Publishing House, New Delhi. Pp.1842.*

**Transaction Method:**

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

**Course Title: Principles of Organic Farming**

**Course Code: BAG205**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
1	0	0	1

**Total hours- 15**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 To teach the principles and practices of organic farming for sustainable crop production.
- 2 To develop an alternative strategy over chemical farming which would be guideline for the working of biological process in natural ecosystem.
- 3 To make responsible use of energy and natural resources such as organic matter in soil for the increase of soil fertility.
- 4 To provide basic and applied knowledge of weed science to students.

**Course contents**

**Theory**

**UNIT I**

**Hours- 4**

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

**UNIT II**

**Hours- 4**

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;

**UNIT III**

**Hours- 4**

Fundamentals of insect, pest, disease andweed management under organic mode of production; Operational structure of NPOP;

**UNIT IV**

**Hours- 3**

Certification process and standards o f organic farming; Processing,leveling,economic consideration sand viability,marketing and export potential of organic products.

**Course Title: Lab- Principles of Organic Farming**

**Course Code: BAG214**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**Practical**

**Hours- 30**

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

**Suggested Readings:**

1. Palaniappan SP &Anandurai K. 1999. *Organic Farming – Theory and Practice*. Scientific Publ.
2. Veeresh GK, Shivashankar K &Suiglachar MA. 1997. *Organic Farming and Sustainable Agriculture*. Association for Promotion of Organic Farming, Bangalore.
3. Woolmer PL & Swift MJ. 1994. *The Biological Management of Tropical Soil Fertility*. TSBF & Wiley.

**Transaction Method:**

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

**Course Title: Fundamentals of Plant Pathology**  
**Course Code: BAG206**

L	T	P	Credits
3	0	0	3

**Total hours- 45**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 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.
- 2 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.
- 3 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.
- 4 Provide a framework that students can use in their profession to best approach plant disease management.

**Theory Contents**

**Unit 1**

**Hours- 11**

**Introduction:** Importance of plant diseases, scope and objective of Plant Pathology. History of Plant Pathology with special reference to Indian work. Terms and concept in Plant Pathology. Pathogenesis. disease triangle and tetrahedron and classification of plant diseases.

**Unit 2**

**Hours- 11**

**Important Plant pathogenic organism** fungi. bacteria. fastidious vesicular bacteria. Phytoplasmas, Spiroplasmas, viruses. viroids, algae. protozoa, phanerogamic parasite and nematodes with example of diseases caused by them. Diseases due to abiotic causes.

**Unit 3**

**Hours- 12**

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

**Unit 4**

**Hours- 11**

**Bacteria and mollicutes:** general morphological characters, basic methods reproduction.  
**Viruses:** nature of properties, structure and transmission. Study of phanerogamic plant parasites. **Epidemiology:** Factors affecting disease development.

**Course Title: Lab- Fundamentals of Plant Pathology**  
**Course Code: BAG215**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

### **Practical Content**

**Hours- 30**

1. Acquaintance with various laboratory equipments and microscopy.
2. Collection and preservation of disease specimen.
3. Preparation of media, isolation and Koch's postulates.
4. General study of different structure of fungi, study of symptoms of various plant diseases.
5. Study of representative fungal genera.
6. Staining and identification of plant pathogenic bacteria.
7. Study of phanerogamic plant parasites.
8. Identification of plant parasitic nematodes.

### **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.

### **Transaction Method:**

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



**Course Title: Production Technology for Vegetables and Spices**

**Course Code: BAG207**

L	T	P	Credits
1	0	0	1

**Total hours- 15**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 Explain the several practices involved in cultivation and management of different vegetable and spice crops.
- 2 Classify different vegetable and spice crops according to their agro-climatic requirement, physiological and morphological features.
- 3 Practice techniques involved in management of different vegetable and spice crops.
- 4 Identify different seeds of vegetable and spice crops with their plant types in their natural existence.

**Course Contents**

**Theory**

**UNIT-I**

**Hours- 4**

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,

**UNIT-II**

**Hours- 3**

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 - Capsicum, Cucumber, Melons, Gourds, Pumpkin.

**UNIT-III**

**Hours- 4**

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 -, French bean, Peas; Cole crops such as Cabbage, Cauliflower, Knol-khol; Bulb crops such as Onion, Garlic.

**UNIT-IV**

**Hours- 4**

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 - Root crops such as Carrot, Raddish, Beetroot; Tuber crops such as Potato; Leafy vegetables such as Amaranth, Palak. Perennial vegetables.

**Course Title: Lab- Production Technology for Vegetables and Spices**

**Course Code: BAG216**

L	T	P	Credits
0	0	2	1

**Practical Contents:**

**Hours- 30**

1. Identification of vegetables.
2. Identification of spice crops.
3. Identification of seeds of vegetables & spice crops.
4. Nursery raising of vegetables.
5. Direct seed sowing and transplanting.
6. Study of morphological characters of different vegetables.
7. Study of morphological characters of different spices.
8. Fertilizers applications.
9. Harvesting & preparation for market.
10. Economics of vegetables and spices cultivation.

**Suggested Readings:**

1. Dhaliwal, M. S. 2017. *Handbook of Vegetable Crops*. Kalyani Publishers, India. Pp 358
2. Hazra, P. 2019. *Vegetable Science and Technology*. New India Publishing Agency, India. pp. 630.
3. Swarup, V. 2006. *Vegetable Science and Technology in India*. Kalyani Publishers, India. pp. 656.
4. Pranab Hazra, A. Chattopadhyay, K. Karmakar and S. Dutta. 2010. *Modern Technology in Vegetable Production*. New India Publishing Agency, New Delhi.
5. Neeraj Pratap Singh, .2007. *Basic Concepts of Vegetable Science*. International Book Distributing Co. New Delhi. Academic Press, New Delhi.
6. Nempal Singh, Singh, D.K., Singh, Y.K. and Virendra Kumar. 2006. *Vegetable Seed Production Technology*. International Book Distributing Co. Lucknow.
7. Hazra, P. 2019. *Vegetable Science and Technology*. New India Publishing Agency, India. pp. 630.
8. Swarup, V. 2006. *Vegetable Science and Technology in India*. Kalyani Publishers, India. pp. 656

**Transaction Method:**

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

**Course Title: Fundamentals of Agricultural Extension Education**

**Course Code: BAG208**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
2	0	0	2

**Total hours- 30**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 Understand the process and functions of a good manager.
- 2 Differentiate between approaches to management strategies or extension organisations
- 3 Able to know how to motivate employees with in your organisation,the groups dynamics to improve performance standards
- 4 Get knowledge abput the concept and relevance of leadership, motivation, and group dynamics in management

**Course Contents**

**Unit I**

**Hours- 8**

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

**Unit II**

**Hours- 8**

Extension systems in India: extension efforts in. pre-independence era (Sriniketan, Martbandam, Firka Development Scheme, Gurgaon Experiment, etc.) and post-independence era (Etawah Pilot Project, Nilokheri Experiment, etc.); various extension/ agriculture development programmes launched by ICAR/ Govt. of India (IADP, IAAP, HYVP, KVK, IVLP, ORP, ND,NATP, NAIP, etc.).

**Unit III**

**Hours- 7**

New trends in agriculture extension: privatization extension, cyber extension/ eextension, 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.

**Unit IV**

**Hours- 7**

Extension administration: meaning and concept, principles and functions. Monitoring and evaluation: concept and definition, transfer of technology: concept and models, capacity building of extension personnel; extension teaching methods: meaning, classification, individual, group and mass contact methods, ICT Applications in TOT.

**Course Title: Lab- Fundamentals of Agricultural Extension Education**

**Course Code: BAG217**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**Practical Contents**

**Hours- 30**

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

**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

**Transaction Method:**

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

**Course Title: Dairy Processing and Safety Issues**

**Course Code: BAG209**

L	T	P	Credits
2	0	0	2

**Total hours- 30**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 To know about breeding and inheritance of characters for his/her milk production, the knowledge regarding milk perception mechanism, composition and factors affecting milk yield.
- 2 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.
- 3 To have the knowledge about nutrition, feeding and management of milch animals,
- 4 Get knowledge about housing principles and space requirement for different animals.

**Course Contents**

**Theory**

**Unit 1**

**Hours- 7**

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

**Unit 2**

**Hours- 7**

**FOOD PROCESSING** : Pasteurization, Sterilization, Bactofugation, Uperization, Stassanization. U.H.T. pasteurization and Homogenization of milk, Neutralization of milk, Cream, Cooling and chilling of milk.

**Unit 3**

**Hours- 8**

**Manufacturing of common dairy product** viz. Cream, Butter, Ghee, Dahi, Yoghurt, Shrikhand & Ice-cream. Manufacturing of Khoa, Evaporated milk, condensed milk, WMP, SMP, Paneer, Cheese, Chhena, Cheddar cheese and. Mozzarella cheese (Pizza cheese).

**Unit 4**

**Hours- 8**

**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.

**Course Title: Lab- Dairy Processing and Safety Issues**

L	T	P	Credits
0	0	2	1

**Course Code: BAG218**

**Practical Content**

**Hours- 30**

- 1 Demostration of Cream separation.
- 2 Preparation of indigenous dairy products viz. Dahi. Chhena. Khoa, Paneer, Cream,
- 3 Ghee, shrikhand.
- 4 Water quality analysis.
- 5 Problem on neutralization of milk and cream.
- 6 Preparation of plants for implementation of HACCP and ISO series,
- 7 Problems on over run.
- 8 Calculation of Ice cream mix.

**Suggested readings:**

1. *Banergee, G.C. 2019. A Test Book of Animal Husbandry.*
2. *Kumar, S., Mishra, B.K. and Kumar, M. 2014. Advances in Livestock Production and Management.*
3. *Singh, R.A. 2009. Poultry Production and management.*

**Transaction Method:**

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

**Course Title: Human Value & Ethics**

**Course Code: BAG210**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
1	0	0	1

**Total hours- 15**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 Understand the role of deliberation and debate in framing such values
- 2 Understand the ideas of values, ethics, and morality in a multicultural context
- 3 Understand and discuss the idea of moral relativism and the challenges it poses to universal values
- 4 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**

**Theory**

**Unit I**

**Hours- 4**

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

**Unit II**

**Hours- 3**

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

**Unit III**

**Hours- 4**

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

**Unit IV**

**Hours- 4**

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

**Suggested readings:**

- 1 *R. R. Gaur, R. Sangal and G. P. Bagaria (). A foundation course in human values and professional ethics, pg. - 279.*

**Transaction Method:**

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

**Course Title: Crop Production Technology – I (Kharif Crops)****Course Code: BAG301**

L	T	P	Credits
1	0	0	1

**Total hours- 15****Course Outcomes:** After completion of course, the students will be able to:

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

**Course Contents****Theory****UNIT I****Hours- 4**

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.

**UNIT II****Hours- 3**

Origin geographical distribution, economic importance. Soil and climatic requirements. varieties, cultural practices and yield of Kharif crops pulses-pigeonpea, mungbean and urdbean;

**UNIT III****Hours- 4**

Origin geographical distribution, economic importance. Soil and climatic requirements. varieties, cultural practices and yield of Kharif crops oilseeds- til, groundnut and soybean.

**UNIT IV****Hours- 4**

Origin geographical distribution, economic importance. Soil and climatic requirements. varieties, cultural practices and yield of Kharif crops fibre crops-cotton & jute; forage crops-sorghum, cowpea, cluster bean and Napier.



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

**Course Code: BAG312**

L	T	P	Credits
0	0	2	1

### **Practical**

**Hours- 30**

- 1 Rice nursery preparation.
- 2 transplanting of rice.
- 3 sowing of soybean, pigeon pea and mung bean,maize,groundnut and cotton.
- 4 Effect of seed size on germination.
- 5 Effect of sowing depth on germination of *kharif* crops
- 6 ,identification of weeds in *kharif* season crops.
- 7 Top dressing and foliar feeding of nutrients.
- 8 study of yield contributing characters.
- 9 yield calculation of kharif season crops.
- 10 study of crop varieties and important agronomic experiment at experimental farm.
- 11 Visit to research centres related to crops.

### **Suggested readings:**

- 1 Das NR. 2007. *Introduction to Crops of India*. Scientific Publ.
- 2 Khare D & Bhale MS. 2000. *Seed Technology*. Scientific Publ.
- 3 Kumar Ranjeet & Singh NP. 2003. *Maize Production in India: Golden Grain in Transition*. IARI, New Delhi.

### **Transaction Method:**

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

**Course Title: Fundamentals of Plant Plant Breeding**  
**Course Code: BAG302**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
2	0	0	2

**Total hours- 30**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 Understand about Biotechnological tools DNA markers and marker assisted selection.
- 2 Able to understand about the Esmasculation, selfing, pollination, and hybrid seed production.
- 3 Get knowledge of Breeding procedures under different methods of of reproduction systems.
- 4 Acquire knowledge about hybridization and pre-breeding

**Course contents**

**Theory**

**Unit-1**

**Hours- 8**

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.

**Unit-2**

**Hours- 7**

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 and modes of selection.

**Unit-3**

**Hours- 8**

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.

**Unit-4**

**Hours- 7**

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.

**Course Title: Lab- Fundamentals of Plant Plant Breeding**

**Course Code: BAG314**

L	T	P	Credits
0	0	2	1

**Practical**

**Hours- 30**

1. Plant Breeder's kit,
2. Study of germplasm of various crops.
3. Study of floral structure of self-pollinated and cross-pollinated crops.
4. To work out the mode of pollination in a given crop and extent of natural out-crossing.
5. Prediction of performance of double cross hybrids. Emasculation and hybridization techniques in self & cross-pollinated crops.
6. Consequences of inbreeding on genetic structure of resulting populations.
7. Study of male sterility system.
8. Handling of segregation populations.
9. Methods of calculating mean, range, variance, standard deviation, heritability.
10. Designs and their analysis in plant breeding experiments.

**Suggested readings;**

- 1 Singh B.D. 2018. *Plant Breeding Principles and methods*. Kalyani Publishers, New Delhi. Pp 918.
- 2 Singh, P. 2017. *Fundamental of Plant Breeding*. Kalyani Publishers, New Delhi. Pp 327

**Transaction Method:**

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

**Course Title: Agricultural Microbiology**  
**Course Code: BAG303**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
1	0	0	1

**Total hours- 15**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 The uses of basic apparatus and equipment used in microbiology laboratory.
- 2 Carryout basics aseptic procedures used in the handling and study of microorganisms
- 3 Isolate, extract and culture microorganisms
- 4 General characteristics of different groups of microorganisms

**Course contents**

**Theory**

**Unit-I**

**Hours- 4**

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

**Unit-II**

**Hours- 4**

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.

**Unit-III**

**Hours- 3**

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.

**Unit-IV**

**Hours- 4**

Microbial degradation of organic matter in soil. Cellulose decomposing microbes for compost preparation & vermin compost. Soil organisms: macro and microorganisms, their beneficial and harmful effects.

**Course Title: Lab- Agricultural Microbiology**  
**Course Code: BAG315**

L	T	P	Credits
0	0	2	1

**Practical contents:**

**Hours- 30**

1. To study microbiology laboratory and its equipments.
2. To study principles of microscopy.
3. To study methods of sterilization.
4. To study nutritional media and their preparations.
5. To study enumeration of microbial population in soil-bacteria, fungi, actinomycetes.
6. To study methods of isolation and purification of microbial cultures.
7. To study isolation of Rhizobium from legume root nodule.
8. To study isolation of Azotobacter from soil.
9. To study isolation of Azospirillum from roots.
10. To study isolation of BGA.
11. To study staining and microscopic examination of microbes.

**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

**Transaction Method:**

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

**Course Title: Agricultural Finance and Cooperation**  
**Course Code: BAG304**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
2	0	0	2

**Total hours- 30**

**CourseOutcomes** After completion of course, the students will be able to:

- 1 To impart knowledge on agricultural finance, its nature and scope, understand time value of money and its types in present view.
- 2 To impart knowledge on history of agriculture finance in India, know various rules, regulations, functions of various banks.
- 3 To study about commercial and co-operative banks in detail.
- 4 To acquaint the knowledge of higher financing agencies RBI, NABAetc.

### **Course contents**

#### **Theory**

#### **UNIT-I**

**Hours- 8**

Theory Agricultural Finance- meaning, scope and significance, credit needs and its role in Indian agriculture. Agricultural credit: meaning, definition, need, classification. Credit analysis; 4 R's, and 3C's of credits. Sources of agricultural finance: institutional and noninstitutional sources, commercial banks, social control and nationalization of commercial banks.

#### **UNIT-II**

**Hours- 8**

Micro financing including KCC. Lead bank scheme, RRBs, Scale of finance and unit [34] cost. An introduction to higher financing institutions - RBI. NABARD. ADB, IMF, world bank. Insurance and Credit Guarantee Corporation of India.

#### **UNIT-III**

**Hours- 7**

Cost of credit. Recent development in agricultural credit. Preparation and analysis of financial statements - Balance Sheet and Income Statement. Basic guidelines for preparation of project reports- Bank norms - SWOT analysis.

#### **UNIT-IV**

**Hours- 8**

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

**Course Title: Lab- Agricultural Finance and Cooperation**  
**Course Code: BAG316**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**Practical content**

**Hours- 30**

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

**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

**Transaction Method:**

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

**Course Title: Farm Machinery and Power**

**Course Code: BAG305**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
2	0	0	2

**Total hours- 30**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 about different sources of farm power and their importance
- 2 about construction and functioning of compression ignition and spark ignition engines
- 3 cooling systems and lubrication systems
- 4 about various tillage's and implements

**Theory**

**Unit-I**

**Hours- 8**

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 an engine.

**Unit-II**

**Hours- 7**

Familiarization with Power transmission system: clutch, gear box, differential and final drive of a tractor, Tractor types, Cost analysis of tractor power and attached implement.

**Unit-III**

**Hours- 8**

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.

**Unit-IV**

**Hours- 7**

Familiarization with Plant Protection equipment. Familiarization with harvesting and threshing equipment.



**Course Title: Lab- Farm Machinery and Power**

**Course Code: BAG317**

L	T	P	Credits
0	0	2	1

**Practical contents:**

**Hours- 30**

1. Study of different components of I.C. engine.
2. To study air cleaning and cooling system of engine.
3. To study clutch, transmission, differential and final drive of a tractor.
4. To study brake, steering, hydraulic control system of tractor.
5. Learning of tractor driving.
6. To study power tillers.
7. To know Implements for hill agriculture.
8. To study mould board plough.
9. To study disc plough and disc harrow.
10. To study seed-cum-fertilizer drills their seed metering mechanism and calibration.
11. To Study different types of sprayers and dusters.
12. Familiarization with different inter-cultivation equipments.
13. To study harvesting and threshing machinery.

**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.*

**Transaction Method:**

Assignment, Power Point presentation, Audio lecture, Video lecture and Experimentation.

**Course Title: Principles of Integrated Disease Management**  
**Course Code: BAG306**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
2	0	0	2

**Total hours- 30**

**Course Outcomes:**

After completion of course, the students will be able to:

- 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

**Course contents**

**Theory**

**Unit-I**

**Hours- 8**

Categories of diseases, IDM: Introduction, history, importance, concepts, principles and tools of IDM. Economic importance of diseases

**Unit-II**

**Hours- 7**

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

**Unit-III**

**Hours- 8**

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

**Unit-IV**

**Hours- 7**

Survey surveillance and forecasting of diseases. Safety issues in fungicide uses. Political, social and legal implication of IDM.

**Course Title: Lab- Principles of Integrated Disease Management**

**Course Code: BAG318**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**Practical Contents**

**Hours- 30**

1. Methods of diagnosis and detection of plant diseases
2. Methods of plant disease measurement
3. Assessment of crop yield losses, calculations based on economics of IDM
4. Identification of biocontrol agents, different predators and natural enemies.
5. Identification and nature of damage of important diseases
6. Management of important diseases.
7. Plan & assess preventive strategies (IDM module) and decision making
8. Crop monitoring attacked by diseases
9. Farmers fields visit.

**Suggested Readings**

1. Tarr SAJ. 1964. *The Principles of Plant Pathology*. McMillan, London. pp 340
2. Vander Plank, JE. 1975. *Principles of Plant Infection*. Acad. Press. pp 280
3. Verma JP, Varma A & Kumar D. (Eds). 1995. *Detection of Plant Pathogens and their Management*. Angkor Publ., New Delhi. pp270

**Transaction Method:**

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

**Course Title: Environmental Studies & Disaster Management**

**Course Code: BAG324**

L	T	P	Credits
1	0	0	1

**Total hours- 15**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 Study the natural resources, ecosystem environmental pollution: cause and effects various environments.
- 2 Study about protection act.
- 3 Get knowledge about historical context of environmental issues and the links between human and natural systems.
- 4 Know about biodiversity, its conservation and bio-geographical classification

**Course Contents**

**Theory**

**Unit I**

**Hours- 4**

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,

**Unit II**

**Hours- 3**

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.

**Unit III**

**Hours- 4**

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.

**Unit IV**

**Hours- 4**

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.

**Course Title: Lab- Environmental Studies & Disaster Management**

**Course Code: BAG325**

L	T	P	Credits
0	0	2	1

**Total hours- 30**

**Practical Content**

1. Visit to a local area to document environmental assets river/forest/grassland/hill/mountain,
2. Visit to a local polluted site-Urban/ Rural/ Industrial/Agricultural,
3. study of common plants, insects, birds and study of simple ecosystems-pond, river, hill slopes, etc.
4. Expected impact of climate change on agricultural production and water resources.
5. Mitigation Strategies, Economics of climate change.
6. Disaster Management introduction, Natural and Manmade Disaster Studies.
7. Informatics for Disaster Management, Quantitative Techniques for Disaster Management
8. Environmental Impact Assessment (EIA) and Disaster Management
9. Disaster Management Policy Environmental Modelling.

**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*

**Transaction Method:**

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

**Course Title: Statistical Methods**  
**Course Code: BAG308**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
1	0	0	1

**Total hours- 15**

### **Course Outcomes**

After completion of course, the students will be able to:

- 1 To enable them to analyse the data data for making agro-productin based plannings
- 2 It is also helpful for the refinement of production and proection technologies for new agro-chemicals used in agriculture.
- 3 It is also helpful for students for making data banking for future use.
- 4 It is helpful in land utilization and irrigation

### **Course Contents**

#### **Theory**

##### **Unit-I**

**Hours- 3**

Introduction to Statistics and its Applications in Agriculture, Graphical Representation of Data, Measures of Central Tendency & Dispersion. Definition of Probability.

##### **Unit-II**

**Hours- 4**

Addition and MultiplicationTheorem (without proof). Simple Problems Based on Probability. Binomial & Poisson Distributions, Definition of Correlation. Scatter Diagram, Karl Pearson's Coefficient of Correlation,Linear Regression Equations.

##### **Unit-III**

**Hours- 4**

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

##### **Unit-IV**

**Hours- 4**

Introduction to Sampling Methods. Sampling versus Complete Enumeration, Simple Random Sampling with and without replacement.Use of Random Number Tables forselection of Simple RandomSample.

**Course Title: Lab- Statistical Methods**  
**Course Code: BAG320**

L	T	P	Credits
0	0	2	1

**Practical contents:**

**Hours- 30**

1. Graphical representation of data.
2. Measures of central tendency (Ungrouped data) with Calculation of Quartiles, Deciles & Percentiles.
3. Measures of Central Tendency (Grouped data) with Calculation of Quartiles, Deciles & Percentiles.
4. Measures of Dispersion (Ungrouped Data).
5. Measures of Dispersion (Grouped Data).
6. Moments, Measures of Skewness & Kurtosis (Ungrouped Data).
7. Moments, Measures of Skewness & Kurtosis (Grouped Data).
8. Correlation & Regression Analysis.
9. Application of One Sample t-test.
10. Application of Two Sample Fisher's t- test.
11. Chi-Square test of Goodness of Fit.
12. Chi-Square test of Independence of Attributes for 2x2 contingency table.
13. Analysis of Variance One Way Classification.
14. Analysis of Variance Two Way Classification. Selection of random sampling  
Simple Random Sampling.

**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. Snedecor, G. W. and Cochran, W. G. 1967: *Statistical Methods 8<sup>th</sup> edition*. Iowa State University Press. pp. 524.
3. Cochran, G.W. and Cox, G.W. 1986: *Experimental Designs 2<sup>nd</sup> edition*. John Wiley & Sons, New York. pp.617.

**Transaction Method:**

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



**Course Title: Fundamentals of Soil and Water Conservation**

**Course Code: BAG309**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
1	0	0	1

**Total hours- 15**

**Course Outcomes:** After completion of course, the students will be able to:

- 1 Get knowledge about practices of soil and water conservation.
- 2 Know about the erosion control principles
- 3 Able to understand soil loss measurement techniques
- 4 Acquire knowledge about the grassed water ways and their design.

### **Course Contents**

#### **Theory**

##### **Unit-I**

**Hours- 3**

Introduction to Soil and Water Conservation. Causes of soil erosion. Definition and agents of soil erosion.

##### **Unit-II**

**Hours- 4**

Water erosion: Forms of water erosion. Gully classification and control measures. Soil loss estimation by universal Loss Soil Equation. Soil loss measurement techniques.

##### **Unit-III**

**Hours- 4**

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.

##### **Unit-IV**

**Hours- 4**

Wind erosion: mechanics of wind erosion, types of soil movement. Principles of wind erosion control and its control measures.

**Course Title: Lab- Fundamentals of Soil and Water Conservation**

**Course Code: BAG321**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**Practical contents:**

**Hours- 30**

1. To study general status of soil conservation in India.
2. Calculation of erosion index.
3. Estimation of soil loss and measurement of soil loss.
4. Preparation of contour maps.
5. To design of contour bunds.
6. To design of grassed water ways.
7. To design of graded bunds.
8. To design of bench terracing system.

**Suggested Readings:**

1. Singh, P.K. 2000. *Watershed Management*. E Media Publications
2. Suresh, R. *Soil and Water Engineering*, Standard Publication House.

**Transaction Method:**

Assignment, Power Point presentation, Audio lecture, Video lecture and Experimentation.

**Course Title: Dairy Science**  
**Course Code: BAG310**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
1	0	0	1

**Total hours- 15**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 To know about breeding and inheritance of characters for milk production, the knowledge regarding milk perception mechanism, composition and factors affecting milk yield.
- 2 To be knowledgeable about Legal standards of milk. Factors affecting the quality and quantity of milk.
- 3 To have the knowledge about nutrition, Milk and its secretion, Transportation and milk distribution, pricing policy of milk.
- 4 To understand the basic principles of refrigeration and cold storage of milk and milk products.

**Course Contents**

**Theory**

**UNIT-I**

**Hours- 4**

Concept of Dairying, Dairying in India, Dairy development in different five year plans. Dairy production statistics. Cleaning and sanitization of dairy equipment.

**UNIT-II**

**Hours- 3**

Dairy cooperatives, Functioning of dairy cooperatives societies, Functioning of Anand Pattern, White revolution, Objectives and achievements of operation flood.

**UNIT-III**

**Hours- 4**

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,

**UNIT-IV**

**Hours- 4**

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.

**Course Title: Lab- Dairy Science**  
**Course Code: BAG322**

L	T	P	Credits
0	0	2	1

**Practical Content**

**Hours- 30**

1. Sampling of milk,
2. C.O.B. Test,
3. M.B.R. Test,
4. Sediment test,
5. Problems on Standardization,
6. Detection of adulterants viz. water, starch, sucrose, urea, detergent and refined oil,
7. Problems on adulteration,
8. Hansa Test,
9. Detection of preservatives,
10. Alcohol test,
11. Acidity of milk.

**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. *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.*

**Transaction Method:**

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

**Course Title: Fundamentals of Entomology II**

**Course Code: BAG311**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
1	0	0	1

**Total hours- 15**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 To study the various aspects of insect ecology and study the various abiotic and biotic factor
- 2 Understand the effect of abiotic and biotic factors on insect ecology and study the agro-ecosystem
- 3 To study various factor for the outbreak of insect-pest, to study pest surveillance and pest forecasting.
- 4 To study the classification of insects and study the identification of pests, to study the various aspects of integrated pest management (IPM)

**Course contents**

**Theory**

**UNIT-I**

**Hours- 4**

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

**UNIT-II**

**Hours- 3**

Effect of biotic factors –food competition, natural and environmental resistance.IPM: Categories of pests. Concept of IPM, Practices, scope and limitations of IPM.

**UNIT-III**

**Hours- 4**

Classification of insecticides, toxicity of insecticides and formulations of insecticides. Chemical control- importance, hazards and limitations. Recent methods of pest control, repellents, antifeedants, hormones, attractants, gamma radiation. Insecticides Act 1968-Important provisions.

**UNIT-IV**

**Hours- 4**

Application techniques of spray fluids. Symptoms of poisoning, first aid and antidotes. Survey, surveillance and forecasting of insect pests. Safety issues of pesticides uses

**Course Title: Lab- Fundamentals of Entomology II**

**Course Code: BAG323**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**Practical Contents**

**Hours- 30**

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

**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 *SarasPublication*.pp.352
3. Prasad, T.V .2019. *Handbook of Entomology*.New Vishal Publications.pp.496.

**Transaction Method:**

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

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

**Course Code: BAG326**

L	T	P	Credits
0	0	4	2

**Total Hours- 60**

**Practical**

1. Crop planning, raising field crops in multiple cropping systems:
2. Field preparation, seed treatment,
3. Nursery raising, sowing,
4. Nutrient, water and weed management and
5. Management of insect-pests diseases of crops,
6. Harvesting, threshing, drying winnowing, storage and marketing of produce.
7. and integrated nutrient, insect-pest and disease management technologies.
8. Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of 8-10 students.

**Suggested readings:**

- 4 Das NR. 2007. *Introduction to Crops of India*. Scientific Publ.
- 5 Khare D & Bhale MS. 2000. *Seed Technology*. Scientific Publ.
- 6 Kumar Ranjeet & Singh NP. 2003. *Maize Production in India: Golden Grain in Transition*. IARI, New Delhi.

**Transaction Method:**

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

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

**Course Code: BAG401**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
1	0	0	1

**Total hours- 15**

**Course Outcomes:**

After completion of course, the students will be able to:

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

**Course contents**

**Theory**

**UNIT I**

**Hours- 4**

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

**UNIT II**

**Hours- 3**

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of pulses, chickpea, lentil, peas.

**UNIT III**

**Hours- 4**

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of oilseeds-rapeseed, mustard, linseed and sunflower

**UNIT IV**

**Hours- 4**

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of sugar crops sugarcane other crop-Potato. Forage crops-berseem, lucerne and oat.



Course Title: Lab- Crop Production Technology -II  
 (Rabi Crops)  
 Course Title: Principles of Seed Technology  
 Course Code: BAG402

L	T	P	Credits
0	0	20	1 2

P

**Practical contents**

**Hours- 30**

- 1 Sowing methods of wheat
- 2 Sowing methods of sugarcane
- 3 Identification of weeds in rabi season crops.
- 4 Numerical problems on seed requirement of rabi crop.
- 5 Study of yield contributing characters of rabi season crops.
- 6 Study of important agronomic experiments of rabi crops at experimental farms.
- 7 Study of rabi forage experiments, visit to research stations of related crops.

**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

**Transaction Method:**

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

**Total hours- 30**

**Course Outcomes:**

**Course Title: Lab- Principles of Seed Technology**

**Course Code: BAG412**

L	T	P	Credits
0	0	2	1

After

- 1 Technologies for seed production of pure-line, synthetics, composites and hybrid varieties.
  - 2 Parameters of quality control to maintain genetic purity of breeder, foundation and certified seeds
  - 3 Grow-out tests for various field crops desired quality of seeds.
  - 4 Get knowledge about genetic purity during seed production, Seed quality
- completion of course, the students will be able to:

**Theory**

**Unit-I**

**Hours- 7**

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 and different classes of seed.

**Unit-II**

**Hours- 7**

Foundation and certified seed production of important cereals, pulses, oilseeds, fodder and vegetables.

**Unit-III**

**Hours- 9**

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.

**Unit-IV**

**Hours- 7**

Seed storage; general principles, stages and factors affecting seed longevity during storage, Measures for pest and disease control during storage, Seed marketing, Private and public sectors and their production and marketing strategies.

**Practical**

## Hours- 30

1. Seed production in major cereals: Wheat, Rice, Maize, Sorghum and Bajra.
2. Seed production in major pulses: Urd, Mung, Pigeonpea, Lentil, Gram, field bean, pea.
3. Seed production in major oilseeds: Rapeseed and Mustard.
4. Seed production in important vegetable crops.
5. Seed sampling and testing: Physical purity, germination, viability. etc.
6. Seed and seedling vigour test.
7. Genetic purity test and Grow out test.
8. Seed certification: Procedure.
9. Field inspection, Preparation of field inspection report.
10. Visit to seed production farms, seed testing laboratories and seed processing plant.

### **Suggested Readings**

1. Aggarawal, R.L. 2018. *Seed technology (2<sup>nd</sup> edition)*, Oxford & IBH publishing, Tamilnadu pp: 848.
2. Jain, B. 2021. *Treasure of seed science and technology*, Jain publishers, Ludhiana ,pp: 160.

### **Transaction Method:**

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

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

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
2	0	0	2

**Total hours- 30**

**Course outcome:**

After completion of course, the students will be able to:

- 1 To understand the concept of problem soils
- 2 To understand the diagnosis and reclamation of salt affected soils, acquire knowledge about the problems of salt affected soil
- 3 To understand the problems, diagnosis, and reclamation of acidic soils, understand the criteria for quality of irrigation water.
- 4 To acquire knowledge about the rational use of poor quality irrigation water.

**Course contents**

**Theory**

**Unit-I**

**Hours- 6**

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

**Unit-II**

**Hours- 7**

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

**Unit-III**

**Hours- 8**

Flooded soils, & Polluted soils. Irrigation water-quality and standards, utilization of saline water in agriculture.

**Unit-IV**

**Hours- 9**

Remote sensing and GIS in diagnosis and management of problem soils. Multipurpose tree species, bio remediation through MPT soils. Land capability and classification, Land suitability classification. Problematic soils under different Agro-ecosystems.

**Course Title: Lab- Problematic Soils and their Management**

**Course Code: BAG413**

L	T	P	Credits
0	0	2	1

**Practical contents**

**Hours- 30**

1. Determination of pH & EC in soil
2. Determination of pH and Ec in water.
3. Lime requirement in soil,
4. Gypsum requirement in soil
5. Estimation of ESP and SAR in Soils.
6. Application of remote sensing and GIS in delineating problematic soil in LIP.
7. Visit of problematic soils in Punjab.

**Suggested Readings**

1. Richards, L.A. (1954) *Diagnosis and improvement of saline and alkali soils*. Pp. 7-33.
2. Jackson, M. L. (1967) *Soil Chemical analysis*. Prentice Hall of India Private Limited, New Delhi. Pp 10-37
3. Bishwajit Sinha. *A TEXTBOOK ON PROBLEMATIC SOILS AND THEIR MANAGEMENT (WITH PRACTICAL)* (Paperback,). Kalyami Publication. ISBN: 9786213880950.

**Transaction Method:**

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

**Course Title: Fundamentals of Biotechnology**  
**Course Code: BAG420**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
1	0	0	1

**Total hours 15**

**Course outcome:**

After completion of course, the students will be able to

- 1 Understanding of Biotechnological Principles
- 2 Proficiency in Laboratory Techniques
- 3 Critical Thinking and Problem Solving: .
- 4 Ethical and Societal Implications .

**Course contents**

**Theory**

**Unit I**

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

**Unit II**

Micro-propagation methods; organogenesis and embryogenesis, Synthetic seeds and their significance; Embryo rescue and its significance; somatic hybridization and cybrids;

**Unit III**

Somaclonal variation and its use in crop improvement; cryo-preservation; Introduction to recombinant DNA methods: physical (Gene gun method), chemical (PEG mediated) and Agrobacterium mediated gene transfer methods;

**Unit IV**

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

**Course Title: Lab- Fundamentals of Biotechnology**  
**Course Code: BAG421**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**Total hours 30**

**Practical**

1. Sterilization techniques.
2. Composition of various tissue culture media and preparation of stock
3. solutions for MS nutrient medium.
4. Callus induction from various explants.
5. Micro-propagation, hardening and acclimatization.
6. Demonstration on isolation of DNA.
7. Demonstration of gel electrophoresis techniques and DNA finger printing.

**Suggested Readings**

1. Brown T A. 2002. *Genomes 2*. 2nd ed. New york: Wiley-Liss.
2. Prave P, Faust U, Sittig W & Sukatsch DA. 1987. *Basic Biotechnology: A Student's Guide*. VCH Verlagsgesellschaft.
3. Prave P, Faust U & Sittig W. 1987. *Fundamentals of Biotechnology*. VCH Verlagsgesellschaft.
4. Renneberg R. 2008. *Biotechnology for Beginners*. Academic Press Publishers.

**Transaction Method:**

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

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

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
1	0	0	1

**Total hours- 15**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 various energy resources and their application
- 2 about production of bio fuel by alternative methods
- 3 about production of bio gas and synthetic gas
- 4 solar energy gadgets and wind mills

**Theory:**

**Unit- I**

**Hours- 3**

Classification of energy sources, contribution of the sources in agricultural sector.

**Unit- II**

**Hours- 4**

Familiarization with biomass utilization for bio-fuel production and their application, Familiarization with types of biogas plants and gasifiers.

**Unit- III**

**Hours- 4**

Bio-gas, Bio-alcohol, biodiesel and bio-oil production and their utilization as bio-energy resource.

**Unit- IV**

**Hours- 4**

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.



**Course Title: Lab- Renewable Energy and Green Technology**

**Course Code: BAG414**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**Practical contents:**

**Hours- 30**

1. To study biogas plants.
2. To study gasifier.
3. To study the production process of biodiesel.
4. To study briquetting machine.
5. To study the production process of bio-fuels.
6. To study solar photovoltaic system: solar light, solar pumping, solar fencing.
7. To study solar cooker.
8. To study solar drying system.
9. To study solar distillation and solar pond.

**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.*

**Transaction Method:**

Assignment, Power Point presentation, Audio lecture, Video lecture and Experimentation.

**Course Title: Production Technology for Ornamental Crops, MAP and Landscaping**  
**Course Code: BAG405**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
1	0	0	1

**Total hours- 15**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 Identify different ornamental crops, medicinal and aromatic plants seed with their plant types in their natural existence.
- 2 Explain the several practices involved in cultivation and management of different ornamental crops, medicinal and aromatic plants.
- 3 Classify different ornamental crops, medicinal and aromatic plants according to their agro-climatic requirement, physiological and morphological features.
- 4 To understand post harvest handling of cut and looseflowersextraction ofessentials oils.

**Course Contents**

**Theory**

**UNIT-I**

**Hours- 3**

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

**UNIT-II**

**Hours- 4**

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

**UNIT-III**

**Hours- 4**

Package of practices for loose flowers like marigold and jasmine under open conditions. Production technology of important medicinal plants like ashwagandha, asparagus, aloe, costus, Cinnamomum, periwinkle, isabgol

**UNIT-IV**

**Hours- 4**

Production technology of important aromatic plants like mint, lemongrass, citronella, palmarosa, ocimum, rose, geranium, vetiver. Processing and value addition in ornamental crops and MAPs produce.

**Course Title: Lab- Production Technology for Ornamental Crops, MAP and Landscaping**  
**Course Code: BAG415**

L	T	P	Credits
0	0	4	2

**Practical contents**

**Hours- 60**

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

**Suggested Readings:**

1. Bose, T.K., Maiti, R.G, Dhua, R.S. and Das P. 2002. Floriculture and Landscaping, Vol. 1.
2. Naya Udyog Publication, Kolkata. pp 508. Singh, A. K. and Sisodia, A. 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.
4. Chattopadhyay, S.K. 2007. Commercial Floriculture. Gene-Tech Books, New Delhi  
Srivastava, H.C. 2014. Medicinal and Aromatic Plants. ICAR, New Delhi.
5. Kumar, N., Abdul Khader, J.B.M, Rangaswamy, P and Irulappan, I. 2004. Introduction to Spices, Plantation Crops, Medicinal and Aromatic Crops. Oxford and IBH publishing Co, New Delhi

**Transaction Method:**

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

**Course Title: Entrepreneurship Development and Business Communication**

**Course Code: BAG406**

L	T	P	Credits
1	0	0	1

**Total hours- 15**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 Acquire knowledge about entrepreneurship development in business environment of Indian economy.
- 2 To know the overview of Indian systems in decision making of entrepreneurs.
- 3 To know how to globalize entrepreneur business environment.
- 4 To know entrepreneur (activities in) managing and motivation of activities indevelopment.

**CourseContents**

**Unit I**

**Hours- 4**

Concept of Entrepreneur, Entrepreneurship Development, Characteristics of entrepreneurs; SWOT Analysis & achievement motivation, Government policy and programs and institutions for entrepreneurship development Impact of economic reforms on Agribusiness/ Agrienterprises.

**Unit II**

**Hours- 4**

Entrepreneurial Development Process: Business Leadership Skills; Developing organizational skill (controlling, supervising, problem solving, monitoring & evaluation).

**Unit III**

**Hours- 4**

Developing Managerial skills, Business Leadership Skills (Communication, direction and motivation Skills), Problem solving skill, Supply chain management and Total quality management

**Unit IV**

**Hours- 3**

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

**Course Title: Lab- Entrepreneurship Development and Business Communication**

**Course Code: BAG416**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**Practical contents:**

**Hours- 30**

1. Assessing entrepreneurial traits, problem solving skills, managerial skills and achievement motivation.
2. Exercise in creativity, time audit through planning, monitoring and Supervision.
3. Identification and selection of business idea, preparation of business plan and proposal writing.
4. Visit to entrepreneurship development institute and entrepreneurs.

**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

**Transaction Method:**

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

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

L	T	P	Credits
1	0	0	1

**Total hours- 15**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 Weather knowledge for betterment of crops.
- 2 Understand earth atmosphere phenomena.
- 3 Measurement of weather element by different instruments.
- 4 Effect of weather elements on crop production, crop monitoring.

**Course Contents**

**Theory**

**UNIT I**

**Hours- 3**

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 seabreeze;

**UNIT II**

**Hours- 4**

Nature and properties of solar radiation. solar constant, depletion of solar radiation, shortwave. longwave and thermal radiation, net radiation, albedo: Atmospheric temperature, temperature inversion, lapse rate, daily and seasonal variations of temperature, vertical profile of temperature.

**UNIT III**

**Hours- 4**

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,

**UNIT IV**

**Hours- 4**

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 micro climate, 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.

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

L	T	P	Credits
0	0	2	1

**Practical contents:**

**Hours- 30**

- 1 Visit of Agrometeorological Observatory.
- 2 site selection of observatory.
- 3 exposure of instruments and weather data recording.
- 4 Measurement of total, short wave and long wave radiation, and its estimation using Planck's intensity law.
- 5 Measurement of albedo and sunshine duration, computation of Radiation Intensity using ASS.
- 6 Measurement of maximum and minimum air temperatures, its tabulation, trend and variation analysis.
- 7 Measurement of soil temperature and computation of soil heat flux.
- 8 Determination of vapor pressure and relative humidity.
- 9 Determination of dew point temperature.
- 10 Measurement of atmospheric pressure and analysis of atmospheric conditions.
- 11 Measurement of wind speed and wind direction, preparation of wind rose Measurement
- 12 Tabulation and analysis of rain.
- 13 Measurement of open pan evaporation and evapotranspiration.
- 14 Computation of PET and AET.

**Suggested Readings:**

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

**Transaction Method:**

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

**Course Title: Agri-Informatics**

**Course Code: BAG408**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
1	0	0	1

**Total hours- 15**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 Makingthe studentsunderstand&learn basicsofComputer.
- 2 Ableto operate aComputerbyknowingallparts&instructions of Computer.
- 3 Makeuseof Computer inourdayto dayLife.
- 4 Learn aboutDOSanditscommands.

**Course contents**

**Theory**

**UNIT I**

**Hours- 3**

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,

**UNIT II**

**Hours- 4**

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.

**UNIT III**

**Hours- 4**

IT application for computation of water and nutrient requirement of crops, Computer-controlled devices (automated systems) for Agri-input management, Smartphone Apps in Agriculture for farm advises, market price. Postharvest management etc.

**UNIT IV**

**Hours- 4**

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.



**Course Title: Lab- Agri-Informatics**

**Course Code: BAG418**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**Practical contents**

**Hours- 30**

1. Study of Computer Components, accessories, practice of important DOS Commands.
2. Introduction of different operating systems such as windows, Unix/ Linux, Creating, Files & Folders, File Management.
3. Use of MS-WORD and MS Power-point for creating, editing and presenting a scientific Document
4. MS-EXCEL - Creating a spreadsheet, use of statistical tools, writing expressions. creating graphs, analysis of scientific data.
5. MS-ACCESS: Creating Database, preparing queries and reports, demonstration of Agri-information system.
6. Introduction to World Wide Web (WWW).
7. Introduction of programming languages.
8. 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.
9. Introduction of Geospatial Technology for generating valuable information for Agriculture.
10. Hands on Decision Support System.
11. Preparation of contingent crop planning.

**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.

**Transaction Method:**

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

**Course Title: Poultry Production & Mngement**  
**Course Code: BAG409**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
2	0	0	2

**Total hours- 30**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 To know about poultry industry in India and production and marketing statistics of eggs and chicken
- 2 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.
- 3 To have the knowledge about nutrition, feeding and management of chicks
- 4 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**

**Theory**

**Unit 1**

**Hours- 6**

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

**Unit 2**

**Hours- 8**

**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.

**Unit 3**

**Hours- 8**

**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.

**Unit 4**

**Hours- 8**

**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.

**Course Title: Lab- Poultry Production & Mngement**

**Course Code: BAG419**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**Practical Content**

**Hours- 30**

1. Neat and clean diagram of hen showing external body parts.
2. structure of egg,
3. Formulation of ration viz. Broiler starter ration, Broiler finisher ration. Chick starter ration, Grower ration, Layer ration and Breeder ration.
4. Vaccination schedule for broiler and layers.
5. Debeaking, Candling of eggs.
6. Dissection of bird fir showing internal body parts.

**Suggested References:**

1. *N.V. Jadhav and M.F. Siddiqui (2010) Handbook of Poultry Production and Management*
2. *T. Burr Charles and Homer O. Stuart (2019) Book on Commercial Poultry Farming*
3. *R.A. Singh (1991) Poultry Production*

**Transaction Method:**

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

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

**Course Code: BAG422**

L	T	P	Credits
0	0	2	1

**Total hours- 30**

**Course Outcomes:**

After completion of course, the students will be able to:

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

**Practical contents**

1. Crop planning (through INM & IPM), raising field crops in multiple cropping systems:
2. Field preparation, seed treatment, nursery raising, sowing, nutrient, water and weed management.
3. Management of insect-pests diseases of crops,
4. Harvesting, threshing, drying winnowing, storage and marketing of produce.
5. Insect-pest and disease management technologies.
6. Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of 8-10 students.

**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

**Transaction Method:**

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

**Course Title: Rainfed and dryland Agriculture**  
**Course Code: BAG501**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
1	0	0	1

**Total hours- 15**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 To study soil and climatic conditions prevalent in rainfed areas
- 2 To study effect of water deficiton physic-morphological characteristics of the plants
- 3 To enhance the quality & productivity of crop production.
- 4 To demonstrate the efficient utilization of water through soil and crop management practices

**Course contents**

**Theory**

**UNIT I**

**Hours- 4**

Introduction: types and history, Problems & prospects of rainfed agriculture in India. Soil and climatic conditions prevalent in rainfed areas.

**UNIT II**

**Hours- 4**

Drought: types, effect of water deficiton physic morphological characteristics of the plants. Mechanism of crop adoption under moisture deficitconditions.

**UNIT III**

**Hours- 3**

Efficient utilization of water through soil and crop management practices, management of crops in rainfed areas.

**UNIT IV**

**Hours- 4**

Contingent crop planning for aberrant weather conditions. Precision agriculture; concepts and techniques: their issues and concerns for Indian agriculture.

**Course Title: Lab- Rainfed and dryland Agriculture**  
**Course Code: BAG518**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**Practical contents:**

**Hours- 30**

- 1 Studies on climatic classifications,.
- 2 studies on rainfall pattern in rainfed areas of the country.
- 3 Studies on cropping pattern of different dryland areas in the country and demarcation of dry land area on map of India.
- 4 Interpretation of metrological data and scheduling of supplemental irrigations based onthe evapo-transpiration demand of crops effective rainfall landits calculations.
- 5 Visit to rainfed research stations/watersheds.

**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).*

**Transaction Method:**

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

**Course Title: Crop Improvement -1 (Kharif crops)**

**Course Code: BAG502**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
1	0	0	1

**Total Hours-15**

**CourseOutcomes:**

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

- 1 To understand cytogenetics relationship among the species of a genera of kharif crops
- 2 Controlled pollination techniques for hybridization in crop plants.
- 3 Estimation of Heterosis and inbreeding and their impacts on reproduction of kharifcrops
- 4 About hybrid seed production technology

**Course contents**

**Theory**

**Unit-1**

**4 Hours**

Centers of origin. distribution of species, wild relatives in different cereals (Rice, Maize, Sorghum and Pearl millet); pulses (Pigeonpea, Urdbean and Mungbean); oilseeds (Groundnut); fibre (Cotton).

**Unit-2**

**2 Hours**

Important concepts of breeding self-pollinated and cross pollinated.

**Unit-3**

**5 Hours**

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

**Unit-4**

**4 Hours**

Hybrid seed production technology in Maize, Rice, Sorghum, Pearl millet and Pigeonpea.

**Course Title: Lab- Crop Improvement -1 (Kharif crops)**

**Course Code: BAG519**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

### **Practical**

**30 Hours**

1. Floral biology.
2. Emasculation and hybridization techniques in different crop species; viz., Rice, Maize, Sorghum, Pearl millet, Pigeonpea, Urdbean, Mungbean, Groundnut, Cotton crops.
3. Maintenance breeding of different kharif crops.
4. Handling of gcrmplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods.
5. Study of field techniques for seed production and hybrid seeds production in Kharif crops.
6. Estimation of heterosis, inbreeding depression and heritability.
7. Layout of field experiments; Study of quality characters, donor parents for different characters.
8. Visit to seed production plots.
- 9.** Visit to A1CRP 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. 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

**Total Hours-30**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 To differentiate insects and pests along with examples
- 2 Study of different insect pests of field crops, horticultural and vegetable crop
- 3 Diagnosing symptoms of damage by major insect pests of crops
- 4 Studying the role of various biotic and abiotic factors of environment on pest Incidence

**Theory contents**

**Unit-I**

**7 Hours**

General account on nature and type of damage by following insect pests arthropods pests. Scientific name, order, family, host range, distribution, biology and bionomics. nature of damage, and management of major pests and scientific name, order, family, host range, distribution, nature of damage and control practice other important arthropod pests (mites) of various field crops.

**Unit-II**

**9 Hours**

Factors affecting losses of stored grain and role of physical, biological, mechanical and chemical factors in deterioration of grain. Insect pests, mites, rodents, birds and microorganisms associated with stored grain and their management. Storage structure and methods of grain storage and fundamental principles of grain store management. Paddy: *Leptocorisa varicroms*, *Hieroglyphus Spp.*, *Nilaparvata lugens*, *Nephotetix, spp.*, *Mythimna separata*.

Jowar Maize: *Chilo partellus*, *Atherigona variasocata*, *Scirpophaga excerptalis*. *Chilo infuscatelles* Sugarcane: Top borer, *Pyrilla*, Early Shoot borer and white fly

**Unit-III**

**6 Hours**

Cotton: *Pectinaphora gossypiella*, *Earias Spp*, *Sylepta derogata*, *Dysdercus Spp* *Bemisia tabacz*, *Amrasca bzungtulla* Oilseeds: *Lipaphis erysimi*, *Athalia proxima* *Ragrada Cruciferarun*, *Dasyneura* Pulses: *Helicoverpa armigera* *Agrotis Spp.*, *Etiella zinckenella*

**Unit-IV**

**8 Hours**

Pests of Stored Grains: *Sitophilus oryzae*, *Trogoderma granarium*, *Sitotroga cerealella*, *Callosobruchus chinensis*. Polyphagous pests: *Odontotermes obesus*, *Holotrichia consanguinea*, *Spilosoma obliqua*, *Spodoptera litura*, *Amsacta Spp.*

**Course Title: Lab- Pests of Crops and Stored Grain and their Management**

**Course Code: BAG520**

L	T	P	Credits
0	0	2	1

**Practical contents**

**30 Hours**

1. Identification of different types of damage.
2. Identification and study of life cycle and seasonal history of various insect pests attacking field crops and their produce.
3. Identification of insect pests and Mites associated with stored grain.
4. Determination of insect infestation by different methods.
5. Assessment of losses due to insects. Calculations on the doses of insecticides application technique.
6. Fumigation of grain store I godown. Identification of rodents and rodent control operations in godowns.
7. Identification of birds and bird control operations in godowns.
8. Determination of moisture content of grain.
9. Methods of grain sampling under storage condition.
10. Visit to Indian Storage Management and Research Institute, Hapur and Quality Laboratory. Department of Food., Delhi. Visit to nearest FCI godowns..

**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

**Transaction Method:**

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

**Course Title: Agricultural Marketing, Trade and Prices**  
**Course Code: BAG504**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
2	0	0	2

**Total Hours-30**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 Planning and designing criteria of agricultural marketing.
- 2 Knowledge regarding choice of nature and determinants of demand and supply of farm products.
- 3 Will get the idea about the types and importance of agencies involved in agricultural marketing
- 4 Knowledge of agricultural prices and policy.

**Course contents**

**Unit I**

**7 Hours**

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 agricommodities: nature and determinants of demand and supply of farm products. producer's surplus - meaning and its types, marketable and marketed surplus, factors affecting marketable surplus of agri-commodities.

**Unit II**

**7 Hours**

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).

**Unit III**

**9 Hours**

Market functionaries and marketing channels: Types and importance of agencies involved in agricultural marketing; meaning and definition of marketing channel; number of channel levels; marketing channels for different farm products; Integration, efficiency, costs and price spread: Meaning, definition and types of market integration; marketing efficiency; marketing costs, margins and price spread; factors affecting cost of marketing: reasons for higher marketing costs of farm commodities; ways of reducing marketing costs: Role of Govt. in agricultural marketing: Public sector institutions- CWC, SWC, FCI, CACP & DMI - their objectives and functions; cooperative marketing in India.

**Unit IV**

**7 Hours**

Risk in marketing: Types of risk in marketing; speculation & hedging; an overview of futures trading; Agricultural prices and policy: Meaning and functions of price; administered prices; need for agricultural price policy; Trade: Concept of International Trade and its need, theories of absolute and comparative advantage. Present status and prospects of international trade in agri-commodities; GATT and WTO; Agreement on Agriculture (AoA) and its implications on Indian agriculture; IPR GST.

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

L	T	P	Credits
0	0	2	1

**30 Hours**

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

**Suggested Readings:**

1. Acharya, S.S. and Agarwal, N.L. 2006. *Agricultural Marketing in India*. Oxford & IBHPublishing Co.Pvt.Ltd. New Delhi. Vol. 4. pp 37-78
2. Kulkarni, K R.1964. *Agricultural Marketing in India*. The Co-operators Books Depot, Mumbai. Vol. 1. pp 111-193

**Transaction Method:**

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Notes, and Group discussion.

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

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
2	0	0	2

**Total Hours- 30**

### **Course Outcomes**

After completion of course, the students will be able to:

- 1 Planning and designing criteria of different protected structures like greenhouse, shrdevets etc.
- 2 Knowledge regarding choice of crops suitable for green house cultivation.
- 3 Will get the idea about the need and requirement of growing crops under protected structure and scope of protected cultivation.
- 4 We get the knowledge and maintenance of thresher winnowing and other field machines.

### **Course contents**

#### **Theory**

#### **Unit I**

**5 Hours**

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

#### **Unit II**

**8 hours**

Green house equipment's, materials of construction for traditional and low costgreenhouses.Irrigationsystemsusedingreenhouses,typicalapplications,passivesolargre enhouse, hot air green house heating systems, green house drying. Cost estimation and economicanalysis.

#### **Unit III**

**7 Hours**

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

#### **Unit IV**

**10 Hours**

Drying anddehydration; moisture measurement, EMC, drying theory, various drying method, commercial graindryer (deep bed dryer, flat bed dryer, tray dryer, fluidized bed dryer, circulatory dryer and solardryer).Materialhandlingequipment;conveyer andelevators,theirprinciple,workingandselection.

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

L	T	P	Credits
0	0	2	1

### **Practical contents**

**30 Hours**

1. Study of different type of green houses based on shape.
2. Determine the rate of air exchange in an active summer winter cooling system.
3. Determination of drying rate of agricultural products inside greenhouse.
4. Study of greenhouse equipment.
5. Visit to various Post Harvest Laboratories.
6. Determination of Moisture content of various grains by oven drying & infrared moisture methods.
7. Determination of engineering properties (shape and size, bulk density and porosity of biomaterials).
8. Determination of Moisture content of various grains by moisture meter.
9. 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**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
2	0	0	2

**Total Hours-30**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 To study the Economic Importance of diseases of Field & Horticultural Crops.
- 2 To study the symptoms of diseases of Field & Horticultural Crops.
- 3 Understand the causes of diseases of Field & Horticultural Crops.
- 4 To study and Understand the disease cycle of Field & Horticultural Crops.

**Course contents**

**Unit-I**

**7 Hours**

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

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;

**Unit-II**

**5 Hours**

Groundnut: early and leaf spots; Pigeonpea: Phytophthora blight, wilt and sterility mosaic; Green gram: Cercospora leaf spot, web blight and yellow mosaic;

**Unit-III**

**9 Hours**

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;

**Unit-IV**

**9 Hours**

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.

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

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**Practical contents**

**30 Hours**

1. Identification and histo-pathological studies of diseases of Rice
2. Identification and histo-pathological studies of diseases of Maize
3. Identification and histo-pathological studies of diseases of groundnut
4. Identification and histo-pathological studies of diseases of Pigeonpea
5. Identification and histo-pathological studies of diseases of Guava
6. Identification and histo-pathological studies of diseases of Banana
7. Identification and histo-pathological studies of diseases of Cruciferous vegetable
8. Identification and histo-pathological studies of diseases of Tomato
9. Collection and preservation of plantdiseasespecimensforherbarium.
10. Students should submit 50 pressed and well-mountedspecimens.

**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

**Transaction Method:**

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



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

**Course Code: BAG507**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
1	0	0	1

**Total Hours-15**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 Explain the several practices involved in cultivation and management of different fruit and plantation crops.
- 2 Identify different seeds of fruit and plantation crop with their plant types in their natural existence.
- 3 Classify different fruit and plantation crops according to their agro-climatic requirement, physiological and morphological features.
- 4 Practice techniques involved in management of different fruit and plantation crops.

**Course contents**

**Theory**

**UNIT-I**

**9 Hours**

Importance and scope of fruit and plantation crop industry in India; Importance of rootstocks; Production technologies for the cultivation of major fruits-mango, banana,

**UNIT-II**

**7 Hours**

Production technologies for the cultivation of citrus, grape, guava, litchi, papaya, sapota, apple, pear, peach, walnut, almond

**UNIT-III**

**7 Hours**

Production technologies for the cultivation of minor fruits- date, ber, pineapple, pomegranate, jackfruit, strawberry,

**UNIT-IV**

**7 Hours**

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

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

L	T	P	Credits
0	0	2	1

**Practical Contents**

**30 Hours**

1. Seed propagation.
2. Scarification and stratification of seeds.
3. Propagation methods for fruit crops.
4. Propagation methods for plantation crops.
5. Description and identification of fruit crops.
6. Description of plantation crops.
7. Preparation of plant bio regulators and their uses.
8. Important pests, diseases and physiological disorders of fruit crops.
9. Important pests, diseases and physiological disorders of plantation crops.
10. Visit to commercial orchards.

**Suggested Readings:**

1. *Bijendra Singh. 2012. Horticulture at a Glance. Kalyani Publishers, Ludhiana*
2. *Parthasarathy, V. A., P.K.Chattopadhyay and Bose, T.K. 2006. Plantation Crops. Vol I and II.*
3. *Kumar, N., Abdul Khader, J.B.M, Rangaswamy, P. and Irulappan, I. 2004. Introduction to Spices, Plantation crops, Medicinal and Aromatic Crops. Oxford and IBH publishing Co, New Delhi.*
4. *Anonymous 2001. Handbook of Horticulture 10<sup>th</sup> edition. ICAR publication, Indian Council of Agricultural Research, New Delhi. pp. 1069.*
5. *Bose, T. K., Mitra, S. K. and Sanyal, D. 2001. Fruits: Tropical and Subtropical, Volume 1, 3<sup>rd</sup> edition. Naya Udyog. pp. 721.*
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.*

**Transaction Method:**

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

**Course Title: Communication Skills and Personality Development**

**Course Code: BAG534**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
1	0	0	1

**Total hours 15**

**Course content**

**Unit I**

**4 Hours**

Communication Skills: Structural and functional grammar; meaning and process of communication, verbal and nonverbal communication; listening and note taking, writing skills, oral presentation skills;

**Unit II**

**4 Hours**

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;

**Unit III**

**3 Hours**

Group discussion. Organizing seminars and conferences. Applied Grammar: Introduction to Word Classes. Structure of the Verb in English. Uses of Tenses. Study of Voice. Use of Conjunctions and Prepositions.

**Unit IV**

**4 Hours**

Sentence Patterns in English. Spoken English: Conversations of Different Situations in Everyday Life. The Concept of Stress, Stress Shift in Words and Sentences. Words with Silent Letters and their Pronunciations. The Basic Intonation Patterns.

**Course Title: Lab- Communication Skills and Personality Development**  
**Course Code: BAG535**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**Total hours 30**

**Practical content**

1. Listening and note taking,
2. Writing skills, oral presentation skills;
3. Field diary and lab record;
4. Indexing, footnote and bibliographic procedures.
5. Reading and comprehension of general and technical articles, precise writing, summarizing, abstracting;
6. Individual and group presentations.

**Suggested Reading**

1. Carroll, B.J. 1986. English for college, Macmillan India Ltd. New Delhi
2. Hahn, "The Internet complete reference", TMH
3. Hornby, A.S. 1975. Guide to patterns and usage in English. Oxford University, NewDelhi.
4. Qurik, R and Green baum, S 2002. A University grammar

**Transaction Method:**

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

**Course Title: Intellectual Property Rights**  
**Course Code: BAG536**

L	T	P	Credits
1	0	0	1

**Total Hours-15**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 Undersatnd about the protection of their invention done in their project work.
- 2 To get knowledge of patents, copy right, trademarks, designs and informationTechnologyAct.
- 3 Further teacher will have to demonstrate with products and ask the student to identify the different types of IPR's.
- 4 Analyse ethical and professional issues which arise in the intellectual property law context.

**Course contents**

**Theory**

**Unit-I**

**4 Hours**

Introduction and meaning of intellectual property, brief introduction to GATT, WTO, TRIPS and WIPO, Treaties for I PR protection; Types of Intellectual Property and legislations covering IPR in India: - Patents, Copyrights, Trademark, Industrial design, Geographical indications,

**Unit-II**

**4 Hours**

Integrated circuits, Trade secrets. Patents Act 1970 and Patent system in India, patentability. process and product patent, filing of patent, patent specification, patent claims, Patent opposition and revocation, infringement, Compulsory licensing.

**Unit-III**

**3 Hours**

Patent Cooperation Treaty, Patent search and patent database. Origin and history including a brief introduction to UPOV for protection of plant varieties, Protection of plant varieties under UPOV and PPV&FR Act of India,

**Unit-IV**

**4 Hours**

Plant breeder's rights, Registration of plant varieties under PPV&FR Act 2001, breeders, researcher and farmer's rights. International treaty on plant genetic resources for food and agriculture (ITPGRFA). Indian Biological Diversity Act, 2002 and its salient features, access and benefit sharing.

**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,

**Transaction Method:**

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

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

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
2	0	0	2

**Total Hours-30**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 To supply wholesome, safe, nutrition's and acceptable food to consumers throughout the year.
- 2 Generate both urban and rural employment.
- 3 Develop new value added products.
- 4 Reduce fruit and vegetable losses.

**Theory content**

**UNIT-I**

**9 Hours**

Definition of food and food science. Composition of food, Foods of animal origin, Digestive system of Ruminants. Definition, Chemistry and Function of Carbohydrate, Fat, Proteins and Water.

**UNIT-II**

**6 Hours**

Requirement, availability, functions and Nutritional deficiency disease of minerals and vitamins. Flavours and colours used in food.

**UNIT-III**

**7 Hours**

Food microbiology with special reference to milk, Physio Chemical properties of milk.

**UNIT-IV**

**8 Hours**

Composition and processing of egg, meat and chicken, feed additives, antibiotics, enzymes and hormones.

**Course Title: Lab- Principles of Food Science and Nutrition**

**Course Code: BAG537**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**Total Hours-30**

**Practical Content**

1. Food Analysis Techniques.
2. Food Processing Demonstrations.
3. Nutritional Assessment.
4. Food Product Development.
5. Field Visits and Industry Interaction.
6. Safety and Hygiene Practices.
7. Research Projects and Internships.

**Suggested Readings:**

1. Owen R, Fennema. 1996. *Food Chemistry, 3rd Ed.* Marcel Dekker, Inc., New York, USA.
2. M. Shafiur Rahman. 2007. *Handbook of Food Preservation, 2nd Ed.* CRC Press, Boca Raton, FL, USA.
3. Fellows P. 2000. *Food Processing Technology: Principles and Practice, 2nd Ed.* CRC Press, Boca Raton, FL, USA.

**Transaction Method:**

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

**Course Title: Geo-informatics and Nano technology and Precision Farming**  
**Course Code: BAG511**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
1	0	0	1

**Total hours-15**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 To acquaint the knowledge about using nano technology and gis technology
- 2 Associate and apply tools and techniques of geo informatics farming.
- 3 Extend and apply tools and techniques of remote sensing
- 4 Evaluate the role of models and forecasting by info crop model and DSSAT

**Contents**

**Theory**

**Unit I**

**3 Hours**

Geo-informatics- definition concepts, tool and techniques; their use in Precision Agriculture. Crop discrimination and yield monitoring.

**Unit II**

**3 Hours**

Soil mapping; fertilizer recommendation using geospatial technologies: Spatial data and their management in GIS.

**Unit III**

**4 Hours**

Remote sensing concepts and application in agriculture; Image processing and interpretation; Global positioning system (GPS), components and its functions.

**Unit IV**

**5 Hours**

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



**Course Title: Lab- Geo-informatics and Nano technology and Precision Farming**  
**Course Code: BAG527**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

### **Practical Content**

**30 Hours**

1. Introduction to GIS software. Introduction to image processing software
2. Visual interpretation of remote sensing images.
3. Generation of spectral profiles of different objects. Supervised and unsupervised classification and acreage estimation.
4. Multispectral remote sensing for soil mapping.
5. Creation of thematic layers of soil fertility based on GIS.
6. Creation of productivity and management zones.
7. Fertilizers recommendations based of VRT and STCR techniques.
8. Crop stress (biotic/abiotic) monitoring using geospatial technology. Use of GPS for agricultural survey.
9. Characterization and applications of nanoparticles in agriculture.
10. Projects formulation and execution related to precision farming and its application in agriculture.

### **Suggested Readings:**

1. Dnyaneshwar Namdev Jagtap and Dr. Balasaheb Sawant Konkan Krishi Vidypeeth, Prashant Balasaheb Pawar. *Text Book on Geoinformatics and Nanotechnology for Precision Farming*. 2017. Publisher: Shri Rajlakshmi Prakashan ISBN: 978-93-84710-72-9.
2. Salwinder Singh Dhaliwal, Rk Naresh, Vivek and Sandeep Singh Tomar. 2019. *Precision Farming Geoinformatics and Nanotechnology*

### **Transaction Method:**

Class black board digital, PPT presentation, notes, assignments, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion and practical labs agro meteorology.

## **ELECTIVE-1**

**Course Title: Agri-business Management**

**Course Code: BAG512**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
2	0	0	2

**Total Hours-30**

### **Course Outcomes:**

After completion of course, the students will be able to:

- 1 To develop business management in agriculture.
- 2 Classification of industries and types of agrobased industries.
- 3 To study the management functions.
- 4 Evaluate the role of project management.

### **Course contents**

#### **Theory**

##### **Unit I**

**7 Hours**

Transformation of agriculture into agribusiness, various stakeholders and components of agribusiness systems. Importance of agribusiness in the Indian economy and New Agricultural Policy. Distinctive features of Agribusiness Management: Importance and needs of agro-based industries.

##### **Unit II**

**8 Hours**

Classification of industries and types of agro based industries. Institutional arrangement, procedures to set up agro based industries. Constraints in establishing agro-based industries. Agri-value chain: Understanding primary and support activities and their linkages. Business environment: PEST & SWOT analysis. Management functions: Roles & activities, Organization culture. Planning, meaning, definition, types of plans.

##### **Unit III**

**9 Hours**

Purpose or mission, goals or objectives, Strategies, policies procedures, rules, programs and budget. Components of a business plan. Steps in planning and implementation. Organization, staffing, directing and motivation. Ordering, leading, supervision, communications. control. Capital Management and Financial management of Agribusiness. Financial statements and their importance. Marketing Management: Segmentation, targeting & positioning.

##### **Unit IV**

**6 Hours**

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.

**Course Title: Lab- Agri-business Management**  
**Course Code: BAG528**

L	T	P	Credits
0	0	2	1

**Practical**

**30 Hours**

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

**Suggested Readings:**

1. Nagpure, S. and Deshmukh, R.G. 2004. *Agribusiness Management*. AGROMET Publishers, Nagpur.pp.481.
2. 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.

**Transaction Method:**

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

**Course Title: Agrochemicals**

**Course Code: BAG513**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
2	0	0	2

**Total Hours-30**

**Course Outcomes;**

After completion of course, the students will be able to:

- 1 To study an agrochemicals and role in agriculture
- 2 Associate and apply tools and techniques of use fertilizers.
- 3 Extend and apply tools and techniques for sustainable agriculture.
- 4 Evaluate the merits and demerits of their uses in agriculture management of agrochemicals for sustainable agriculture.

**Contents**

**Theory**

**Unit-I**

**8 Hours**

An introduction to agrochemicals, their type and role in agriculture, effect on environment, soil, human and animal health. merits and demerits of their uses in agriculture management of agrochemicals for sustainable agriculture. Herbicides-Major classes, properties and important herbicides. Fate of herbicides. Fungicides-Classification-Inorganic fungicides characteristics, preparation and use of sulfur and copper

**UNIT-II**

**8 Hours**

Mode of action-Bordeaux mixture and copper oxychloride. Organic fungicides- Mode of action- Dithiocarbamates characteristics, preparation and use of Zineb and maneb. Systemic fungicides- Benomyl. carboxin, oxycarboxin, Metalaxyl, Carbendazim. characteristics and use. Introduction and classification of insecticides: inorganic and organic insecticides Organochlorine, Organophosphates, Carbamates, Synthetic pyrethroids Neonicotinoids. Hiorationals.

**UNIT-III**

**7 Hours**

Insecticide Act and rules, Insecticides banned, withdrawn and restricted use, Fate of insecticides in soil & plant. IGRs Biopesticides, Reduced risk insecticides, Botanicals, plant and animal systemic insecticides their characteristics and uses. Fertilizers and their importance. Nitrogenous fertilizers: Feed stocks and Manufacturing of ammonium sulphate. ammonium nitrate, ammonium chloride, urea. Slow release N- fertilizers.

**UNIT-IV**

**7 Hours**

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

**Course Title: Lab- Agrochemicals**

**Course Code: BAG529**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**Practical**

**30 Hours**

1. Sampling of fertilizers and pesticides.
2. Pesticides application technology to study about various pesticides appliances.
3. Quick tests for identification of common fertilizers.
4. Identification of anion and cation in fertilizer.
5. Calculation of doses of insecticides to be used.
6. To study and identify various formulations of insecticide available in market  
Estimation of nitrogen in Urea.
7. Estimation of water soluble P<sub>2</sub>O<sub>5</sub> and citrate soluble P<sub>2</sub>O<sub>5</sub> in single superphosphate.
8. Estimation of potassium in-Muriate of Potash/ Sulphate of Potash by flame photometer.
9. Determination of copper content in copper oxychloride. Determination of sulphur content in sulphur fungicide.
10. Determination of thiram.
11. Determination of ziram content.

**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.*

**Transaction Method:**

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

**Course Title: Commercial Plant Breeding**

**Course Code: BAG514**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
2	0	0	2

**Total Hours-30**

### **Course Outcomes**

After completion of course, the students will be able to:

- 1 To develop modes of plant reproduction
- 2 Associate and apply tools and techniques of optimizing hybrid.
- 3 Extend and apply tools for hybrid seed production.
- 4 Evaluate the understanding the difficulties in hybrid seed production

### **Course contents**

#### **Unit-I**

**8 Hours**

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

#### **Unit-II**

**8 Hours**

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

#### **Unit-III**

**7 Hours**

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.

#### **Unit-IV**

**7 Hours**

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.

**Course Title: Lab- Commercial Plant Breeding**  
**Course Code: BAG530**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

## **Practical**

**30 Hours**

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

### **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

### **Transaction Method:**

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

**Course Title: Landscaping**

**Course Code: BAG515**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
2	0	0	2

**Total Hours-30**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 To develop an agriculture web map service
- 2 Associate and apply tools to identify the implements used in landscape design.
- 3 Extend and apply tools and techniques of landscape design for special effects
- 4 Evaluate the role of computer software, visit to important gardens/parks/institutes.

**Course contents**

**UNIT-I**

**8 Hours**

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

**UNIT-II**

**7 Hours**

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

**UNIT-III**

**7 Hours**

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

**UNIT-IV**

**8 Hours**

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



**Course Title: Lab- Landscaping**  
**Course Code: BAG531**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**Practical contents**

**30 Hours**

1. Identification of trees.
2. Identification of shrubs.
3. Identification of annuals.
4. Identification of pot plants.
5. Propagation, care and maintenance of trees, shrubs and annuals of plants.
6. Potting and repotting.
7. Identification of tools and implements used in landscapedesign.
8. Training and pruning of plants for special effects.
9. Lawn establishment and maintenance.
10. Layout of formal gardens, informal gardens, special type of gardens (sunken garden, terrace garden, rockgarden) a.
11. Visit to importantgardens/parks/institutes.

**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.*

**Transaction Method:**

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

**Course Title: Food Safety and Standards**  
**Course Code: BAG516**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
2	0	0	2

**Total hours- 30**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 To develop food safety ideas.
- 2 Associate and apply tools and techniques of food storage and their safety measures.
- 3 Extend and apply tools and techniques to check the Standards for food products.
- 4 Evaluate the laws and standards related to food.

**Course contents**

**Theory**

**UNIT-I**

**8 Hours**

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.

**UNIT-II**

**7 Hours**

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.

**UNIT-III**

**7 Hours**

Accreditation and Auditing. Water Analysis, Surface Sanitation and Personal Hygiene. Food laws and Standards-Indian Food Regulatory Regime, FSSA. Global Scenario CAC. Other laws and standards related to food.

**UNIT-IV**

**8 Hours**

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.

**Course Title: Food Safety and Standards**  
**Course Code: Lab- BAG532**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**Practical Content**

**30 Hours**

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

**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.*

**Transaction Method:**

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

**Course Title: Biopesticides & Biofertilizers**  
**Course Code: BAG517**

L	T	P	Credits
2	0	0	2

**Total Hours- 30**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 To develop Isolation and purification of important bio-pesticides
- 2 Identification of entomopathogenic entities in field condition
- 3 Study Mass production of AM inoculants.
- 4 Evaluate the Isolation and purification of Azaspirillum

**Course contents**

**Theory**

**Unit-I**

**7 Hours**

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

**Unit-II**

**8 Hours**

Methods of application of biopesticides. Methods of quality control and Techniques of biopesticides. Impediments and limitation in production and use of biopesticide. Biofertilizers Introduction. status and scope. Structure and characteristic features of bacterial biofertilizers Azospirillum, Azotobacier, Pseudomonas. Rhizobium and FranIcia; Cynobacterial biofertilizers- Anabaena. Nostoc, Hapalosiphon and fungal biofertilizers- AM mycorrhiza and ectomycorhiza.

**Unit-III**

**8 Hours**

Nitrogen fixation -Free living and symbiotic nitrogen fixation. Mechanism of phosphate soluhilization and phosphate mobilization, K solubilization. Production technology: Strain selection, sterilization, growth and fermentation, mass production of carrier based and liquid biofertiizers. FCC) specifications and quality control of biofertilizers.

**Unit-IV**

**7 Hours**

Application technology for seeds', seedlings, tubers, sets etc. Biofertilizers -Storage, shelf life, quality control and marketing. Factors influencing the efficacy of biofertilizers. Assignment, Power Point presentation, Audio lecture, Video lecture, Plain text, Handouts, Case based study and Group discussion

**Course Title: Lab- Biopesticides & Biofertilizers**  
**Course Code: BAG533**

L	T	P	Credits
0	0	2	1

**Practical contents**

**30 Hours**

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

**Suggested Readings:**

1. *Arshad A. 2021. Biopesticides and Bio agents 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*

**Transaction Method:**

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

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

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
1	0	0	1

**Total hours-45**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 Understand about the farming system components
- 2 Get knowledge about the conservation agriculture
- 3 Acquire knowledge about the cropping system
- 4 Know sustainable agriculture-problems and its impact on agriculture

**Course Contents**

**Theory**

**Unit I**

**4 Hours**

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

**Unit II**

**3 Hours**

Cropping system and pattern, multiple cropping systems, efficient cropping system and their evaluation.

**Unit III**

**4 Hours**

Sustainable agriculture-problems and its impact on agriculture. Conservation agriculture strategies.

**Unit IV**

**4 Hours**

HEIA, LELA and LEISA and its techniques for sustainability, Integrated farming system components of IFS and its advantages, farming system and environment.

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

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**Practical Content**

**30 Hours**

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

**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*

**Transaction Method:**

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

**Course Title: Crop Improvement -II (Rabi crops)**  
**Course Code: BAG602**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
1	0	0	1

**Total hours-15**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 To understand cytogenetics relationship among the species of a genera of rabi crops
- 2 Controlled pollination techniques for hybridization in crop plants.
- 3 Estimation of Heterosis and inbreeding and their impacts on reproduction of rabi crops
- 4 Know about hybrid seed production technologies

**Course contents**

**Theory**

**Unit-1**

**4 Hours**

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

**Unit-2**

**4 Hours**

Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, adaptability, stability,

**Unit-3**

**3 Hours**

Abiotic and biotic stress tolerance and quality (physical, chemical, nutritional);

**Unit-4**

**4 Hours**

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



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

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**Practical contents**

**30 Hours**

1. Floral biology.
2. Emasculation and hybridization techniques in different crop species namely Wheat, Chickpea, pea, Rapeseed Mustard, Sunflower and Tomato.
3. Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed descent methods.
4. Study of field techniques for seed production and hybrid seeds production in rabi crops:
5. Estimation of heterosis, inbreeding depression and heritability;
6. Layout of field experiments:
7. Study of quality characters, study of donor parents for different characters;
8. Visit to seed production plots;
9. Visit to AICRP plots of different field crops.

**Suggested Readings**

3. Singh, B.D. 2018. *Plant Breeding (Principles and methods)*, Kalyani publishers, New Delhi. pp. 918.
4. Singh, P. and Arumugam, N. 2016. *Essential of Plant Breeding*. Kalyani publisher, New Delhi. pp. 243.

**Transaction Method:**

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

**Course Title: Manures, Fertilizers and Soil fertility Management**  
**Course Code: BAG603**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
2	0	0	2

**Total hours- 30**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 To study about various organic sources of fertilizers
- 2 To understand manufacturing processes and properties of chemical fertilizers.
- 3 To acquire knowledge about fertilizer control order and fertilizer storage.
- 4 To understand about soil water testing and fertilizer use efficiency.

**Course Contents**

**Theory**

**UNIT I**

**7 Hours**

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

**UNIT II**

**7 Hours**

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

**UNIT III**

**8 Hours**

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

**UNIT IV**

**8 Hours**

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.

**Course Title: Lab- Manures, Fertilizers and Soil fertility Management**

**Course Code: BAG617**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**Practical contents**

**30 Hours**

- 1 Introduction of analytical instruments and their principles, calibration and applications.
- 2 Colorimetry and flame photometry.
- 3 Estimation of soil organic carbon.
- 4 Estimation of alkaline hydrolysable N in soils.
- 5 Estimation of soil extractable P in soils.
- 6 Estimation of exchangeable K; Ca and Mg in soils.
- 7 Estimation of soil extractable S in soils.
- 8 Estimation of DTPA extractable Zn in soils.
- 9 Estimation of N in plants.
- 10 Estimation of P in plants.
- 11 Estimation of K in plants. Estimation of S in plants.

**Suggested Readings:**

1. Brady, N. C. 2016. *The Nature and Properties of Soils*. 15th edition Publisher: Pearson Education, ISBN: 978-0133254488
2. Javid Ahmad Sofi. 2016. *Practical Manual for Analysis of Soil Water Fertilizer and Manure Hardcover*. Daya publishing. ISBN-10 : 9789351247791

**Transaction Method:**

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

**Course Title: Farm Management, Production & Resource Economics**

**Course Code: BAG604**

L	T	P	Credits
1	0	0	1

**Total hours- 15**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 Determine and outline those conditions which give optimum use of resources in the production of crops and livestock.
- 2 Determine the extent to which the existing use of resources deviate from what is considered the optimal use level.
- 3 Analyse the forces which condition production patterns and resource use in relation to the existing opportunities.
- 4 Explain the means and methods adaptable in moving from the existing levels to the optimum use of farm resources.

**Course contents**

**Theory**

**Unit-I**

**4 Hours**

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.

**Unit-II**

**4 Hours**

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.

**UNIT-III**

**4 Hours**

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.

**UNIT-IV**

**3 Hours**

Concepts of resource economics, differences between NRE and agricultural economics, unique properties of natural resources. Positive and negative externalities in agriculture.

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

L	T	P	Credits
0	0	2	1

**Practical Contents**

**30 Hours**

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

**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.*

**Transaction Method:**

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

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

**Course Code: BAG605**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
2	0	0	2

**Total hours- 30**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 To study the Economic Importance of diseases of Horticultural Crops.
- 2 To study the symptoms of diseases of Horticultural Crops.
- 3 Understand the causes of diseases of Horticultural Crops.
- 4 To study and Understand the disease cycle of Horticultural Crops.

**Course contents**

**Theory**

**Unit-I**

**7 Hours**

Symptoms. Etiology, disease cycle and management of major diseases of following crops: Field Crops: Wheat: Rusts, loose smut, karnal bunt, powdery mildew. Alternaria blight and ear cockle; Sugarcane: red rot, smut, wilt and grassy shoot. Sunflower: Sclerotinia stem rot and Alternaria blight:

**Unit-II**

**8 Hours**

Mustard: Alternaria blight, white rust, downy mildew; Gram: wilt and Ascochyta blight; Lentil: Rust and wilt; Cotton: Vascular wilt and black arm; Pea: Downy mildew, powdery mildew and rust.

**Unit-III**

**7 Hours**

Horticultural Crops: Mango: Anthracnose, malformation, powdery mildew; Citrus: canker and gummosis; Grape vine: Downy mildew powdery mildew; Apple: scab and Fire blight; Peach: leaf curl; Cucurbits: downy mildew, powdery mildew and wilt; Onion and garlic: purple blotch and stemphylium blight;

**Unit-IV**

**8 Hours**

Chilli: anthracnose and leaf curl; Turmeric: leaf spot; Coriander; stem gall; Marigold: Botrytis blight; Rose: dieback. powdery mildew; Potato: Early and late blight, Common scab. powdery scab. black scurf and potato mosaic.

**Course Title: Lab- Diseases of Field and Horticultural Crops and their Management-II**

**Course Code: BAG619**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**Practical contents**

**30 Hours**

1. Identification and histo-pathological studies of diseases of wheat
2. Identification and histo-pathological studies of diseases of Sugarcane
3. Identification and histo-pathological studies of diseases of Mustard
4. Identification and histo-pathological studies of diseases of Gram
5. Identification and histo-pathological studies of diseases of Lentil
6. Identification and histo-pathological studies of diseases of Cotton
7. Identification and histo-pathological studies of diseases of Mango
8. Identification and histo-pathological studies of diseases of Grapes
9. Collection and preservation of plantdiseasespecimensforherbarium.
10. Students should submit 50 pressed and well-mountedspecimens.

**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

**Transaction Method:**

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

**Course Title: Post-harvest Management and value addition of fruits and vegetables**  
**Course Code: BAG606**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
1	0	0	1

**Total hours- 15**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 Explain the several practices involved in Post-Harvest Management and Value Addition of Fruits and Vegetables
- 2 Explain the several practices involved in Post-Harvest Management and Value Addition of Fruits and Vegetables.
- 3 Prepare different processed product of fruit and vegetable.
- 4 Know about different standards and guideline, specification for preparation of different processed product from fruits and vegetables.

**Course contents**

**Theory**

**UNIT-I**

**4 Hours**

Importance of post-harvest processing of fruits and vegetables, extent and possible causes of post-harvest losses

**UNIT-II**

**4 Hours**

Pre-harvest factors affecting postharvest quality, maturity, ripening changes occurring during ripening; Respiration and factors affecting respiration rate; Harvesting and field handling; Storage (ZECC, cold storage, CA, MA, and hypobaric);

**UNIT-III**

**4 Hours**

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

**UNIT-IV**

**3 Hours**

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



**Course Title: Lab- Post- harvest Management and value addition of fruits and vegetables**  
**Course Code: BAG620**

L	T	P	Credits
0	0	2	1

### **Practical contents**

**30 Hours**

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

### **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, Ahmedabad, Gujarat. pp 758
4. Rathore, N.S., Mathur, G.K., Chasta, S.S. 2012. *Post-harvest Management and Processing of Fruits and Vegetables*. ICAR, New Delhi.
5. Srivastava, R.P. and Sanjeev Kumar. 2002. *Fruit and Vegetable Preservation: Principles and Practices*. International Book Distribution Company, Lucknow.
6. Giridharilal, G.S., Siddappa and Tondon, G.L. 2007. *Preservation of Fruits and Vegetables*. ICAR, New Delhi.
7. Mitra, S.K. 2005. *Post Harvest Physiology and Storage of Tropical and Subtropical Fruits*. CABI Publishers, Kolkata.

### **Transaction Method:**

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

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

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
1	0	0	1

**Total hours- 15**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 Concept need, principles & components of watershed management Integrated watershed management
- 2 Factors effecting watershed management
- 3 The technology has become an ecessity to improve the food safety and strengthen nation's food security.
- 4 Appropriate techniques for management of different types of degraded & wasteland

**Course Contents**

**UNIT I**

**4 Hours**

WatershedManagement-Conceptneed,principles & components of watershed management, integrated watershed management. Factors effecting watershed management, trun off & soil loss management in a watershed socio-economic concept of watershed.

**UNIT II**

**4 Hours**

Peoples participation in watershed management. Policy approaches & management plan, problems of watershed management.

**UNIT III**

**3 Hours**

Wasteland Management-Definition, concept & types of degraded & wasteland. Distribution & extent of watershed in India & UttarPradesh.

**UNIT IV**

**4 Hours**

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.

**Course Title: Lab- Water shed and wasteland Management**  
**Course Code: BAG621**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**Practical contents:**

**30 Hours**

- 1 Characterization and delineation of model watershed.
- 2 Field demonstration on soil & moisture conservation measures.
- 3 Field demonstration on construction of water harvesting structures.
- 4 Visit to rainfed research station/watershed.

**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.

**Transaction Method:**

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

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

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
2	0	0	2

**Total Hours 30**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 Concept need, principles & components of Horticultural Crops and their Management
- 2 Importance of beneficial insects
- 3 Insect pests and diseases of honeybee
- 4 Identification of major parasitoids and predators commonly used in biological control

**Course contents**

**Theory**

**Unit-I**

**8 Hours**

Types of silkworm, voltinism and biology of silkworm. Mulberry cultivation, mulberry varieties, methods of harvesting and preservation of leaves. Rearing of mulberry silkworm,

**Unit-II**

**7 Hours**

Rearing appliances, mounting and harvesting of cocoons. Pests and diseases of silkworm, management, and methods of disinfection. Importance of beneficial insects.

**Unit-III**

**8 Hours**

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.

**Unit-IV**

**7 Hours**

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

**Course Title: Lab- Beneficial insects and Pests of Horticultural Crops and their Management**  
**Course Code: BAG622**

L	T	P	Credits
0	0	2	1

**Practical Contents**

**30 Hours**

- 1 Identification of different types of damage.
- 2 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.
- 3 Visit to orchards and gardens.
- 4 Mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves.
- 5 Types of silkworm, voltinism and biology and rearing of silkworm and equipment.
- 6 Honey bee species and castes of bees.
- 7 Beekeeping appliances and seasonal management.
- 8 Bee enemies and diseases.
- 9 Bee pasturage, bee foraging and communication.
- 10 Species of lac insect, host plant identification.
- 11 Identification of other important pollinators, weed killers and scavengers.
- 12 Visit to research and training institutions devoted to sericulture, beekeeping., lac culture and natural enemies

**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.

**Transaction Method:**

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

## **ELECTIVE-II**

**Course Title: Protected Cultivation**  
**Course Code: BAG609**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
2	0	0	2

**Total hours- 30**

### **Course Outcomes:**

After completion of course, the students will be able to:

- 1 Explain the fundamentals of climate controlled protected cultivation practices and suitable crops.
- 2 Understand the structural components of the protected cultivation and technologies available.
- 3 Ability to differentiate between polyhouse, greenhouse and nethouse
- 4 Employ the method of production of crops using protected cultivation technologies.

### **Course contents**

#### **Theory**

#### **UNIT-I**

**7 Hours**

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

#### **UNIT-II**

**8 Hours**

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

#### **UNIT-III**

**8 Hours**

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

#### **UNIT-IV**

**7 Hours**

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

**Course Title: Lab- Protected Cultivation**  
**Course Code: BAG623**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**Practical contents**

**30 Hours**

1. Raising of seedlings and saplings under protected conditions.
2. Use of portrays in quality planting material production.
3. Bed preparation and planting of crops for production.
4. Intercultural operations.
5. Soil EC and pH measurement.
6. Regulation of irrigation and fertilizers through drip, fogging and misting.

**Suggested Readings:**

1. *Vilas M. Salone and Ajay K. Sharma.2012. Greenhouse Technology and Applications. Agrotech Publishers. New Delhi.*
2. *S. Prasad and U. Kumar. 2012. Greenhouse Management of Horticultural Crops. Second edition, Agrobios. New Delhi*
3. *K.Radha Manohar and C. Igathinathane, 2013. Greenhouse Technology and Management BS Publications.*
4. *Warade, S.D. 2003. Protected cultivation of Horticulture crops. CAFT (fruits), MPKV, Rahuri. pp 306*
5. *Singh, B. 2005. Protected cultivation of vegetable crops. Kalyani publishers, New Delhi. pp 180*
6. *Dhaliwal, M.S. 2008. Handbook of vegetable crops.Kalyani publishers, Ludhiana. pp 389*

**Transaction Method:**

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

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

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
2	0	0	2

**Total hours 30**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 To study Micro propagation of horticultural crops
- 2 Modern field preparation
- 3 Application of precision farming in horticultural crops
- 4 Learn about Nursery-protrays, micro-irrigation. EC,Ph based fertilizer scheduling,

**Course contents**

**Theory**

**UNIT-I**

**7 Hours**

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

**UNIT-II**

**8 Hours**

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

**UNIT-III**

**8 Hours**

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.

**UNIT-IV**

**7 Hours**

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



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

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**Practical contents**

**30 Hours**

1. Micropropagation of horticultural crops
2. Micro -irrigation .
3. Modern field preparation and planting methods.
4. Protected cultivation:methods and techniques.
5. Practical Types of polyhouses and shadenet houses.
6. Canopy management and high density orcharding.
7. Components of precision farming: Remotesensing, Geographical InformationSystem (GIS), Differential Geo-positioning System (DGPS), Variable Rate applicator(VRA)
8. Application of precision farming in horticultural crops (fruits, vegetables and ornamental crops).
9. Mechanized harvesting of produce.
- 10.Intercultural operations,tools and equipments –identification and application.
11. EC, pH based fertilizer scheduling.
- 12.Visit to hi-tech orchard/nursery.

**Suggested Readings:**

1. *Hartman, H.T., Kester, D.E., Davies, F.T. and Geneve, R.L. 2015.Plantpropagationprinciples 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. *Hi-tech Horticulture- T.A. More, MPKV, Rahuri Balraj Singh,2005: Protected cultivation of vegetable crops. Kalyani publication*
5. *Patil M.T. & Patil, P.V.,2004 Commercial Protected Floriculture.MPKV, Rahuri Commercial floriculture- Prasad & kumar*
6. *Green house operation & Management: Paul V. Nelson*
7. *Green house operation & Management: Paul V. Nelson*
8. *Nelson, Paul V. 2011. Greenhouse operation & Management.*

**Transaction Method:**

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

**Course Title: Weed Management**  
**Course Code: BAG611**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
2	0	0	2

**Total hours- 30**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 To study weed preservation
- 2 To study herbicide and agro-chemicals
- 3 To use spraying equipment's
- 4 To calculate efficiency and weed index

**Course contents**

**Theory**

**UNIT I**

**8 Hours**

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

**UNIT II**

**7 Hours**

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

**UNIT III**

**7 Hours**

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

**UNIT IV**

**8 Hours**

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

**Course Title: Lab- Weed Management**  
**Course Code: BAG625**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**Practical contents**

**30 Hours**

- 1 Techniques of weed preservation.
- 2 Weed identification and their losses study.
- 3 Biology of important weeds.
- 4 Study of herbicide formulations and mixture of herbicide.
- 5 Herbicide and agro- chemicals study.
- 6 Shift of weed flora study in long term experiments.
- 7 Study of methods of herbicide application, spraying equipment's.
- 8 Calculations of herbicide doses.
- 9 Weed control efficiency and weed index.

**Suggested Readings:**

1. *Gupta, O.P. 2007. Weed management Principles and Practices. Publisher: Bio-Green Books. pp.336.*
2. *Gupta, O.P. 2008. Modern Weed Management. Publisher: Bio-Green Books. pp.637.*
3. *Rao, V.S. 2006. Principles of Weed Science. CRC Press; 2nd edition. pp.566*

**Transaction Method:**

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

**Course Title: System Simulation and Agro-advisory**  
**Course Code: BAG612**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
2	0	0	2

**Total hours- 30**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 To study the representation of soil-plant-atmospheric continuum
- 2 To study Modelling techniques for their estimation of crop production
- 3 To know Weather forecasting
- 4 To know regarding Agro-advisory.

**Course contents**

**Theory**

**Unit I**

**7**

**Hours**

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

**Unit II**

**8 Hours**

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

**Unit III**

**8 Hours**

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

**Unit IV**

**7 Hours**

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.

**Course Title: Lab- System Simulation and Agro-advisory**

**Course Code: BAG626**

L	T	P	Credits
0	0	2	1

**Practical contents:**

**30 Hours**

- 1 Preparation of crop weather calendars.
- 2 Preparation of agro-advisories based on weather forecasts using various approaches and synoptic charts.
- 3 Working with statistical and simulation models for crop growth.
- 4 Potential & achievable production: yield forecasting, insect & disease forecasting models.
- 5 Simulation with limitations of water and nutrient management options.
- 6 Sensitivity analysis of varying weather and crop management practices.
- 7 Use of statistical approaches in data analysis and preparation of historical, past and present meteorological data for medium range weather forecast.
- 8 Feed back from farmers about the agro advisory.

**Suggested Readings:**

- 1 Bishnoi, O.P. 2010. *Applied Agroclimatology* by Oxford Book Company, Jaipur, India-302108, and Edition.
- 2 Wallach, D., Makowski, 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 Ramkrishnan, R. and Gehrke, Johannes. 2014. *Database Management Systems* by M.C. Grawhill Education (India) Pvt.Ltd, New Delhi, Indian Edition.
- 5 *Text book of Agril. Meteorology* by M.C. Varshneya, P. Balakrishna Pillai, ICAR New Delhi, 2003.
- 6 *Basic Principles of Agril. Meteorology* by V. Radhakrishna Murthy, BS Publication, Hyderabad, 2002

**Transaction Method:**

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

**Course Title : Agricultural Journalism**  
**Course Code: BAG613**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
2	0	0	2

**Total hours- 30**

### **Course Outcomes**

After completion of course, the students will be able to:

- 1 To develop scope of agricultural journalism
- 2 Associate and apply tools for gathering agricultural information.
- 3 Extend and apply tools and techniques to learn agricultural journalism.
- 4 Evaluate the laws and standards related to journalism.

### **Course contents**

#### **Theory**

##### **Unit I**

**7 Hours**

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

##### **Unit II**

**8 Hours**

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

##### **Unit III**

**7 Hours**

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

##### **Unit IV**

**8 Hours**

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

**Course Title : Lab- Agricultural Journalism**  
**Course Code: BAG627**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**Total hours- 30**

**Practical contents**

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

**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*

**Transaction Method:**

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

**Course Title : Management of Fish cum duck, quail and rabbit farming**  
**Course Code: BAG614**

L	T	P	Credits
2	0	0	2

**Total hours- 30**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 To develop fishery units
- 2 Identification and report formulation of Fishery units
- 3 To study preparation ration for duck.
- 4 To evaluate the Preparation of different products from eggs

**Course contents**

**Theory**

**Unit I**

**8 Hours**

**Fishery:** Definition, common characteristics and position of fish in Animal Kingdom, fishery statistics preparation and management of fish pond, physical and chemical condition of water for fishery, feeds and feeding of fishes, breeding of fish, diseases and enemies of fishes, use of Duck/quality beats on fish feeds.

**Unit II**

**8 Hours**

**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.

**Unit III**

**7 Hours**

**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.

**Unit IV**

**7 Hours**

**Rabbitry:** Introduction, scope and advantages of rabbit farming, breeds, breeding, housing, care and management of young and adult rabbit. feeds and feeding for rabbits, common problems of rabbitry including vaccination schedule, fur and meat production technology.



**Course Title : Lab- Management of Fish cum  
duck, quail and rabbit farming**  
**Course Code: BAG628**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**Total hours- 30**

**Practical Content**

1. Fishery units, visit, Demonstration and report formulation.
2. Different type of fishes, deep water, middle water, and surface water.
3. Evaluation of Duck Egg (candling) and Grading.
4. Vaccination schedule for duck and Quail.
5. Preparation Ration for Duck, Quail. Rabbit and Fish.
6. Preparation of different products from eggs.

**Suggested readings:**

1. *Banerjee, G.C. (2019) A Textbook of Animal Husbandry.*
2. *Sastri, N.S.R., Thomas, C.K. and Singh, R.A. (2009) Livestock Production and Management.*
3. *Singh, R.A.F (2009) Poultry Production.*

**Transaction Method:**

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

**Course Title: General orientation & On campus training by different faculties**  
**Course Code: BAG701**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**Total hours- 30**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 Understanding of the RAWE programme, development of team work.
- 2 Changed attitude towards learning, handling practical work and solving management problems.
- 3 Building confidence as an individual, building competence
- 4 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**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	16	8

**Total hours- 240**

### **Course Outcomes**

After completion of course, the students will be able to:

- 1 Fieldexperience, understanding real-life.
- 2 Understanding the gap between the rural and urban people.
- 3 Ability to plan out strategy.
- 4 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 their 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.

**Course Title: Unit attachement in Uni.  
/College. KVK/Research Station Attachement  
Course Code: BAG703**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	10	5

**Total hours- 150**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 Understanding of the RAWE programme, development of team work.
- 2 Changed attitude towards learning, handling practical work and solving management problems.
- 3 Building confidence as an individual, building competence
- 4 Knowledge of research experimental techniques, disclosure of recent advancement in training and research, Knowledge of collection, compilation, and analysis of experimental data

**RAWECOMPONENT-I**  
**Village Attachment Training Programme**

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

**Course Title: RAWE & AIA: Plant clinic**  
**Course Code: BAG704**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	4	2

**Total hours- 60**

**Course Outcomes:**

- 1 Field experience, understanding real-life.
- 2 Understanding the gap between the rural and urban people
- 3 Ability to planout strategy
- 4 Understanding the mundane work & problems

**Course Title: RAWE & AIA: Agro-Industrial Attachment**

**Course Code: BAG705**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	6	3

**Total hours- 90**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 Field experience, understanding real-life.
- 2 Understanding the gap between the rural and urban people
- 3 Ability to planout strategy
- 4 Understanding the mundane work & problems

**Practical contents**

After the completion of course work, the students of B.Sc. Agri. (Hons.) will receive training underthe 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 Valuea ddition (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 thereport 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**

- Students shall be placed in Agro-and Cottage industries and Commodities Boards for 03weeks.
- Industries include Seed/Sapling production, Pesticides-insecticides, Postharvest-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.



**Course Title: Project Report Preparation, Presentation and Evaluation**

**Course Code: BAG706**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	2	1

**Total hours- 30**

**Practical contents**

During the last week of the training, the students will submit their 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.

**Course Title: Production Technology for Bio agents and Bio fertilizer (non credit)**

**Course Code: BAG801**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	20	10

**Total hours- 300**

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

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 To study the classical biological control scenarios in agricultural pest management.
- 2 To Understand economic importance of different categories of beneficial insects and useful insects in agricultural pest management.
- 3 To Evaluate efficacy of various bio pest control agents, mass production of natural enemies of pest insects.
- 4 To understand manufacturing processes and properties of bioagents and biofertilizers.

**Suggested Readings:**

1. Arshad, A. 2021. *Biopesticides and Bioagents Novel Tools for Pest Management*. Apple Academic Press. pp. 11.
2. Santhakumari, P.and VijaySree. 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

**Transaction Methods:**

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

**Course Title: Seed Production and Technology (non credit)**

**Course Code: BAG802**

L	T	P	Credits
0	0	20	10

**Total hours- 300**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 To introduce the basic principles of quality seed production.
- 2 To learn various conventional and non-conventional Hybrid Seed Production technologies.
- 3 To learn about the concepts and significance of seed quality control.
- 4 To know about various aspects related to seed certification.

**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

**Transaction Method:**

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

**Course Title: Mushroom Cultivation Technology (non credit)**

**Course Code: BAG803**

L	T	P	Credits
0	0	20	10

**Total hours- 300**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 Understanding mushroom, types (edible & poisonous) and mushroom production.
- 2 Learning cultivation of different edible mushrooms.
- 3 Building knowledge on diseases and pests of mushroom and their management. Knowing harvesting and postharvesting processes of mushroom
- 4 Learning value added products preparation from mushroom. Having the prospects of commercial mushroom production.

**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.*

**Transaction Method:**

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

**Course Title: Soil, plant, water and seed testing (non credit)**

**Course Code: BAG804**

L	T	P	Credits
0	0	20	10

**Total hours- 300**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 Ability to demonstrate of tackling practical analytical chemical problems,
- 2 Demonstrate understanding of the basic theory and relevant parameters in analytical chemistry.
- 3 Demonstrate awareness of the limitations of the various methods, experimental chemical analytical results and draw conclusions.
- 4 Discuss chemical analytical aspects relevant for the selection of proper analytical techniques for real-life problem situations.

**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.*

**Transaction Method:**

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

**Course Title: Commercial Beekeeping (non credit)**  
**Course Code: BAG805**

L	T	P	Credits
0	0	20	10

**Total hours- 300**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 Students will be able to findout what needed in order to start beekeeping business
- 2 Understanding of the responsibilities of urban beekeepers.
- 3 Awareness of resources from where to purchase beekeeping equipment and assembling of it.
- 4 Ablility to identify major parts of the honey bee such as the stinger or mandibular parts.

**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.*

**Transaction Method:**

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

**Course Title: Poultry Production Technology (non credit)**

**Course Code: BAG806**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	20	10

**Total hours- 300**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 Get knowledge about egg or broiler production and health management practices in poultry.
- 2 Know about the bio security practices in poultry production.
- 3 Utilize feed and water management strategy in poultry production.
- 4 Acquire knowledge of handling, collecting and storage of table eggs on farm.

**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*.

**Transaction Method:**

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

**Course Title: Commercial Horticulture**  
**Course Code: BAG807**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	1	10

**Total hours- 300**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 Commercial Nursery & Greenhouse Crop Production.
- 2 Detailed study about recent advances in horticulture. Aware with the mechanism of Pest and Disease Management of Horticultural Crops.
- 3 Awareness created about general principles of fruits and vegetables preservation.
- 4 Study the best management practices to enhance economic, environmental, and community sustainability.

**Suggested Readings:**

1. Anonymous, 2001. *Handbook of Horticulture 10<sup>th</sup> 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, 3<sup>rd</sup> 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.

**Transaction Method:**

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



**Course Title: Floriculture and Landscaping (non credit)**

**Course Code: BAG808**

L	T	P	Credits
0	0	20	10

**Total hours- 300**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 Study of importance and export potential in floriculture.
- 2 Practicing various techniques of plant propagation, disease and pest of cut flowers.
- 3 Principles and practices of landscaping e.g.home gardens,small parks etc.
- 4 Raising nursery plants for commercial floriculture.

**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.

**Transaction Method:**

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

**Course Title: Food Processing (non credit)**  
**Course Code: BAG809**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	20	10

**Total hours- 300**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 To supply whole some, safe, nutrition's and acceptable food to consumers throughout the year.
- 2 Generate both urban and rural employment.
- 3 Develop new Value-added products and reduce fruit and vegetable losses.
- 4 How to prevent the fruits from spoilage, decay at the time of harvesting, Transportation and storage.

**Suggested Readings:**

1. James G. Brennan. 2006. *Food Processing Handbook*. Wiley-VCH Verlag GmbH & Co. KGaA, Wein, eim, Germany.
2. Fellows, P. 2000. *Food Processing Technology: Principles and Practice, 2nd Ed.* CRC Press, Boca Raton, FL, USA

**Transaction Method:**

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

**Course Title: Agriculture Waste Management (non credit)**

**Course Code: BAG810**

L	T	P	Credits
0	0	20	10

**Total hours- 300**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 To study the various methods of agricultural waste management for eco-friendly energy and manure production.
- 2 To study methods and biochemistry of composting. Determination of bio-energy potential of agro-waste.
- 3 Various eco-friendly methods for agricultural waste management.
- 4 Nutritive value and energy production potential of agro wastes.

**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.*

**Transaction Method:**

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

**Course Title: Organic Production Technology (non credit)**

**Course Code: BAG811**

L	T	P	Credits
0	0	20	10

**Total hours- 300**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 Understand the concept and the importance of organic farming.
- 2 Understand the maintenance and preserving the existing ecosystems.
- 3 Acquire knowledge of agricultural technology for fertilization of land and composting.
- 4 Get knowledge of agricultural technology for crop protection in organic farming.

**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.Fossel.2007. Organic Farming: Everything You Need to Know. Voyageur Press.pp 380
- 5 Hunsen.Ann Larkin. 2010.Organic farming manual. pp 320

**Transaction Method:**

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

**Course Title: Commercial Sericulture (non credit)**

**Course Code: BAG812**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	20	10

**Total hours- 300**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 Understanding of silkworm rearing, reeling, twisting, propagation skills and diseases.
- 2 Responsible actions of urban sericulturists.
- 3 Learn about the production, planning, extension, costing and management strategy.
- 4 Techniques of silk weaving, dying and printing technology in sericulture.

**Suggested Readings:**

1. Alford, D.V. 2019. *Beneficial Insects*. CRC Press.pp.400
2. Prasad, T.V. *Handbook of Entomology*. New Vishal Publications.Pp.496.

**Transaction Method:**

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

**Course Title: Water Harvesting (non credit)**  
**Course Code: BAG813**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	20	10

**Total hours- 300**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 Understanding of Water Harvesting Principles.
- 2 Design and Implementation Skills
- 3 Learn about the Sustainability and Environmental Impact
- 4 Community Engagement and Stakeholder Collaboration.

**Course Title: Audio- visual aids & agro informatics (non credit)**

**Course Code: BAG814**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
0	0	20	10

**T**

**total hours- 300**

**Course Outcomes:**

After completion of course, the students will be able to:

- 1 Understanding Enhanced Communication Skills
- 2 Proficiency in Agroinformatics Tools.
- 3 Application of Multimedia Techniques.
- 4 Critical Thinking and Problem Solving.