GURU KASHI UNIVERSITY

Bachelor of Science (Agriculture)

Session: 2023-24

UG Studies in Agriculture

Graduate Outcomes of the programme

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.

Program Learning Outcomes

After completing the programme, the learner will be able to:

1. Imbibe coherent knowledge in plant and animal world for developing effective management tools.

2. Develop ability for characterization, identification, and diagnosis of plant health issues.

3. Analyze data of plant and animal production systems for appropriate conclusions.

4. Find relationships between inputs and outputs in agriculture for making profitable and effective decisions.

5. Update regarding different scenarios in agriculture- climate, sustainability in monitoring and geospatial integrating.

6. Integrate different aspects of agriculture for an economic growth of human populations.

7. Develop ability to be competent professionally with ethical responsibility and reasoned decision-making at various levels.

8. Understad legal and ethical issues impacting agricultural organizations.

9. Analyse the impact globalization and diversification in agriculture.

10. Develop Understanding and analyzing existing issues in agriculture and future planning.

Course Structure of B.Sc. Agriculture (Hons.) 4 Year-2023-24

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	Core	2	0	2	3
2	BAG102	Fundamentals of Genetics	Core	2	0	2	3
3	BAG103	Fundamentals of Soil Science	Core	2	0	2	3
4	BAG104	Fundamentals of Horticulture	Core	1	0	2	2
5	BAG105	Rural Sociology & Educational Psychology	Ability Enhancement	1	0	2	2
6	BAG106	Introduction to Forestry	Core	1	0	2	2
7	BAG107	Introductory Animal Husbandry	VAC	2	0	2	3
8	BAG123	Comprehension & Communication Skills in English	Technical Skill	0	0	2	1
9	BAG110	Introductory Biology	VAC	1	0	2	2
10	BAG112	Elementary Mathematics	VAC	2	0	0	2
11	BAG124	Lab. NSS/NCC/Physical Education & Yoga Practices**	Ability Enhancement	0	0	2	1
Total				14	0	20	24
otal hours				34			

Semester: 2nd							
Sr. no.	**Subject Code**	**Subject Name**	**Type of Subject T/P**	**(Hours Per Week)**			**No. of Credits**
				L	**T**	**P**	
1	BAG201	Fundamentals of Crop Physiology	Core	2	0	2	3
2	BAG202	Fundamentals of Plant Biochemistry	Core	2	0	2	3
3	BAG203	Fundamentals of Entomology-I	Core	2	0	2	3
4	BAG204	Fundamentals of Agricultural Economics	Core	2	0	0	2
5	BAG205	Principles of Organic Farming	Core	1	0	2	2
6	BAG206	Fundamentals of Plant Pathology	Core	3	0	2	4
7	BAG207	Production Technology for Vegetables and Spices	Technical Skill	1	0	2	2
8	BAG208	Fundamentals of Agricultural Extension Education	Ability Enhancement	2	0	2	3
9	BAG209	Dairy Processing and Safety Issues	Technical Skill	2	0	2	3
10	BAG210	Human Values & Ethics	Ability Enhancement	1	0	0	1
Total				18		16	26
Total hours				34			

Semester: 3rd

Sr. No.	Subject Code	Subject Name	Type of Subject T/P	(Hours Per Week)			No. of Credits
				L	T	P	
1	BAG301	Crop Production Technology -1 (*Kharif* crops)	Core	1	0	2	2
2	BAG302	Fundamentals of Plant Breeding	Core	2	0	2	3
3	BAG303	Agricultural Microbiology	Core	1	0	2	2
4	BAG304	Agricultural Finance and Co-Operation	Core	2	0	2	3
5	BAG305	Farm Machinery and Power	Technical Skill	2	0	2	3
6	BAG306	Principles of Integrated Disease Management	Core	2	0	2	3
7	BAG308	Statistical Methods	Technical Skill	1	0	2	2
8	BAG309	Fundamental of Soil and Water Conservation	Technical Skill	1	0	2	2
19	BAG310	Dairy Science	Ability Enhancement	1	0	2	2
10	BAG311	Fundamentals of Entomology-II	Core	1	0	2	2
Total				14		20	24
Total hours				34			

Semester: 4th							
Sr. No.	**Subject Code**	**Subject Name**	**Type of Subject T/P**	**(Hours Per Week)**			**No. of Credits**
				L	**T**	**P**	
1	BAG401	Crop Production Technology –II *(Rabi Crops)*	Core	1	0	2	2
2	BAG402	Principles of Seed Technology	Technical Skill	2	0	2	3
3	BAG403	Problematic soils and their Management	Core	2	0	2	3
4	BAG404	Renewable Energy and Green Technology	Core	1	0	2	2
5	BAG405	Production Technology for OrnamentalCrops, MAP and Landscaping	Technical skill	1	0	4	3
6	BAG406	Entrepreneurship Development and Business Communication	Ability enhancement	1	0	2	2
7	BAG407	Introductory Agro-meteorology & Climate Change	Technical skill	1	0	2	2
8	BAG408	Agri- Informatics	Technical skill	1	0	2	2
9	BAG409	Poultry Production & Management	Ability enhancement	2	0	2	3
10	BAG420	Environmental Studies & Disaster Management	Ability enhancement	1	0	0	1
Total				13		20	23
Total hours				33			

Semester: 5th							
Sr. No.	**Subject Code**	**Subject Name**	**Type of Subject T/P**	**(Hours Per Week)**			**No. of Credits**
				L	**T**	**P**	
1	BAG501	Rainfed and Dry land Agriculture	Core	1	0	2	2
2	BAG502	Crop Improvement-1 (*Kharif* crops)	Core	1	0	2	2
3	BAG503	Pests of Crops and Stored Grain and their Management	Core	2	0	2	3
4	BAG504	Agricultural Marketing, Trade & Prices	Technical skill	2	0	2	3
5	BAG505	Protected Cultivation and Secondary Agriculture	Technical skill	2	0	2	3
6	BAG506	Diseases of Field and Horticultural Crops andtheir Management-I	Core	2	0	2	3
7	BAG507	Production Technology for Fruit and Plantation Crops	Core	1	0	2	2
8	BAG510	Principles of Food Science & Nutrition	Core	2	0	0	2
9	BAG511	Geo-informatics and Nanotechnology	Technical skill	1	0	2	2
		Elective-I (one course)					
10	BAG512	Agri-business Management	Technical skill	2	0	2	3
11	BAG513	Agrochemical	Technical skill	2	0	2	3
12	BAG514	Commercial Plant Breeding	Technical skill	2	0	2	3
13	BAG515	Landscaping	Technical skill	2	0	2	3
14	BAG516	Food Safety and standards	Technical skill	2	0	2	3
15	BAG517	Bio pesticides & bio-chemicals	Technical skill	2	0	2	3
	Total			16		18	25
	Total hours			34			

Semester: 6th							
Sr. No.	**Subject Code**	**Subject Name**	**Type of Subject T/P or both**	**(Hours Per Week)**			**No. of Credits**
				L	**T**	**P**	
1	BAG601	Farming System, Precision Farming & Sustainable Agriculture	Core	1	0	2	2
2	BAG602	Crop Improvement-II (*Rabi* crops)	Core	1	0	2	2
3	BAG603	Manures, Fertilizers and Soil Fertility Management	Core	2	0	2	3
4	BAG604	Farm Management, Production & Resource Economics	Technical skill	1	0	2	2
5	BAG605	Diseases of Field and Horticultural Crops andtheir Management-II	Core	2	0	2	3
6	BAG606	Post-harvest Management and ValueAddition of Fruits and Vegetables	Ability enhancement	1	0	2	2
7	BAG607	Watershed and Wasteland Management	Technical skill	1	0	2	2
8	BAG608	Beneficial insects and Pest of HorticulturalCrops and their Management	Core	2	0	2	3
9	BAG629	Intellectual Property Rights	Ability enhancement	1	0	0	1
		Elective-II					
10	BAG609	Protected Cultivation	Technical skill	2	0	2	3
11	BAG610	Hi-tech. Horticulture	Technical skill	2	0	2	3
12	BAG611	Weed Management	Technical skill	2	0	2	3
13	BAG612	System Simulation & Agro-advisory Credits	Technical skill	2	0	2	3
14	BAG613	Agriculture Journalism	Technical skill	2	0	2	3
15	BAG614	Composition cum Duck/(and) Quail/(and) Rabbit culture	Technical skill	2	0	2	3
16		Educational Tour**	Technical skill	0	0	4 (Non gradial)	2
Total				14	0	18	23
Total hours				32			

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

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

RAWE Component -II

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

Programme name: B.Sc. Agriculture (Hons.) 4 year							
Programme structure: BAG							
8th Semester							
Modules for Skill Development and Entrepreneurship: A student has to register 20 credits opting for two modules of (0+10) credits each (total 20 credits) from the package of modules in the VIII sem.							
Sr. No.	**New Course Code**	**Title of the module**	**Type of Course**	**L**	**T**	**P**	**Credits**
1	BAG801	Production Technology for Bioagents and Biofertilizer	Technical skill	0	0	20	10
2	BAG802	Seed Production and Technology	Technical skill	0	0	20	10
3	BAG803	Mushroom Cultivation Technology	Technical skill	0	0	20	10
4	BAG804	Soil, Plant, Water and Seed Testing	Technical skill	0	0	20	10
5	BAG805	Commercial Beekeeping	Technical skill	0	0	20	10
6	BAG806	Poultry Production Technology	Technical skill	0	0	20	10
7	BAG807	Commercial Horticulture	Technical skill	0	0	20	10
8	BAG808	Floriculture and Landscaping	Technical skill	0	0	20	10
9	BAG809	Food Processing	Technical skill	0	0	20	10
10	BAG810	Agriculture Waste Management	Technical skill	0	0	20	10
11	BAG811	Organic Production Technology	Technical skill	0	0	20	10
12	BAG812	Commercial Sericulture	Technical skill	0	0	20	10

Programme name: B.Sc. Agriculture (Hons.) 4 year		
Programme structure: BAG		
Evaluation of Experiential Learning Programme		
Sr. No.	**Parameters**	**Max. Marks**
1	Project Planning and Writing	10
2	Presentation	10
3	Regularity	10
4	Monthly Assessment	10
5	Output delivery	10
6	Technical Skill Development	10
7	Entrepreneurship Skills	10
8	Business networking skills	10
9	Report Writing Skills	10
10	Final Presentation	10
	Total	**100**

Programme name: B.Sc. Agriculture (Hons.) 4 year		
Programme structure: BAG		
Discipline wise credits		
Sr. No.	**Group**	**Credits**
1	Agronomy and Agrometeorology	23
2	Genetics & Plant Breeding	16
3	Soil Science	12
4	Entomology	15
5	Agricultural Economics	17
6	Agricultural Engineering	9
7	Plant Pathology	16
8	Horticulture and Forestry	30
9	Agricultural Extension & Human Values and Ethics	6
10	Biology, Crop physiology, Agricultural microbiology & Environment	8
11	Statistics, Computer Application and I.P.R.	7
12	Animal Husbandry and Dairying	15
13	English & Agriculture Journalism	5
14	NSS/NCC/Physical Education & Yoga Practices**	1
15	Educational Tour**	2
	Total	182
	RAWE	20
	ELP	20
	Grand Total	**182+20+20=222**
	** Non-gradial courses	

Evaluation Criteria for Theory Courses

A. Continuous Assessment: [25 Marks]

Continuous Assessment 1: [10 Marks]

Continuous Assessment 2: [10 Marks]

Continuous Assessment 3: [05 Marks]

B. Mid Semester Test: [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

L	T	P	Credits
2	0	2	3

Total hours-60

Course Outcomes: After completion of this course, the learner will be able to:

1 Attain knowledge about tillage practices and nutrient use efficiency
2 Acquire knowledge about soil-water and plant relationship.
3 Carryout about weed control strategies and herbicide resistance

4 Design the 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.

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

L	T	P	Credits
2	0	2	3

Total hours-60

Course Outcomes: After completion of this course, the learner will be able to:

1 Learn about the Basic structure and functions of DNA and chromosomes, basics of the molecular processes of DNA replication, transcription and translation.
2 Acquaint with laws of inheritance for qualitative and quantitative traits.
3 Understand the basic biochemical pathways of Carbohydrate, lipids, proteins and other essential secondary metabolites.
4 Compile knowledge about 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 pseudoalieles.

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.

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

L	T	P	Credits
2	0	2	3

Total hours-60

Course Outcomes: After completion of this course, the learner will be able to:

1 Acquire knowledge about soil formationandclassification.
2 Understand the physical and chemical properties of soil.
3 Get familiar with the soil moisture dynamics in soil, understand the thermal properties, gaseous exchange of soil.
4 Compile 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 formingrocks and minerals; weathering, processes and factors of soil formation; Soil Profile, components ofsoil; Soilphysical 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 plantgrowth, 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 andmicroorganisms, their beneficial and harmful effects; Soil pollution - behavior of pesticides andinorganiccontaminants, prevention and mitigation of soil pollution.

Practical Contents

30 Hours

1. Study of soil profile in field.
2. Study of soil sampling tools,
3. Collection of representative soil sample, itsprocessing and storage.

4. Study of soil forming rocks and minerals.
5. Determination of soil density,moisturecontentandporosity.
6. Determinationofsoiltextureby feelandBouyoucos
7. Methods.Determination of soil pH and electrical conductivity.
8. Determination of cation exchange capacity ofsoil
9. Studyof soilmap.Determination of soil colour.
10. Estimation of organic matter content ofsoil.
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

L	T	P	Credits
1	0	2	2

Total hours- 45

Course Outcomes: After completion of this course, the learner 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 Recognize 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.

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. Layoutand 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. Visitsto commercial nurseries/orchard.

Suggested Readings:

1. *Chadda K.L 2001. Handbook of Horticulture, ICAR Publication, pp.1031.*
2. *KunteY.N andYawalkar 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	2	2

Total hours- 45

Course Outcomes: After completion of this course, the learner will be able to:

1 Understand the meaning, scope and importance of sociology and psychology of rural areas.
2 Extend the education in rural areas to bridge gap between rural and urban societies.
3 Be acquainted with the scope and importance of education psychology in agricultural extension.
4 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.

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	2	2

Total hours- 45

Course Outcomes: After completion of this course, the learner will be able to:

1 Get familiar with concept of agro-forestry.
2 Recognize and prepare Models and design of agro forestry along with crops.
3 Be acquainted with Merits of different type of agro forestry system.
4 Create models of 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.

Practical contents

30 Hours

1 Identification of tree-species.
2 Diametermeasurementsusingcalipersandtape,diametermeasurements of forked,

buttressed, fluted and leaning trees.

3 Height measurement of standing treesby 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. AgroforestyPrinciple 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: IntroductoryAnimalHusbandry
Course Code: BAG107

L	T	P	Credits
1	0	2	2

Total hours- 45

Course Outcomes: After completion of this course, the learner 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

Thoery

Unit I **4 Hours**

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

Unit II **4 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 **4 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 **4 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 Enterotoximea, Vaccination schedule.

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: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 communicatin.
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 andgeneral 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 inginitiative, 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. pp128*
2. *Balasubrmanyam 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: Introductory Biology
Course Code: BAG110

L	T	P	Credits
1	0	2	2

Total hours- 45

Course Outcomes: After completion of this course, the learner will be able to:

1 Understanding to the living world and diversityandcharacteristics oflife
2 To know about Cell and cell division
3 To know seed and seed germination.
4 To know aboutRole ofanimalsinagriculture

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 flowing plants. Seed and seed germination.

Unit-IV **4 Hours**

Plant systematic- viz; Brassicaccac, Fabaccac and Poaceae. Role of animals in agriculture.

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 - Brassicaccae. 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: **Elementary Mathematics**

Course Code: **BAG112**

L	T	P	Credits
2	0	0	2

Total hours- 30

Course Outcomes: After completion of this course, the learner will be able to:

1 Demonstrate an understanding of the foundations and historyof 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 Implement 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 linea nd Intercept form of equation of line.

Unit II **Hours- 7**

Normal form of equation offline, General form of equation offline, Point of intersection of two straight lines, Angles between two straight lines, Parallel lines, Perpendicular lines, Angle of bisectors between two lines. Area of triangle and quadrilateral. Circle: Equation of circle whose centre and radius is known,General equation of a circle, Equation of circle passing through three given points, Equation of circlewhose diameters is line joining two points $(x_j. y_j)$ & $(x^2. y^2)$> 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, en,sinx & cosx from first principle, Derivatives of sum, difference, product and quotient of two functions, Differentiation of functions of functions (Simple problem base donit), Logarithmic differentiation (Simple problem base donit), Differentiation by substitution method and simple problems based onit. Differentiation of InverseTrigonometric functions. Maxima and Minima of the functions of the formy, 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 simplewell known curves (simple problems based onit). Matrices and Determinants: Definition of Matrices, Addition, Subtraction, Multiplication, Transpose and Inverse upto 3rd order. Properties of determinants up to 3rd order and their evaluation.

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: 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 this course, the learner will be able to:

1 Understand the principles of life time fitness and will incorporate fitness activities in to a healthy and active life style.
2 Acquire knowledge and demonstrate skills to safely engage in physical activity.
3 Get acquaint with 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 conductfor 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 thesocial change.

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

Social harmony and national integration: Indian history andculture, 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 aspart 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 thes kills, 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 thes kills, correction of skills, involvement in game situation.
8. Teaching of difficult skills of Kabaddi–demonstration, practice of the skills, correction of skills, involvementin 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 Bookof 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

L	T	P	Credits
2	0	2	3

Total hours- 60

Course Outcomes: After completion of this course, the learner will be able to:

1 Understand various plant metabolic processes, namely photosynthesis, respiration and translocation of metabolites.
2 Acquire knowledge of Plant growth and development, hormones and growth regulators, physiology of seed and fruit development in plants
3 Get familiar with plant water relationships, processes of osmosis and plasmolysis
4 Analyse 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_3, C_4 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.

Practical contens:

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_2.
5. Moll's half-leaf experiment.
6. To study production of CO_2 during respiration.

7. Study tissue test for mineral nutrients, estimation of relative water content.
8. Measurement of photosynthetic CO_2 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

L	T	P	Credits
2	0	2	3

Total hours- 60

Course Outcomes: After completion of this course, the learner will be able to:

1 Understand the structure and classification of bio-molecules for life origin vij., Carbohydrates, lipids and proteins etc.
2 Examine the synthesis and metabolism of Carbohydrates, lipids, proteins etc.
3 Catalogue the role of enzyme, vitamins and hormones in metabolism of Carbohydrates, lipids, proteins etc.
4 Demonstrate the 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, TCAcycle, Glyoxylate cycle, Electron transport chain. Metabolism of lipids: Beta oxidation, Biosynthesis offattyacids. Nucleotides: DNA, RNA.

Unit-III **Hours- 7**

Concepts and applications of plant biotechnology; Scope, organ culture, embryo culture, cell suspension culture, callus culture, another culture, pollen culture and ovuleculture 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 usein crop improvement; cryo-preservation.

Practical Ccontents:

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	2	3

Total hours- 60

Course Outcomes: After completion of this course, the learner will be able to:

1 Study the various aspects of insect ecology.To study the various abiotic and biotic factors.

2 Understand the effect of abiotic and biotic factors on insect ecology and agro-ecosystem.

3 Examine various factor for the out/weakofinsect-pest and pest surveillance and pest forecasting.

4 Develop understanding about classification of insects, the identification of pests and the various aspects of integrated pest management(IDM)

Course Contents

Unit-I **Hours- 7**

Theory Classification of phylum Arthropoda upto classes. Relationship of class Insecta with other classes of Arthropoda. Morphology: Structure and functions of insect cuticle and moulting. Body segmentation. Structure of Head, thorax and abdomen. Structure and modifications of insect antennae, mouth parts, legs, wing venation, modifications and wing coupling apparatus.

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, secretary (Endocrine) and reproductive systems in insects. Types of reproduction in insects.

Unit-III **Hours- 7**

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

Unit-IV **Hours- 7**

Hemiptera: Pentatomidae, Coreidae, Cimicidae, Pyrrhocoridae. Lygaeidae, Cicadellidae, Delphacidae, Aphididae, Coccidae, Lophophidac, Alcurodidac, Pseudococcidae; Neuroptera: Chrysopidae; Lepidoptera: Pieridae, Papiloinidae, Noctuidae, Sphingidae, Pyralidae, Gelechiidae, Arctiidae, Saturnidae, Bombycidae; Coleoptera: Coccinellidae, Chrysomelidae, Cerambycidae, Curculionidac, Bruchidae, Scarabaeidae; Hymenoptera: Tenthridinidae, Apidae. Trichogrammatidae, ichneumonidae, Braconidae, Chalcididae; Diptera: Cecidomyiidae, Tachinidae, Agromyziidae, Culicidae, Muscidae, Tephritidae.

Practical Contents

Hours- 30

1 Methods of collection and preservation of insects including immature stages
2 External features ofgrasshopper/blister beetle
3 Types of insect antennae, mouthparts and legs
4 Wing venation, types ofwings andwing coupling apparatus
5 Types of insect larvae andpupae
6 Dissection of digestivesystem 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 5th edition. Cambridge University Press. pp. 959.*
2. *Prasad, T.V. 2019. Handbook of Entomology. New Vishal Publications.Pp.496.*
3. *Nayar, K. K. Anathkrishanan T.N. and David, B.V. 2009. General and Applied Entomology. Tata McGraw-Hill.pp.589.*

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

L	T	P	Credits
2	0	0	2

Total hours- 30

Course Outcomes: After completion of this course, the learner 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. Explicate 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

L	T	P	Credits
1	0	2	2

Total hours- 45

Course Outcomes: After completion of this course, the learner will be able to:

1 Learn the principles and practices of organic farming for sustainable crop production.
2 Develop an alternative strategy over chemical farming which would be guideline for the working of biological process in natural ecosystem.
3 Make responsible use of energy and natural resources such as organic matter in soil for the increase of soil fertility.
4 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.

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	2	4

Total hours- 75

Course Outcomes: After completion of this course, the learner will be able to:

1 Get familiar with the basic vocabulary of plant pathology and plant disease management.

2 Introduce and illustrate the major groups of organisms that cause plant diseases.

3 Enhance understanding of scientific research, especially a sitapplies to the science of plant pathology and the study of microorganisms.

4 Provide a frame work 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. diseases 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, sub-divisions. 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.

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	2	2

Total hours- 45

CourseOutcomes: After completion of this course, the learner 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.

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

L	T	P	Credits
2	0	2	3

Total hours- 60

Course Outcomes: After completion of this course, the learner 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 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.

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 forDevelopment. 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

L	T	P	Credits

Course Code: BAG209

2	0	2	3

Total hours- 60

CourseOutcomes: After completion of this course, the learner will be able to:

1 Know about breeding and inheritance of characters for hishee milk production, the knowledge regarding milk perception mechanism, composition and factors affecting milk yield.
2 Acquire knowledge 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 Gather information about nutrition, feeding and management of milch animals,
4 Create models 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, Yoghart, 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.

Practical Content

Hours- 30

1 Demostraction 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

L	T	P	Credits

Course Code: BAG210

1	0	0	1

Total hours- 15

Course Outcomes: After completion of this course, the learner will be able to:

1 Understand the role of deliberation and debate in framing such values
2 Acquire the ideas of values, ethics, and morality in a multicultural context
3 Discuss the idea of moral relativism and the challenges it poses to universal values
4 Get acquaint with 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	2	3

Total hours- 45

Course Outcomes: After completion of this course, the learner will be able to:

1 Introduce more efficient production systems for major cereals and pulses, fulfilling the demands of commercial firms, farmers, industrials and consumers.
2 Enhance the quality & productivity of crop production, implement forage crop trials: fodder maize, sorghum, bajra.
3 Acquire new technologies in crop production: fertigation & new varieties maintain tight contact with farmers.
4 Develop technology for 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, pearlmillet and fingermillet.

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; foragecrops-sorghum,cowpea,clusterbeanand Napier.

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 centresr elated 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

L	T	P	Credits
2	0	2	3

Total hours- 60

Course Outcomes: After completion of this course, the learner will be able to:

1 Understand about Biotechnological tools DNA markers and marker assisted selection.
2 Acquire knowledge about the Esmasculation, selfing, pollination, and hybrid seed production.
3 Get acquint with Breeding procedures under different methods of of reproduction systems.
4 Develop concepts 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, aclimatization 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 breedingmethods and uses, breeding for important biotic and abiotic stresses, Biotechnological tools DNA markers and marker assisted selection.

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 Brreding.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

L	T	P	Credits
1	0	2	2

Total hours- 45

Course Outcomes: After completion of this course, the learner will be able to:

1 Use the basic apparatus and equipment used in microbiology laboratory.
2 Carryout basics aseptic procedures used in the handling and study of microorganisms.
3 Isolate or extract and culture microorganisms.
4 Gain knowledge of 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 micros for compost preparation & vermin compost. Soil organisms: macro and microorganisms, their beneficial and harmful effects.

Pracital 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 isolationof 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

L	T	P	Credits
2	0	2	3

Total hours- 60

CourseOutcomes: After completion of this course, the learner will be able to:

1 Impart knowledge on agricultural finance, its nature and scope, understand time value of money and its types in present view.
2 Get familiar with history of agriculture finance in India, know various rules, regulations, functions ofvarious banks.
3 Study about commercial and co-operative banks in detail.
4 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 histoiy 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

Practical content

Hours- 30

1. Determination of most profitable level of capital use.
2. Optimum allocation of limited amount ofcapital among different enterprises.
3. Analysis of progress andperformance of cooperatives usingpublisheddata.
4. Analysis of progress andperformance 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 requirementoffarmbusiness-Acasestudy.
7. Preparation and analys is of balance sheet-Acasestudy.
8. Preparation and analysis of income statement - A case study.
9. Appraisal of a loan proposal - A casestudy.
10. Techno-economic parameters for preparation of projects.
11. Preparation of Bankable projects forvariousagricultural productsand its valueaddedproducts.

Suggested Readings:

1. *Ghosal, S.N. 1966. Agricultural Financing in India. Asia Publishing House, Bombay.pp.452*
2. *Johl, S.S. and Moore, C.V. 1970. Essentials of Farm Financial Management. Today and Tomorrow's Printers and Publishers, New Delhi.pp.586*
3. *Hamptron, J. J. 1983. Financial Decision Making: Concepts, Problems and Cases. Prentice Hall of India, New Delhi.pp.384*

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

L	T	P	Credits
2	0	2	3

Total hours- 60

Course Outcomes: After completion of this course, the learner will be able to:

1 Understand the different sources of farm power and their importance
2 Acquire knowledge about construction and functioning of compression ignition and spark ignition engines
3 Develop the cooling systems and lubrication systems
4 Get acquaint with 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.

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

L	T	P	Credits
2	0	2	3

Total hours- 60

Course Outcomes: After completion of this course, the learner 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 Create knowledge 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.

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: Statistical Methods
Course Code: BAG308

L	T	P	Credits
1	0	2	2

Total hours- 45

Course Outcomes: After completion of this course, the learner will be able to:

1 Analyse the data data for making agro-productin based plannings
2 Understand refinement of production and proection technologies for new agro-chemicals used in agriculture.
3 Develop ideas for making data banking in future.
4 Create land utilization and irrigation models.

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.

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 (GroupedData).
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 ofGoodness of Fit.
12. Chi-Square test of Independence of Attributes for 2x2 contingency table.
13. Analysisof Variance One Way Classification.
14. Analysis of Variance Two Way Classification. Selection of random sampleusing 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. *Snedocor, G. W. and. Cochran, W. G .1967: Statistical Methods 8th edition. Iowa State University Press. pp. 524.*
3. *Cochran, G.W. and, Cox, G.W. 1986: Experimental Designs 2nd 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: Fundametal of Soil and Water Conservation
Course Code: BAG309

L	T	P	Credits
1	0	2	2

Total hours- 45

Course Outcomes: After completion of this course, the learner will be able to:

1 Get knowledge about practices of soil and water conservation.
2 Know about the erosion control principles
3 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.

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

L	T	P	Credits
1	0	2	3

Total hours- 45

Course Outcomes: After completion of this course, the learner will be able to:

1 Understand breeding and inheritance of characters for milk production, the knowledge regarding milk perception mechanism, composition and factors affecting milk yield.
2 Acquire knowledgeable about Legal standards of milk. Factors affecting the quality and quantity of milk.
3 Get familiar with nutrition, Milk and its secretion, Transportation and milk distribution, pricing policy of milk.
4 Develop 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.

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

L	T	P	Credits
1	0	2	3

Total hours- 60

Course Outcomes: After completion of this course, the learner will be able to:

1 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 Know about various factor for the outbreak of insect-pest, to study pest surveillance and pest forecasting.
4 Get acquaint with 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. Recentmethods 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

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

Course Code: BAG401

L	T	P	Credits
1	0	2	2

Total hours- 60

Course Outcomes: After completion of this course, the learner will be able to:

1 Develop more efficient production systems for major field crops: wheat, gram, rapeseed & mustard, oat, barley.
2 Fulfil the demands of commercial firms, farmers, industrials and consumers.
3 Enhance the quality & productivity of crop production.
4 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.

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.

Course Title: Fundamentals of Seed Technology
Course Code: BAG402

L	T	P	Credits
2	0	2	3

Total hours- 60

Course Outcomes: After completion of this course, the learner will be able to:

1 Study the technologies for seed production of pure-line, synthetics, composites and hybrid varieties.
2 Understand parameters of quality control to maintain genetic purity of breeder, foundation and certified seeds
3 Get familiar with grow-out tests for various field crops desired quality of seeds.
4 Create knowledge about genetic purity during seed production, Seed quality

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 (2nd 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

L	T	P	Credits
2	0	2	3

Total hours- 60

Course outcome: After completion of this course, the learner will be able to:

1 Understand the concept of problem soils
2 Comprehend the diagnosis and reclamation of salt affected soils, acquire knowledge about the problems of salt affected soil
3 Be aware of the problems, diagnosis, and reclamation of acidic soils, understand thecriteriafor quality o firrigation water.
4 Acquire knowledge about the rational use of poor quality irrigation water.

Course contens

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 sofsoils. Land capability and classification, Land suitability classification.Problematic soils under different Agro-ecosystems.

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. Visitof 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, Ne*

w De3lhi. 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: Renewable Energy and Green Technology
Course Code: BAG404

L	T	P	Credits
1	0	2	2

Total hours- 45

Course Outcomes: After completion of this course, the learner will be able to:

1 Understand various energy resources and their application.
2 Know about production of bio fuel by alternative methods.
3 Get acquaint with production of bio gas and synthetic gas.
4 Develop models of 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.

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. *Quaschning, 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

L	T	P	Credits
1	0	4	3

Total hours- 75

Course Outcomes: After completion of this course, the learner 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 Create post harvest handling of cut and looseflowersextraction of essentials 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, lilium 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.

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. Texbook of Floriculture and Landscaping. 2017. NIPA. pp 446.*
3. *Singh, R. and Singh, B. K. 2020. Introductory Ornamental Horticulture and Landscape gardening. Daya Publication. pp 229.*
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	2	2

Total hours- 45

Course Outcomes: After completion of this course, the learner will be able to:

1 Acquire knowledge about entrepreneurship development in business environment of Indian economy.
2 Understand the overview of Indian systems in decision making of entrepreneurs.
3 Get familiar with how to globalize entrepreneur business environment.
4 Develop skilss of 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.

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 AgriculturalExtension, Aman Publishing House, Meerut.pp:1-456*
4. *Sagar Mondal and Ray, G.L.2009. Text Book of Entrepreneurship and RuralDevelopment. 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	2	2

Total hours- 45

CourseOutcomes: After completion of this course, the learner will be able to:

1 Acquire knowledge about weather for betterment of crops.
2 Understand earth atmosphere phenomena.
3 Measure the weather element by different instructs.
4 Study the 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, temperatureinversion, 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 ofcondensation, formation of dew, fog. mist, frost, cloud; Precipitation. process of precipitation. typesof 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.

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 albe do and sunshine duration,computation of Radiation Intensity using ASS.
6 Measurement of maximum and minimum air temperatures.itstabulation, trend and variation analysis.
7 Measurement of soil temperature and computation of soilheatflux.
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 windrose Measurement
12 Tabulation and analysis of rain.
13 Measurement of open pan evaporation and evapotranspiration.
14 Computation of PETand AET.

Suggested Readings:

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

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

L	T	P	Credits
1	0	2	2

Total hours- 45

Course Outcomes: After completion of this course, the learner will be able to:

1 Making the students understand & learn basics of Computer.
2 Operate a Computer by knowing all parts & instructions of Computer.
3 Make use of Computer inourdayto dayLife.
4 Learn about DOS and its commands.

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.

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 & Mnagement

L	T	P	Credits

Course Code: BAG409

2	0	2	3

Total hours- 60

Course Outcomes: After completion of this course, the learner will be able to:

1 Know about poultry industry in India and production and marketing statistics of eggs and chicken
2 Get familiar about different animal breeds and their genesis. To understand the reproductive behaviour and parturition process and factors affecting fertility.
3 Acquire knowledge about nutrition, feeding and management of chicks
4 Develop management skills, 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.

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: Environmental Studies & Disaster Management	**L**	**T**	**P**	**Credits**

Course Code: BAG420

1	0	0	1

Total hours- 15

Course Outcomes: After completion of this course, the learner will be able to:

1 Study the natural resources, ecosystem environmental pollution: cause and effects various environments.
2 Gather knowledge 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 sports 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-basedorganizations and media.

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: Rainfed and dryland Agriculture
Course Code: BAG501

L	T	P	Credits
1	0	2	2

Total hours- 45

CourseOutcomes: After completion of this course, the learner will be able to:

1 Study soil and climatic conditions prevalent in rainfed areas
2 Know about water deficiton physic-morphological characteristics of the plants
3 Enhance the quality & productivity of crop production.
4 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.

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

L	T	P	Credits
1	0	2	3

Total Hours-40

CourseOutcomes: After completion of this course, the learner will be able to:

1 Understand cytogenetics relationship among the species of a genera of kharif crops
2 Learn about controlled pollination techniques for hybridization in crop plants.
3 Acquire knowledge about estimation of Heterosis and inbreeding and their impacts on reproduction of kharifcrops
4 Imbibe ideas of 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 Pear[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.

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	2	3

Total Hours-60

Course Outcomes:

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

1 Differentiate insects and pests alongwith examples.
2 Study different insect pests of field crops, horticultural and vegetable crop.
3 Gather information about Diagnosing symptoms of damage by major insect pests of crops
4 Study the role of various biotic and abiotic factors of environmenton 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 partel1us. Atherigona variasoccata, Scirpophaga excerpatalis. 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 bzgutulla 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.

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

L	T	P	Credits
2	0	0	2

Total Hours-30

Course Outcomes: After completion of this course, the learner will be able to:

1 Plan and designing criteria of agricultural marketing.
2 Acquire knowledge regarding choice of nature and determinants of demand and supply of farm products.
3 Get the idea about the types and importance of agencies involved in agricultural marketing
4 Develop theories about 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.

Practical

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

L	T	P	Credits
2	0	2	3

Total Hours- 60

Course Outcomes: After completion of this course, the learner will be able to:

1 Plan and designing criteria of different protected structures like greenhouse, shrdevets etc.
2 Gather knowledge regarding choice of crops suitable for green house cultivation.
3 Get familiar with idea about the need and requirement of growing crops under protected structure and scope of protected cultivation.
4 Attain 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,passivesolargreenhouse, 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.

Practical contents

30 Hours

1. Study of different type of green houses based on shape.
2. Determine the rate of air exchange in anactive summer winter cooling system.
3. Determination of drying rate of agricultural products insidegreenhouse.

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. Fieldvisittoseedprocessingplant.

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, NewDelhi. pp 180*
3. *Dhaliwal, M.S. 2008. Handbook of vegetable crops.. Kalyani publishers, Ludhiana. pp 389*

Course Title: Diseases Of Field and Horticultural Crops and their Management-I
Course Code: BAG506

L	T	P	Credits
2	0	2	3

Total Hours-60

Course Outcomes: After completion of this course, the learner will be able to:

1 Understand the economic Importance of diseases of Field & HorticulturalCrops.
2 Study the symptoms of diseases of Field & Horticultural Crops.
3 Comprehend the causes of diseases of Field & HorticulturalCrops.
4 Develop understanding 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 sterilitymosaic; 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.

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 plantdiseasedspecimensforherbarium.
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

L	T	P	Credits
1	0	2	2

Total Hours-45

Course Outcomes: After completion of this course, the learner 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.

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 10th 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, 3rd 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: Principles of Food Science and Nutrition
Course Code: BAG510

L	T	P	Credits
2	0	0	2

Total Hours-60

Course Outcomes: After completion of this course, the learner will be able to:

1 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.

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

L	T	P	Credits
1	0	2	2

Total hours-45

Course Outcomes: After completion of this course, the learner will be able to:

1 Acquent 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.

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 nanoparticies in agriculture.

10. Projects formulation and execution related to precision farming anf 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 Nanotechnolgy 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 presnetaion, 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

L	T	P	Credits
2	0	2	2

Total Hours-60

Course Outcomes: After completion of this course, the learner will be able to:

1 Understand about the business management in agriculture.
2 Classify the levels of industries and types of agrobased industries.
3 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, polices 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.

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

L	T	P	Credits
2	0	2	3

Total Hours-60

Course Outcomes: After completion of this course, the learner will be able to:

1 Study an agrochemicals and role in agriculture
2 Associate and apply tools and techniques of touse fertilizers.
3 Extend and applytoolsandtechniquesfor sustainableagriculture.
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 agriculturemanagement of agrochemicals for sustainable agriculture. Herbicides-Major classes, propertiesand 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- Dithiocarbamatescharacteristics, preparation and use of Zineb and maneb.Systemic fungicides- Benomyl. carbox in, oxycarboxin, Metalaxyl, Carbendazim.characteristics and use. Introduction and classification of insecticides: inorganic and organicinsecticides Organochlorine, Organophosphates, Carbamates, Synthetic pyrethroidsNeonicotinoids. Hiorationals.

UNIT-III **7 Hours**

Insecticide Act and rules, Insecticides banned, withdrawn andrestricted use, Fate of insecticides in soil & plant. IGRs Biopesticides, Reduced riskinsecticides, Botanicals, plant and animal systemic insecticides their characteristics and uses.Fertilizers and their importance. Nitrogenous fertilizers: Feed stocks and Manufacturing ofammonium 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 ofpotassium 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 NPKcomplexes. Fertilizer control order. Fertilizer logistics and marketing. Plant bio-pesticides forecological agriculture, Bio-insect repellent.

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 kin market Estimation of nitrogen in Urea.
7. Estimation of water soluble P2O5 and citrate soluble P2O5 in single superphosphate.
8. Estimation of potassium in-Muraite of Potash/ Sulphate of Potash by flame photometer.
9. Determination of copper content in copper oxychloridc. Determination of sulphurcontent 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

L	T	P	Credits
2	0	2	3

Total Hours-60

CourseOutcomes: After completion of this course, the learner will be able to:

1 Understand the modes of plant reproduction
2 Associate and apply tools and techniques of optimizing hybrid.
3 Extend and applytools forhybrid 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, pearlmillet, castor, sunflower.cotton pigeonpea.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: haploidinducer, tissue culturetechniques and biotechnological tools. IPR issues in commercial plantbreeding: 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 selfand cross pollinated crops.

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 KalyaniPublication 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 companyLimited, 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

L	T	P	Credits
2	0	2	3

Total Hours-60

CourseOutcomes: After completion of this course, the learner will be able to:

1 Understand 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 ornments, 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. CADapplication.

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 andimplements 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

L	T	P	Credits
2	0	2	3

Total hours- 60

Course Outcomes: After completion of this course, the learner will be able to:

1 Understand 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.

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 Societyof 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	2	3

Total Hours- 60

Course Outcomes: After completion of this course, the learner will be able to:

1 Understand isolation and purification of important bio-pesticides
2 Identify of entomopathogenic entities in field condition
3 Imbibe knowledge about Mass production of AM inoculants.
4 Evaluate the Isolation and purification of Azospirillum

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

Practical contents

30 Hours

1 Isolation and purification of important biopcsticides: Trichoderma Pseudomonas, Bacillus, Metarlozium 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 Azaspirillum , 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

L	T	P	Credits
1	0	2	2

Total hours-45

Course Outcomes: After completion of this course, the learner 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.

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 -2 (Rabi crops)
Course Code: BAG602

L	T	P	Credits
1	0	2	2

Total hours-45

Course Outcomes: After completion of this course, the learner will be able to:

1 Understand cytogenetics relationship among the species of a genera of kharif crops
2 Study Controlled pollination techniques for hybridization in crop plants.
3 Estimate Heterosis and inbreeding and their impacts on reproduction of kharifcrops
4 Develop models of 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 modem 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.

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 gerrnplasm and segregating populations by different methods like pedigree, bulk and single seed decent 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

L	T	P	Credits
2	0	2	3

Total hours- 60

Course Outcomes: After completion of this course, the learner will be able to:

1 Study about various organic sources of fertilizers
2 Understand manufacturing processes and properties of chemical fertilizers.
3 Acquire knowledge about fertilizer control order and fertilizer storage.
4 Develop 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 majornitrogenous, phosphatic, potassic fertilizers, secondary & micronutrient fertilizers, Complexfertilizers,nano fertilizers Soil amendments, FertilizerStorage,Fertilizer ControlOrder.

UNIT III **8 Hours**

History of soil fertility and plant nutrition.criteria of essentiality. role, deficiency and toxicitysymptoms of essential plant nutrients, Mechanisms of nutrient transport to plants, factors affectingnutrient 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 ofdifferent 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 ofapplicationunder rainfed and irrigated conditions.

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 insoils.

5 Estimation of soil extractable P in soils.

6 Estimation of exchangeable K; Ca and Mg in soils.

7 Estimation of soil extracts able S in soils.

8 Estimation of DTPA extracts able 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	2	2

Total hours- 60

Course Outcomes: After completion of this course, the learner will be able to:

1 Determine and outline those conditions which give optimum use of resources in the production of crops and livestock.
2 Establish the extent towhichtheexistinguse ofresourcesdeviatefrom whatis 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 andmethods adaptablein 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 productionfunction in decision-making on a farm.

Unit-II **4 Hours**

factor-product, factor-factor and product relationship, law ofequi-marginal/or principles of opportunity cost and law of comparative advantage. Meaning andconcept of cost, types of costs and their interrelationship, importance of cost in managing farmbusiness and estimation of gross farm income, net farm income, family labour income and farmbusinessincome.

UNIT-III **4 Hours**

Farmbusiness analysis,Meaning and importanceof farmplanningandbudgeting,appraisal of farm resources, selection of crops and livestock's enterprises. Concept of risk anduncertainty occurs in agriculture production, nature and sources of risks and its managementstrategies**,** Crop/livestock/machinery insurance – weather based crop insurance, features,determinants of compensation.

UNIT-IV **3 Hours**

Concepts of resource economics, differences between NRE andagricultural economics, unique properties of natural resources.Positive and negative externalities inagriculture.

Practical Contents

30 Hours

1. Preparation of farm layout.

2. Determinationofcostoffencingof afarm.
3.Computationofdepreciationcost of farm assets.
4.Application of equi-marginal returns/opportunity cost principle in allocation offarm 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 enterprisecombination.
8.Application of cost principles including CACP concepts in the estimation of cost ofcrop and livestock enterprises.
9. Preparation of farm plan and budget, farm records and accounts andprofit&lossaccounts.
10. Collectionand analysisofdataon variousresourcesinIndia.

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

L	T	P	Credits
2	0	2	3

Total hours- 60

Course Outcomes: After completion of this course, the learner will be able to:

1 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 Acquire information 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.

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 plantdiseasedspecimensforherbarium.
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

L	T	P	Credits
1	0	2	2

Total hours- 60

Course Outcomes: After completion of this course, the learner will be able to:

1 Understand 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**

Importanceofpost-harvestprocessingoffruitsandvegetables,extentandpossible causesofpost-harvest losses

UNIT-II **4 Hours**

Pre-harvest factors affecting postharvest quality, maturity, ripening achangesoccurring during ripening; Respiration and factors affecting respiration rate; Harvesting and fieldhandling; 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**

Tomatoproducts- Concepts and Standards; Drying/ Dehydration of fruits and vegetables – Concept andmethods,osmoticdrying.Canning— Conceptsand Standards,packagingof products.

Practical contents

30 Hours

1. Applications of different types of packaging, containers for shelf life extension.
2. Effect oftemperature on shelf life and quality of produce.

3. Demonstration of chilling and freezinginjuryinvegetablesandfruits.
4. Extractionandpreservationofpulpsandjuices.
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, cannedproducts.
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, Ahemdabad, 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

L	T	P	Credits
1	0	2	2

Total hours- 45

Course Outcomes: After completion of this course, the learner will be able to:

1 Understand the concept need, principles & components of watershed management Integrated watershed management
2 Acquire knowledge about factors effecting watershed management
3 Access the technology has become an ecessity to improve the food safety and strengthen nation's food security.
4 Develop 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.

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 Pest of Horticultural Crops and their Management
Course Code: BAG608

L	T	P	Credits
2	0	2	3

Course Outcomes: After completion of this course, the learner will be able to:

1 Acquire the concept need, principles & components of horticultural Crops and their Management
2 Understand the importance of beneficial insects.
3 Get familiar with Insect pests and diseases of honey bee.
4 Identify of major parasitoids and predators commonly used in biological control

Course contents

Theory

Unit-I **4 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 **4 Hours**

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

Unit-III **4 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 anddiseases of honey bee.

Unit-IV **4 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.

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.

Course Title: Intellectual Property Rights
Course Code: BAG629

L	T	P	Credits
1	0	0	1

Total Hours-15

Course Outcomes: After completion of this course, the learner will be able to:

1 Understand the objectives of the IPR is to make the students aware of their rights for the protection of their invention done in their project work.
2 Get acquaint with registration in our country and foreign countries of their invention, designs and thesis or theory written by the students during their project work and for this theymust have knowledge of patents, copy right, trademarks, designs and informationTechnologyAct.
3 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 farmers 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 Intellectal Property Rights,*

Transaction Method:

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

ELECTIVE-2

Course Title: Protected Cultivation
Course Code: BAG609

L	T	P	Credits
2	0	2	3

Total hours- 60

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, lilium, 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.

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

L	T	P	Credits
2	0	2	3

Course Outcomes: After completion of this course, the learner will be able to:

1 Study Micro propagation of horticultural crops
2 Acquire knowledge about modern field preparation
3 Apply for 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, canop management, high density orcharding. Components of precision fanning:

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 tohi-techorchard/nursery.

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. *Hi-tech Horticulture- T.A.More, MPKV,Rahuri Balraj Singh,2005: Protected cultivation of vegetable crops.Kalyani publication*
8. *Patil M.T. & Patil,P.V.,2004 Commercial Protected Floriculture.MPKV,Rahuri Commercial floriculture- Prasad & kumar*
9. *Green house operation & Management: Paul V. Nelson*
10. *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

L	T	P	Credits
2	0	2	3

Total hours- 60

Course Outcomes: After completion of this course, the learner will be able to:

1 Understand methods of weed preservation
2 Acquire knowledge about herbicide and agro-chemicals
3 Understand about spraying equipment's
4 Evaluate and 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.

Pracical 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

L	T	P	Credits
2	0	2	3

Total hours- 60

Course Outcomes: After completion of this course, the learner will be able to:

1 Understand the representation of soil-plant-atmospheric continuum
2 Enhance knowledge about modelling techniques for their estimation of crop production
3 Develop models to weather forecasting
4 Create Agro-advisory regarding weather.

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.

Practical contents:

30 Hours

1 Preparation of crop weather calendars.
2 Preparation of ago-advisories based on weather forecastsing 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., Makowshi, D. and Jones,J. W. 2006. Working with Dynamic crop models, Evaluation, Analysis, Parametrization and Applications by Elsevier Oxford U.K, First edition.*
3 *Sahoo, D.D. and Solanki, R.M. 2008. Remote Sensing Techniques in Agriculture by Agrobios (India), Jodhpur.*
4 *Ramkrishnan, R.andGehrke, 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. Meteoorology 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

L	T	P	Credits
2	0	2	3

Total hours- 60

Course Outcomes: After completion of this course, the learner will be able to:

1 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 outing.

Practical contents

30 Hours

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 forDevelopment. 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 : Composition cum Duck/ (and) Quail/ (and) Rabbit culture

Course Code: BAG614

L	T	P	Credits
2	0	2	3

Total hours- 60

Course Outcomes: After completion of this course, the learner will be able to:

1 Understand about fishery units
2 Identify and report formulation of Fishery units
3 Acquire knowledge about preparation for duck.
4 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 stastics 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 rabit. feeds and feeding for rabbits, common problems of rabbitry including vaccination schedule, fur and meat production technology.

Practical Content

30 Hours

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

L	T	P	Credits
0	0	2	1

Total hours- 30

Course Outcomes: After completion of this course, the learner will be able to:

1 Understand of the RAWE programme, development of team work.
2 Change the attitude towards learning, handling practical work and solving management problems.
3 Build confidence as an individual, building competence
4 Develop 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

L	T	P	Credits
0	0	16	8

Total hours- 240

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 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 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.

Course Title: Unit attachement in Uni. /College. KVK/Research Station Attachement
Course Code: BAG703

L	T	P	Credits
0	0	10	5

Total hours- 150

Course Outcomes: After completion of this course, the learner will be able to:

1 Understand of the RAWE programme, development of team work.
2 Change attitude towards learning, handling practical work and solving management problems.
3 Build confidence as an individual, building competence
4 Develop research experimental techniques, disclosure of recent advancement in training and research, Knowledge of collection, compilation, and analysis of experimental data

RAWEComponent-I
VillageAttachmentTrainingProgramme

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

Course Title: RAWE & AIA: Plant clinic
Course Code: BAG704

L	T	P	Credits
0	0	4	2

Total hours- 60

Course Outcomes: After completion of this course, the learner will be able to:

1 Understand the Field experience, understanding real-life.

2 Study the gap between the rural and urban people

3 Get acquaint with ability to planout strategy

4 Find the mundane work & problems

Course Title: RAWE & AIA: Agro-Industrial Attachment
Course Code: BAG705

L	T	P	Credits
0	0	6	3

Total hours- 90

Course Outcomes: After completion of this course, the learner will be able to:

1 Understand the Field experience, understanding real-life.

2 Study the gap between the rural and urban people

3 Get acquaint with ability to planout strategy

4 Find 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

L	T	P	Credits
0	0	2	1

Total hours- 30

Practcal contents

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.

Course Title: Production Technology for Bio agents and Bio fertilizer (non credit)

Course Code: BAG801

L	T	P	Credits
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 this course, the learner will be able to:

Course Title: Seed Production and Technology (non credit)

L	T	P	Credits

Course Title: Seed Production and Technology (non credit)
Course Code: BAG802

L	T	P	Credits
0	0	20	10

Course Code: BAG802

0	0	20	10

1 Study the classical biological control scenarios in agricultural pest management.
2 Understand economic importance of different categories of beneficial insects and useful insects in agricultural pest management.
3 Evaluate efficacy of various bio pest control agents, mass production of natural enemies of pest insects.
4 Develop 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.

Total hours- 300

Course Outcomes: After completion of this course, the learner will be able to:

1 Introduce the basic principles of quality seed production.
2 Understand various conventional and non-conventional Hybrid Seed Production technologies.
3 Get familiar with the concepts and significance of seed quality control.
4 Create knowledge 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 this course, the learner will be able to:

1 Understand mushroom, types (edible & poisonous) and mushroom production.
2 Learn about cultivation of different edible mushrooms.
3 Create knowledge on diseases and pests of mushroom and their management. Knowing harvesting and postharvesting processes of mushroom
4 Acquire knowledge about 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 this course, the learner 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 Evaluate 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: Seed Production and Technology (non credit)
Course Code: BAG802

L	T	P	Credits
0	0	20	10

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

L	T	P	Credits
0	0	20	10

Total hours- 300

Course Outcomes: After completion of this course, the learner 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

L	T	P	Credits
0	0	1	10

Total hours- 300

Course Outcomes: After completion of this course, the learner 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 10th edition. ICAR publication, Indian Council of Agricultural Research, New Delhi. pp.1069.*
2. *Bose, T. K., Mitra, S. K. and Sanyal, D. 2001. Fruits: Tropical and Subtropical, Volume 1, 3rd edition. Naya Udyog. pp.721.*
3. *Katyal, S.L, Krishnamurthi, S. and Singh, Sham.1963. Fruit Culture in India. India Republic of India. Indian Council of Agricultural Research, New Delhi. pp.451.*
4. *Singh, Ranjit. 1969. Fruits.National Book Trust, India. pp.213.*

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

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.

Course Outcomes: After completion of this course, the learner will be able to:

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

L	T	P	Credits
0	0	20	10

Total hours- 300

Course Outcomes: After completion of this course, the learner 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, Weinh, 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 this course, the learner 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 soild 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)	**L**	**T**	**P**	**Credits**
Course Code: BAG811	0	0	20	10

Total hours- 300

Course Outcomes: After completion of this course, the learner 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

L	T	P	Credits
0	0	20	10

Total hours- 300

Course Outcomes: After completion of this course, the learner 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.