GURU KASHI UNIVERSITY

Bachelor of Science (Hons.) in Agriculture

Session: 2025-26

Faculty of Agriculture

Graduate Attributes of the Programme: -

Type of learning outcomes	**The Learning Outcomes Descriptors**
Graduates should be able to demonstrate the acquisition of:	
Learning outcomes that are specific to disciplinary/interdisciplinary areas of learning	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.
Generic learning outcomes	Scholarly responsible citizens and professionals equipped with critical and ethical thinking regarding global food, natural resource management and sustainable agriculture. Leadership readiness with good entrepreneurial and communication skills to share knowledge and ideas in communities.

Programme Learning outcomes: A Postgraduate Certificate is awarded to students who have demonstrated the achievement of the outcomes located at level 6.0:

Element of the Descriptor	**Programme learning outcomes relating to Undergraduate Certificate**
The graduates should be able to demonstrate the acquisition of:	
Knowledge and understanding	Comprehend the principles and methodologies used in Agriculture.
General, technical and professional skills required to perform and accomplish tasks	Possess deep insight of various streams of agriculture i.e. Agronomy, Plant Pathology, Entomology, Horticulture etc.
Application of knowledge and skills	Familiarize with various methods/ techniques/ instruments used in various streams of Agriculture to acquaint with production, harvesting and processing techniques in agriculture.
Generic learning outcomes	Updation regarding different scenarios in agriculture-climate, sustainability in monitoring and geospatial integrating.
Constitutional, humanistic, ethical, and	Development of understating for eco-friendly management of diseases for sustainable agriculture.

moral values	
Employability and job-ready skills, and entrepreneurship skills and capabilities/qualities and mindset	Developing ability to be competent professionally with ethical responsibility and reasoned decision-making at various levels.
Credit requirements	A total of 166-174 credit hours is recommended for the four years of UG programmes.
Entry requirements	The eligibility for entry into the UG programmes will be + 2 Science; the students will be admitted as per norms of ICAR/ SAUs. The 1st year of the programme will be having the foundation, introductory and skill enhancement courses. The 2nd year will be having basic core courses with some more options for skill enhancement. The 3rd year of the programme will have advanced core courses. The 4th year programme will emphasize more on the specialisation and elective courses as well as advanced skill enhancement through internship and research.

First year										
I Semester										
S. No	Subject Code	**Course Title**	**Subject Type**	**L**	**T**	**P**	**Credit Hours**	**Int.**	**Ext.**	**Total Marks**
1	DKSA100	Induction cum Foundation course (Deekshaarambh)	AEC	0	0	2	1 (NG) Non-gradial	S/US	S/US	S/US
2	SEC101	SEC-I (Mushroom production technology)	SEC	0	0	4	2	15	35	50
3	SEC102	SEC-II (Beneficial insect farming)	SEC	0	0	4	2	15	35	50
4	ENG101	Communication Skills	AEC	1	0	0	1	10	15	25
5	ENG102	Communication Skills Lab	AEC	0	0	2	1	10	15	25
6	AGRON101	Fundamentals of Agronomy	Core	2	0	0	2	15	35	50
7	AGRON102	Fundamentals of Agronomy Lab	Core	0	0	2	1	10	15	25
8	SOIL101	Fundamentals of Soil Science	Core	2	0	0	2	15	35	50
9	SOIL102	Fundamentals of Soil Science Lab	Core	0	0	2	1	10	15	25
10	HORT101	Fundamentals of Horticulture	Core	2	0	0	2	15	35	50
11	HORT102	Fundamentals of Horticulture Lab	Core	0	0	2	1	10	15	25
12	AGRON103	Farming based livelihood systems	Core	2	0	0	2	15	35	50
13	AGRON104	Farming based livelihood systems Lab	Core	0	0	2	1	10	15	25
14	SOC101	Rural Sociology and Educational Psychology	AEC	2	0	0	2	15	35	50
15	NSS101	National Service Scheme(NSS-I) Lab	AEC (Select any one)	0	0	2	1	10	15	25
	NCC101	National Cadet Corps(NCC-I) Lab								
16	BIO101	Introductory Biology	Remidial (need based, select any one)	1	0	0	1	10	15	25
	MTH101	Elementary Mathematics								
							22+1=23			

First year										
II Semester										
S. No	Subject Code	**Course Title**	**Subject Type**	**L**	**T**	**P**	**Credit Hours**	**Int.**	**Ext.**	**Total Marks**
1	SEC151	SEC-III (Horticulture nursery management)	SEC	0	0	2	2	15	35	50
2	SEC152	SEC-IV (Seed production technology)	SEC	0	0	2	2	15	35	50
3	EXT151	Personality Development	AEC	1	0	0	1	10	15	25
4	EXT152	Personality Development Lab	AEC	0	0	2	1	10	15	25
5	AGM151	Environmental Studies and Disaster Management	Core	2	0	0	2	15	35	50
6	AGM152	Environmental Studies and Disaster Management Lab	Core	0	0	2	1	10	15	25
7	SOIL151	Soil Fertility Management	Core	2	0	0	2	15	35	50
8	SOIL152	Soil Fertility Management Lab	Core	0	0	2	1	10	15	25
9	ENTO151	Fundamentals of Entomology	Core	2	0	0	2	15	35	50
10	ENTO152	Fundamentals of Entomology Lab	Core	0	0	2	1	10	15	25
11	LPM151	Livestock and Poultry Management	Core	1	0	0	1	10	15	25
12	LPM152	Livestock and Poultry Management Lab	Core	0	0	2	1	10	15	25
13	PATH151	Fundamentals of Plant Pathology	Core	2	0	0	2	15	35	50
14	PATH152	Fundamentals of Plant Pathology Lab	Core	0	0	2	1	10	15	25
15	NCC151 / NSS151	NCC-II Lab / NSS-II Lab	AEC (Select any one)	0	0	2	1	10	15	25
							21			
16	EXIT151	Internship					4 Credits 10 Weeks (For exit)	S/US	S/US	S/US

Second year										
III Semester										
S. No	Subject Code	**Course Title**	**Subject Type**	**L**	**T**	**P**	**Credit Hours**	**Int.**	**Ext.**	**Total Marks**
1	SEC200	SEC-V(Biofertlizer and biopesticide production)	SEC	0	0	2	2	15	35	50
2	ECON200	Entrepreneurship Development and Business Communication	Core	2	0	0	2	15	35	50
3	ECON201	Entrepreneurship Development and Business Communication Lab	Core	0	0	2	1	10	15	25
4	PED200	Physical Education, First Aid and Yoga Practices Lab	AEC	0	0	4	2	15	35	50
5	GPB200	Principles of Genetics	Core	2	0	0	2	15	35	50
6	GPB201	Principles of Genetics Lab	Core	0	0	2	1	10	15	25
7	AGRON200	Crop Production Technology-I (Kharif crops)	Core	2	0	0	2	15	35	50
8	AGRON201	Crop Production Technology-I (Kharif crops) Lab	Core	0	0	2	1	10	15	25
9	HORT200	Production Technology of Fruit and Plantation Crops	Core	1	0	0	1	10	15	25
10	HORT201	Production Technology of Fruit and Plantation Crops Lab	Core	0	0	2	1	10	15	25
11	EXT200	Fundamentals of Extension Education	Core	1	0	0	1	10	15	25
12	EXT201	Fundamentals of Extension Education Lab	Core	0	0	2	1	10	15	25
13	NEM200	Fundamentals of Nematology	Core	1	0	0	1	10	15	25
14	NEM201	Fundamentals of Nematology Lab	Core	0	0	2	1	10	15	25
15	AGRON202	Principles and Practices of Natural Farming	Core	1	0	0	1	10	15	25
16	AGRON203	Principles and Practices of Natural Farming Lab	Core	0	0	2	1	10	15	25
			Core				21			

Second year										
IV Semester										
S. No	**Subject Code**	**Course Title**	**Subject Type**	**L**	**T**	**P**	**Credit Hours**	**Int.**	**Ext.**	**Total Marks**
1	SEC251	Plantation crops production and management	SEC	0	0	2	2	15	35	50
2	INF251	Agri informatics	Core	2	0	0	2	15	35	50
3	INF252	Agri informatics Lab	Core	0	0	2	1	10	15	25
4	HORT251	Production Technology of Vegetables and Spices	Core	1	0	0	1	10	15	25
5	HORT252	Production Technology of Vegetables and Spices Lab	Core	0	0	2	1	10	15	25
6	PATH251	Diseases of Field Crops & their Management	Core	2	0	0	2	15	35	50
7	PATH252	Diseases of Field Crops & their Management Lab	Core	0	0	2	1	10	15	25
8	ECON251	Principles of Agricultural Economics and Farm Management	Core	2	0	0	2	15	35	50
9	AGRON251	Crop Production Technology-II (Rabi Crops)	Core	2	0	0	2	15	35	50
10	AGRON252	Crop Production Technology-II (Rabi Crops) Lab	Core	0	0	2	1	10	15	25
11	AGE251	Farm Machinery and Power	Core	1	0	0	1	10	15	25
12	AGE262	Farm Machinery and Power Lab	Core	0	0	2	1	10	15	25
13	AGRON251	Water Management	Core	1	0	0	1	10	15	25
14	AGRON252	Water Management Lab	Core	0	0	2	1	10	15	25
15	SOIL251	Problematic Soils and their management	Core	1	0	0	1	10	15	25
16	SOIL252	Problematic Soils and their management Lab	Core	0	0	2	1	10	15	25
17	GPB251	Basics of Plant Breeding	Core	2	0	0	2	15	35	50
18	GPB252	Basics of Plant Breeding Lab	Core	0	0	2	1	10	15	25
							24			
19	EXIT251	Internship					10 Weeks (For exit)	S/US	S/US	S/US

Third year										
V Semester										
S. No	**Subject Code**	**Course Title**	**Subject Type**	**L**	**T**	**P**	**Credit Hours**	**Int.**	**Ext.**	**Total Marks**
1	ECON300	Agricultural Marketing and Trade	Core	2	0	0	2	15	35	50
2	ECON301	Agricultural Marketing and Trade Lab	Core	0	0	2	1	10	15	25
3	AGRON300	Introduction to Agro-meteorology	Core	1	0	0	1	10	15	25
4	AGRON301	Introduction to Agro-meteorology Lab	Core	0	0	2	1	10	15	25
5	BIO300	Fundamentals of Crop Physiology	Core	2	0	0	2	15	35	50
6	BIO301	Fundamentals of Crop Physiology Lab	Core	0	0	2	1	10	15	25
7	ENTO300	Pest management in Field Crops and Stored Grains	Core	2	0	0	2	15	35	50
8	ENTO301	Pest management in Field Crops and Stored Grains Lab	Core	0	0	2	1	10	15	25
9	PATH300	Diseases of Horticultural Crops & their Management	Core	2	0	0	2	15	35	50
10	PATH301	Diseases of Horticultural Crops & their Management Lab	Core	0	0	2	1	10	15	25
11	GPB300	Crop Improvement-I	Core	1	0	0	1	10	15	25
12	GPB301	Crop Improvement-I Lab	Core	0	0	2	1	10	15	25
13	AGRON300	Weed Management	Core	1	0	0	1	10	15	25
14	AGRON301	Weed Management Lab	Core	0	0	2	1	10	15	25
15	HORT300	Ornamental Crops, MAPs and Landscaping	Core	1	0	0	1	10	15	25
16	HORT301	Ornamental Crops, MAPs and Landscaping Lab	Core	0	0	2	1	10	15	25
11	BIO302	Essentials of Plant Biochemistry	Core	1	0	0	1	10	15	25
12	BIO303	Essentials of Plant Biochemistry Lab	Core	0	0	2	1	10	15	25
							22			

Third year										
VI Semester										
S. No	**Subject Code**	**Course Title**	**Subject Type**	**L**	**T**	**P**	**Credit Hours**	**Int.**	**Ext.**	**Total Marks**
1	BIO351	Fundamentals of Agri Biotechnology	Core	2	0	0	2	15	35	50
2	BIO352	Fundamentals of Agri Biotechnology Lab	Core	0	0	2	1	10	15	25
3	STAT351	Basic and Applied Agril. Statistics	Core	2	0	0	2	15	35	50
4	STAT352	Basic and Applied Agril. Statistics Lab	Core	0	0	2	1	10	15	25
5	GPB351	Crop Improvement-II	Core	1	0	0	1	10	15	25
6	GPB352	Crop Improvement-II Lab	Core	0	0	2	1	10	15	25
7	AGE351	Renewable energy in Agriculture and Allied Sector	Core	1	0	0	1	10	15	25
8	AGE352	Renewable energy in Agriculture and Allied Sector Lab	Core	0	0	2	1	10	15	25
9	AGRON351	Dry land agriculture/Rainfed agriculture and watershed management	Core	1	0	0	1	10	15	25
10	AGRON352	Dry land agriculture/Rainfed agriculture and watershed management Lab	Core	0	0	2	1	10	15	25
11	AGRON353	Introductory Agroforestry	Core	2	0	0	2	15	35	50
12	AGRON354	Introductory Agroforestry Lab	Core	0	0	2	1	10	15	25
13	PATH351	Agricultural Microbiology and Phyto-remediation	Core	1	0	0	1	10	15	25
14	PATH352	Agricultural Microbiology and Phyto-remediation Lab	Core	0	0	2	1	10	15	25
15	ECON351	Agricultural Finance & Cooperation	Core	2	0	0	2	15	35	50
16	ECON352	Agricultural Finance & Cooperation Lab	Core	0	0	2	1	10	15	25
17	GPB353	Fundamentals of Seed Science & Technology	Core	1	0	0	1	10	15	25
18	GPB354	Fundamentals of Seed Science & Technology Lab	Core	0	0	2	1	10	15	25
19	ENTO351	Pest of horticultural crops and their Management	Core	1	0	0	1	10	15	25
20	ENTO352	Pest of horticultural crops and their Management Lab	Core	0	0	2	1	10	15	25
							24			

Fourth year										
VII Semester										
	1	5 Elective Courses (major or minor) each of 4 (3+1) credits for B.Sc (Hons) Agriculture degree								
S. No	**Subject Code**	**Course Title**	**Subject Type**	**L**	**T**	**P**	**Credit Hours**	**Int.**	**Ext.**	**Total Marks**
Crop production (Combination I)										
1	CPD400	System Simulation and Agroadvisory	Core	3	0	0	3	25	50	75
2	CPD401	System Simulation and Agroadvisory Lab	Core	0	0	2	1	10	15	25
3	CPD402	Geoinformatics and Remote Sensing, precision farming	Core	3	0	0	3	25	50	75
4	CPD403	Geoinformatics and Remote Sensing, precision farming Lab	Core	0	0	2	1	10	15	25
5	CPD404	Principles and Practices of Organic Farming/Conservation Agriculture	Core	3	0	0	3	25	50	75
6	CPD405	Principles and Practices of Organic Farming/Conservation Agriculture Lab	Core	0	0	2	1	10	15	25
7	CPD406	Production of Commercial Crops	Core	3	0	0	3	25	50	75
8	CPD407	Production of Commercial Crops Lab	Core	0	0	2	1	10	15	25
9	CPD408	Analytical Techniques in Soil, Plant, Fertilizer and water Analysis	Core	3	0	0	3	25	50	75
10	CPD409	Analytical Techniques in Soil, Plant, Fertilizer and water Analysis Lab	Core	0	0	2	1	10	15	25
Horticulture (Combination II)										
1	HORT400	Landscaping	Core	3	0	0	3	25	50	75
2	HORT401	Landscaping Lab	Core	0	0	2	1	10	15	25
3	HORT402	Hi-tech Horticulture	Core	3	0	0	3	25	50	75
4	HORT403	Hi-tech Horticulture Lab	Core	0	0	2	1	10	15	25
5	HORT404	Protected cultivation	Core	3	0	0	3	25	50	75
6	HORT405	Protected cultivation Lab	Core	0	0	2	1	10	15	25

7	HORT406	Post Harvest Technology and ValueAddition	Core	3	0	0	3	25	50	75
8	HORT407	Post Harvest Technology and ValueAddition Lab	Core	0	0	2	1	10	15	25
9	HORT408	Food Science and Nutrition	Core	3	0	0	3	25	50	75
10	HORT409	Food Science and Nutrition Lab	Core	0	0	2	1	10	15	25
Crop protection (Combination III)										
1	CPT400	Bioformulation and Nanoformulation	Core	3	0	0	3	25	50	75
2	CPT401	Bioformulation and Nanoformulation Lab	Core	0	0	2	1	10	15	25
3	CPT402	Biopesticides and Biofertilizers	Core	3	0	0	3	25	50	75
4	CPT403	Biopesticides and Biofertilizers Lab	Core	0	0	2	1	10	15	25
5	CPT404	Agrochemicals	Core	3	0	0	3	25	50	75
6	CPT405	Agrochemicals Lab	Core	0	0	2	1	10	15	25
7	CPT406	Pesticides and Plant Protection Equipments	Core	3	0	0	3	25	50	75
8	CPT407	Pesticides and Plant Protection Equipments Lab	Core	0	0	2	1	10	15	25
9	CPT408	Beneficial insects	Core	3	0	0	3	25	50	75
10	CPT409	Beneficial insects Lab	Core	0	0	2	1	10	15	25
Genetics and Plant Breeding (Combination IV)										
1	GPB400	Biotechnology of Crop Improvement	Core	3	0	0	3	25	50	75
2	GPB401	Biotechnology of Crop Improvement Lab	Core	0	0	2	1	10	15	25
3	GPB402	Commercial Plant breeding	Core	3	0	0	3	25	50	75
4	GPB403	Commercial Plant breeding Lab	Core	0	0	2	1	10	15	25
5	GPB404	Micro-propagation Technologies	Core	3	0	0	3	25	50	75
6	GPB405	Micro-propagation Technologies Lab	Core	0	0	2	1	10	15	25
7	GPB406	Commercial Seed Production	Core	3	0	0	3	25	50	75
8	GPB407	Commercial Seed Production Lab	Core	0	0	2	1	10	15	25
9	GPB408	Climate Resilient Agriculture	Core	3	0	0	3	25	50	75
10	GPB409	Climate Resilient Agriculture Lab	Core	0	0	2	1	10	15	25
Agribusiness Management (Combination V)										
1	ABM400	Agri-Business Management	Core	3	0	0	3	25	50	75
2	ABM401	Agri-Business Management Lab	Core	0	0	2	1	10	15	25
3	ABM402	Management of natural resources	Core	3	0	0	3	25	50	75
4	ABM403	Management of natural resources Lab	Core	0	0	2	1	10	15	25

5	ABM404	Agricultural Journalism	Core	3	0	0	3	25	50	75
6	ABM405	Agricultural Journalism Lab	Core	0	0	2	1	10	15	25
7	ABM406	Farm Management, Production and Resource Economics	Core	3	0	0	3	25	50	75
8	ABM407	Farm Management, Production and Resource Economics Lab	Core	0	0	2	1	10	15	25
9	ABM408	Financial and Project Management	Core	3	0	0	3	25	50	75
10	ABM409	Financial and Project Management Lab	Core	0	0	2	1	10	15	25

VIII Semester										
S. No	**Subject Code**	**Course Title**	**Subject Type**	**L**	**T**	**P**	**Credit Hours**	**Int.**	**Ext.**	**Total Marks**
1	RAWE451	For student opting 4year B.Sc. (Hons.) degree Student READY (RAWE / Experiantial Learning / Hands on Training / Industrial Attachment /Project Work / Internship	ELP	_	_	_	20	125	375	500
			Total				**20**			
		***Online courses**					10			
							Grand Total			

RAWE Component-I
Village Attachment Training Programme

Sr. No.	Activity	Duration
1	Orientation and Survey of Village	1 Week
2	Agronomical Interventions	1 Week
3	Plant Protection Interventions	1 Week
4	Soil Improvement Interventions (Soil sampling and testing)	1 Week
5	Fruit and Vegetable production interventions	1 Week
6	Food Processing and Storage interventions	1 Week
7	Animal Production Interventions	1 Week
8	Extension and Transfer of Technology activities	1 Week
9.	Crop improvement & seed production interventions	1 Week
10	Agro-economics & analysis interventions	1 Week

RAWE Component -II

Sr. No.	Activity
1	**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

Course Title: Induction cum Foundation Course
(Deeksha Arambh)- Non gradiel

L	T	P	Credits
1	0	0	1

Course code: DKSA100

Total Hours: 30

Course Outcomes

- Help for cultural Integration of students from different backgrounds.
- Know about the operational frame work of academic process in the University.
- Instilling life and social skills,
- Social awareness, ethicsand values, team-work, leadership, creativity, etc.
- Identify the traditional values and indigenous cultures along with diverse potentialities both in indigenous and developed scenario.
- Identify strength and weakness of the students in different core areas of the discipline.

The details of activities will be decided by the parent universities. The structures hall include, but not restricted to:

i. Discussions on operational framework of academic process in the University, as well as interactionswith academic & research managers of the University.

ii. Interactionwith alumni, business leaders, perspective employers, outstanding achievers, and people with inspiring life experiences

iii. Group activities to identify the strength and weakness of students (with expert advice for their improvement) as well as to create a plat form for students to learn from each other's life experiences.

iv. Activities to enhance cultural Integration of students from different backgrounds.

v. Field visit store lated fields/ establishments.

vi. Sessions on personality development (instilling life and social skills,social awareness,ethics and values, team work, leadership, etc.) and communication skills.

L	T	P	Cr
0	0	4	2

Course Title:-Mushroom Production Technology

Course code: SEC101

Total Hours: 60

Objectives

To make the students learn about basics of mushroom cultivation

Learning Outcomes: The students will know about:

1. Media preparation for spawn culturing.
2. Types of mushroom culture.
3. Cultivation of different types of mushroom.

Practical

- Mushrooms: an agri-business
- Nutritional and medicinal value of mushrooms different type of media preparation for raising cultures
- Methods of sterilization single spore culture multi-spore culture ingredients of spawn production of button mushroom isolation of pure culture of different mushroom
- Production of mother spawn/master spawn production of commercial spawn of different mushrooms quality of good spawn
- Cultivation of technology of white button mushroom
- Compost preparation of button mushroom wetting of substrate mixing of different ingredients and turning of compost for button mushroom long method of composting short method of composting
- Qualities of good compost and its testing fabrication of low-cost mushroom house spawning methods maintenance of environment in mushroom house picking and marketing of button mushroom
- Disease, moulds, insect pests and nematodes of button mushroom and their management
- Disorders of mushroom and their management cultivation of oyster mushroom
  a) Formulation in compost preparation for oyster mushroom
  b) Cultivation methods of oyster mushroom
  c) Maintenance of environment of oyster mushroom
  d) Insect pest disease management in oyster mushroom
- Cultivation of milky mushroom
  a) Different types of subtract preparation of milky mushroom
  b) Environment management of milky mushroom

- Post-harvest processing of mushroom
- Management of indoor environment parameters, *i.e.*, temp and moisture
- Cultivation of shiitake mushroom, and cultivation of paddy straw-mushroom
- Uses of spent-mushroom compost, and economics of button mushroom cultivation
- Economics of oyster-mushroom cultivation, and economics of milky mushroom cultivation
- Economics of shiitake mushroom cultivation, and Fabrication of mushroom farm poisonous mushrooms. Visit to different mushroom houses

L	T	P	Cr
0	0	4	2

Course Title:- Beneficial Insects Farming
Course code: SEC102

Total Hours: 60

Learning outcomes
Students will be able to know about entrepreneurial opportunities in entomology, provide information on productive insects and their products, as well as important biological control agents used to control pest population.

Practical
Honey bee species, caste of bees; Beekeeping appliances and seasonal management; Bee enemies and diseases; Bee pasturage, bee foraging and communication; Division and sectioning of honey bee boxes; Migration of honeybee boxes; Types of silkworm, voltinism and biology of silkworm; Mulberry/castor cultivation, mulberry varieties and methods of harvesting and preservation of leaves; Species of lac insect, host plant identification; Identification of other important pollinators, weed killers and scavengers; Insect orders bearing predators and parasitoids used in pest control and their mass multiplication techniques; Visit to research and training institutions devoted to beekeeping, sericulture, lac culture and natural enemies.

Suggested Readings

1. DeBach, P. 1974. Biological control by Natural enemies. Cambridge University Press.
2. Dhaliwal GS and Arora R. 2001. Integrated Pest Management: Concepts and approaches. Kalyani Publ., New Delhi.
3. Dhaliwal, GS and Koul O. 2007. Biopesticides and Pest Management. Kalyani Publ., New Delhi.
4. Gautam, R.D. Biological Pest Suppression, Westvill Publising Co., New Delhi.
5. Manfred Mackaur, Laster E.Ehler and Jens Roland. 1990. Critical Issues in Biological control- Intercept Ltd. Project Directorate of Biological control. 1994. Technology for mass production of Natural enemies. Technical Bulletin -4.
6. Srivastava, K.P. 2004. A Text Book of Entomology, Vol. I, Kalyani Publishers, New Delhi.
7. Abrol, D.P. 2013. Beekeeping: A Comprehensive Guide to Bee and Beekeeping, Scientific Publishers, Jodhpur.

Course Title:-Communication Skills

L	T	P	Credits
1	0	0	1

Course code:- ENG101

Total Hours: 15

Course Outcomes:

- To acquire competence in oral, written and non – verbal communication.
- Develop strong personal and professional communication.
- Demonstrate positive group communication.
- Linguistic and non-linguistic barriers to communication.

Course Content

Theory

Unit- I **4 Hours**

Communication Process**:**The magic of effective communication; Building self-esteem andovercoming fears; Concept, nature and significance of communication process; Meaning, types and models of communication.

Unit- II **4 Hours**

Verbal and non-verbal communication; Linguistic and non-linguistic barriers to communication and reasons behind communication gap/ miscommunicationBasic Communication Skills:Listening, Speaking, Reading and Writing Skills; Precis writing/Abstracting/Summarizing.

Unit-III **4 Hours**

Style of technical communication Curriculum vitae/resume writing; Innovative methods to enhance vocabulary, analogy questions.Structural and Functional Grammar:Sentence structure, modifiers, connecting words and verbals; phrases and clauses.

Unit-IV **3 Hours**

Case: subjective case, possessive case; objective case; Correct usage of nouns. Pronouns and antecedents, adjectives, adverbs and articles; Agreement of verb with the subject: tense, mood, voice; Writing effective sentences; Basic sentence faults.

Course Title:-Communication Skills Lab

L	T	P	Credits
0	0	2	1

Course code:- ENG102

Total Hours: 30

Practicals

1. Listening and note taking; Writing skills: precis writing, summarizing and abstracting.
2. Reading and comprehension (written and oral) of general and technical articles.
3. Micro-presentations and Impromptu Presentations: Feedback on presentations.
4. Stage manners: grooming, body language, voice modulation, speed.
5. Group discussions; Public speaking exercises; vocabulary building exercises.
6. Interview Techniques; organization of events.

Suggestedreadings:

1. *Allport,GW,1937,Personality: A Psychological Interpretation.Holt,NewYork.*
2. *Brown Michele & Gyles Brandreth,1994, How to Interview and be Interviewed.SheldonPress,London.*
3. *Carnegie Dale, 1997,The Quickand Easy Way to Effective Speaking. Pocket Books, NewYork.*
4. *Francis Peter SJ,2012, Soft Skills and Professional Communication.Tata McGraw Hill, NewDelhi.*
5. *Kumar S and Pushpa Lata, 2011,Communication Skills. Oxford University Press.*
6. *Neuliep James W, 2003, Intercultural Communication A Contextual Approach. Houghton Mifflin Co Boston.*
7. *Pease, Allan,1998, Body Language. Sudha Publications, Delhi.*
8. *Raman M and Singh P,2000, Business Communication.Oxford University Press.*
9. *Seely J, 2013, Oxford Guide to Effective Writing and Speaking. Oxford University Press.*

Course Title: Fundamentals of Agronomy

Course code: AGRON101

L	T	P	Credits
2	0	0	2

Course Outcomes:
Total Hours: 30

- To impart the basic and fundamental knowledge of Agronomy.
- Classification of essential nutrients, role of macro and micro nutrients.
- Scheduling of irrigation, different approaches of scheduling irrigation.
- Water management in irrigation practices.

Course Content

Theory

Unit- I **7 Hours**

Agronomy and its scope: Definition, Meaning and scope of Agronomy; Art, science and business of crop production, relation of Agronomy with other disciplines of Agricultural Science, Fields crops and classification, importance, ecology and ecosystem, Seeds and sowing: Definitions of crops, variety and seed. Factors affecting crop stands establishment: good quality seed, proper tillage, time of sowing seed rate, depth and method of sowing: broadcasting, drilling, dibbling, transplanting etc.

Unit-II **8 Hours**

Tillage and tilth: Definition, objectives, types, advantages and disadvantages of tillage including conservation tillage. Crop density and geometry: plant geometry and planting geometry, its effect on growth, yield. Crop nutrition: Definition of essential nutrients, criteria of essentiality, functional elements, classification of essential nutrients, role of macro and micro nutrients. Nutrient absorption, active and passive absorption of nutrients, forms of plant nutrients absorbed by plants, Combined /un-combined forms. Manures and fertilizers, nutrient use efficiency: Sources of nutrients: Inorganic (fertilizers), organic (manures) and bio-fertilizers; their classification and characteristics, method of preparation and role of organic manures in crop production.

Unit-III **8 Hours**

Integrated Nutrient Management: Meaning, different approaches and advantages of INM. Green manure role in crop production: Definition, objectives types of green manuring, desirable characteristics, advantages and limitations of green manuring, Water management: Water resources of the world, India and the state; Soil Moisture Constants –gravitational water, capillary water, hygroscopic water,

Soil moisture constants, Concept of water availability to plants, soil- plant-water relationship, crop water requirement, water use efficiency, Methods of irrigation : Scheduling of irrigation, different approaches of scheduling irrigation.

Unit-IV **7 Hours**

Weeds: Definition, Importance and basics of classification of weeds and their control. Cropping systems: Factors affecting cropping systems, major cropping patterns and systems in the country. Sustainable crop production: Definition, importance and practices, natural resources and conservation pollution and pollutants, Allelopathy: Meaning and importance in crop production, Growth and development of crops**:** Definition, Meaning and factors affecting growth and development

Course Title: Fundamentals of Agronomy Lab

Course code: AGRON102

L	T	P	Credits
0	0	2	1

Practical:
Total Hours: 30

1. A visit to Instructional Crop farm and study on field crops, Identification of crops, seeds, fertilizers, pesticides, Crops and cropping systems in different Agro-climatic zones of the state.
2. Study of some preparatory tillage implements, Study of inter tillage implements, Practice of ploughing / puddling, Study and practice of inter cultivation in field crops.
3. Numerical exercises on calculation of seed, plant population and fertilizer requirement, Study of yield contributing characters and yield estimation of crops, Identification of weeds in different crops.
4. Seed germination and viability test of seed, Practice on time and method of application of manures and fertilizers.
5. Measurement of soil moisture by gravimetric and volumetric method and bulk density, Determination of field capacity.
6. Determination of gross and net irrigation requirement, Determination of infiltration rate

Suggested readings:

1. *William L Donn.1965. Meteorology. McGraw-Hill Book Co. NewYork.*
2. *Yawalkar K Sand Agarwal J P.1977. Manures and Fertilizers. Agricultural Horticultural Publishing House, Nagpur.*
3. *Rao V S. 1992. Principles of Weed Science. Oxford and IBH Publishing Co. Ltd. New Delhi.*
4. *Reddy Yellamanda T and Shankar Reddy G H.1995. Principles of Agronomy. Kalyani Publishers Ludhiana.*
5. *Reddy, S. R. 2008. Principle of Crop Production, Kalyani Publisher, Ludhiana.*

Course Title:- Fundamentals of Soil Science
Course Code:- SOIL101

L	T	P	Credits
2	0	0	2

Total Hours: 30

Course Outcome:

- To impart knowledge on soil genesis.
- Basics oil properties with respect to plant growth**.**
- To know soil reaction and buffering capacity.

Course Content

Theory

Unit- I **7 Hours**

Soil- Pedological and edaphalogical concepts. Rocks and minerals, weathering, soil formation.

Unit – II **8 Hours**

Soil profile, soil texture, soil structure. Bulk density and particle density, soil consistency, soil temperature, soil air.

Unit- III **7 Hours**

Soil reaction and buffering capacity. Soil taxonomy, keys to soil orders. Soils of India.

Unit- IV **8 Hours**

Determination of soil moisture constants- field capacity; water holding capacity, study of infiltration rate of soil.

Course Title:- Fundamentals of Soil Science Lab

Course Code:- SOIL102

L	T	P	Credits
0	0	2	1

Total Hours: 30

Practical:

1. Study of general properties of minerals.
2. Study of minerals-silicate and non-silicate minerals.
3. Study of rocks-igneous, sedimentary and metamorphic rocks; study of a soil profile, collection and processing of soil for analysis.
4. Study of soil texture-feel method, mechanical analysis, determination of bulk density, particle density and soil porosity.
5. Determination of soil color, study of soil structure and aggregate analysis, determination of soil moisture.
6. Determination of soil moisture constants- field capacity; water holding capacity, Study of infiltration rate of soil.

Suggested readings:

1. Soil Fertility and Nutrient Management–By S. S. Singh, Kalyani Publishers.
2. Introductory Soil Science–By Dilip Kumar Das, Kalyani Publishers.
3. Soil Fertility and Fertilizers –By Samual L. Tisdale, Macmillan Publishing Company, New York The nature and Properties of Soils–By Harry O. BuckmanandNyleC

Course Title: Fundamentals of Horticulture

L	T	P	Credits
2	0	0	2

Course Code:- HORT101

Total Hours: 30

Course Outcome:

- To provide knowledge on different branches of horticulture viz. pomology, olericulture, floriculture and landscaping, spices and medicinal plants.
- To provide knowledge on orchard management, propagation methods.
- Cultural operations and nutrient management of horticultural crops.
- To provide knowledge on different physiological aspects of horticultural crops.

Course Content

Theory

Unit- I **7 Hours**

Horticulture its different branches, importance & scope, Horticulture & botanical classification, soil and climate for horticultural crops.

Unit-II **8 Hours**

Plant propagation- methods and propagation structures, seed dormancy and seed germination, principles of orchard establishment, principles and methods of training and pruning of fruit crops.

Unit-III **8 Hours**

Juvenility and flower bud differentiation, unfruitfulness in horticultural crops, pollination, pollinizers and pollinators, fertilization and parthenocarpy, medicinal and aromatic plants.

Unit-IV **7 Hours**

Importance of bioregulators in horticultural crops, irrigation and its methods, Fertilizer application in horticultural crops.

Course Title: Fundamentals of Horticulture Lab

Course code:- HORT102

L	T	P	Credits
0	0	2	1

Total Hours: 30

Practical:

1. Identification and nomenclature of fruit, Layout of an orchard, pit making and system of planting.
2. Nursery raising techniques of fruit crops, Understanding of plant propagation structures, Propagation through seed sand plant parts.
3. Propagation techniques for horticultural crops, Container, potting mixture, potting and repotting.
4. Training and pruning methods on fruit crops, Preparation off fertilizer mixture and application.
5. Preparation and application of PGR, Layout of different irrigation systems, Maturity studies, harvesting, grading, packaging and storage.

Suggested readings:

1. *Basics of Horticulture by Jitendra Singh*
2. *Introduction to Horticulture by N. Kumar*
3. *Handbook of Horticulture by K. L. Chadda*

Course title: Farming based livelihood systems

L	T	P	Credits
2	0	0	2

Course code: AGRON103

Total Hours: 30

Course Outcomes:

- Tomakethestudents awareaboutfarming basedlivelihoodsystemsinagriculture.
- Todisseminatetheknowledgeandskillhowfarmingbasedsystemscanbeasourceof livelihood.
- Risk & success factors in farming based livelihood systems.
- Central & State Government, Public & Private organizations.

Course Content

Theory

Unit- I **7 Hours**

Status of agriculture in India and different states, Income of farmers and rural people in India, Livelihood-Definition, concept and livelihood pattern in urban & rural areas, Different indicators to study livelihood systems. Agricultural livelihood systems (ALS): Meaning, approach, approaches and framework, Definition of farming systems and farming based livelihood. systems.

Unit- II **7 Hours**

Prevalent Farming systems in India contributing to livelihood.Types of traditional &modern farming systems. Components of farming system/ farming based livelihood systems- Crops and cropping systems, Livestock, (Dairy, Piggery, Goatry, Poultry, Duckry etc.), Horticulturalcrops, Agro--forestry systems, Aqua cultureDuck/PoultrycumFish, DairycumFish, PiggerycumFish etc.

Unit- III **8 Hours**

Small, mediumandlarge enterprises including value chains and secondary enterprises as livelihood components for farmers, Factors affecting integration of various enterprises of farming for livelihood. Feasibility of different farming systems for different agro-climatic zones, Commercial farming based livelihood models by NABARD, ICAR and other organizations across the country, Case studies on different livelihood enterprises associated with the farming.

Unit- IV **8 Hours**

Risk & success factors in farming based livelihood systems, Schemes &programmes by Central & State Government, Public & Private organizations involved in promotion of farming based livelihood opportunities. Role of farming based livelihood enterprisesin21st Century in view of circular economy, green economy, climate change, digitalization & changing life style.

Course title: Farming based livelihood systems lab
Course code: AGRON104

L	T	P	Credits
0	0	2	1

Total Hours: 30

Practical

1. Survey of farming systems and agricultural based livelihood enterprises.
2. Study of components of important farming based livelihood models/ systems in different agro-climatic zones.
3. Study of production and profitability of crop based, livestock based, processing based and integrated farming based livelihood models, Field visit of innovative farming system models.
4. Visit of Agri-based enterprises & their functional aspects for integration of production, processing & distribution sectors.
5. Study of agri-enterprises involved in industry and service sectors(Value Chain Models), Learning about concept of project formulation onfarming based livelihood systems along with cost & profit analysis, Case study of Start-Ups in agri-sectors.

SuggestedReadings:

1. *Dixon,J.andA.GulliverwithD.Gibbon.(2001).FarmingSystemsandPoverty:ImprovingFarmers'LivelihoodsinaChangingWorld.FAO&WorldBank,Rome,Italy&Washington,DC,USA.*
2. *Ashley, C.; Carney, D. (1999). Sustainable Livelihoods: Lessons from Early Experience; Department for International Development: London, UK,; Volume 7. [Google Scholar].*
3. *Reddy,S.R.2016.FarmingSystemandSustainableAgriculture,KalyaniPublishers, NewDelhi.*
4. *Panwaretal.2020.IntegratedFarmingSystemmodelsforAgriculturalDiversification, EnhancedIncome and employment, Indian Council of Agricultural Research, New Delhi.*
5. *Singh, J.P., et al. 2015. Region Specific Integrated Farming System Models, ICAR-Indian Institute of Farming Systems Research, Modipuram.*
6. *Walia, S. S. and U. S. Walia, 2020. Farming System and Sustainable Agriculture, Scientific Publishers, Jodhpur, Rajasthan.*
7. *Livelihood Improvement of Underprivileged Farming Community: Some Experiences from Vaishali, Samastipur, Darbhanga and Munger Districts of Bihar byB. P. Bhatt, Abhay Kumar, P.K. Thakur, AmitavaDeyUjjwal Kumar,Sanjeev Kumar,B.K. Jha, LokendraKumar,K. N. Pathak, A. Hassan, S.*

K. Singh, K. K.SinghandK. M.SinghICAR ResearchComplexfor EasternRegionICAR Parisar,P.O. Bihar Veterinary College,Patna - 800 014, Bihar.

8. *Carloni, A(2001). Global Farming Systems Study: Challenges and Priorities to 2030 –Regional Analysis: Sub-Saharan Africa, Consultation Document, FAO, Rome, Italy*
9. *Evenson,R.E. (2000).Agricultural Productivity and Production in Developing Countries'.In FAO,The State of Food and Agriculture,FAO,Rome,Italy.*
10. *Agarwal, A. &Narain, S. (1989). Towards Green Villages: A strategy for Environmentally, Sound and Participatory Rural Development, Center for Science and Environment, New Delhi, India.*

Course Title: Rural Sociology and Educational Psychology

Course code: SOC101

L	T	P	Credits
2	0	0	2

Total Hours: 30

Course Outcomes:

- Provide knowledge on concept and importance of sociology.
- Rural sociology as well as the relationship with Extension Education.
- Role of social groups in Agricultural Extension**.**
- Relationship between Rural and Urban societies.

Course Content

Theory

Unit- I **8 Hours**

ExtensionEducationandAgriculturalExtension–Meaning, Definition, Scope, and Importance. Sociology and rural sociology, Meaning, Definition, Scope, Importance of Rural Sociology in Agricultural Extension, and Interrelationship between Rural Sociology & Agricultural Extension. Indian Rural Society, Important characteristics, Differences and Relationship between Rural and Urban societies. Social Groups- Meaning, Definition, Classification, Factors considered information and organization of groups, Motivation in group formation and Role of social groups in Agricultural Extension.

Unit-II **8 Hours**

Social Stratification- Meaning, Definition, Functions, Basis for stratification, Forms of Social stratification-Characteristics and Differences between Class& Caste System. Cultural concepts- Culture, Customs, Folkways, Mores, Taboos, Rituals and Traditions- Meaning, Definition and their Role in Agricultural Extension. Social Values and Attitudes – Meaning, Definition, Types and Role of Social Values and Attitudes in agricultural Extension. Social Institutions- Meaning, Definition, Major institutions in Rural Society, Functions, and their Role in agricultural Extension.

Unit-III **7 Hours**

Social Organizations- Meaning, Definition, Types of organizations and role of social organizations in agricultural Extension. Social Control- Meaning,Definition,need of social control and Means of Social Control. Social change-Meaning, Definition, Nature of Social Change, Dimensions of social

change and factors of social change. Leadership- Meaning, Definition, Classification, Roles of leader, Different methods of Selection of Professional and Lay leaders. Training of Leaders Meaning, Definition, Methods of training, Advantages and Limitations in use of local leaders in Agricultural Extension.

Unit-IV **7 Hours**

Psychology and Educational Psychology- Meaning, Definition, Scope, and Importance of Educational Psychology in Agricultural Extension.Intelligence-Meaning, Definition, Types, Factors affecting intelligence and Importance of intelligence in Agricultural Extension.Personality-Meaning, definition,Types,Factors influencing the Personality and Role of personality in agricultural Extension.Teaching-Learning process-Meaning and Definition of Teaching, Learning, learning experience and Learning situation, Elements of learning situation and its characteristics. Principles of learning and their implication of teaching.

Suggested readings:

1. *J.B.Chitambar-IntroductoryRuralSociology.*
2. *Ray,G.L. -ExtensionCommunicationandManagement.*
3. *DahamaO.P.andBhatnagar,O.P.-EducationandCommunicationforDevelopment.*
4. *SandhuA.S.-TextbookonAgriculturalCommunication.*
5. *A.R.Desai-RuralSociologyinIndia.*
6. *RVelusamyTextbookonRuralSociologyandEducationalPsychology.*
7. *M.B.Ghorpade-Essentialofpsychology.*
8. *WebMaterials.*
9. *Prepared You Tube videos.*

Course Title: National Cadit Corps (NCC), National Service Scheme(NSS)

Course code: NSS101/NCC101

L	T	P	Credits
0	0	2	1

Total Hours: 30

National Cadet Corps- As as government guidelines, for getting B and C certificate in NCC, minimum years of requirement is 2 & 3 years along with 1-2 annual camps

- Aims, objectives, organization of NCC and NCC song.DG'scardinals ofdiscipline.
- Drill-aim, general words ofcommand,attention, stands at ease,standeasyandturning.
- Sizing, numbering, forming inthreeranks, openandcloseordermarch,and dressing.
- Saluting at the halt,getting on parade,dismissing, andfallingout.
- Marching, length of pace, and time of marching in quick/slow time and halt. Side pace,pace forward and to the rear. Turning on the march and wheeling. Saluting on the march.
- Markingtime,forward march,and halt.Changing step,formation of squad and squad drill.
- Commandandcontrol,organization,badgesofrank,honors,andawards
- Nation Building- cultural heritage, religions, traditions, and customs of India. National integration. Values and ethics, perception, communication, motivation, decision making, discipline and duties of good citizens. Leadership traits, types of leadership. Character/personality development. Civil defense organization, types of emergencies, firefighting, protection. Maintenance of essentialservices, disaster management, aid during development projects.
- 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.
- Structure and function of human body, diet and exercise, hygiene and sanitation. Preventable diseases including AIDS, safe blood donation, first aid, physical and mental health. Adventure activities. Basic principles of ecology, environmental conservation, pollution and its control.

National Service Scheme(NSS)

Evoking social consciousness among students through various activities viz.,

working together, constructive, and creative social work, to be skillful in executing democratic leadership, developing skill in programme, tobe able to seek self-employment, reducing gap between educated and uneducated, increasing awareness and desire to help sections of society.

All the activities related to the National Service Scheme are distributed under four different courses viz., National Service Scheme I, National Service Scheme II, National Service Scheme III and National Service Scheme IV each having one credit load.The entire four courses should be offered continuously for two years. A student enrolled in NSS course should put in at least 60 hour of social work in different activities in a semester other than five regular one day campina year and one special camp for duration of 7days at any semester break period in the two years. Different activities will include orientation lectures and practical works. Activities directed by the Central and State Government have to be performed by all the volunteers of NSS as per direction.

Introduction and Basic Components of NSS

- Orientation:history,objectives,principles,symbol,badge;regularprogramsunder NSS
- Organizational structure of NSS, Code of conduct for NSS volunteers, points to be considered by NSS volunteers' awareness about health.
- NSS program activities. Conceptofregular activities, special camping,day camps, basisofadoptionof village/slums, conducting survey, analyzing guiding financial patterns of scheme, youth program/ schemes of GOI, coordinationwithdifferent agencies and maintenance of diary. Understandingyouth. Definition, profile, categories, issuesandchallenges of youth; and opportunities for youth who is agent of the social change.
- Community mobilization.Mapping of community stakeholders, designing the message as per problems and their culture; identifying methods of mobilization involving youth-adult partnership.Social harmony and national integration
- Indian history and culture, role of youth in nation building, conflict resolution and peace- building. Volunteerism and shramdaan. Indian tradition of volunteerism, its need, importance, motivation, and constraints; shaman as part of volunteerism
- Citizenship, constitution, and human rights. Basic features of constitution of India, fundamental rights andduties, humanrights, consumer awarenessandrightsandrightstoinformation. Familyandsociety. Concept of family, community (PRIs and other community-based organizations) and society

Course Title:- Horticulture nursery management

L	T	P	Cr
0	0	4	2

Course code: SEC151

Course Objective

To provide knowledge and skills for the propagation, care and management of quality planting materials, emphasizing sustainable practices and techniques to enhance crop productivity and nursery business management

Learning Outcome

Students will learn the method to propagate, grow and manage high-quality nursery plants, focusing on techniques for producing healthy seedlings and saplings. They will also gain skills in nursery design, maintenance and sustainable practices for horticulture crop production.

Practical

Layout of model nursery; Tools and equipment-identification and application; Different methods of breaking seed dormancy stratification, scarification and use of plant growth regulators; Extraction and storage of healthy seeds, seed bed preparation; Identification and raising of rootstocks for different fruit plants, soil solarization, preparation of potting mixtures; Selection of healthy scion wood, practices in different methods of plant propagation like cutting, layering, budding and grafting in fruit plants; Micro-propagation-explant preparation, media preparation, culturing–meristem tip culture, axillary bud culture, micro-grafting and hardening of plants; Nursery management practices, *i.e.*, weed control, irrigation, nutrition, removal of sprouts, *etc.*; Protection of nursery plants against adverse climatic conditions; Protected structures; Diagnosis and control of important diseases and pests in the nursery, lifting and packing of nursery plants; Visit to commercial tissue culture laboratories and accredited nurseries.

Course Title:- Seed production technology

L	T	P	Cr
0	0	4	2

Course code: SEC152

Objectives

1. To give students a greater understanding about various aspects of seed science and technology including seeds of genetically modified crops
2. To develop awareness among the students on seed laws and regulations
3. To train the students in research on seed production, certification, testing, drying, processing, storage, marketing
4. To strengthen human resources in the seed production technology of field crops and vegetables

Learning outcomes

1 To gain knowledge of quality seed production.
2.To gain knowledge of different methods of seed production and processing.
3.To gain knowledge of evaluating quality seed by using different seed testing methods
4.To gain knowledge of hands on practice to utilize agrotechnology, machines and implements to produce quality seeds, maintain its quality and seed marketing as per seed Act and regulations.

Practical

Improved seed quality and monitoring; Seed sampling and physical purity test; Germination and viability test; Seedling vigour test; Different classes of improved seed; Causes of deterioration of seed quality and their control in self- and cross-pollinated crop varieties and hybrids; Seed certification and its procedure, field inspection; Maintenance of genetic purity during seed production, organic seed production; Varietal identification through grow-out test and electrophoresis, molecular and biochemical test; Detection of genetically modified crops, transgene contamination in non-GM crops; Seed drying, processing and their steps; Seed treatment practices and methods of application; Seed packing; General practices of seed storage, factors affecting seed longevity during storage, measures for pest and disease control during storage; Seed marketing-structure and organization, seed marketing activities, seed standards as per seed Act; Seed regulations in relation to marketing, improved seed production technology, preparation of seed bed and nursery, isolation distances, rouging of off type and candidate/volunteer plants, seed inspection; Foundation and certified seed production, seed production in major cereals- wheat, rice, maize, sorghum and bajra; Seed production in major pulses- pigeon pea, green gram, black gram, chickpea; Seed production in major oilseeds- groundnut, sesame, soybean, mustard, castor; Seed production in cotton; Seed production in vegetable crops- tomato, eggplant, hot pepper and okra; Genetic purity test grow-out test and electrophoresis; Field inspection and preparation of field inspection report; Visit to national and state seed production farms; Visit to seed testing laboratories and processing plants; Practices in seed storage and marketing.

Course Title:Personality Development

Course Code: EXT151

L	T	P	Cr
1	0	0	1

Total hours-15

Course Outcomes:

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

1. To make students realize their potential strengths
2. To cultivate their inter-personals kills and improve employability.

Course contents
Theory:

UNIT I **3 Hours**

Personality Definition, Nature of personality, theories of personality and its types. Thehumanistic approach Maslow's self-actualization theory, shaping of personality

UNIT II **4 Hours**

Determinants of personality, Myers-Briggs Typology Indicator, Locus of control and performance, Type A and Type B Behaviours, Personality and Organizational Behaviour

UNIT III **4 Hours**

Foundations of individual behavior and factors influencing individual behavior, Models of individual behavior, Perception and attributes and factors affecting perception, Attribution theory and case studies on Perception and Attribution. Learning: Meaning and definition, theories and principles of learning, Learning and organizational behavior, Learning and training, learning feedback

UNIT IV **4 Hours**

Attitude and values, Intelligence- types of Intelligence, theories of intelligence, measurements of intelligence, factors influencing intelligence, intelligence and Organizational behavior, emotional intelligence. Motivation-theories and principles, Teamwork and group dynamics.

Course Title: Lab-Personality Development
Course Code: EXT152

L	T	P	Cr
0	0	2	1

Total hours-30

Practical Contents:

1. MBTI personality analysis
2. Learning Styles and Strategies
3. Motivational needs
4. Firo-B and Interpersonal Communication
5. Teamwork and team building
6. Group Dynamics and Win-win game
7. Conflict Management
8. Leadership styles
9. Case studies on Personality
10. Organizational Behavior.

Suggested Readings:

1. Andrews, Sudhir, 1988. How to Succeed at Interviews. 21st (rep.) New Delhi. Tata McGraw-Hill.

2. Heller, Robert, 2002. Effective Leadership. Essential Managerseries. Dk Publishing.

3. Hindle, Tim, 2003. Reducing Stress. Essential Managerseries. Dk Publishing.

4. Lucas, Stephen, 2001. Art of Public Speaking. New Delhi. Tata-Mc-GrawHill.

5. Mile, D. J, 2004. Power of Positive Thinking. Delhi. Rohan Book Company.

6. Pravesh Kumar, 2005. All about Self-Motivation. NewDelhi. Good will Publishing House.

7. Smith, B, 2004. Body Language. Delhi: Rohan Book Company.

8. Shaffer, D.R., 2009. Social and Personality Development (6thEdition). Belmont, CA: Wadswor

Transaction Method:

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

Course Title: Environmental Studies and Disaster Management

Course Code: AGM151

L	T	P	Credits
2	0	0	2

Total hours-30

Course Outcomes:

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

1. To expose and acquire knowledge on the environment
2. To gain the state of the art skill and expertise on management of disasters

Course contents

Theory

UNIT I **8 Hours**

Introduction to Environment-Environmental Studies - Definition, scope and importance-Multidisciplinary nature of environmental studies - Segments of Environment-Spheres of Earth – Lithosphere – Hydrosphere - Atmosphere Different layers of atmosphere. Natural Resources: Classification – Forest resources. Water resources. Mineral resources Food resources. Energy resources. Land resources. Soil resources. Ecosystems-Concept of an ecosystem-Structure and function of an ecosystem - Energy flow in the ecosystem. Types of ecosystems. Biodiversity and its conservation: Introduction, definition, types. Biogeographical classification of India. Importance and Value of biodiversity. Biodiversity hot spots.

UNIT II **8 Hours**

Threats and Conservation of biodiversity Environmental Pollution: Definition, cause, effects and control measures of: a. Air pollution. b. Water pollution.c. Soil pollution. d. Marine pollution. e. Noise pollution. f. Thermal pollution h. light pollution. Solid Waste Management: Classification of solid wastes and management methods, Composting, Incineration, Pyrolysis, Biogas production, Causes, effects and control measures of urban and industrial wastes. Social Issues and the Environment: Urban problems related to energy. Water conservation, rainwater harvesting, watershed management. Environmental ethics: Issues and possible solutions, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.

UNIT III **7 Hours**

Environment Protection Act. Air (Prevention andControl of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Human Population and the Environment: Environment and human health: Human Rights, Value Education. Women and Child Welfare. Role of Information Technology in Environment and human health

UNIT IV **7 Hours**

Disaster management-Disaster definition, Types - Natural Disasters - Floods, drought, cyclone, earthquakes, landslides, avalanches, volcanic eruptions, Heat and cold waves. Man Made Disasters-Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, road accidents, rail accidents, air accidents, sea accidents. International and National strategy for disaster reduction. Concept of disaster management, national disaster management framework; financial arrangements; role of NGOs, community- based organizations and media in disaster management. Central, state, district and local administration in disaster control; Armed forces in disaster response; Police and other organizations in disaster management.

Course Title: Lab-Environmental Studies and Disaster Management

Course Code: AGM152

L	T	P	Credits
0	0	2	1

Total hours-30

Practical Contents:

1. Visit to a local area to document environmental assets river/forest/grassland/hill/mountain.
2. Energy: Biogas production from organic wastes.
3. Visit to windmill/hydropower/solar power generation units. Biodiversity assessment in farming system.
4. Floral and faunal diversity assessment in polluted and unpolluted system.
5. Visit to local polluted site - Urban/Rural/Industrial/Agricultural to study of common plants, insects and birds.
6. Environmental sampling and preservation.
7. Water quality analysis: pH, EC and TDS.Estimation of Acidity, Alkalinity. Estimation of water hardness.
8. Estimation of DO and BOD in water samples. Estimation of COD in water samples.
9. Enumeration of E. coli in water sample. Assessment of Suspended Particulate Matter (SPM).
10. Study of simple ecosystem – Visit to pond/river/hills. Visit to areas affected by natural disaster.

Suggested Readings:

1. *De. A. K., 2010. Environmental chemistry. Published by New Age International Publishers, New Delhi. ISBN:13–978 81 224 2617 5. 384 pp.*
2. *Dhar Chakrabarti. P.G., 2011. Disaster management - India's risk management policy frameworks and key challenges. Published by Centre for Social Markets (India), Bangalore. 36 pp.*
3. *Erach Bharucha, Textbook for Environmental studies. University Grants Commission, New Delhi*
4. *Parthiban, K. T., Vennila, S., Prasanthrajan, M., Umesh Kanna, S. Forest, Environment, Biodiversity and Sustainable development. Narendra Publishing House, New Delhi, India 2023. (In Press).*
5. *Prasanthrajan M, P.P. Mahendran., 2008. A textbook on Ecology and Environmental Science. ISBN 81-8321-104-6. Agrotech Publishing Academy, Udaipur - 313 002. First Edition: 2008*
6. *Prasanthrajan M, 2018. Objective environmental studies and disaster*

management. ISBN 9789387893825. Scientific publishers, Jodhpur, India. Pp. 146.

7. *Sharma, P.D. 2009, Ecology and Environment, Rastogi Publications, Meerat, India.*
8. *Tyler Miller and Scot Spoolman. 2009. Living in the Environment (Concepts, Connections, and Solutions). Brooks/cole, Cengage learning publication, Belmont, USA.*

Transaction Method:

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

Course Title: Soil Fertility Management
Course Code: SOIL151

L	T	P	Credits
2	0	0	2

Total hours-30

Course Outcomes:

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

1. To provide a comprehensive knowledge of soil fertility, plant nutrition, fertilizers, and nutrient management

Course contents

Theory:

UNIT I **7 Hours**

Introduction and importance of manures and fertilizers. Fertilizer recommendation approaches. Integrated nutrient management

UNIT II **7 Hours**

Cemical fertilizers: classification, composition and properties of major fertilizers, secondary & micronutrient fertilizers, Complex fertilizers, nano fertilizers Soil amendments, Fertilizer Storage, Fertilizer Control Order

UNIT III **8 Hours**

History of soil fertility and plant nutrition. Criteria of essentiality. role, deficiency and toxicity symptoms of essential plant nutrients, Mechanisms of nutrient transport to plants, factors affecting nutrient availability to plants. Chemistry of macro and micronutrients. Soil fertility evaluation, Soil testing. Critical levels of different nutrients in soil.

UNIT IV **8 Hours**

Forms of nutrients in soil, plant analysis, rapid plant tissue tests. Indicator plants. Methods of fertilizer recommendations to crops. Factor influencing nutrient use efficiency (NUE), methods of application under rainfed and irrigated conditions. STCR/ RTNM/ IPNS.

Course Title:Lab-Soil Fertility Management
Course Code: SOIL152

L	T	P	Credits
0	0	2	1

Total hours-30

Practical Contents:

1. Introduction of analytical instruments and their principles
2. Calibration and applications of Coloremetry and flame photometry
3. Estimation of alkaline hydrolysable N in soils
4. Estimation of soil extractable P in soils
5. Estimation of exchangeable K in soils
6. Estimation of exchangeable Ca and Mg in soils
7. Estimation of soil extractable S in soils
8. Estimation of DTPA extractable Zn in soils
9. Estimation of N in plants and Estimation of P in plants
10. Estimation of K in plants and Estimation of S in plants.

Suggested Readings:

1. Soil Fertility and Nutrient Management – By S.S. Singh, Kalyani Publishers

2. Introductory SoilScience – By Dilip Kumar Das, Kalyani Publishers

3. Soil Fertility and Fertilizers – By Samual L. Tisdale, Werner L. Nelson and James D. Beaton, Macmillan Publishing Company, New York

4. The nature and Properties of Soils – By Harry O. Buckman and Nyle C.

Transaction Method:

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

Course Title: Fundamentals of Entomology
Course Code: ENTO151

L	T	P	Credits
2	0	0	2

Total hours-30

Course Outcomes:

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

1. To know the history of entomology, classification of insects and their relationship with other arthropods
2. To study the various morphological characters of class insecta and their importance for classification of insects
3. To get an idea about the different physiological systems of insects and their roles in growth and development and communications of insects
4. To study the characteristics of commonly observed insect orders and their economically important families

Course contents
Theory

UNIT I **7 Hours**

History of Entomology in India. Major points related to dominance of Insecta in Animal kingdom.Classification of phylum Arthropoda upto classes. Relationship of class Insecta with other classes of Arthropoda. Morphology: Structure and functions of insect cuticle and molting. Body segmentation. Structure of head, thorax and abdomen.

UNIT II **7 Hours**

Structure and modifications of insect antennae, mouth parts, legs, Wing venation, modifications and wing coupling apparatus. Structure of male and female genital organ. Metamorphosis and diapause in insects. Types of larvae and pupae. Structure and functions of digestive, circulatory, excretory, respiratory, nervous, secretary (Endocrine) and reproductive system, in insects. Types of reproduction in insects. Major sensory organs. Insect Ecology: Introduction, Environment and its components. Effect of abiotic factors and biotic factors. Categories of pests. Concept of IPM, Practices, scope and limitations of IPM

UNIT III **8 Hours**

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

Orthoptera: Acrididae, Tettigonidae, Gryllidae, Gryllotalpidae; Dictyoptera: Mantidae, Blattidae; Odonata; Isoptera: Termitidae; Thysanoptera: Thripidae; Hemiptera: Pentatomidae, Coreidae, Cimicidae, Pyrrhocoridae, Lygaeidae, Cicadellidae, Delphacidae, Aphididae, Coccidae, Lophophidae, Aleurodidae, Pseudococcidae

UNIT IV **8 Hours**

Neuroptera: Chrysopidae; Lepidoptera: Pieridae, Papiloinidae, Noctuidae, Sphingidae, Pyralidae, Gelechiidae, Arctiidae, Saturnidae, Bombycidae; Coleoptera: Coccinellidae, Chrysomelidae, Cerambycidae, Curculionidae, Bruchidae, Scarabaeidae; Hymenoptera: Tenthridinidae, Apidae. Trichogrammatidae, lchneumonidae, Braconidae, Chalcididae; Diptera: Cecidomyiidae, Tachinidae, Agromyziidae, Culicidae, Muscidae, Tephritidae.

Course Title:Lab-Fundamentals of Entomology
Course Code: ENTO152

L	T	P	Credits
0	0	2	1

Total hours-30

Practical Contents:

1. Methods of collection and preservation of insects including immature stages; External features of Grasshopper/Blisterbeetle

2. Types of insect antennae, mouth parts and legs; Wing venation, types of wings andwing coupling apparatus.

3. Types of insect larvae and pupae

4. Dissection of digestive system in insects (Grasshopper)

5. Study of characters of orders Orthoptera, Dictyoptera, Odonataand their families of agricultural importance

6. Study of characters of orders Isoptera, Thysanoptera, Hemiptera, Lepidopteraand their families of agricultural importance

7. Study of characters of orders Neuroptera, Coleoptera, Hymenoptera, Diptera and their families of agricultural importance

8. Insecticides and their formulations.

9. Pesticide appliances and their maintenance.

10. Sampling techniques for estimation of insect population and damage.

Suggested Readings:

1. Imm's General Textbook of Entomology - O.W. Rechards and R.G. Davies

2. Introduction to the study of Insects – D. J.Borror and DeLong's

3. Fundamentals of Ecology - Eugene. P. Odum & Gray W. Barrett

4. Integrated pest Management Concept and Approaches - G.S. Dhaliwal and RameshArora

Transaction Method:

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

Course Title: Livestock and Poultry Management
Course Code: LPM151

L	T	P	Credits
1	0	0	1

Total hours-15

Course Outcomes:

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

1. Provide basic knowledge to the students about scientific livestock and poultry rearing practices
2. Entrepreneurship development through Livestock/poultry and Agriculture Integrated farming System

Course contents

Theory

UNIT I **3 Hours**

Role of livestock in the national economy. Reproduction in farm animals and poultry. Housing principles, space requirements for different species of livestock and poultry.

UNIT II **4 Hours**

Management of calves, growing heifers and milch animals. Management of sheep, goat and swine. Incubation, hatching and brooding. Management of growers and layers. Important Indian and exotic breeds of cattle, buffalo, sheep, goat, swine and poultry. Improvement of farm animals and poultry.

UNIT III **4 Hours**

Digestion in livestock and poultry. Classification of feedstuffs. Proximate principles of feed. Nutrients and their functions. Feed ingredients for ration for livestock and poultry. Feed supplements and feed additives.

UNIT IV **4 Hours**

Feeding of livestock and poultry. Introduction of livestock and poultry diseases. Prevention (including vaccination schedule) and control of important diseases of livestock and poultry.

Course Title: Lab-Livestock and Poultry Management
Course Code: LPM152

L	T	P	Credits
0	0	2	1

Total hours-15

Practical Contents:

1. External body parts of cattle, buffalo, sheep, goat, swine and poultry.
2. Handling and restraining of livestock. Identification methods of farm animals and poultry.
3. Visit to IDF and IPF to study breeds of livestock and poultry and daily routine farm operations and farm records.
4. Judging of cattle, buffalo and poultry.
5. Culling of livestock and poultry.
6. Planning and layout of housingfor different types of livestock. Computation of rations for livestock.
7. Formulation of concentrate mixtures.
8. Clean milk production, milking methods.
9. Hatchery operations, incubation and hatching equipments. Management of chicks, growers and layers.
10. Debeaking, dusting and vaccination. Economics of cattle, buffalo, sheep, goat, swine and poultry production

Suggested Readings:

1. A Textbook of Animal Husbandry by G. C. Banerjee

2. A textbook of Livestock Production management in Tropic by D. N. Verma

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: PATH151

L	T	P	Credits
2	0	0	2

Total hours-30

Course Outcomes:

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

1. To get acquainted with the role of different microorganisms in the development of plant disease.
2. To get general concepts and classification of plant diseases.
3. To get knowledge of general characteristics of fungi, bacteria, virus, and other microorganisms causing plant diseases.
4. To acquaint the students with reproduction in fungi, and bacteria, causing plant diseases.
5. To get acquainted with various plant disease management principles andpractices.

Course contents
Theory:

UNIT I **7 Hours**

Introduction to Plant Pathology: Concept of disease in plants; Different terms used in Plant Pathology, History of Plant Pathology with special references to India

UNIT II **8 Hours**

Causes of plant disease: Inanimate and animate causes; Classification of plant disease; Parasitism and pathogenesis, Development of disease inplants: Disease Triangle, Disease cycle, Fungi and their morphology, reproduction and classification of fungi

UNIT III **7 Hours**

Bacteria: Morphology, reproduction classification of phytopathogenic bacteria, other plant pathogens: Mollicutes; Flagellant protozoa; FVB; Green algae and parasitic higher plants

UNIT IV **8 Hours**

Viruses and viroids, virus transmission, Principles of Plant disease management: Disease management with chemicals, Host resistance, cultural and biological method of Integrated Disease Management (IDM).

L	T	P	Credits
0	0	2	1

Course Title:Lab-Fundamentals of Plant Pathology
Course Code: PATH152

Total hours-30

Practical Contents:

1. Study of the microscope andacquaintance with laboratory material and equipments
2. Study of different plant disease symptoms
3. Microscopic examination of general structure of fungi
4. Simplestaining of bacteria: Direct and indirect staining and Gram staining of bacteria
5. Microscopic examination of fungal diseased specimen
6. Microscopic examination of bacterial diseased specimen
7. Preparation of culture media and Isolation of plant pathogens: Fungi, bacteria and viruses
8. Purification of plant pathogens
9. Study on plant disease diagnosis: Koch's Postulates
10. Characteristics,formulation, methods of application and calculation on fungicides

Suggested Readings:

1. Pathak, V. N. Essentials of Plant Pathology. Prakash Pub., Jaipur
2. Agrios, G N. 2010. Plant Pathology. Acad. Press.
3. Kamat, M. N. Introductory Plant Pathology. Prakash Pub., Jaipur
4. Singh R S. 2008. Plant Diseases. 8th Ed. Oxford & IBH. Pub. Co.
5. Singh R S. 2013. Introduction to Principles of Plant Pathology. Oxford and IBH Pub. Co.
6. Alexopoulos, Mims and Blackwel. Introductory Mycology
7. Mehrotra R S & Aggarwal A. 2007. Plant Pathology. 7th Ed. Tata McGraw Hill Publ. Co. Ltd.
8. Gibbs A & Harrison B. 1976. Plant Virology – The Principles. Edward Arnold, London
9. Hull R. 2002. Mathews Plant Virology. 4th Ed. Academic Press, NewYork.
10. Verma J P. 1998. The Bacteria. Malhotra Publ. House, New Delhi.
11. Goto M.1990. Fundamentals of Plant Bacteriology. Academic Press, NewYork.
12. Dhingra O D & Sinclair J B.1986. Basic Plant Pathology Methods. CRC Press, London, Tokyo.
13. Nene Y L & Thapliyal P N. 1993. Fungicides in Plant Disease

Control. 3rd Ed. Oxford & IBH, New Delhi.
14. Vyas S C.1993.Handbook of Systemic Fungicides. Vols.I-III. Tata McGraw Hill,New Delhi.
15. Rajeev K & Mukherjee R C. 1996. Role of Plant Quarantine in IPM. Aditya Books.
16. Rhower G G. 1991. Regulatory Plant Pest Management. In: Handbook of Pest Management in Agriculture. 2nd Ed. Vol. II. (Ed. David Pimental). CRC Press.

Transaction Method:

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

Course Title: National Cadit Corps (NCC)/ National Service Scheme (NSS)

Course Code: NCC151/NSS151

L	T	P	Credits
0	0	2	1

Total hours-30

National Cadet Corps (NCC)

1. Arms Drill- Attention, stand at ease, stand easy. Getting on parade. Dismissing and falling out. Ground/take up arms, examine arms. Shoulder from the order and vice-versa, present from the order and vice-versa. Saluting at the shoulder at the halt and on the march. Short/long trail from the order and vice- versa. Guard mounting, guard of honor, Platoon/Coy Drill.

2. Characteristics of rifle(.22/.303/SLR), ammunition, firepower, stripping, assembling, care, cleaning, and sight setting. Loading, cocking, and unloading. The lying position and holding.

3. Trigger control and firing a shot. Range Procedure and safety precautions. Aiming and alteration of sight. Theory of groups and snap shooting. Firing at moving targets. Miniature range firing. Characteristics of Carbine and LMG.

4. Introduction to map, scales, and conventional signs. Topographical forms and technical terms.

5. The grid system. Relief, contours, and gradients. Cardinal points and finding north. Types of bearings and use of service protractor. Prismatic compass and its use. Setting a map, finding north and own position. Map to ground and ground to map. Knots and lashings, Camouflage and concealment, Explosives and IEDs.

6. Field defences obstacles, mines and mine lying. Bridging, watermanship. Field water supplies, tracks and their construction. Judging distance. Description of ground and indication of landmarks. Recognition and description of target. Observation and concealment. Field signals. Section formations. Fire control orders. Fire and movement. Movement with/without arms. Section battle drill. Types of communication, media, latest trends and developments.

National Service Scheme (NSS):

1. Importance and role of youth leadership

2. Meaning, types and traits of leadership, qualities of good leaders; importance and roles of youth leadership, Life competencies

3. Definition and importance of life competencies, problem-solving and decision-making, interpersonal communication. Youth development programs

4. Development of youth programs and policy at the national level, state level and voluntary sector; youth-focused and youth-led organizations

5. Health, hygiene and sanitation. Definition needs and scope of health education; role of food, nutrition, safe drinking water, water borne diseases and sanitation (Swachh Bharat Abhiyan) for health; national health programs and reproductive health. Youth health, lifestyle, HIV AIDS and first aid.

6. Healthy lifestyles, HIV AIDS, drugs and substance abuse, home nursing

and first aid. Youth and yoga. History, philosophy, concept, myths, and misconceptions about yoga; yoga traditions andits impacts, yoga as a tool for healthy lifestyle, preventive and curative method

Note:

1. As per the guidelines of Ministry of Youth Affairs and Sports, GOI, minimum duration for a NSS volunteer to be eligible for Certificate-Ais 2 years; for Certificate-Bis 3 years and for Certificate-Cis 4 years.
2. Hence, additional contents for Semester III and Semester IVcontents (optional) may beincluded by the College for securing those advanced certificates if interested students are there.

Semester III (optional)

Vocational Skill development

1. To enhance the employment potential and to set up small business enterprises skills of volunteers, a list of 12 to 15 vocational skills will be drawn up based on the local conditions and opportunities. Each volunteer will have the option to select two skill-areas out of this list of issues related environment.
2. Environmental conservation, enrichment and sustainability, climatic change, natural resource management (rainwater harvesting, energy conservation, forestation, waste land development and soil conservations) and waste management. Disaster management. Introduction and classification of disaster, rehabilitation, and management after disaster; role of NSS volunteers in disaster management.
3. Entrepreneurship development. Definition, meaning and quality of entrepreneur; steps in opening of an enterprise and role of financial and support service institution.
4. Formulation of production-oriented project. Planning, implementation, management, and impact assessment of project. Documentation and data reporting. Collection and analysis of data, documentation, and dissemination of project reports.

Semester IV (optional)

Youth and Crime

1. Sociological and psychological factors influencing youth crime, cyber crime, pear mentoring in preventing crime and awareness for juvenile justice.

2. Civil/self-defense. Civil defense services, aims and objectives of civil defense;needs and training of self-defense. Resource mobilization. Writing a project proposal of self-fund units (SFUs) and its establishment.

Course Title:- Biofertlizer and biopesticide production

L	T	P	Cr
0	0	4	2

Course code: SEC200

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

1 Student will study the history, concept, quality control and application of biopesticides and bio-fertilizers, their importance, scope and potential.

2 Student will develop ability to differentiate the structure and characteristic features of various bacterial bio-fertilizers.

3 Student will interpret storage, shelf life, quality control and marketing and factors influencing the efficacy of bio-pesticides & bio-fertilizers.

4 Student will be able to evaluate mechanism of Production technology of bio-pesticides and bio-fertilizers.

Practical **Total Hours- 30**

1.Isolation and purification of important biopesticides:*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-Wetsieving method and sucrose gradient method.

10. Mass production of AM inoculants.

Suggested readings:

1. Dhaliwal, G. S. and Koul, O., Kalyani Publishers, 2007 Biopesticides and Pest Management, Biopesticides and Pest Management,

2. Mukerji, K. G., Tewari, J. P., Arora, D. K. and Saxena, G., Aditya Books, New Delhi, 1992 Recent Developments in Biocontrol of Plant Diseases, Recent Developments in Biocontrol of Plant Diseases

3. Campbell, R., Cambridge Univ. Press, Cambridge, 1989 Biological Control of Microbial Plant Pathogens, Biological Control of Microbial Plant Pathogens.

4. Cook, R. J. and Baker, K. F., APS, St Paul, Minnesota, 1983 The Nature and Practice of Biological Control of Plant Pathogens, The Nature and Practice of Biological Control of Plant Pathogens

Course Title: Entrepreneurship Developmentand Business Communication

Course Code: ECON200

L	T	P	Credits
2	0	0	2

Total hours- 30

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

1. Provide student an insight into the concept andscopeo fentrepreneurship.
2. To expose the students to various aspects of establishment and management of as mall business unit.
3. To enable the students to develop financially viable agribusiness proposal.
4. To provide student an insight into the concept andscope of entrepreneurship.

Course Contents

Theory

UNIT I **Hours- 8**

Development of entrepreneurship, motivational factors, social factors, environmental factors, characteristics of entrepreneurs ,entrepreneurial attributes/competencies.Concept,need for and importance of entrepreneurial development. Evolution of entrepreneurship, objectives of entrepreneurial activities, types of entrepreneurs, functions of entrepreneurs, importance of entrepreneurial development, and process of entrepreneurship development.

UNIT II **Hours- 7**

Environment scanning and opportunity identification need for scanning–spotting of opportunity- scanning of environment– identification of product / service – starting a project; factors influencing sensing the opportunities. Infrastructure and support systems- good policies, schemes for entrepreneurship development;role of in ancial institutions,andother agencies inentrepreneurship development. Steps involved in functioning of anenterprise

.

UNIT III **Hours- 8**

Selection of theproduct/services, selection of form of ownership; registration, selectionofsite, capitalsources, acquisition of manufacturing knowhow, packaging and distribution.Planning of an enterprise, project identification, selection, and formulation of project; project report preparation, EnterpriseManagement. Production management – product, levels of products, product mix, quality control, cost of production,production controls, Material management.Production management–raw material costing, inventory control.

UNIT IV **Hours- 7**

Personal management – manpower planning, labour turn over, wages / salaries. Financial management /accounting – funds, fixed capital and working capital, costing and pricing, long term planning and short-termplanning, bookkeeping, journal, ledger, subsidiary books, annual financial statement,taxation. Marketing management- market, types, marketing assistance, market strategies. Crisis management- raw material, production, leadership, market, finance, natural.

Course Title: Lab- Entrepreneurship Developmentand Business Communication

Course Code: ECON201

L	T	P	Credits
0	0	2	1

Practical **Total Hours- 30**

1. Visit to small scale industries/agro-industries
2. Interaction with successful entrepreneurs/ agric-entrepreneurs.
3. Visit to financial institutions and support agencies.
4. Preparation of project proposal for funding by different agencies.

Suggested readings:

- *Charantimath P.M.,2009, Entrepreneurship Developmentand Small Business Enterprises. Pearson Publications, New Delhi.*
- *Desai V.,2015 Entrepreneurship: Development and Management ,Himalaya Publishing House.*
- *Gupta C.B.2001. Management Theory and Practice.Sultan Chand & Sons.*
- *Indu Grover. 2008. Handbook on Empowerment and Entrepreneurship. Agro tech Public Academy.*
- *Khanka S.S.1999. Entrepreneurial Development. S.Chand & Co.*
- *Mehra P.,2016, Business Communication for Managers. Pearson India, NewDelhi.*
- *Pandey M.and Tewari D., 2010, The Agribusiness Book. IBDC Publishers, Lucknow.*
- *Singh D.1995.Effective Managerial Leadership. Deep&DeepPubl.*
- *Singhal R.K., 2013, Entrepreneurship Development & Management, Katson Books.*
- *Tripathi PC & Reddy PN. 1991. Principles of Management. Tata McGraw Hill. Vasant Desai,1997.Small Scale Industries and Entrepreneurship. Himalaya Publ. House*

Transaction Method:

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

Course Title: Lab Physical Education,First Aid and Yoga Practices

Course Code: PED200

L	T	P	Credits
0	0	2	1

Pracital

Total Hours- 30

1.Physical education; TrainingandCoaching - Meaning&Concept; Methods of Training; aerobic andaerobic exercises

2. Calisthenics, weighttraining, circuittraining, interval training

3. Fartlek training; Effects ofExercise on Muscular, Respiratory, Circulatory & Digestive systems

4.Balanced Diet and Nutrition: Effects of Diet on Performance; Physiologicalchangesduetoageingandroleofregularexerciseonageingprocess; Personality, its dimensions and types.

5. Role of sports inpersonalitydevelopment; Motivationand Achievements in Sports; Learning and Theories of learning; Adolescent Problems & its Management; Posture; Postural Deformities; Exercises for good posture.

Yoga;HistoryofYog, Typesof Yog, IntroductiontoYog,

- Asanas(DefinitionandImportance)Padmasan, Gaumukhasan,Bhadrasan,Vajrajasan,Shashankasan,Pashchimotasan,Ushtrasan,Tadasan,Padhas tasan, Ardhchandrasan, Bhujangasan, Utanpadasan, Sarvangasan , Parvatasan , Patangasan, Shishupalanasan – left leg-right leg,Pavanmuktasan,Halasan,Sarpasan,Ardhdhanurasan,Sawasan
- Suryanamskar Pranayama (Definition and Importance) Omkar, Suryabheda, Chandrabhedan, Anulom Vilom,Shitali, Shitkari, Bhastrika, Bhramari
- Meditation (Definitionand Importance), Yogic Kriyas (Kapalbhati), Tratak, Jalneti and Tribandh
- Mudras (Definition and Importance) Gyanmudra, Dhyanmudra, Vayumudra, Akashmudra, Pruthvimudra, Shunyamudra, Suryamudra, Varunmudra, Pranmudra, Apanmudra, Vyanmudra, Uddanmudra

Course Title: Principle of genetics

Course Code: GPB200

L	T	P	Credits
2	0	0	2

Total hours- 30

Course Outcomes:

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

1. Understand basic principles of Mendelian inheritance and to predict the ratio of a specic fie genotype and/or phenotype from a cross.

2. Perform and interpret the results of a Chi Square analysis.

3. Apply the knowledge to decide the most likely mode of inheritance based on pedigree chart.

4. Understand the molecular basis of genetic diseases and repair mechanisms.

Course contents

Theory

Unit-I **Hours- 8**

Pre and post Mendelian concepts of heredity, Mendelian principles of heredity, Architecture of chromosomes, chromonemata, chromosome matrix, chromomeres, centromere, secondary constriction and telomere, special types of chromosomes.

Unit-II **Hours- 7**

Chromosomal theory of inheritance-cell cycle andcell division-mitosis and meiosis. Probabilit and Chi-square. Dominance relationships, Epistatic interactions with example. Dominance relationships, Epistatic interactions with example. Multiple alleles, pleiotropism and pseudoalleles, Sex determination and sex linkage, sex limited and sex influenced traits, Blood group genetics

Unit-III **Hours- 8**

Linkage and its estimation, crossing over mechanism, chromosome mapping, Structural and numerical variations in chromosomes and their implications, Use of haploids, dihaploidsanddoublehaploidsinGenetics, Mutation, classification, Methods of inducing mutations and CIB technique, mutagenic agents and induction of mutation.

Unit-IV **Hours- 7**

Qualitative and quantitative traits, Polygenes and continuous variations, multiple factor hypothesis, Cytoplasmic inheritance, Genetic disorders,Nature, structure and replication of genetic material, Protein synthesis, Transcription and translational mechanism of genetic material, Gene concept: Gene structure, function and regulation, Lac and Trp operons.

Course Title: Lab Principle of genetics

Course Code: GPB201

L	T	P	Credits
0	0	2	1

Pracital

Total Hours- 30

1. Study of microscope
2. Stud 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 croo-over analsis(through two point test cross and three point test cross data).
9. Study on sex linked inheritance in Drsoophila.
10. Study on models on DNA and RNA structures.

Suggested readings:

1. *B.D.Singh. 2001 Fundamentals of Genetics:*
2. *Gardner,Simmons and Snustad. 1998 Principles of Genetics*
3. *M. W.Strickberger. 2015 Genetics*
4. *Dunna nd Dobzhansky 1950 Principles of Genetics:Sinnott,*

Transaction Method:

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

Course Title: Crop ProductionTechnology-I (Kharif crops)

Course Code: AGRON200

L	T	P	Credits
2	0	0	2

Total hours- 30

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

1. To know about origin, geographical distribution, and economic importance of Kharif crops
2. In the course study the students will be able to know about Soil and climatic requirements, varieties, cultural practices and yield of Kharif crops
3. Analysis of comparative benefits of the different Kharif crops
4. Constraints in production of oilseeds and pulses maybe identified through course content.
5. Production technology of kharif cereals and millets fulfil the need of human consumption and milch cattle.

Course contents

Theory

UNIT-I **Hours- 8**

Origin, geographical distribution, economic importance, soil and climatic requirements, varities, culturalpracticesandyieldofKharifcrops.Cereals-rice, maize, sorghum,pearl millet and fingermillet

UNIT-II **Hours- 7**

Origin, geographical distribution, economic importance, soil and climatic requirements, varities, cultural practices and yield of pulses- pigeonpea, mungbean and urd bean

UNIT-III **Hours- 8**

Origin, geographical distribution, economic importance, soil and climatic requirements, varities, cultural practices and yield of oil seed groundnut, and soybean.

UNIT-IV **Hours- 7**

Origin, geographical distribution, economic importance, soil and climatic requirements, varities, cultural practices and yield of fibre crops- cotton & jute; forage crops- sorghum, cowpea, cluster bean and napier.

Course Title: Crop ProductionTechnology-I (Kharif crops)

Course Code: AGRON201

L	T	P	Credits
2	0	0	2

Practical content **Total Hours- 30**

1. Rice nursery preparation,transplanting of rice
2. Sowingof soybean,pigeon pea and mung bean, maize, groundnut and cotton
3. Effect of seed size on germination andseedling vigour of Kharif season crops
4. Effect of sowing depth on germination of Kharif crops
5. Identification of weeds in Kharif season crops, top dressingand foliar feeding of nutrients. 6.study of yield contributing characters and yield

6.calculation of Kharif seasonc rops,

7.study of crop varities and important agronomic experiments at experiential farm.

8.Study of forage experiments morphological description of Kharif season crops

9. visit to research centres of related crops.

Suggested Readings**:**

1. *B. Gurarajan, R. Bala Subramanian and V.Swaminathan 2000 .Recent Strategies on Crop Production.Ka Publishers, New Delhi.*
2. *Chidda Singh.1997. Modern techniques of raising field crops. Oxford and IBH Publishing Co. Pvt. New Delhi.*
3. *Rajendra Prasad. Textbook of Field Crops Production 1987 - CommercialCrops. Volume IIICAR Publication.*
4. *S.R.Reddy.2009.Agronomy of Field Crops. KalyaniPublishers,NewDelhi.*
5. *S.S.Singh.2005.Crop Management. Kalyani Publishers, NewDelhi.*
6. *UAS,Bangalore.2011.Package of Practice.UAS, Bangalore.*
7. *Subhash Chandra Bose,M.and Balakrishnan,V.2001.Forage Production South Asian Publishers, New Delhi.*

Transaction Method:

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

Course Title: - Production Technology of Fruits and Plantation Crops

Course Code: HORT200

L	T	P	Credits
2	0	0	2

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

1. Learn about scope and importance of fruits and plantation crops.

2. Know more about origin, area, climate, soil, improved varieties and cultivation practices such as time and methods of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting and yield of different fruits and plantation crops.

3. Physiological disorders of important fruits and plantation crops.

4. Learn technical cultivation practices of major fruit crops - mango, banana, citrus, grape, guava, litchi, papaya, apple, pear and peach.

5. learn technical cultivation practices of minor fruit crops-pineapple.
6. pomegranate, jackfruit, strawberry.
7. learn technical cultivation practices of plantation crops-coconut, arecanut, cashew, tea, coffee & rubber.

Course contents

Theory

UNIT-I **Hours- 4**

Importance and scope of fruit and plantation crop industry in India; High density planting; Use of rootstocks; Production technologies for the cultivation of major fruits-mango, banana, citrus, grape, guava.

UNIT-II **Hours- 3**

Importance and scope of fruit and plantation crop industry in India; High density planting; Use of rootstocks; Production technologies for the cultivation of major fruits papaya, apple, pear, peach

UNIT-III **Hours- 4**

Importance and scope of fruit and plantation crop industry in India; High density planting; Use of rootstocks; Production technologies for the cultivation of minor fruits- pineapple, pomegranate, jackfruit, strawberry

UNIT-IV **Hours- 4**

Importance and scope of fruit and plantation crop industry in India; High density planting; Use of rootstocks; Production technologies for the cultivation of nut crops; plantation crops-coconut, arecanut, cashew, tea, coffee & rubber

Course Title: Lab- Production Technology of Fruits and Plantation Crops

Course Code: HORT201

L	T	P	Credits
0	0	2	1

Total hours- 30

Practical

1.seed propagation.Scarification and stratification of seeds.

2.Propagation methods for fruit and plantation crops including Micro-propagation.

3.Description and identification of fruit.

4.Preparation of plant bio regulators and their uses.

5. Pests, diseases and physiological disorders of above fruit and plantation crops, Visit to commercial orchard.

Suggested readings

1. Bose, T.K. and Mitra, S.K. 1990. Fruits-Tropical and Sub-tropical. Naya Prakashan, Calcutta. 2. Chattopadhya, P.K. 2012.

2. Text Book on Pomology (Fundamentals of Fruit Growing). Kalyani Publishers, Ludhiana.

3. Bijendra Singh. 2012. Horticulture at a Glance. Kalyani Publishers, Ludhiana.

4. Parthasarathy,V.A., P.K. Chattopadhyay and Bose, T.K. 2006. Plantation Crops.Vol I and II. Parthasankar basu Naya Udyog, Kolkata

Course Title: Fundamentals of Extension Education

Course Code: EXT200

L	T	P	Credits
1	0	0	1

Total hours- 15

Course Outcomes:

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

1.Perceive the importance of extension education in respect to technology of transfer (TOT) among the farmers.

2: Know the major rural development programmes before independence and after independence.

3: Aware about the ongoing programmes under different ministries of Govt. Of India and extension agency like ATMA, KVK etc.

4: Prepare audio visual aids to provide informal or formal information among the farmer

Theory **Course content**

Unit-I **Hours- 4**

Reorganised Extension System (T&V system) various extension/ agriculture development programmes launched by ICAR/ Govt. of India (IADP, IAAP,HYVP,KVK,IVLP,ORP,ND,NATP,NAIP,etc.).SocialJusticeandpovertyalleviation programme- ITDA, IRDP/SGSY/NRLM. Women Development Programme-RMK, MSY etc.

Unit-II **Hours- 5**

New trends in agriculture extension: privatization extension, cyber extension/ e-extension, market-led extension, farmer-led extension, expert systems, etc. Rural Development: concept, meaning, definition; various rural development programmes launched by Govt. of India. Community Dev.-meaning,

definition, concept & principles, Philosophy of C.D.

Unit-III **Hours- 4**

Rural Leadership: concept and definition,types of leaders in rural context;Methodof identification of Rural Leader. Extension administration: meaning and concept, principles and functions. Monitoring and evaluation: concept and definition, monitoring and evaluation of extension programmes; transfer of technology: concept and models, capacity building of extension personnel.

Unit-IV **Hours- 3**

Extension teaching methods: meaning, classification, individual, group and mass contact methods, ICT Applications in TOT (New and Social Media), media mix strategies; communication: meaning and definition; Principles and Functions of Communication, models and barriers to communication. Agriculture journalism; diffusion and adoption of innovation: concept and meaning, process and stages of adoption, adopter category.

Course Title: LAB Fundamentals of Extension Education

Course Code: EXT201

L	T	P	Credits
0	0	2	1

Practical **Total Hours- 30**

1.To get acquainted with university extensionsy stem.

2.Groupdiscussion-exercise: Identification of rural leaders in village situation; preparation and use of AV aids.

3. preparation of extension literature – (leaflet, booklet, folder, pamphlet news stories and success stories.

4.Presentation skills exercise; micro teaching exercise; A visit to village to understand the problems being encountered by the villagers/ farmers.

5.to study organization and functioning of DRDA/PRI and other development departments at district level

6.visit to NGO/FO/FPO and learning from their experience in rural development; understanding

7.PRA techniques and their application in village development planning; exposure to mass media

8. visit to community radio and television studio for understanding the process of programme production; script writing, writingfor print and electronic media

9 Developing script for radio and television.

Suggested Readings

1*) Dahama, O.P. and Bhatnagar, O.P. 1980. Education and Communication for Development. Oxford &lBH Publishing Co. Pvt. Ltd., New Delhi.*

2) Dudhani, C.M.; Hirevenkatgoudar, L.V., Manjunath, L.; Hanchinal, S.N. and Patil, S.L. (2004). Extension Teaching Methods and Communication Technology, UAS, Dharwad.

3) Kamat, M.G. (1985). Writing for Farm Families. Allied Publishers, New Delhi.

Kelsey, L.D. and Hearne, G.C. (1963). Cooperative Extension Work, Comstar Publishing Associate, New York.

5) Mehta, D.S.(1981). Mass Communication and Journalism in India. Vikas Publication, New Delhi.

6) Ray, G.L. (1991). Extension Communication and Management. Noya Prakash, Calcutta.

7) Reddy, A.A 2005 Extension Education. Sri Lakshmi Press, Bapatla.

8) Rogers, E.M. 2003. Diffusion of Innovations. Free Press, New Delhi.

9) Samanta, R.K. (1990). Development Communication for Agriculture. BR Publishing Corporation, Delhi.

Transaction Method:

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

Course Title: Fundamentals of Nematology

Course Code: NEM200

L	T	P	Credits
2	0	0	2

Course Outcomes:

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

1. Udentify different nematode species, including economically important parasitic nematodes.
2. Understand the basic morphology and classification of nematodes.
3. Understand the factors influencing nematode populations and distribution.
4. Understand the plant's defense mechanisms against nematodes.

Course contents

Theory

Unit-I **Hours- 8**

Introduction-History of phytonematology, habitat and diversity,economic importance of nematodes.General characteristics of plant parasitic nematodes.Nematode - definition, general morphology and biology.

Unit-II **Hours- 7**

Classification of nematodes upto family level with emphasis on groups containing economically important genera.Classification of nematodes on the basis of feeding/parasitichabit.Symptomatology

Unit-III **Hours- 8**

Role of nematodes in disease development, Interaction between plant parasitic nematodes and disease causing fungi, bacteria and viruses. Nematodepests of crops: Rice, wheat, vegetables, pulses, oilseed andfiber crops, citrus andbanana, tea, coffee and coconut.

Unit-IV **Hours- 7**

Differentmethods of nematode management: Cultural methods, physical; methods, Biological methods, Chemical methods , Plant Qurantine, Plant resistance and INM.

Course Title: Lab- Fundamentals of Nematology

Course Code: NEM201

L	T	P	Credits
0	0	2	1

Practical Contents **Total Hours- 30**

1.Sampling methods, collection of soil and plant samples

2. Extraction of nematodes from soil and plant tissues following Cobb'ssieving and decanting technique, Baermann funnel techinique.

3. Pickingand counting of plant parasitic nematode.

4.Identification of economically important plantnematodes upto generic level with the help of keys and description: Meloidogyne, Pratylenchus; Heterodera, Tylenchulus, Xiphinema, and Helicotylenchus etc.

5. Study of symptoms caused by important nematode pests of cereals, vegetables, pulses, plantation crops etc.

6.Methods of application of nematicides and organic amendments.

Suggested readings:

1.Text book on Introductory Plant Nematology-R.K.Walia andH.K.Bajaj

2. Plant Parasitic Nematodes (Vol-1) by Zukerman,Mai,RohdE

3.Plant Parasitic Nematodes of India: Problems and Progress by-Gopal Swarup,D.R.Dasgupta,P. K. Koshy.

4.Economic Nematology-Edited by J.M.Webster

Transaction Method:

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

Course Title: Principle sand Practices of Natural Farming	L	T	P	Credits
Course Code: AGRON200	1	0	0	1

Total hours- 15

Course Outcomes:

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

1 grasp the core principles of natural farming, including its emphasis on soil health, biodiversity, and ecological balance. .

2 Recognizing the importance of using local and diverse seed varieties.

3 mportance of soil microorganisms in nutrient cycling, plant health, and disease suppression.

4 learned natural farming techniques in real-world settings.

Course Contents

Theory

Unit I **Hours- 4**

Indian Heritage of Ancient Agriculture, History of Natural Farming, Importance of natural farming in view of climate change, soil health, water use carbon sequestration, biodiversity conservation, food security and nutritional security, and sustainable development goals(SDGs), Concept of natural farming; Definition of natural farming;Objective of natural farming

Unit II **Hours- 3**

Essential characteristics and Principles of natural farming; Scope and importance of natural farming. Main Pillars of natural farming; Methods/ types/schools of natural arming. Characteristics and design of a natural farm, Concept of ecological balance, ecological engineering and community responsibility in natural versus o the farming systems, Introduction to concept of ecological,water, carbon and nitrogen foot prints

Unit III **Hours- 4**

Concept and evaluation of ecosystem services,

Integration of crops, trees and animals, cropping system approaches, Biodiversity, indigenous seed production, farm waste recycling, water conservation and renewable energy useapproaches on a natural farm,Rearing practices for animals under natural farming**,**Nutrient management in natural farming and their sources, Insect, pest, disease and weed management under natural farming

Unit IV **Hours- 3**

Mechanization in natural farming, Processing, labelling, economic consideration sand viability, certification and standards in natural farming, marketing and export potential of natural farming produce and products. Initiatives taken by Government (central/state), NGOs and other organizations for promotion of natural farming and chemical free agriculture, Case studies and successstories in natural farming and chemical free traditional farming,Entrepreneurship opportunities in natural farming.

Course Title: Lab- Principle sand Practices of Natural Farming

Course Code: AGRON201

L	T	P	Credits
0	0	2	1

Total hours- 30

Practical Content

1. Visit of natural farm and chemical free traditional farms to study the various components and operations of natural farming

2. Principles at the farm; Indigenous technical knowledge (ITK) for seed, tillage, water, nutrient, insect-pest,disease and weed management ;On-farm inputs preparation methodsand protocols, 3.Studies in green manuring in-situand green leaf manuring,

4. Studies on different types of botanicals and animal urine and dung based non-aerated and aerated inputs for plant growth, nutrient, insect and pest and disease management.

6. Weed management practices in natural

5. Technique of Indigenous seed production-storage and marketing

6. Partialandcompletenutrientand financial budgeting in natural farming; farming; Evaluation of ecosystem services in natural farming (Crop, Field and System)..

Suggested Readings:

1. *1 Nalini S. 1999. Krishi-Parashara (Agriculture by Parashara) by Parashara. Brig Sayeed Road, Secunderabad, Telangana: AAHF Classic Bulletin, Asian Agri-History Foundation. 104pp.*
2. *ShamasastryR.1915.Kautilya'sArthashastra.*
3. *Ayachit SM. 2002. Kashyapi Krishi Sukti (A Treatise on Agriculture by Kashyapa). BrigSayeed Road, Secunderabad, Telangana: Asian Agri-History Foundation 4: 205.*
4. *Nalini S. 1996. Vrikshayurveda (The Science of Plant Life) by Surapala. AAHF Classic Bulletin 1.AsianAgri-History Foundation, Brig Sayeed Road, Secunderabad, AP (nowTelengana), India. 94pp.*
5. *Ecological Farming-The seven principles of a food systemthat has people at*

its heart .May 2015, Greenpeace.

6. *HLPE.2019.Agroeeological and other innovative approaches for sustainable agriculture and food systems that enhance food security and nutrition. Areport by the High Level Panel of Experts on Food Security and nutrition of the Committee on World Food Security, Rome. https://fao.org/3/ea5602en/ea5602en.pdf.*
7. *FAO. 2018. The 10 elements of agro-ecology: guiding the transition to sustainable food and agricultural system .https://www.fao.org/3/i9037en/i9037en.pdfAgro ecosystem Analysis for Research and Development Gordon R. Conway.1985*
8. *UKBehera.2013.AtextBookofFarmingSystem.AgrotechPublishingHouse, Udaipur.*
9. *(ISBN:978-81-8321-309-7)*
10. *Hill S.B and Ott. P. (eds.). 1982 Basic Techniques in Ecological Farming Berkhauser Verlag, Basel, Germany, 366 pp.*

Transaction Method:

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

Course title: Plantation crops production and their management

L	T	P	Cr
0	0	4	2

Course code: SEC251

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

CourseTitle:Agri Informatics
CourseCode: INF251

L	T	P	Credits
2	0	0	2

Total hours-30

Course Outcomes:

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

1 Making the students understand & learn basics of Computer
2 Able to operate a Computer by knowing all parts & instructions of Computer.
3 Make use of Computer in our day to day Life.
4 Learn about DOS and its commands.

Course contents

Theory

UNITI **8**

Hours

Introduction to Computers, Anatomy of Computers, Memory Concepts, Units of Memory, Operating System: Definition and types, Applications of MS-Office forcreating, Editing and Formatting a document, Data presentation, Tabulation and graph creation, Statistical analysis, Mathematical expressions, Database, concepts and types, creating data base, Uses of DBM Sin Agriculture.

UNITII **8Hours**

Internet and World Wide Web (WWW): Concepts and components, Computer programming :General concepts, Introduction to Visual Basic, Java, Fortran, C/C++,etc. concepts and standard input/ output operations, e-Agriculture, Concepts, design and development, Application of innovative ways to use information and communication technologies (IT) in Agriculture, Computer Models in Agriculture: Statistical, weather analysis and crop simulation models, concepts, structure, inputs-outputs files, limitation, advantages and application of models for understanding plant processes, sensitivity, verification, calibration and validation.

UNITIII **7Hours**

IT applications for computation of water and nutrient requirement of crops, Computer-controlled devices (automated systems) for Agri-input management, Smart phone mobile apps in agriculture for farm advice: Market price, post harvest management etc.

UNITIV **7Hours**

Geospatial technology: Concepts, techniques, components and uses 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 and crop calendars using IT tools, Digital India and schemes to promote digitalization of agriculture in India.

L	T	P	Credits
0	0	2	1

CourseTitle:Lab-Agri Informatics
CourseCode: INF252

Practical contents **Total Hours30**

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 as scientific documents.
4. MS-EXCEL- Creating as Spread sheet, Use of statistical tools, Writing expressions, Creating graphs, Analysis of scientific data, Handling macros.
5. MS-ACCESS: Creating Database, preparing queries and reports, Demonstration of Agri- information system.
6. Introduction to World Wide Web (WWW) and its component.
7. Introduction of programming languages such as Visual Basic, Java, Fortran,C,C+.
8. Hands on practice on Crop Simulation Models (CSM), DSSAT/ Crop-Info / Crop Syst/ Wofost, Preparation of inputs file for CSM and study of model outputs, computation of water and nutrient requirements of crop using CSM and IT tools.
9. Use of smart phones and other devices in agro-advisory and dissemination of market information.
10. Introduction of Geospatial Technology.
11. Hands on practice on preparation of Decision Support System.
12. Preparation of contingent crop planning, India Digital Ecosystem of Agriculture (IDEA).

Suggested Readings:

1. *Fundamentals of Computer by V. Rajaroman.*
2. *Introduction to Information Technology by Pearson.*
3. *Introduction to Database Management System by C. J. Date.*
4. *Concepts and Techniques of Programming in C by Dhabal Prasad Sethi and Manoranjan, Wiley India.*
5. *Introductory Agri Informatics by Mahapatra, Subrat Ketal, Jain Brothers Publication.*

Transaction Method:

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

Course Title: Production Technology of Vegetables and Spices
Course Code: HORT251

L	T	P	Credits
1	0	0	1

Total hours-15

CourseOutcomes:

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

1 Explain the several practices involved in cultivation and management of different vegetable and spice crops.
2 To educate about the origin, area, climate, soil, improved varieties and cultivation practices of vegetables and spices.
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.

CourseContents

Theory

Unit-I **4Hours**

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, Chili and Capsicum).

Unit-II **3Hours**

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 (Cucumber, Melons, Gourds, Pumpkin, Frenchbean and Peas).

Unit-III **4Hours**

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 (Cole crops such as Cabbage ,Culiflower, Knol-Khol; Bulb crops such as Onion, Garlic; Root crops such as Carrot and Raddish).

Unit-IV **4Hours**

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 (Beetroot; Tuber crops such as Potato; Leafy vegetables such as Amaranth, Palak, Perennial vegetables).

Course Title: Lab-Production Technology of Vegetables and Spices
Course Code: HORT252

L	T	P	Credits
0	0	2	1

Practical Contents

Total hours-30

1. Identification of vegetables crops.
2. Identification of spice crops.
3. Identification of seeds of vegetables & spice.
4. Nursery raising.
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. *Vegetable crops by J. Kabir, T.K. Bose, M.G. Som*

2. *Olericulture, Fundamentals of Vegetable Production (Vol.1) by K.P. Singh, AnantBahadur*

3. *Vegetable crops (Production technology, VolII) by M.S. Fagaria, B.R. Choudhury, R.S. Dhaka*

Transaction Method:

Assignment,PowerPointpresentation,Audiolecture,Videolecture,Plaintext, Handouts, Case based study and Group discussion

CourseTitle:Diseases of Field Crops & their Management
CourseCode: PATH251

L	T	P	Credits
2	0	0	2

Total hours-30

Course Outcomes:

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

1 To study the symptoms produced on the host.
2 To study the etiology of the diseases.
3 To know about the disease cycle of the pathogens during pathogenesis.
4 To study the epidemiological factors responsible for disease development.

CourseContents

Theory

UnitI **7 Hours**

Symptoms, etiology, disease cycle, epidemiology and management of major diseases of the following crops: Rice(Blast, Brown Spot, Sheath Blight, False smut, Bacterial Leaf Blight, Bacterial Leaf Streak, Tungro, Khaira); Wheat (Rusts, Loose smut, Karnal Bunt); Maize(Banded Leaf and Sheath Blight, Southern and Northern blight, Downy mildew); Sorghum (Smuts, Grain mold, Anthracnose); Bajra (Downy mildew, Ergot).

UnitII **5 Hours**

Symptoms, etiology, disease cycle, epidemiology and management of major diseases of the following crops: Finger millet (Blast, Leaf Spot); Groundnut (Early and Late leaf spots, Rust, Wilt); Soybean (Rhizoctonia blight, Bacterial Spot, Seed and Seedling rot, Mosaic).

UnitIII **9 Hours**

Symptoms, etiology, disease cycle, epidemiology and management of major diseases of the following crops: Grams (Ascochyta blight, Wilt, Grey mold); Pea (Downy Mildew, Powdery Mildew, Rust); Black gramand Green gram(Web blight, Cercospora Leaf Spot, Anthracnose, Yellow Mosaic); Sugarcane (Red rot, Smut, Grassy Shoot, Ratoon Stunting, Pokah Boeng).

UnitIV **9 Hours**

Symptoms, etiology, disease cycle, epidemiology and management of major diseases of the following crops: Mustard (Alternaria blight, White Rust, Downy Mildew, Sclerotinia Stem Rot) and Sunflower (Sclerotinia Stem Rot, Alternaria blight); Cotton (Anthracnose, Vascular wilts, Black Arm). Horticultural crops: Citrus(Canker, Gummosis) and Guava (Wilt, Anthracnose).

CourseTitle:Lab-Diseases of Field Crops & their Management
CourseCode: PATH252

L	T	P	Credits
0	0	2	1

Practical Contents **30 Hours**

1. To study the symptoms of different diseases of crops: Blast and Brown spot of rice, Sheath blight and Bacterial leaf blight of rice,
2. To study the symptoms of different diseases of crops: Rhizoctonia and Cercospora leaf s Green gram / Black gram,
3. To study the symptoms of different diseases of crops: Alternaria blight and Downy mildew of Mustard,
4. Acquaintance with fungicides, Antibiotics and Biopesticides and their use in management of diseases of horticultural crops.
5. Identification and histopathological studies of selected diseases of field and horticultural crops covered in theory.
6. Field visit for the diagnosis of field problems, Collection and preservation of plant diseased specimens for herbarium.
7. Students should submit 50 pressed and well mounted specimens.

Suggested Readings:

1. *Plant Diseases (By: R.S. Singh)*
2. *Plant Disease Management: Principles and Practices (By: Hriday Chaube)*
3. *Integrated Plant Disease Management (By: R.C. Sharma)*
4. *Plant Pathology (By: G.N. Agrios, 2010)*
5. *Lab Manual for diseases of field and horticultural crops: (By Dr. A.Mehta and B. Singh)*

Transaction Method:

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

Course Title: Principles of Agricultural Economics and Farm Management
Course Code: ECON251

L	T	P	Credits
2	0	0	2

Total hours- 30

CourseOutcomes:

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

1 To aware the student about broad areas covered under agricultural Economics and farm management

2 To impart knowledge on judicious use of resources for optimum production

3 Analyse the forces which condition production patterns and resource use in relation to the existing opportunities.

4 Explain the means and methods adaptable in moving from the existing levels to
the optimum use of farm resources.

Course Contents

Theory

UNIT-I **7Hours**

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 **7Hours**

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, equi- marginal utility principle. Consumer's equilibrium and derivation of demand curve, concept of consumer surplus.

UNIT-III **8Hours**

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. Laws of returns: Law of variable proportions and law of returns to scale. Cost: Cost concepts, short run and long run cost curves. Supply: Stock v/s supply, law of supply, supply schedule, supply curve, determinants of supply, elasticity of supply. Distribution theory: meaning, factor market and pricing of factors of production. 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 **8Hours**

Population: Importance, Malthusian and Optimum population theories, natura land socio-economic 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. Economic systems: Concepts of economy and its functions, important features of capitalistic, socialistic and mixed economies, elements of economic planning. Forms of business organizations, international trade and balance of payments. GST and its implication on Indian economy.

Suggested Readings:

1. *S.Subha Reddy, P.Raghu Ram,T.V. Neelakanta andI. BhvaniDevi.2004. Agricultural Economics. Oxford & IBH publishing Co. Pvt. Ltd*

2. *Johl, S.S and T.R Kapur.2009. Fundamentals of Farm Business Management. Kalyani Publishers*

Course Title: Crop Production Technology-II (Rabi Crops)
CourseCode: AGRON251

L	T	P	Credits
2	0	0	2

Totalhours- 30

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

1	To impart basic and fundamental knowledge on principles and practices of rabi crop production.
2	To impart knowledge and skill on scientific crop production and management. .
3	To introduce new technologies in crop production: fertigation & new varieties maintain tight contact with farmers.
4	To understand different implements used in ploughing

Course contents

Theory

Unit I **8Hours**

Origin, geographical distribution, economic importance, soil and climatic requirements, varities, cultural practices and yield of Rabi crops; cereals- wheat and barley, pulses- chickpea, lentil, peas.

Unit II **6Hours**

Origin, geographical distribution, economic importance, soil and climatic requirements, varities, cultural practices and yield of Rabi crops; oilseed- rapeseed, mustard and sunflower;

Unit III **8Hours**

Origin, geographical distribution, economic importance, soil and climatic requirements, varities, cultural practices and yield of Rabi crops; sugar crops- sugarcane, medicinal and aromatic crops- mentha, lemongrass and citronella

Unit IV **8Hours**

Origin, geographical distribution, economic importance, soil and climatic requirements, varities, cultural practices and yield of Rabi crops; Forage crops – berseem, lucerne and oat.

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

CourseCode: AGRON252

L	T	P	Credits
0	0	2	1

Practical contents

30Hours

1. Sowing methods of wheat
2. Sowing methods of sugarcane
3. Identification of weeds in rabi season crops,
4. Study of morphological characteristics of rabi crops,
5. Study of yield contributing characters of rabi season crops,
6. Yield and juice quality analysis of sugarcane,
7. Study of important agronomic experiments of rabi crops at experimental farms.
8. Study of rabi forage experiments, oil extraction of medicinal crops,
9. Visit to research stations of related crops.

Suggested readings:

1. *B. Gurarajan, R. Bala subramanian and V.Swaminathan. Recent Strategies on Crop Production.Kalyani Publications New Delhi.*
2. *Chidda Singh.1997. Modern techniques of raising field crops. Oxford and IBH Publishing Co. Pvt. Ltd., Delhi.*
3. *Rajendra Prasad. Textbook of Field Crops Production - Commercial Crops. Volume III CAR Publication.*
4. *Rajendra Prasad. Textbook of Field Crops Production - Food grain Crops. Volume I ICAR Publication.*
5. *S.R. Reddy. 2009. Agronomy of Field Crops. Kalyani Publishers, New Delhi.*
6. *S.S. Singh. 2005. Crop Management. Kalyan iPublishers, New Delhi. UAS, Bangalore. 2011. Package of Practice. UAS, Bangalore.*
7. *Rajendra Prasad 2002. Text Book of Field crops Production, ICAR, New Delhi.*
8. *Reddy, S.R. 2004. Agronomy of Field crops, Kalyani Publishers, Ludhiana.*

Transaction Method:

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

CourseTitle: Farm Machinery and Power

CourseCode: AGE251

L	T	P	Credits
1	0	0	1

Total hours-15

Course Outcomes:

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

1 To enable the students to understand the need of farm power
2 To enable the students to understand basic principles and parts of IC engine
3 To know different tillage, sowing, intercultural, plant protection equipments
4 Know the working principles of threshers, harvesting of field and horticultural crops .

Course Contents

Theory

Unit-I **4Hours**

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.

Unit-II **4Hours**

Familiarization with different systems of I.C. engines: Air cleaning, cooling, lubrication, fuel supply and hydraulic control system of a tractor. Familiarization with Power transmission system: clutch, gear box, differential and final drive of a tractor, Tractor types, Cost analysis of tractor power and attached implement.

Unit-III **3Hours**

Criteria for selection of tractor and machine implements. Familiarization with Primary and Secondary Tillage implement, Implement for hill agriculture, implement for intercultural operations.

Unit-IV **4Hours**

Familiarization with sowing and planting equipment, calibration of a seed drill and solved examples, Familiarization with Plant Protection equipment, Familiarization with harvesting and threshing equipment.

CourseTitle:Lab–Farm Machinery and Power
CourseCode: AGE252

L	T	P	Credits
0	0	2	1

Practical contents ***30 Hours***

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

SuggestedReadings

1. Jagdiswar Sahay–Elements of Agricultural Engineering
2. Surendra Singh-Farm machinery–Principles and applications, ICAR, NewDelhi
3. Jain, S.C. and C.R. Rai. Farm Tractor and maintenance and repair. Standard Publishers, 1705-B, Naisarak,. Delhi- 110006
4. Ojha, T.P. and A.M. Michael, A.M. Principles of Agricultural Engineering. Vol.I. Jain brothers, 16/893, East Park Road, Karol Bagh, New Delhi -110005.

TransactionMethod:

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

CourseTitle: Water Management
CourseCode: AGRON251

L	T	P	Credits
1	0	0	1

Totalhours- 15

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

1 To study the important properties of soil affecting water availability to crops
2 To study different methods of irrigation and water management practices of both field and horticultural crops and drainage.
3 To study the soil moisture conservation practices including management of rainwater, watershed and command areas
4 To study the water requirement for optimum growth and development

Course Contents

Thoery

Unit I **4Hours**

Irrigation: definition and objectives, Importance function of water for plant growth, water resources and irrigation development for different crops in India; Soil plant water relationships; Available and unavailable soil moisture – distribution of soil moisture – water budgeting – rooting characteristics – moisture extraction patter.

Unit II **3Hours**

Effect of moisture stress on crop growth. Methods of soil moisture estimation, evapotranspiration and crop water requirement; effective rainfall, different approaches of scheduling of irrigation.

Unit III ***4Hours***

Methods of irrigation: surface and sub-surface, pressurized methods viz., sprinkler and drip irrigation, their suitability, merits and limitations, fertigation, economic use of irrigation water; Layout of different irrigation systems, Irrigation efficiency and water use efficiency, conjunctive use of water, irrigation water quality and its management.

Unit IV ***4Hours***

Water management of different crops (rice, wheat, maize, groundnut, sugarcane, mango, banana and tomato); Agricultural drainage. Water management problem, soils quality of irrigation water, irrigation management practices for different soils and crops., drip, sprinkler. Layout of underground pipeline system.

CourseTitle: Lab–Water Management
CourseCode: AGRON252

L	T	P	Credits
0	0	1	2

PracticalContents ***30 Hours***

1. Determination of bulk density by field method.
2. Determination of soil moisture content by gravimetric method, tensiometer, electrical resistance block and neutron moisture meter.
3. Determination of field capacity by field method.
4. Determination of permanent wilting point
5. Measurement of irrigation water by using water measuring devices viz., flumes and weirs.
6. Calculation of irrigation water requirement (Problems).
7. Determination of infiltration rate.
8. Demonstration of furrow method of irrigation;
9. Demonstration of check basin and basin method of irrigation.
10. Visit to farmers field and cost estimation of drip irrigation system.
11. Demonstration of filter cleaning, fertigation, injection and flushing of lateral.
12. Layout for different methods of irrigation.
13. Erection and operation of sprinkler irrigation system.
14. Measurement of emitter discharge rate, wetted diameter and calculation of emitter discharge variability.
15. Determination of EC, pH, carbonates, bio-carbonates, Ca++ and Mg++ in irrigation water (quality parameters).

SuggestedReadings

1. *Rao,Y.P. and Bhaskar, S.R. Irrigation technology. Theory and practice. Agrotech publishing Aca Udaipur.*
2. *Dilip Kumar Mujmdar. Irrigation water management: Principles and Practices. Prentice Hall of India Pvt.*
3. *S.V. Patil & Rajakumar,G.R.,WaterManagementinAgricultureandHorticulturalCrops.Satish publishing House, Delhi.*
4. *Carr M.K.V. and Elias Fereres. Advances in Irrigation Agronomy. Cambridge University Press.*
5. *Michael, A.M. Irrigation Theory and practice. Vikas publishing house Pvt, Ltd.*

TransactionMethod:

Assignment,PowerPointpresentation,Audiolecture,Videolecture,Plaintext, Handouts, Case based study and Group discussion.

CourseTitle: Problematic Soils and their Management

CourseCode: SOIL251

L	T	P	Credits
1	0	0	1

Total hours- 15

CourseOutcomes:

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

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

Course Content

Thoery

Unit-I **4Hours**

Soil quality and health, Distribution of Wasteland and problem soils in India with special reference to Assam and North Eastern Region. Categorization of Problem soils based on properties.

Unit-II ***4Hours***

Reclamation and management of Acid soils, Saline, Sodic soils, Acid Sulphate soils, Eroded and Compacted soils, polluted soils. Management of Riverine soils, Waterlogged soils, Contaminated soils (Pesticide contamination, Heavy metal contamination).

Unit-III ***4Hours***

Mined soils (Coal mined, Oil mined),Irrigation water–quality and standards, utilization of saline water in agriculture. Use of Remote sensing and GIS in diagnosis and management of problem soils. Irrigation and water quality.

Unit-IV ***3Hours***

Multipurpose tree (MPT) species, bio remediation through MPTs of soils, land capability and classification, land suitability classification.

Course Title:Lab-Problematic Soils and their Management
Course Code: SOIL252

L	T	P	Credits
0	0	2	1

Practical Content

30 Hours

1. Determination of pH and EC of saturation extract of problematic soil.
2. Determination of redox potential in soil,
3. Estimation of water soluble and exchangeable cations in soil and
4. Computation of SAR and ESP and characterization of problematic soil.
5. Determination of Gypsum requirement of alkali/sodic soil.
6. Determination of lime requirement of acidic soil.
7. Determination of Quality of irrigation water (pH, EC, Ca, Mg, Na, CO_3, HCO_3, Cl, SAR and RSC),
8. Determination of nitrate(NO_3^-) from irrigation water,
9. Determination of dissolved oxygen and free carbon dioxide levels in water samples.

Suggested Readings:

1. *Srivastava, V.C., 2002. Management of Problem Soils -Principles and Practices. AGROBIOS (India).*
2. *Osman, Khan Towhid,2018, Management of Soil Problems. Springer publication*
3. *Indian Society of Soil Science, 2002. Fundamental of Soil Science. IARI, New Delhi.*
4. *Brady Nyle C and Ray R Well, 2014. Nature and properties of soils. Pearson Education Inc., New Delhi.*
5. *CirsanJ.Paul,1985, Principles of Remote Sensing. Longman, NewYork.*
6. *Agarwal, R.R., Yadav, J.S.P. and Gupta, R.N.(1982).Saline Alkali soils of India, ICAR, New Delhi.*

TransactionMethod:

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

CourseTitle:Basics of Plant Breeding

CourseCode: GPB251

L	T	P	Credits
2	0	0	2

TotalHours-30

CourseOutcomes:

Aftercompletionofcourse,thestudentswillbeableto:

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

Course Contents

Thoery

Unit-I **8Hours**

Historical development, concept, nature and role of plant breeding, major achievements and future prospects; Genetics in relation to plant breeding, modes of reproduction and apomixes, self-incompatibility and male-sterility-genetic consequences, cultivar options, Domestication, Acclimatization and Introduction;

Unit-II **7Hours**

Centres of origin/diversity, Components of Genetic variation; Heritability and genetic advance; Genetic basis and breeding methods in self pollinated crops-mass and pure line selection, hybridization techniques and handling of segregating population; Multiline concept, Concepts of population genetics and Hardy-Weinberg Law, Genetic basis and methods of breeding cross-pollinated crops, modes of selection.

Unit-III **8Hours**

Population movement schemes- Ear to Row method, Modified Ear to Row, recurrent selection schemes; Heterosis and inbreeding depression, development of inbred lines and hybrids, composite and synthetic varieties; Breeding methods in asexually propagated crops, clonal selection and hybridization; Maintenance of breeding records and data collection; Wide hybridization and pre-breeding.

Unit-IV **7Hours**

Polyploidy in relation to plant breeding, mutation breeding- methods and uses; Breeding for important biotic and abiotic stresses; Biotechnological tools-DNA markers and marker assisted selection. Participatory plant breeding; Intellectual

Property Rights, Patenting, Plant Breeders & Farmer's Rights.

CourseTitle: Lab-Basics of Plant Breeding
CourseCode: GPB252

L	T	P	Credits
0	0	2	1

Total Hours 30

Practical Content

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

Suggested Readings:

1. Principles of Plant Breeding (1st& 2nd Edition) by R W Allard.
2. Plant Breeding: Principles & Practices by J R Sharma.
3. Plant Breeding- B.D. Singh
4. Principles and Procedures of Plant Breeding-Biotechnical and Conventional Approaches by G S Chahal and S S Gosal
5. Principles of Plant Genetics and Breeding by George Acquaah.

Course Title:Agricultural Marketing and Trade
Course Code: ECON300

L	T	P	Credits
2	0	0	2

Total hours-30

Course Outcomes:

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

1. To understand the fundamentals of agricultural marketing and trade.
2. To analyze the factors influencing supply and demand in agricultural markets.
3. To explore different marketing channels and strategies in agriculture.
4. To examine the role of government policies and regulations in agricultural markets.

Course contents

Theory:

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

UNIT II **8 Hours**

Pricing and promotion strategies: pricing considerations and approaches–cost based and competition-based pricing; Market promotion–advertising, personal selling, sales promotion and publicity– meaning, merits and demerits; marketing process and functions: Marketing process concentration, dispersion and equalization; exchange functions – buying and selling; physical functions – storage, transport and processing; facilitating functions – packaging, branding, grading, quality control and labelling (Agmark)

UNIT III **7 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 marketing integration; marketing efficiency; marketing costs, margins and prices pread; factors affecting cost of marketing; reasons for higher marketing costs of farm commodities; ways of reducing marketing costs;

UNIT IV **8 Hours**

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

India; Risk in marketing: Types of risk in marketing; speculation & hedging; an overview of future trading; Agricultural prices and policy: Meaning and functions of price; administered prices; need for innovations in 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; WTO; Agreement on Agriculture (AoA) and its implications on Indian agriculture; IPR. Role of government in agricultural marketing. Role of APMC and its relevance in the present-day context.

Course Title: Lab-Agricultural Marketing and Trade
Course Code: ECON301

L	T	P	Credits
0	0	2	1

Total hours-30

Practical Contents:

11. Plotting and study of demand and supply curves and calculation of elasticities;
12. Study of relationship between market arrivals and prices of some selected commodities;
13. Computation of marketable and marketed surplus of important commodities;
14. Study of price behavior over time for some selected commodities; Construction of index numbers;
15. Visit to a local market to study various marketing functions performed by different agencies,
16. Identification of marketing channels for selected commodity,
17. Collection of data regarding marketing costs, margins and prices-pread and presentation of report in the class;
18. Visit to market institutions –NAFED, SWC, CWC, cooperative marketing society, etc. to study their organization and functioning.
19. Application of principles of comparative advantage of international trade.

Suggested Readings:

9. *Acharya, S.S. and Agarwal, N.L., 2006, Agricultural Marketing in India, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.*
10. *Chinna, S. S.,2005, Agricultural Economics and Indian Agriculture. Kalyani Pub, N. Delhi.*
11. *Dominic Salvatore, Micro Economic Theory*
12. *Kohls Richard, L. and Uhl Josheph, N., 2002, Marketing of Agricultural Products, Prentice-Hall of India Private Ltd., New Delhi.*
13. *Kotler and Armstrong, 2005, Principles of Marketing, Pearson Prentice-Hall.*
14. *Lekhi, R.K. and Jogindr Singh, 2006, Agricultural Economics. Kalyani Publishers, Delhi.*
15. *Memoria, C.B., Joshi, R.L. and Mulla, N.I.,2003, Principles and Practice of Marketing in India, Kitab Mahal, New Delhi.*
16. *Pandey Mukesh and Tewari, Deepali, 2004, Rural and Agricultural Marketing, International Book Distributing Co. Ltd, New Delhi.*
17. *Sharma, R.,2005, Export Management, Laxmi Narain Agarwal, Agra.*

Transaction Method:

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

Course Title: Introduction to Agro-meteorology
Course Code: AGRON300

L	T	P	Credits
2	0	0	2

Total hours-30

Course Outcomes:

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

3. To expose and acquire knowledge on the environment
4. To gain the state-of-the-art skill and expertise on management of disasters

Course contents

Theory:

UNIT I **8 Hours**

Introduction to Environment-Environmental Studies - Definition, scope and importance-Multidisciplinary nature of environmental studies - Segments of Environment-Spheres of Earth – Lithosphere – Hydrosphere - Atmosphere Different layers of atmosphere. Natural Resources: Classification – Forest resources. Water resources. Mineral resources Food resources. Energy resources. Land resources. Soil resources. Ecosystems-Concept of an ecosystem-Structure and function of an ecosystem - Energy flow in the ecosystem. Types of ecosystems. Biodiversity and its conservation: Introduction, definition, types. Biogeographical classification of India. Importance and Value of biodiversity. Biodiversity hot spots.

UNIT II **8 Hours**

Threats and Conservation of biodiversity Environmental Pollution: Definition, cause, effects and control measures of: a. Air pollution. b. Water pollution.c. Soil pollution. d. Marine pollution. e. Noise pollution. f. Thermal pollution h. light pollution. Solid Waste Management: Classification of solid wastes and management methods, Composting, Incineration, Pyrolysis, Biogas production, Causes, effects and control measures of urban and industrial wastes. Social Issues and the Environment: Urban problems related to energy. Water conservation, rainwater harvesting, watershed management. Environmental ethics: Issues and possible solutions, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.

UNIT III **7 Hours**

Environment Protection Act. Air (Prevention andControl of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Human Population and the Environment: Environment and human health: Human Rights, Value Education. Women and Child Welfare. Role of Information Technology in Environment and human health

UNIT IV **7 Hours**

Disaster management-Disaster definition, Types - Natural Disasters - Floods, drought, cyclone, earthquakes, landslides, avalanches, volcanic eruptions,

Heat and cold waves. Man Made Disasters-Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, road accidents, rail accidents, air accidents, sea accidents. International and National strategy for disaster reduction. Concept of disaster management, national disaster management framework; financial arrangements; role of NGOs, community- based organizations and media in disaster management. Central, state, district and local administration in disaster control; Armed forces in disaster response; Police and other organizations in disaster management.

Course Title: Lab-Introduction to Agro-meteorology
Course Code: AGRON301

L	T	P	Credits
0	0	2	1

Total hours-30

Practical Contents:

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

Suggested Readings:

1. *Introduction to Agrometeorology & Climate Change by Alok Kumar Patra*
2. *Fundamentals of Agrometeorology and Climate Change by G.S. Mahi&P.K. Kingra*
3. *Text Book of Agricultural Meteorology by MCVarshneya& PB Pillai*
4. *Introduction to Agrometeorology by H.S. Mavi*
5. *Agricultural Meteorology by G.S.L.H.V. Prasado Rao*

Transaction Method:

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

Course Title: Fundamentals of Crop Physiology
Course Code: BIO300

L	T	P	Credits
2	0	0	2

Total hours-30

Course Outcomes:

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

1. To explain about the basic physiological process of plant viz. plant cell and water relations, mineral nutrition, carbon metabolism, reproductive physiology and plant growth and development.

Course contents

Theory:

UNIT I **7 Hours**

Definitions of plant physiology and crop physiology, Importance of crop physiology, Relationship of crop physiology with other branches of crop science. Diffusion and osmosis, Physiological roles of water to crop plants, Definition of water potential and components of water potential, Water absorption by plants: Concept of active and passive absorption, Water loss by plants: Types of waterloss: transpiration, stomatal physiology and guttation, Water use efficiency and factors affecting WUE. Terminologies / Definitions: Plant hormone, Plant growth regulators (PGR), Plant growth inhibitor. Recognized classes of PGR (Auxins, Gibberellins, Cytokinins, Ethylene and Abscisic acid) and their major physiological roles, Agricultural uses of PGRs (IBA, NAA, 2, 4 –D, GAs, Kinetin etc).

UNIT II **7 Hours**

Classification of mineral elements: Essential and beneficial elements, Passiveandactivetransport of mineral element: Nernst equation, ion transport, ion pump and channels, Functions of essential elements and their deficiency and toxicity symptoms, Hydroponics and sand culture. Brief outline of: Photosynthetic apparatus, pigment system, quantum requirement and quantum yield: Structure of chloroplast, Examples of different photosynthetic pigments (chlorophyll, carotenoids, phycobilins etc.), Difference between chlorophyll a and chlorophyll b, Structure of chlorophyll a and chlorophyll b, short discussion on quantumrequirement and quantum yield, red drop and Emerson enhancement effect, Pigment system I & II.

UNIT III **8 Hours**

Introduction to light reaction of photosynthesis, Light absorption by photosynthetic pigments and transfer of energy, Source of O2during photosynthesis: Hill reaction, Brief introduction to cyclic and non-cyclic photo- phosphorylation: production of assimilatory powers. Introduction to

C3, C4and CAM pathways: Calvin Cycle, Hatch & Slack Cycle, CAM Cycle, Significanceof the sepathways (concept ofphotorespiration, absenceofphotorespirationinC4plant: Productivity of C4plant, CAM: an adaptive mechanism), Factors affecting photosynthesis (light, temperature, CO2, O2etc). Outline of the process of respiration: Definition and importance, Glycolysis, Kreb Cycle and ETC, Factors affecting respiration (O2, temperature, CO2etc.).

UNIT IV **8 Hours**

Terminologies / Definitions: Growth, Development and Differentiation. Measurement of plant growth (fresh weight, dry weight, linear dimension, area etc). Introduction to CGR, RGR, NAR etc. Short discussion on factors affecting growth and development. Photoperiodism: Classical works of Garner andAllard.Photoperiodic Classification of plants: Short Day Plant, Long Day Plant, Day Neutral plant etc. Introduction toPhotoperiodic induction Site of photo-inductive perception, Role of Phytochrome Introduction to Vernalization (What is vernalization, devernalizationetc). Meaning, classification (seasonal, sequential etc), relation with abscission. Physiological and biochemical changes during senescence, Abscission and its significance, Concept of stay green, Hormonal regulation of senescence.

Course Title:Lab-Fundamentals of Crop Physiology
Course Code: BIO301

L	T	P	Credits
0	0	2	1

Total hours-30

Practical Contents:

1. Study on structure and distribution of stomata;
2. Demonstration of imbibition, osmosis, plasmolysis,
3. Estimation of water potential, relative water content;
4. Tissue test for mineral nutrients, identification of nutrient deficiency and toxicity symptoms inplant;
5. Estimation of photosynthetic pigments, rate of photosynthesis, respiration and transpiration;
6. Plant growth analysis; Study on senescence and abscission, hormonal regulation of senescence;
7. Demonstration of the effects ofdifferent PGRs on plants.

Suggested Readings:

5. *Plant Physiology by Robert M. Devlin and Francis H. Witham*
6. *Plant Physiology by LincolnTaiz and Eduardo Zeiger*
7. *Plant physiology by Frank B. Salisbury and Cleon W. Ross*
8. *Fundamentals of Plant Physiology by Lincoln Taiz, Eduardo Zeiger, Ian Max Mølle and Angus Murphy*
9. *Devlin's Exercises in Plant Physiology by Robert Devlin, Francis H. Witham and David F. Blaydes*

Transaction Method:

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

Course Title: Pest management in crops and stored grains

Course Code: ENTO300

L	T	P	Credits
2	0	0	2

Total hours-30

Course Outcomes:

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

1. Diagnosis and management of major insect and non-insect pests of crops in field and storage

Course contents

Theory

UNIT I **7 Hours**

General description on nature and type of damage by different arthropodpests; Scientific name, order, family, host range, distribution, biology and bionomics;

UNIT II **8 Hours**

Nature of damage and management of major insect pests of various field crops, vegetable crops, fruit crops, plantation crops, ornamental crops, spices and condiments.

UNIT III **8 Hours**

Structural entomology and important household pests, their nature of damage and management. Factorsaffecting loss of stored grains.

UNIT IV **7 Hours**

Insect pests, mites, rodents, birds and microorganisms associated with stored grains and their management. Storage structures and methods of grain storage and fundamental principles of stored grains management.

Course Title:Lab-Pest management in crops and stored grains

Course Code: ENTO301

L	T	P	Credits
0	0	2	1

Total hours-30

Practical Contents:

11. Field visit, identification of major insect pests and their damage symptoms.
12. Collection and preservation of major insect pests; collection of damage samples, their identification and herbarium preparation.
13. Methods of monitoring of pest incidence in situ.
14. Management strategies of insect pests of different crops.
15. Study on structural entomology and household pests.
16. Storage structures and methods of grain storage.
17. Spraying techniques for selected field and horticultural crops.
18. Vertebrate pest management.

Suggested Readings:

1. Pest Management: Methods, Applications and Challenges, Tarique Hassan Askary,

2. Agriculture,AgricultureIssuesandpolicies,Books,Nova,PestControl,Science and Technology,2022

3. Essentials of Pest Management: Key Information on Pest Identification and its Management, 2022. Prakash Rambhat Thalya and Ravi Chandra

4. A Textbook of Insect Pest and Disease Management, 2021.Somnath Sen, and Mohd. Sameer, S. Kataria & Sons publish.

5.Agricultural Pests of India and Southeast Asia, A. S. Athwal, Kalyani Publsh.

6. A Textbook of Applied Entomology, K.P. Srivastava and G, S. Dhaliwal, Kalyani Publish.

Transaction Method:

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

Course Title: Diseases of Horticultural Crops & their Management Credits

Course Code: PATH300

L	T	P	Credits
2	0	0	2

Total hours-30

Course Outcomes:

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

1. To study the symptoms produced on the host
2. To study the etiology of the diseases
3. To know about the disease cycle of the pathogens during pathogenesis
4. To study the epidemiological factors responsible for disease development
5. To study the management techniques for curbing the major diseases of horticultural crops

Course contents

Theory

UNIT I **7 Hours**

Banana (Sigatoka, Panama wilt, Bacterial wilt, Bunchy top); Papaya (Foot rot, Leaf Curl, Mosaic) and Pomegranate (Bacterial blight); Apple (Scab, Powdery Mildew, Fire Blight, Crown Gall) and Peach (Leaf Curl);

UNIT II **8 Hours**

Grapevine (Downy mildew, Powdery mildew, Anthracnose) and Strawberry (Leaf Spot); Coconut (Bud rot, Ganoderma Wilt), Tea (Blister blight) and Coffee (Rust); Mango (Anthracnose, Malformation, Bacterial blight, Powdery mildew); Potato (Early and Late blight, Black scurf, Leafroll, Mosaic) and Tomato (Damping off, Wilt,

UNIT III **7 Hours**

Early and Late blight, Leaf curl, Mosaic); Brinjal (Phomopsis blight and fruit rot, Sclerotinia blight) and Chilli (Anthracnose and Fruit rot, Wilt, Leaf Curl); Cucurbits (Powdery and Downy mildew, Wilts) and Cruciferous vegetables (Alternaria leaf spot, Black rot, Cauliflower mosaic);

UNIT IV **8 Hours**

Beans (Anthracnose, Bacterial blight) and Okra (Yellow vein mosaic); Ginger (Soft rot), Turmeric (Leaf Spot) and Coriander (Stem gall); Rose (Dieback, Powdery mildew, Black Leaf Spot) and Marigold (Botrytis blight, Leaf spots).

Course Title:Lab-Diseases of Horticultural Crops & their Management Credits

Course Code: PATH301

L	T	P	Credits
0	0	2	1

Total hours-30

Practical Contents:

11. Downy mildew and Powdery of Cucurbits,
12. Early blight of Late blight of Potato and Tomato,
13. Phomopsis blight of Brinjal,
14. Powdery mildew and rust of Pea,
15. Stem Gall of Coriander, Anthracnose and Fruit rot of Chilli,
16. Taphrina leaf spot of Turmeric, Red rot of Sugarcane,
17. Acquaintance with fungicides, Antibiotics and Biopesticides and their use in management of diseases of horticultural crops.
18. Identification and histopathological studies of selected diseases of horticultural crops covered in theory.
19. Field visit for the diagnosis of field problems, Collection and preservation of plant diseased specimens for herbarium.
20. Students should submit 50 pressed and well mounted specimens.

Suggested Readings:

3. *Plant Diseases (By: R.S. Singh)*
4. *Plant Disease Management: Principles and Practices (By: Hriday Chaube)*
5. *Integrated Plant Disease Management (By: R.C. Sharma)*
6. *Plant Pathology (By: G.N. Agrios, 2010)*
7. *Lab Manual for diseases of field and horticultural crops: (By Dr. A. Mehta and B. Singh)*

Transaction Method:

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

Course Title: Crop Improvement-I
Course Code: GPB300

L	T	P	Credits
1	0	0	1

Total hours-15

Course Outcomes:

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

1. To provide knowledge about Self-pollinated and cross pollinated Kharif crops.
2. To learn about originand distribution of Kharif crops.
3. To design breeding objectives of major kharif crops.
4. To impart information on different crop varieties for Kharif season.

Course contents

Theory:

UNIT I **4 Hours**

Centres of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fibres; fodders and cash crops; vegetable and other horticultural crops;

UNIT II **4 Hours**

Plant genetic resources, it sutilization and conservation, study of genetics of qualitative and quantitative characters; Important concepts of breeding self-pollinated, cross-pollinated and vegetatively propagated crops.

UNIT III **4 Hours**

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

UNIT IV **3 Hours**

Hybrid seed production technology in Maize, Rice, Sorghum, Pearl Millet and Pigeopea etc. Ideotype concept, climate resilient crop varieties for future.

Course Title:Lab-Crop Improvement-I
Course Code: GPB301

L	T	P	Credits
0	0	2	1

Total hours-15

Practical Contents:

11. Floral biology, emasculation and hybridization techniques in different crop species viz.
12. Rice, Jute, Maize, Sorghum, Pearl millet, Ragi, Pigeopea, Urdbean, Mungbean, Soybean, Groundnut, Sesame, Castor, Cotton, Cowpea, Tabacco, Brinjal, Okra and Cucurbitaceous crops.
13. Maintenance breeding of different kharif crops.
14. Handling of germplasmand segregating populations by different methods likepedigree, bulk and singleseed decent methods;
15. Study of field techniques for seed production and hybrid seed production in kharifcrops;
16. Estimation of heterosis, inbreeding depression and heritability; Layout of field experiments;
17. Study of quality characters, donor parents for different characters; Visit to seed production plots; Visit to AICRP breeding plots of different crops.

Suggested Readings:

1. *Breeding field crops-I by V.L. Chopra*
2. *Genetic improvement of field crops by C.B. Singh and D. Khare*
3. *Genetics and Breeding of Pulse crops by D.P. Singh*
4. *Vegetable breeding–Principles and Practices by Hari Har Ram*
5. *Breedingfield crops by D.A. Sleper and J.M. Poehlman*
6. *Plant Breeding–theory and practice by S.K. Gupta*
7. *Breeding Asian field crops by J.M. Poehlman and D.N. Barthakur*
8. *Practical manuals on Crop Improvement I(Kharif crops) by Rajendra Kumar Yadav*

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: AGRON300

L	T	P	Credits
1	0	0	1

Total hours-15

Course Outcomes:

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

1. To teach students about principles of weed science
2. To impart practical knowledge of weed management in field and horticiulral crops

Course contents

Theory:

UNIT I **4 Hours**

Introduction to weeds, characteristics of weeds, their harmful and beneficial effects on ecosystem. Classification, reproduction and dissemination of weeds, crop-weed completion, factors of competition, losses on growth and yield of crops; factors affecting growth and development.

UNIT II **4 Hours**

Concepts of weed management: physical, cultural, chemical and biological; principles and methods, integrated weed management, implements for weed control, robotic weed control, weed management in organic/ natural farming.

UNIT III **4 Hours**

Herbicide classification and properties of important herbicides, concept of adjuvants, surfactants, herbicide formulation and their use. Mode of action of herbicides and selectivity phenomenon. Concept of herbicide mixture and utility in agriculture, Herbicide compatibility with agro-chemicals and their application.

UNIT IV **3 Hours**

Herbicide resistance and its management. Weed management in different field and horticultural crops; aquatic weed management.

Course Title:Lab-Weed management
Course Code: AGRON301

L	T	P	Credits
0	0	2	1

Total hours-15

Practical Contents:

1. Techniques of weed preservation,
2. Weed identification and losses caused by weeds.
3. Biology of important weeds.
4. Study weeds in different situations, Study on shift in weed flora in long term trials,
5. Study of herbicide formulations and mixture of herbicide.
6. Study methods of herbicide application,
7. Herbicide spraying equipments, their parts, use and maintenance.
8. Weed control implements,
9. Calculation of herbicide doses and requirement, weed control efficiency and weed index.

Suggested Readings:

1. *Crafts, A.S. and Robbins, W.W. 1973. Weed Control. Tata McGraw-Hill Publishing Co. Ltd., New Delhi. Gupta, O.P. 1984.Scientific WeedManagement. Today and Tomorrow Printersand Publishers, NewDelhi. Gupta, O.P. 2015. Modern Weed Management. Agro Bios (India), Jodhpur.*

2. *Naidu, V.S.G.R., Handbook of Weed Identification. Directorate of Weed Research, Jabalpur.*

3. *Rajagopal, A., Aravindan, R. and Shanmugavelu, K.G., 2015. Weed management of Horticultural Crops. Agr (India), Jodhpur.*

4. *Ramamoorthy, K. and Subbian, P., Predominant Weedflorainhill –ecosystems. Agrobios (India), Jodhpur. Rao, V.S. 2000. Principles of Weed Science. Oxford & IBH Publishing Co., New Delhi.*

5. *Subramanian, S., Mohammed Ali, A. and Jayakumar, R. 1991. All About Weed Control. Kalyani Publi Ludhiana.*

6. *Tadulingam, C. and Venkatnarayana, D. 1955. A Handbook of Some South Indian Weeds. GovernmentMadras.*

7. *Thakur, C.1977.Weed Science. Metropolitan Book Co. Pvt. Ltd., NewDelhi.*

Transaction Method:

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

Course Title: Ornamental Crops, MAPs and Landscaping
Course Code: HORT300

L	T	P	Credits
1	0	0	1

Total hours-15

Course Outcomes:

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

1. To educate in detail about origin, area, climate, soil, improved varieties production technology of flowers and MAPs
2. To educate about concept, designing principles and components of landscaping
3. To educate about the physiological disorders of commercial flowers
4. To educate about the post-harvest management and value addition in flower crops and MAP

Course contents

Theory:

UNIT I **4 Hours**

Production technology of ashwagandha, costus, isabgol and geranium; Production technology of mint, aloe and ocimum; Production technology of plants like lemongrass, citronella, vetiver and palmarosa.

UNIT II **3 Hours**

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

UNIT III **4 Hours**

Production technology of important cut flowers like rose, gerbera and orchids; Production technology of gladiolus, tuberose and lilium; Production technology of chrysanthemum and carnation; Packageofpracticesforlooseflowerslikemarigoldandjasmine under open conditions

UNIT IV **4 Hours**

Brief concept of home landscaping, Carpet bedding, Topiary, Bonsai, Lawn, flower arrangement, Herbaceous Border, Hedge, Edge etc.; Processing and value addition imp ornamental crops; Processing and value addition of MAPs produce.

Course Title: Lab-Ornamental Crops, MAPs Landscaping

Course Code: HORT301

L	T	P	Credits
0	0	2	1

Total hours-15

Practical Contents:

1. Identification MAPs and Ornamental plants (trees, Shrubs, Climbers, seasonal flower and house plants).
2. Propagationof MAP, Bedpreparationandplantingof MAP.
3. Nursery bed preparation and sowing of seasonal flower seeds;
4. Propagation of ornamental plants by terminal/herbaceous cuttings;
5. Propagation of Anthurium and orchids; Propagationof Bougainvillea;
6. Planting of Gerbera suckers; Gladiolus corms;
7. Establishment and maintenance of lawn;
8. Preparation of flower preservatives and their use in extending the vaselife of cut flowers;
9. Training and pruning of ornamental plants and raising of hedge and edge;
10. Planning and layout of garden.

Suggested Readings:

1. *Floriculture in India by G.S. Randhawa and Mukopadhyay*
2. *Introduction to spices, plantation crops, medicinal and aromatic plants by N. Kumar, Abdul Khadder,*
3. *P. Rangaswamy, I. Irulappam*
4. *Textbook of floriculture and landscaping by Anil K. Singh and Anjana Sisodia*
5. *Commercial flowers (Vol1and2) by T.K. Bose*

Transaction Method:

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

Course Title:Essentials of Plant Biochemistry
Course Code: BIO302

L	T	P	Credits
2	0	0	2

Course Outcomes:

After completion of course, thestudents willbeableto:

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

Course Contents

Theory

Unit-I **8 Hours**

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 **8 Hours**

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 **7 Hours**

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 **7 Hours**

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.

Course Title: Fundamentals of Plant Biochemistry Lab
Course Code: BIO303

L	T	P	Credits
0	0	2	1

Practical Contents: **Hours-30**

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

Suggested Readings:

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

Course Title:Fundamental of Agri Biotechnology
Course Code: BIO351
Credits Hours:2(2+1)

L	T	P	Credits
2	0	0	2

Course Outcomes:
To familiarize the students with the fundamental principles of biotechnology, various developments in biotechnology and its potential applications.

Course contents

Theory:

Unit I

Introduction to Plant Tissue Culture & Genetic Engineering: History; Cellular totipotency &
cytodifferentiation; Callus culture, Single-cell/suspension culture and their applications, Organogenesis & somatic embryogenesis, Somaclonal variation and its use in crop improvement, Embryo rescue technique and its significance in hybrid development.

Unit II

In vitro fertilization, ovule culture and its significance in hybriddevelopment, Protoplast isolation, culture and regeneration, Somatic hybridization (somatic hybrids & cybrids) and its application in crop improvement, Anther and pollen culture for haploid production; Development of disease-free (virus free) plants through apical meristem culture, Micropropagation technique for the generation of quality planting material.

Unit III

Introduction to Molecular Biology: DNA structure, structure & function; DNA replication, transcription and translation, RNA, types and function, Nucleic acid hybridization, PCR and its applications.

Unit IV

Introduction to recombinant DNA technology: DNA modifying enzymes & vectors, Plant genetic transformation – physical (Gene gun method), chemical (PEG mediated) and Agrobacterium-mediated gene transfer methods, Transgenics and its importance in crop improvement with successful stories, Introduction to various molecular markers: RFLP, RAPD, SSR, SNP etc., Marker-assisted breeding in crop improvement.

Course Title:Fundamental of Agri Biotechnology Lab
Course Code: BIO352

L	T	P	Credits
0	0	2	1

Practical Contents

1. Introduction to Plant Tissue Culture Laboratory,
2. Good Laboratory Practices; Media Preparation & sterilization,Glassware sterilization;
3. Micropropagation, Callus induction and culture, Anther culture, Apical meristemculture,
4. Preparation of synthetic seeds, Isolation of plasmid DNA, Quantification of DNA; Agarose
5. GelElectrophoresis & visualization of plasmid DNA; Restriction digestion of plasmid DNA and agarose gelelectrophoresis;
6. Isolation of Plant genomic DNA; PCR amplification of DNA, Gel electrophoresis of amplifiedDNA

Suggested readings:

1. Bhojwani SS. 1983. Plant Tissue Culture: Theory and Practice. Elsevier.
2. Singh BD. 2007. Biotechnology: Expanding Horiozon. Kalyani
3. Christou P & Klee H. 2004. Handbook of Plant Biotechnology. John Wiley & Sons.
4. Lewin B. 2008. Gene IX. Peterson Publications/ Panima. W.H. Freeman & Co.
5. Primrose SB. 2001. Molecular Biotechnology. Panima.

Course Title: Basic and Applied Agril. Statistics

Course Code: STAT351

L	T	P	Credits
2	0	0	2

Course Outcomes:

To provide an idea on Statistical concepts of both descriptive and inference Statistics which willbe useful to do statistical analysis.

Course contents

Theory:

Unit I

Coefficient ofCorrelation. Types of Correlation Coefficient. Properties of Correlation Coefficient.Definition of LinearRegression. Regression Equations. Regression Coefficients. Properties of Regression Coefficients.Tests of Significance. Definition. Null and Alternative Hypothesis. Type I and Type II Error.

Unit II

CriticalRegion and Level of Significance. One Tailed and Two Tailed Tests. Test Statistic.One Sample, Two Sampleand Paired t-test with Examples.F-test for Variance.ANOVA and Experimental Designs.

Unit III

Definition of ANOVA. Assignable and Non-assignable Factors.Analysis of One-way Classified Data.Basic Examples of Experimental Designs. Terminologies. CompletelyRandomized Design (CRD).

Unit IV

Sampling Theory. Introduction. Definition of Population, Sample, Parameter and Statistic. Sampling VsComplete Enumeration. Sampling Methods. Simple Random Sampling with Replacement and withoutReplacement. Use of Random Number Table.

Course Title:Basic and Applied Agril. Statistics Lab
Course Code: STAT352

L	T	P	Credits
0	0	2	1

Practical Contents:

1. Diagrammatic and Graphicalrepresentation of data.
2. Calculation of A.M., Median and Mode (Ungrouped andGrouped data).
3. Calculation of S.D. and C.V. (Ungrouped and Grouped data).
4. Correlation and Regressionanalysis.
5. Application of t-test (one sample, two sample independent and dependent).
6. Analysis of variance oneway classification. CRD.
7. Selection of random sample using simple random sampling.

Suggested readings:

1. Fundamentals of Statistics by D. N.Elhance, Kitab Mahal Publishers.
2. Fundamentals of Applied Statistics by S.C. Gupta and V. K. Kapoor, Sultan Chand and Sons.
3. Basic Statistics by B. L.Agarwal, New Age International Publishers.
4. Agricultural Statisticsby S.P. Singh and R.P.S. Verma, Rama Publishing House.
5. Agriculture and Applied Statistics-I by P.K. Sahu, Kalyani Publishers.
6. Agriculture and Applied Statistics-II by P. K. Sahu and A. K. Das, Kalyani Publishers.

Course Title:Crop Improvement – II

Course Code: GPB351

L	T	P	Credits
2	0	0	2

Credits Hours: 2(1+1)

Course Outcomes:

i) To provide knowledge about Self-pollinated and crosspollinated rabicrops

ii) To learn about origin and distribution of rabi crops

iii) To design breeding objectives of major rabicrops

iv) To impart information on different crop varieties for rabiseason

Course contents

Theory:

UnitI

Centres of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fibres; foddersand cash crops; vegetable and other horticultural crops; Plant genetic resources, its utilization and conservation,

UnitII

study of genetics of qualitative and quantitative characters; Important concepts of breeding self-pollinated,cross-pollinated and vegetatively propagated crops.

UnitIII

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

UnitIV

Hybridseed production technology in Wheat, Oat, Chickpea, Rapeseed & Mustard etc. Ideotype concept, climateresilient crop varieties for future.

Course Title: Crop Improvement – II Lab
Course Code: GPB352

L	T	P	Credits
0	0	2	1

Practical Contents:

1. Floral biology, emasculation and hybridization techniques in different crop species viz. Wheat, Oat, Rapeseed& Mustard, Pulses, Potato, Sugarcane, Tomato, Chilli, Onion etc.
2. Study of field techniques for seed productionand hybrid seed production in rabi crops;
3. Estimation of heterosis, inbreeding depression and heritability;
4. Studyof quality characters, donor parents for different characters in tomato;
5. Visit to seed production plots;
6. Visit toAICRP breeding plots of different crops.

Suggested readings:

1. Breeding field crops-I by V.L. Chopra
2. Genetic improvement of field crops by C.B. Singh and D. Khare
3. Genetics and Breeding of Pulse crops by D.P. Singh
4. Vegetable breeding – Principles and Practices by Hari Har Ram

Course Title:Renewable energy in Agriculture and Allied Sector

Course Code: AGE351

L	T	P	Credits
2	0	0	2

Credits Hours: 2(1+1)

Course Outcomes:

1. To gain the knowledge on different types of materials used in Renewable Energy
2. To understand the importance of Renewable Energy technology and its applications.
3.To train the studentson the applications of solar thermal technology.

Course contents

Theory:

Unit I

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

Unit II

Familiarization with types of biogas plants andgasifiers, biogas, bioalcohol, biodiesel and biooil production and their utilization as bioenergy resource,

Unit III

introduction of solar energy, collection and their application, Familiarization with solar energy gadgets: solarcooker, solar water heater, application of solar energy: solar drying, solar pond, solar distillation, solarphotovoltaic system and their application,

Unit IV

introduction of wind energy and their application. Availability ofbio mass and their application in different places

Course Title:Renewable energy in Agriculture and Allied Sector Lab
Course Code: AGE352

L	T	P	Credits
0	0	2	1

Practical Contents:

1. Familiarization with renewable energy gadgets. To study biogas plants, To study gasifier,
2. To study theproduction process of biodiesel,
3. To study briquetting machine,
4. To study the production process of bio-fuels.
5. Familiarization with different solar energy gadgets.
6. To study solar photovoltaic system: solar light, solarpumping, solar fencing.
7. To study solar cooker and solar drying system.
8. To study solar distillation andsolar pond. Solar Wind hybrid system.
9. Field visit to Solar –Wind farm.

Suggested readings:

1. CS Solanki: Solar Photovoltaic – Fundamentals, Technologies and Applications, PHI Learning Pvt.Ltd., 2011.
2. S. Sukhatme and J.Nayak: Solar Energy: Principles of Thermal Collection and Storage, Third Edition(Tata McGraw-Hill, 2008)
3. V.V.N. Kishore, Renewable Energy Engineering and Technology: principles and practice, Teri,India, 2008.

Course Title: Dryland agriculture/ Rainfed agriculture and watershed management

Course Code: AGRON351

L	T	P	Credits
2	0	0	2

Credits Hours: 2(1+1)

Course Outcomes:

1. To learn about characteristics and conditions of dryland/rainfed agriculture
2. To gain knowledge about drought and its mitigation
3. To impart knowledge on water harvesting and watershed management

Course contents

Theory:

UnitI

Dryland/Rainfed agriculture: Introduction, types and characteristics; History of dry land/rainfed agriculturein India; Problems and prospects of dry land/rainfed agriculture in India; Soil and climatic conditions prevalent indry land/rainfed areas; Soil and water conservation techniques,

UnitII

Drought: types, effect of water deficit on physio-morphological characteristics of the plants, Crop adaptation and mitigation to drought; Water harvesting: importance,its techniques,

UnitIII

Efficient utilization of water through soil and crop management practices, Crops and cropping systemsin dry land/rainfed areas;

UnitIV

Management of crops in dry land/rainfed areas, Contingent crop planning for aberrantweather conditions, Concept, history, objective, principles and components of watershed management, factorsaffecting watershed management.

Course Title:Dryland agriculture/ Rainfed agriculture and watershed management Lab
Course Code: AGRON352

L	T	P	Credits
2	0	0	2

Practical Contents:

1. Studies on climate classification, studies on rainfall pattern in rainfed areas of the country and pattern ofonset and withdrawal of monsoons.
2. Studies on cropping pattern of different rainfed areas in the country anddemarcation of rainfed area on map of India.
3. Interpretation of meteorological data and scheduling of supplementalirrigation on the basis of evapo-transpiration demand of crops.
4. Critical analysis of rainfall and possible drought periodin the country.
5. Effective rainfall and its calculation.
6. Studies on cultural practices for mitigating moisture stressincluding mechanical and agronomic measure.
7. Soil moisture determination under different land situations, Importanceof seed priming to mitigate drought.
8. Assessment of meteorological drought. Characterization and delineation of modelwatershed.
9. Field demonstration on soil & moisture conservation measures. Field demonstration on construction ofwater harvesting structures.
10. Visit to rainfed research station/watershed.

Suggested readings:

1. A.K.Srivastava and P.K.Tyagi, 2011. Practical Agricultural Meteorology. New Delhi Publishing Agency, New
Delhi.
2. D.Lenka, 2006. Climate, Weather and Crops in India. Kalyani Publishers, New Delhi.
3. G.S. L.H.V.Prasad Rao, 2008. Agricultural Meteorology. Prentice Hall of India Pvt. Ltd., New Delhi.
4. H.S.Mavi and Graeme J.Tupper, 2005. Agrometeorology – Principles and applications of climate studies in
agriculture. International Book Publishing Co., Lucknow.
5. H.S.Mavi, 1994. Introduction to Agrometeorology. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
6. H.V.Nanjappa and B.K.Ramachandrappa, 2007. Manual on Practical Agricultural Meteorology. AgrobiosIndia. Jodhpur.
7. S.R.Reddy, 1999. Principles of Agronomy. Kalyani Publishers, New Delhi.
8. T.Yellamanda Reddy and G.H.SankaraReddi, 2010. Principles Of Agronomy. Kalyani Publishers, New Delhi I

Course Title: Introductory Agroforestry
Course Code: AGRON353

L	T	P	Credits
1	0	0	1

Total hours-15

Course Outcomes:

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

1. To studyAgroforestry as an alternate system of land use
2. To study different types of Agro forestry for soil and water conservation
3. To study the characteristics of Agroforestry in terms its potential for soil moisture conservation practices

Course contents

Theory

UNIT I **4 Hours**

Agro-forestry: Definition and scope of Agroforestry system, Type of Agroforestry system, potential of Agroforestry in India, Prevailing agroforestry system in NE India, MPTS- definition, role of MPTS in agroforestry system, its selection for different agroforestry system, MPTS of NE India,

UNIT II **4 Hours**

Ecological aspects of Agroforestry system, tree -crop interaction – competition, nutrient recycling, Traditional Agroforestry as a viable choice to conserve Agro biodiversity in North-East India. Management of Agro-forestry system, Role of agro forestry in soil and water conservation, windbreak, shelterbelt–definition, objectives., Socio-economic aspects of Agroforestry system, Design and Diagnostic study of agroforetry system.

UNIT III **4 Hours**

Silviculture: Defination and scope of silviculture system, Propagation of tree species, Regeneration by seed, coppice, root suckers, Transplanting, stamp, branch cutting, rhizomes, Nursery bed preparation and management, Cultural practices for bare root and seedling, field handling of nursery stock.

UNIT IV **3 Hours**

Management of tree species, Silviculture of important tree species, choice of species-site factors, root, crown and bole characteristics, phenology, nutritional and water requirement, ground operation, tending, harvesting utility etc.

Course Title: Introductory Agroforestry Lab
Course Code: AGRON354

L	T	P	Credits
0	0	2	1

Total hours-15

Practical Contents:

1. Study of tree growth measurement,
2. Study of environmental parameters affecting AF System.
3. Plant propagation methods, Pre-sowing seed treatment, preparation of nursery bed exercise,
4. Practicing students experience in vegetation, aforestation method, practical training, pruning, coppicing, pollarding etc.
5. Natural and artificial regeneration.
6. Design and diagnostic survey of agro-forestry system.
7. Evaluation of agro-forestry system in different agro climatic zones.
8. Exposure Visit to prevailing agroforestry systems of the state and related important institutions.

Suggested Readings:

1. *Nair, P.K. R: 1993.An Introduction to Agroforestry, Kluar Academic Publisher Del*

Transaction Method:

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

Course Title:Agricultural Microbiology and Bio - remediation

Course Code: PATH351

L	T	P	Credits
2	0	0	2

Credits Hours: 2(1+1)

Course Outcomes:

1. To get an introduction to microbiology with specific focus on its significance in agriculturescience
2. To get acquainted with the bacterial structure and the function of the different bacterialcomponents
3. To get highlights on different fields of microbiology
4. To get highlights on the Bioremediation of polluted soils using microbial mediators andphytoremediation
5. To get a concept of biological control and the role of biopesticides in plant diseasemanagement

Course contents

Theory:

UnitI

Introduction to Microbiology: Definition, applied areas of Microbiology and Importance of Microbiology.History of Microbiology: Discovery of microorganisms, spontaneous generation theory, Germ theory ofdiseases, Immunization, fermentation, and origin of life. Bacteria: cell structure, chemoautotrophy, photo autotrophy, growth. Bacterial genetics: Geneticrecombination- transformation, conjugation and transduction.

UnitII

Genetic Engineering: Plasmids, episomes, and genetically modified organisms. Air Microbiology: Phyllosphere microflora, Phylloplane microflora, microflora of floral parts etc.Food Microbiology: Microbial spoilage and principles of food preservations, Food poisoning. Water Microbiology: Types of water, water microorganisms, and microbial analysis of water e.g. coliform test,Purification of water.

UnitIII

Industrial Microbiology: Microbial products, Biodegradation, Biogas production, Biodegradable plastics etc.Biological control: Microbial biopesticides for plant disease management, Concepts of rhizosphere microbiology- Rhizodeposits -biochemical nature, release mechanism in rhizosphere,function, Carbon flow in rhizosphere, Rhizosphere microbiome-residents and their roles.

UnitIV

Potential of plant growth promoting rhizobacteria (PGPR) and endophytes on soil health and sustainability. Bioremediation of polluted soils using microbial mediators, Phytoremediation of polluted soils.

Course Title:Agricultural Microbiology and Bio - remediation Lab.
Course Code: PATH352

L	T	P	Credits
2	0	0	2

Practical Contents:

1. Study of the microscope,Acquaintance with laboratory material and equipments,
2. 2. Microscopic observationof different groups of microorganisms: moulds (Fungi),
3. Direct staining of bacteria by crystal violet, Negativeor indirect staining of bacteria by nigrosin,
4. Gram staining of bacteria,
5. Study of phyllosphere and rhizospheremicroflora,
6. Measurement of microorganisms, Preparation of culture media, Isolation andpurification ofrhizospheric microbes,
7. Isolation and purification of N-fixers, Isolation and purification of Nutrient solubilizers,
8. Isolation and purification of Endophytes.

Suggested readings:

1. Pelczar, M.J., Chan, E.C.S. &Kreig, N.R. (2002) Microbiology. 5th Edition, TataMcGraw-Hill, NewDelhi.

2. Rangaswami, G. &Bagyaraj, D. J. (2005) Agricultural Microbiology. Prentice-Hall of India Pvt. Ltd.,New Delhi.

3. Mukherjee, N. & Ghosh, T. (2004). Agricultural Microbiology. Kalyani Publishers, Calcutta

4. Dubey, H.C. (2007). A Textbook of Fungi, Bacteria and Viruses. Vikas Publishing House Ltd.,NewDelhi – 10014

5. Salyers, A. A., & Whitt, D. D. (2001). Microbiology: diversity, disease, and the environment.Fitzgerald Science Press, Inc.

6.Prescott, L. M. (2002). Microbiology 5th Edition.McGraw-Hill Inc.,US

Course Title:Agricultural Finance & Cooperation
Course Code: ECON351

L	T	P	Credits
2	0	0	2

Credits Hours: 2(1+1)

Course Outcomes:

To impart knowledge on issues related to lending to priority sector credit management and
financial risk management.

Course contents

Theory:

UnitI

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.

UnitII

Sources of agricultural finance: institutional and noninstitutional sources, commercial banks, social control andnationalization of commercial banks, Micro financing including KCC. Lead bank scheme, RRBs, Scale offinance and unit cost. An introduction to higher financing institutions – RBI, NABARD, ADB, IMF, worldbank, Insurance and Credit Guarantee Corporation of India. Cost of credit. Recent development in agriculturalcredit. Preparation and analysis of financial statements – Balance Sheet and Income Statement.

UnitIII

Basic
guidelines for preparation of project reportsBank norms – SWOT analysis. Agricultural Cooperation –Meaning, brief history of cooperative development in India, objectives, principles of cooperation, significanceof 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. 3 R's, 5 C's and 7 P's of credit.

UnitIV

Crop insurance:its scope, significance and limitations and the potential of the newly launched 'Pradhan MantriFasalBimaYojana' (Prime Minister's Crop Insurance Scheme). Successful cooperative systems in Gujarat(AMUL), Tamil Nadu (Aavin), Karnataka (Nandini), Maharashtra and Punjab.

Course Title: Agricultural Finance & Cooperation Lab
Course Code: ECON352

L	T	P	Credits
2	0	0	2

Practical Contents:

1. Optimum allocation of limited amount of capital among different enterprise. Analysis of progress andperformance of cooperatives using published data.
2. Analysis of progress and performance of commercial banksand RRBs using published data.
3. Visit to a commercial bank, cooperative bank and cooperative society toacquire firsthand knowledge of their management, schemes and procedures.
4. Estimation of credit requirementof farm business – A case study. Preparation and analysis of balance sheet – A case study.
5. Preparation andanalysis of income statement – A case study. Appraisal of a loan proposal – A case study.
6. Techno-economicparameters for preparation of projects.
7. Preparation of Bankable projects for various agricultural products andits value added products.
8. Seminar on selected topics. Different types of repayment plans.

Suggested readings:

1. Gittinger JP 1982. Economic Analysis of Agricultural Projects. The Johns Hopkins Univ. Press.
2. Reddy S. S and Ram P.R 1996. Agricultural Finance and Management. Oxford & IBH.

Course Title: Fundamentals of Seed Science & Technology

Course Code: GPB353

L	T	P	Credits
2	0	0	2

Credits

Hours: 2(1+1)

Course Outcomes:

i) To impart basic and fundamental knowledge on principles and practices seed science andtechnology

ii) To impart practical skills on scientific seed production and postharvest qualitymanagement.

Course contents

Theory:

UnitI

Introduction to seed technology, definition and importance. Seed quality -definition, characters ofgood quality seed, Causes of deterioration of varietal purity and assessment of genetic purity, different classesof seed.

UnitII

Foundation and certified seed production of important cereals, pulses and oilseed, field inspection,importance and procedures, post harvest seed quality management,Seed processing procedures, seed dryingSeed treatment, its importance, method of application and seed packing.

UnitIII

Seed storage - general principles,stages and factors affecting seed longevity during storage, Seed health management during storage.

UnitIV

SeedCertification and legislation, Seed Act and Seed Act enforcement, duty and powers of seed inspector, offencesand penalties. Seeds Control Order 1983, basics of seed quality testing.

Course Title:Fundamentals of Seed Science & Technology Lab
Course Code: GPB353

L	T	P	Credits
2	0	0	2

Practical Contents:

1. Seed Structure, Seed sampling, Physical purity, Moisture determination, Germination test
2. Seed andseedling vigour test, Seed Viability.
3. Genetic purity test: Grow out test
4. Field inspection, seed health testingusing blotter and agar plate method.
5. Visit to seed production farms, seed testing laboratories and seedprocessing plant.

Suggested Readings:

1. Agarwal, R.L (1995). Seed Technology (2nd edition). Oxford & IBH Publishing Co. Pvt. Ltd. NewDelhi, India.

2. Khare, D., Bhale, M.S. (2019). Seed Technology (2nd revised & enlarged edn), Scientific Publishers,ISBN: 978-81-72338-84-8, New Pali Road, P.O. Box 91, Jodhpur, India

3. Vanangamudi, K. (2014). Seed Technology (An illustrated book), New India Publishing Agency,New Delhi, India

4. Bhojwani SS & Bhatnagar SP. 1999. The Embryology of Angiosperm. Vikas Publ

5. McDonald MB Jr & Copeland LO. 1997. Seed Production: Principles and Practices.Chapman & Hall.

6. Tunwar NS & Singh SN. 1988. Indian Minimum Seed Certification Standards. CSCB, Ministry ofAgriculture, New Delhi.

Course Title: Pests of Horticultural Crops and Their Management

Course Code: ENTO351

L	T	P	Credits
2	0	0	2

Credits Hours: 2(1+1)

Course Outcomes:

Upon completion of the course, students will:

1. Identify the types of insects attacking different horticultural crops and recommend appropriate management strategies.
2. Suggest botanical pesticides or green-label chemical pesticides for vegetable crops to minimize pesticide residues.
3. Understand the principles of ornamental horticulture and its role in environmental beautification.
4. Develop a foundation for higher studies in entomology.

Course Contents

Theory:

Unit I

Taxonomic position, host range, distribution, biology, and nature of damage of major pests of vegetable crops such as Brinjal, Okra, Tomato, Potato, Sweet Potato, Onion, and Chilli, along with their management.

Unit II

Taxonomic position, host range, distribution, biology, and nature of damage of major pests of vegetable crops such as Pumpkin, Cucumber, Pointed Gourd, Snake Gourd, other Gourds, Cabbage, Cauliflower, Radish, Knolkhol, and Coriander, along with their management.

Unit III

Taxonomic position, biology, damage symptoms, and ecological factors responsible for insect pests of fruit crops like Mango, Apple, Citrus, Guava, Banana, Grapes, Pomegranate, Sapota, Custard Apple, and Ber, along with their management.

Unit IV

Taxonomic position, host range, distribution, biology, and nature of damage of major pests of ornamental &Plantation crops such as Chrysanthemum, Jasmine, Tuberose, Tagetes, and Rose, coffee, tea, coconut, cashew along with their management.

Course Title: Pests of Horticultural Crops and Their Management
Course Code: ENTO351

L	T	P	Credits
2	0	0	2

Practical Contents

1. Identification and damage symptoms of insect pests infesting Solanaceae crops (Brinjal, Tomato, Potato, etc.).
2. Identification and damage symptoms of insect pests infesting Brassicaceae crops (Cabbage, Cauliflower, Radish, Knolkhol, etc.).
3. Identification and damage symptoms of insect pests infesting Cucurbitaceae crops (Pumpkin, Cucumber, Gourds, etc.).
4. Identification and damage symptoms of insect pests infesting temperate fruit crops (Apple, Pear, Plum, etc.).
5. Identification and damage symptoms of insect pests infesting tropical fruit crops (Mango, Banana, Papaya, etc.).
6. Identification and damage symptoms of insect pests infesting subtropical fruit crops (Guava, Citrus, Pomegranate, etc.).
7. Identification and damage symptoms of insect pests infesting flower crops (Marigold, Tuberose, Jasmine, etc.).
8. Identification and damage symptoms of insect pests infesting ornamental plants (Rose, Chrysanthemum, etc.).
9. Field visit and collection of major insect pests and their damaged plant samples for further study.
10. Study of different types of pest control methods including biological, cultural, mechanical, and chemical control.
11. Identification of natural enemies (predators and parasitoids) of major horticultural insect pests.
12. Study of Integrated Pest Management (IPM) strategies for sustainable horticultural pest control.
13. Preparation of pest management recommendations using botanical and chemical control methods for vegetable crops.
14. Collection,preservation, assessment of damageand population of important insect - pests affecting field crops

Suggested Readings:

1. Atwal, A.S. 1976. Agricultural Pests of India and South East Asia. Kalyani Publishers, Ludhiana.
2. Butani, D.K. and Jotwani, M.G. 1984. Insects in Vegetables. Periodical Export Book Agency,New Delhi.
3. Khare, S.P. 1993. Stored Grain Pests and Their Management. Kalyani Publishers, Ludhiana.
4. Dwivedi. 1996. A Text Book of Plant Nematology. Aman Publishing House, Meerut.

Course Title: System Simulation and Agro-advisory

L	T	P	C
3	0	0	3

Course Code: BAG7400

Total hours- 45

Objectives

1. To impart the knowledge of statistical and simulation modeling in crop yield estimation.
2. To get acquainted with different weather forecasting techniques and their usability analysis.
3. To study about the preparation and dissemination of agro-advisory bulletin.

Course Contents

Unit I **Hours-12**

System approach for representing soil-plant-atmospheric continuum, system boundaries. Crop models – concepts, techniques, types of crop models, and data requirements. Relational diagrams for crop models.

Unit II: **Hours-13**

Evaluation of crop responses to weather elements. Elementary crop growth models – calibration, validation, verification, and sensitivity analysis. Potential and achievable crop production – concept and modeling, techniques for estimation.

Unit III: **Hours-11**

Crop production in moisture and nutrients limited conditions – components of soil water and nutrient balance. Weather forecasting – types, methods, tools & techniques, forecast verification, and value-added weather forecast. ITK for weather forecast and its validity; crop-weather calendars.

Unit IV: **Hours-9**

Preparation of agro-advisory bulletin based on weather forecast. Use of crop simulation model for preparation of agro-advisory and its effective dissemination.

Transaction Mode

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Course Title: System Simulation and Agro-advisory Lab

L	T	P	C
0	0	2	1

Course Code: BAG7401

Total hours- 30

Course Contents

Preparation of crop weather calendars. Preparation of agro-advisories using synoptic charts. Working with statistical and simulation models for crop growth and yield forecasting. Simulation with limitations of water and nutrient management options. Sensitivity analysis of varying weather and crop management practices. Use of statistical approaches in data analysis and preparation of meteorological data. Feedback from farmers about the agro-advisory.

Transaction Mode

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings

1.Introduction to Agrometeorology by H.S. Mavi.

2. Agricultural Meteorology by G.S.L.H.V. Prasado Rao.

3 Advances in Plant Atmospheric Interactions (Eds. Rao, V.U.M., Rao, A.V.M.S., Rao, G.G.S.N., Ramana Rao, B.V., Vijaya Kumar, P., and Venkateswarlu, B) – Central Research Institute for Dryland Agriculture (CRIDA), Santoshnagar, Hyderabad.

4 Text Book of Agricultural Meteorology (ICAR) by M.C. Varshneya & P.B. Pillai.

5 Principles of Agricultural Meteorology by O.P. Bishnoi.

Course Title: Geoinformatics and Remote Sensing, Precision Farming

L	T	P	C
3	0	0	3

Course Code: BAG7402

Total hours- 45

Objectives

1. Enabling students to acquire knowledge on the basics of remote sensing techniques for precision farming applications.
2. To provide a comprehensive knowledge of remote sensing, precision farming, and its benefits in improving crop production and soil health management.

Course Contents

Unit I: **Hours-11**

Introduction and history of remote sensing; sources and principles of remote sensing. Propagation of radiations in atmosphere and interaction with matter. Application of remote sensing techniques in land use, soil surveys, crop stress, and yield forecasting. Advantages and disadvantages of remote sensing.

Unit II: **Hours-13**

Remote sensing institutes in India; basic concepts of geoinformatics. AI in agriculture – history and fundamentals of big data & machine learning (ML). Use of AI in autonomous systems – agricultural robots, drone monitoring, driverless tractors, automated sprinklers, and self-harvesting machines.

Unit III: **Hours-12**

Use of AI in crop analysis – monitoring soil quality, promoting organic crops, monitoring weeds, and precision agriculture. Role of AI for sustainability and climate change, yield and demand forecasting, and food tech. Impact of blockchain and AI in emerging markets and technology deployment in agriculture.

Unit IV: **Hours-9**

Expert System – introduction, characteristics, features, and applications. Rule-based system architecture; software agents. Responsible AI in agriculture and data sharing.

Transaction Mode

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Course Title: Geoinformatics and Remote Sensing, Precision Farming Lab

L	T	P	C
0	0	2	1

Course Code: BAG7403

Total hours- 30

Course Contents

Familiarization with remote sensing equipment and data products. Interpretation of aerial photographs and satellite data. GPS and GIS – georeferencing of toposheets. AI use case studies in agriculture. Search and control strategies – blind search, breadth-first search, depth-first search, hill climbing, best-first search, branch and bound search. Programming in Prolog – syntax, data structures, backtracking, input-output, built-in predicates, grammar rules.

Transaction Mode

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings

1. **Data Analytics in Bioinformatics: A Machine Learning Perspective** – Edited by Rabinarayan Satpathy, Tanupriya Choudhury, Suneeta Satpathy, Sachi Nandan.
2. **Machine Learning Approaches to Bioinformatics** by Zheng Rong Yang.
3. **Textbook of Remote Sensing and Geographical Information Systems** by M. Anji Reddy.
4. **Precision Agriculture Technologies for Food Security and Sustainability** by A. El-Kader, M. Sherine, M. El-Basioni, M. Basma.
5. **Principles and Theory of Geoinformatics** by P.K. Garg – Khanna Publishers (2019).
6. **Advances in Geoinformatics, Remote Sensing, and GIS** by Bhunia, Gouri Sankar, Uday Chatterjee & Gopal Krishna Panda – BIO GREEN.
7. **Artificial Intelligence: Machine Learning, Deep Learning, and Automation Processes** by John Adamssen (2020) – Efalon Acies.
8. **Remote Sensing and Image Interpretation** (6th Edition) – Wiley Student Edition (2011).
9. **Remote Sensing and Geographic Information** by A.M. Chandra and S.K. Ghosh – Narosa Publishing House.

Course Title: Principles and Practices of Organic Farming and Conservation Agriculture

L	T	P	C
3	0	0	3

Course Code: BAG7404

Total hours- 45

Objectives

1. To teach students the principles of crop production under organic and conservation agriculture situations.
2. To impart practical knowledge of organic and conservation agriculture practices.

Course Contents

Unit I: **Hours-9**

Concept of organic farming – principles and its scope in India. Choice of crops and varieties in organic farming. Nutrient management in organic farming and their sources.

Unit II: **Hours-11**

Fundamentals of insect, pest, disease, and weed management under organic mode of production. Operational structure of NPOP and certification process. Crop standards of organic farming.

Unit III: **Hours-12**

Processing, labeling, economic considerations, and viability of organic products. Marketing and export potential of organic products. Initiatives by Government, NGOs, and other organizations for promoting organic agriculture.

Unit IV: **Hours-13**

Conservation agriculture – definition, origin, principles, advantages, and challenges. Primary practices – minimum soil disturbance, crop residue retention, and crop diversification. Complementary practices – conservation agriculture vis-a-vis climate-smart agriculture.

Transaction Mode

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Course Title: Principles and Practices of Organic Farming and Conservation Agriculture Lab

Course Code: BAG7405

L	T	P	C
0	0	2	1

Total hours- 30

Course Contents

Visit to organic farms – study of various components and their utilization. Preparation of enriched compost and vermicompost – quality analysis. Application of bio-fertilizers. Indigenous technology knowledge (ITK) for nutrient, insect-pest, and disease management. Studies in green manuring in-situ and green leaf manuring. Use of botanicals for insect-pest management. Weed management in organic farming. Cost analysis of organic production systems. Practices of conservation agriculture.

Transaction Mode

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings

1. **Gaur, A.C.** – *Handbook of Organic Farming and Biofertilizers*.
2. **Dahama, A.K.** – *Organic Farming for Sustainable Agriculture*. Agrobios (India), Jodhpur.
3. **Sharma, Arun K.** – *Handbook of Organic Farming*. Agrobios (India), Jodhpur.
4. **Palaniappan, S.P., and Annadurai, K.** – *Organic Farming – Theory and Practice*. Scientific Publishers, Jodhpur.
5. **Thapa, U., and Tripathy, P.** – *Organic Farming in India – Problems and Prospects*. Agrotech Publishing, Udaipur.
6. **Veeresh, G.K.** – *Organic Farming*. Foundation Books, New Delhi.
7. **Purshit, S.S.** – *Trends in Organic Farming in India*. Agros Bios (India), Jodhpur.
8. **Thampan, P.K.** – *Organic Agriculture*. Peckay Tree Crops Development Foundation, Cochin, Kerala.
9. **Sathe, T.V.** – *Vermiculture and Organic Farming*. Days Publishing House, New Delhi.
10. **Singh, Abhinandan, Pankaj Kumar Ojha, and Rahul Kumar** (2018) – *Conservation Agriculture Technologies*. Biotech Books.
11. **Acharya, Sankar Kr., Sreemoyee Bera, Cornea Saha, Prabhat Kumar, Monirul Haque, Riti Chatterjee, and Anwesha Mandal** (2022) – *Conservation Agriculture Approach and Application*. Scholars World, 292 p.

Course Title: Production of Commercial Crops

L	T	P	C
3	0	0	3

Course Code: BAG7406

Total hours- 45

Course Contents

Unit I **Hours-13**

Origin and geographic distribution of cotton, maize, jute, sunhemp, soybean, sugarcane, sugarbeet, potato, ginger, turmeric, and mentha. Economic importance of these crops in terms of contribution to the national and global economy, industrial uses, market demand, and export potential.

Unit II **Hours-12**

Soil requirements including soil type, pH range, fertility status, and amendments. Climatic requirements covering temperature, rainfall, growing season, photoperiod sensitivity, and regional adaptability for each crop.

Unit III **Hours-11**

Major high-yielding, disease-resistant, and region-specific varieties of commercial crops. Cultural practices including seed rate, spacing, sowing time and method, irrigation, nutrient management, weed, pest, and disease management, and harvesting techniques.

Unit IV **Hours-9**

Yield potential, average and maximum yields, and factors affecting yield. Post-harvest processing including storage, handling, value addition, industrial processing, and marketing and export channels.

Transaction Mode

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Course Title: Production of Commercial Crops Lab

L	T	P	C
0	0	2	1

Course Code: BAG7407

Total hours- 30

Course Contents

Cultural practices for commercial crops. Effect of seed size and sowing depth on germination. Morphological characteristics of commercial crops. Identification of weeds of commercial crops. Identification propagation, seed selection, seed treatment, processing and distillation techniques for different medicinal, aromatic and spice crops

Transaction Mode

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings:

1. **Chhidda Singh, Prem Singh and Rajbir Singh** (2017). *Modern Techniques of Raising Field Crops.* Oxford and IBH Publishing Co. Pvt. Ltd.
2. **Reddy, S.R.** (2016). *Agronomy of Field Crops.* Kalyani Publishers.
3. **Das, N.R.** (2015). *Introduction to Commercial Crops.* Scientific Publishers.
4. **Sharma, R.P.** (2018). *Principles and Practices of Agronomy.* Kalyani Publishers.
5. **Yadav, D.S.** (2017). *Agriculture and Agronomy.* Kalyani Publishers.
6. **FAO** (2020). *Guidelines for Crop Production and Management.* FAO Publications.
7. **Prajapati, N.K.** (2014). *Commercial Crops Production Technology.* Agrotech Publishing Academy.
8. **Weiss, E.A.** (2000). *Oilseed Crops.* Blackwell Science Ltd.

Course Title: Analytical Technique and Instrumental Methods in Soil and Plant Analysis

Course Code: BAG7408

L	T	P	C
3	0	0	3

Total hours- 45

After successful completion of this course, the students will be able to:
1. Acquire the knowledge regarding the concept of soil fertility and soil Productivity
2. Get the knowledge regarding the concept of nutrients sources
3. Attain knowledge regarding the concept of transformation of nutrients (NPK)
4. Learn about the concept of availability of micro nutrients and their transformation
5. Know the concept of site specific nutrient management concept of soil fertility evaluation and soil quality

Unit I **Hours-13**

Preparation of solutions for standard curves. Indicators and standard solutions for acid-base, oxidation-reduction, and complexometric titrations. Soil, water, and plant sampling techniques, processing, and handling. Determination of nutrient potentials and potential buffering capacities of soils for phosphorus and potassium. Estimation of phosphorus, ammonium, and potassium fixation capacities of soils.

Unit II **Hours-12**

Principles of visible, ultraviolet, and infra-red spectrophotometry. Atomic absorption spectrometry, flame photometry, and inductively coupled plasma spectrometry. Chromatographic techniques, mass spectrometry, and X-ray diffractometry. Identification of minerals by X-ray using different methods. CHNS analyzer and its applications.

Unit III **Hours-9**

Electrochemical titration of clays. Estimation of exchangeable cations (Na, Ca, Mg, K). Estimation of root cation exchange capacity. Measurement of redox potential. Drawing normalized exchange isotherms and their interpretation.

Unit IV **Hours-11**

Wet digestion, fusion, and extraction of soil with aqua regia for elemental analysis. Tri-acid and di-acid digestion of plant samples. Determination of available and total nutrients (N, P, K, S, Ca, Mg, Zn, Cu, Fe, Mn, B, Mo) in soils and plants.

Transaction Mode

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Course Title: Analytical Technique and Instrumental Methods in Soil and Plant Analysis Lab
Course Code: BAG7409

L	T	P	C
0	0	2	1

Total hours- 30

Preparation of solutions for standard curves and indicators for acid-base and complexometric titrations. Sampling, processing, and handling of soil, water, and plants. Determination of nutrient potentials and buffering capacities for phosphorus and potassium. Principles of visible, UV, and IR spectrophotometry. Techniques of atomic absorption, flame photometry, ICP spectrometry, and X-ray diffractometry for mineral identification. Estimation of exchangeable cations (Na, Ca, Mg, K) and root cation exchange capacity. Wet digestion and aqua regia extraction for elemental analysis. Tri-acid/di-acid digestion of plant samples. Determination of available and total nutrients (N, P, K, S, Ca, Mg, Zn, Cu, Fe, Mn, B, Mo) in soils and plants. Measurement of redox potential.

Transaction Mode

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings

1. **Lindsay, W.L.** (1979). *Chemical Equilibria in Soils.* Wiley-Interscience.
2. **Jackson, M.L.** (1973). *Soil Chemical Analysis.* Prentice Hall of India.
3. **Sparks, D.L.** (1996). *Methods of Soil Analysis. Part 3 – Chemical Methods.* Soil Science Society of America.
4. **Hesse, P.R.** (1971). *A Textbook of Soil Chemical Analysis.* Chemical Publishing Co.
5. **Page, A.L., Miller, R.H., and Keeney, D.R.** (1982). *Methods of Soil Analysis. Part 2 – Chemical and Microbiological Properties.* Soil Science Society of America.
6. **Tandon, H.L.S.** (1993). *Methods of Analysis of Soils, Plants, Waters and Fertilizers.* Fertilizer Development and Consultation Organization.
7. **Westerman, R.L.** (1990). *Soil Testing and Plant Analysis.* Soil Science Society of America.
8. **Brady, N.C. and Weil, R.R.** (2016). *The Nature and Properties of Soils.* Pearson.

Course Title: Landscaping

Course Code: BAG7410

L	T	P	C
3	0	0	3

Total Hours-30

Course Outcomes:

After completion of course, thestudents willbeableto:

1 Todevelop anagricultureweb mapservice
2 Associateandapplytools toidentifytheimplements used inlandscapedesign.
3 Extendand applytools andtechniquesof landscapedesignforspecialeffects
4 Evaluatetheroleofcomputersoftware,visittoimportantgardens/parks/institutes.

Coursecontents

UNIT-I **8 Hours**

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

UNIT-II **7 Hours**

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

UNIT-III **7 Hours**

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

UNIT-IV **8 Hours**

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

Course Title: Lab- Landscaping
Course Code: BAG7411

L	T	P	C
0	0	2	1

Practical contents

30 Hours

1. Identification of trees.
2. Identification of shrubs.
3. Identification of annuals.
4. Identification of pot plants.
5. Propagation, care and maintenance of trees, shrubs and annuals of plants.
6. Potting and repotting.
7. Identification of tools 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, rock garden) a.
11. Visit to important gardens/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:Hi-tech.Horticulture
Course Code: BAG7412

L	T	P	C
3	0	0	3

Total hours 30

CourseOutcomes:

After completion of course, thestudents willbeableto:

1 TostudyMicropropagationofhorticulturalcrops
2 Modernfieldpreparation
3 Applicationofprecisionfarminginhorticulturalcrops
4 Learn about Nursery-portrays,micro-irrigation.EC,Phbasedfertilizerscheduling,

Coursecontents

Theory

UNIT-I **7 Hours**

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

UNIT-II **8 Hours**

Protected cultivation: advantages, controlled conditions, method and techniques, Micro irrigation systems and its components; EC. pH based fertilizer scheduling, canopy management, high density orcharding. Components of precision 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 shadenet houses, Intercultural operations, tools and equipment's identification and application, Micropropagation, Nursery-portrays, micro-irrigation. EC, pH based fertilizer scheduling, canopy management,visit tohi-tech orchard/nursery.

Course Title: Lab- Hi-tech.Horticulture
Course Code: BAG7413

L	T	P	C
0	0	2	1

Practical contents

30 Hours

1. Micropropagation of horticultural crops
2. Micro -irrigation .
3. Modern field preparation and planting methods.
4. Protected cultivation: methods and techniques.
5. Practical Types of polyhouses and shade net houses.
6. Canopy management and high density orcharding.
7. Components of precision farming: Remote sensing, Geographical Information System (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 equipment's –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*

1. *Hi-tech Horticulture- T.A. More, MPKV, Rahuri Balraj Singh,2005: Protected cultivation of vegetable crops. Kalyani publication*
2. *Patil M.T. & Patil, P.V.,2004 Commercial Protected Floriculture.MPKV, Rahuri Commercial floriculture- Prasad &kumar*
3. *Green house operation & Management: Paul V. Nelson*
4. *Green house operation & Management: Paul V. Nelson*
5. *Nelson, Paul V. 2011. Greenhouse operation & Management.*

Transaction Method:

Assignment, Power Point presentation, Audio lecture, Video lecture, Plain

Course Title: Protected Cultivation
Course Code: BAG7414

L	T	P	C
3	0	0	3

Total hours- 30

CourseOutcomes:

After completion of course, thestudents willbeableto:

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 net house
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.

L	T	P	C
0	0	2	1

Course Title: Lab- Protected Cultivation
Course Code: BAG7415

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:Post- harvest Management and value addition of fruits and vegetables

L	T	P	C
3	0	0	3

Course Code: BAG7416

Total hours- 15

CourseOutcomes:

After completion of course, thestudents willbeableto:

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

Coursecontents

Theory

UNIT-I **4 Hours**

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

UNIT-II **4 Hours**

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

UNIT-III **4 Hours**

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

UNIT-IV **3 Hours**

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

Course Title:Lab- Post- harvest Management and value addition of fruits and vegetables
Course Code: BAG7417

L	T	P	C
0	0	2	1

Practical contents

30 Hours

1. Applications of different types of packaging, containers for shelf life extension.
2. Effect of temperature on shelf life and quality of produce.
3. Demonstration of chilling and 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: Principles of Food Science and Nutrition
Course Code: BAG7418

L	T	P	C
3	0	0	3

Total Hours-30

Course Outcomes:

After completion of course, thestudents willbeableto:

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

Theory content

UNIT-I **9 Hours**

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

UNIT-II **6 Hours**

Requirement, availability, functions and Nutritional deficiency disease of minerals and vitamins. Flavors and colors used in food.

UNIT-III **7 Hours**

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

UNIT-IV **8 Hours**

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

Course Title:Lab- Principles of Food Science and Nutrition
Course Code: BAG7419

L	T	P	C
3	0	0	3

Total Hours-30

Practical Content

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

Suggested Readings:

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

Transaction Method:

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

Course Title: **Bio formulation and Nano formulation**

Course Code: **BAG7420**

L	T	P	Credits
3	0	0	3

Total hours- 45

Objectives:

1. To enable students to acquire expertise and skill to develop bioformulation and Nanoformulation

2. To know the importance of biopesticides and biofertilizers

3. To make the students know about various techniques involved in biofertilizers and biopesticides production

4. To get knowledge on essential oils, botanicals, Pheromones, and parapheromone and their application in insect pest management

5. To get concepts on agrochemical formulations with nanoparticles and acquaint them with nanotechnology

Course contents:

Unit I: **Hours- 11**

Introduction and history of biological control of pests and diseases, Microbial biopesticides: the global and Indian market scenario; biopesticides for organic agriculture.

Unit II: **Hours- 11**

Different phytopathogenic biocontrol agents: Mode of action, Different entomopathogenic biocontrol agents: Mode of action, Microbial inoculants as biofertilizer candidates, Production, quality assessment and methods of application of biopesticides and biofertilizers.

Unit III: **Hours- 11**

Regulatory system of biopesticides in India, Formulations of plant essential oils, botanicals, Pheromone, and parapheromone and their application in insect pest management, Use of predators and parasitoids for insect pest management.

Unit IV: **Hours- 12**

Nanotechnology: its applications in pest and disease diagnosis and management, Nano biopesticides: Concept and importance, different techniques of producing nano biopesticides, Nano Fertilizers: Concept and importance, Types of nano fertilizers, Different techniques of producing nano fertilizers, Green synthesis of nano fertilizers, green slow-release fertilizer composition based on urea-modified hydroxyapatite nanoparticles.

Course Title: Bio formulation and Nano formulation Lab
Course Code: BAG7421

L	T	P	Credits
0	0	2	1

Total hours- 30

Course contents:

1. Introduction & acquaintance with biopesticide laboratory,
2. Preparation of culture media, Isolation and purification of bioagent from soil and infected insects.
3. Microscopic study of different microbial bioagents,
4. In vitro assay of microbial bioagents against plant pathogens.
5. In vitro compatibility study among different microbial bioagents,
6. Mass multiplication of biopesticides,
7. Population enumeration of biocontrol agents in different biopesticides
8. Preparation of plant extracts and their efficacy test against insect pests,
9. Use of pheromone parapheromone for monitoring and management of insect pests,
10. Bioassay of Entomopathogenic biocontrol agents on insect pests,
11. Preparation of microbial inoculants of biofertilizer microbes,
12. Compatibility of biofertilizer microbes,
13. Preparation of solid & liquid consortia of biofertilizer microbes.

Suggested readings:

1. Baker, E.F. and James, R.C. 1982. Biological Control of Plant Pathogens. American Phytopathological Society
2. Borkar,S.G. 2015. Beneficial Microbes as Biofertilizers and its Production Technology
3. Boland, G.J. and David, L.1998. Plant microbe interactions and Biological Control. Kuykendall Marel Dekker, INC.
4. Ciancia, A. and Mukerji, K.J. 2007. General Concepts of Integrated Pest and Disease Management. Edited Published by Springer.
5. Cincholkar, S.B. and Mukherji, K.G. 2007. Biological Control of Plant Diseases. Hawarth Food and Agricultural products.
6. Gnanamanickam, S.S. 2002. Biological control of crop Disease. Kuykendall Marel Dekker, INC.
7. Ramanujam, B. and Rabindra, R.J. 2006. Current Status of Biological Control of Plant Disease usingAntagonistic Organisms in India. Precision Fototype Services Bangalore.
8. Singh, S.P. and Hussanini, S.S. 1998. Biological Suppression of Plant Disease, PhytoparasiticNematodesand Weeds. Precision Fototype Services Bangalore.
9. Allhoff, Fritz and Lin, Patrick (Eds) 2009. Nanotechnology and Society, ISBN: 978-1-4020- 6208-7 Springer Publications, UK

10. Prasad, Ram, Vivek Kumar, Manoj Kumar and Devendra Choudhary Eds, 2019.Nanobiotechnology in Bioformulations, Kindle Edition

11. Koul, Opender Ed, 2019. Nano-biopesticides taoday and future perspectives, Academic Press

12. Shah, MA and Tokeer Ahmad Nano Science & Technology, Wiley India

Course Title: Bio pesticides and Bio fertilizers
Course Code: BAG7422

L	T	P	Credits
3	0	0	3

Total hours- 45

Objectives:

1. To provide knowledge on principles, methods, and mechanisms of bio-control agents and their use against plant diseases
2. To provide knowledge on principles, methods, and mechanism of biofertilizers and their use in agriculture

Course contents:

Unit I:
Hours- 11

History and concept of bio pesticides. Importance, scope and potential of bio pesticides. Definitions, concepts and classification of bio pesticides *viz*. Pathogen, botanical pesticides, and bio rationales. Botanicals and their uses.

Unit II: **Hours- 11**

Mass production technology of bio-pesticides. Virulence, pathogenicity and symptoms of entomopathogenic pathogens and nematodes, Methods of application of bio pesticides. Methods of quality control and Techniques of bio pesticides. Impediments and limitation in production and use of bio pesticides.

Unit III: **Hours- 11**

Biofertilizers - Introduction, status and scope. Structure and characteristics features of bacterial biofertilizers – *Azospirillum*, *Azotobacter*, *Bacillus*, *Pseudomonas*, *Rhizobium* and Frankia; Cynobacterial bio fertilizers, Anabaena, Nostoc, Hapalosiphon and fungal biofertilizers – AM mycorrhiza and ectomycorhiza. Nitrogen fixation –Free living and symbiotic nitrogen fixation. Mechanism of phosphate solubilisation and phosphate mobilization, K solubilisation.

Unit IV: **Hours- 12**

Production Technology: Strain selection, sterilization, growth and fermentation, mass production of carrier based and liquid biofertiizers. FCO specifications and quality control of biofertilizers. Application technology for seeds, seedlings, tubers, sets *etc*. Biofertilizers-Storage, shelf life, quality control and marketing. Factors influencing the efficiency of biofertilizers.

Course Title: Bio pesticides and Bio fertilizers Lab
Course Code: BAG7423

L	T	P	Credits
0	0	2	1

Total hours- 30

Course contents:

1. Isolation and purification of important biopestisides: *Trichoderma Pseudomonas*, *Bacillus*, *Metarhyzium etc*. and its production.
2. Identification of important botanicals.
3. Visit to biopesticide laboratory in nearby area.
4. Field visit to explore naturally infected cadavers.
5. Identification of entomopathogenic entities in field condition.
6. Quality control of biopesticides.
7. Isolation and purification of *Azospirillum*, *Azotobactor*, 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:

Biopesticides

1. Baker, E.F. and James, R.C. 1982. Biological Control of Plant Pathogens. American Phytopathological Society

2. Boland, G.J. and David, L.1998. Plant microbe interactions and Biological Control. Kuykendall Marel Dekker, INC.

3. Borkar,S.G. 2015.Beneficial Microbes as Biofertilizers and its Production Technology

4. Ciancia, A. and Mukerji, K.J. 2007. General Concepts of Integrated Pest and Disease Management. Edited Published by Springer.

5. Cincholkar, S.B. and Mukherji, K.G. 2007. Biological Control of Plant Diseases. Hawarth Food and Agricultural products.

6. Gnanamanickam, S.S. 2002. Biological control of crop Disease. Kuykendall Marel Dekker, INC.

7. Ramanujam, B. and Rabindra, R.J. 2006. Current Status of Biological Control of Plant Disease usingAntagonistic Organisms in India. Precision Fototype Services Bangalore.

8. Singh, S.P. and Hussanini, S.S. 1998. Biological Suppression of Plant Disease, PhytoparasiticNematodesand Weeds. Precision Fototype Services Bangalore.

Biofertilizers

1. Handbook of Microbial Biofertilizers- Dr. Awani Kr. Singh, Agrotech Press, Jaipur,India

2. Biofertilizers for Sustainable Agriculture- Sampat Nehra, Aavishkar Publishers, Jaipur,India

3. Organic Farming- A.K. Singh, New India Publishing Agency,New Delhi

4. Earthworm Vermiculture and Vermicomposting, R.K. Bhatnagar, R.K. Palta, Kalyani Publishers

5. Organic Farming: Standards, Accreditation, Certification and Inspection-Dushyent Gehlot, Agrobios (India)

6. Fungal Biopesticides and VAM applications-P.C.Trivedi, Pointer publishers, Jaipur,India

Course Title: Agrochemicals

course Code: BAG7424

L	T	P	Credits
3	0	0	3

Total hours- 45

Objectives: To impart knowledge on different classes of agrochemicals

Course contents:

Unit I:
Hours- 11

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

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

Fungicides- classification –Inorganic fungicides-characteristics, preparation and use of sulphur and copper.

Mode of action- Bordeaux mixture and copper oxychloride.

Unit II: **Hours- 11**

Organic fungicides –Mode of action –Dithiocarbamates- characteristics, preparation and use of Zineb and maneb. Systemic fungicides- Benomyl, carboxin, oxycarboxin, Metalaxyl, Carbendazim, characteristics and use. Introduction and classification and insecticides: inorganic and organic insecticides organochorine, Ogranophosphates, Carbamates, Synthetic pyrethriods Neonicotinoids, Biorationals, Insecticide Act and rules, Insecticides banned, withdrawn and restricted use, fate of insecticides in soil &plant. IGR Biopesticides, Reduced risk insecticides, Botanical, Plant and animal systemic insecticides their characteristics and uses.

Unit III: **Hours- 11**

Fertilizers and their importance. Nitrogenous fertilizers: Feedstocks and Manufacturing of ammonium sulphate, ammonium nitrate, ammonium chloride, urea. Slow release N-fertilizers. Phosphatic fertilizers: feedstock and manufacturing of single superphosphate. Preparation of bone meal and basic slag. Potassic fertilizers: Natural sources of potash, manufacturing of potassium chloride, potassium sulphate and potassium nitrate.

Unit IV: **Hours- 12**

Mixed and complex fertilizers: Sources and compatibility- preparation of major, secondary and micronutrient mixtures. Complex fertilizers: Manufacturing of ammonium phosphates, nitrophosphates and NPK complexes. Fertilizer control order. Fertilizer logistic and marketing. Plant bio-pesticides for ecological agriculture, Bio-insect repellent.

Suggested readings:

1. Buchel KH (Ed.) 1992. Chemistry of pesticides. John Wiley & Sons

2. Panda H. 2022.The Complete Technology Book on Pesticides, Insecticides, Fungicides and Herbicides (Agrochemicals) with Formulae, Manufacturing Process, Machinery & Equipment Details 2nd Revised Edition. NPCS

3. Biswas D. R. 2021. A Text Book of Fertilizers. New India Publishing Agency

4. Singh, A., 2022 Basics of Agrochemical Formulations:, Brillion Publishing, 176p.
5. Larramendy, M.L 2017Toxicity and Hazard of Agrochemicals:,INTECH, 170p.

Course Title: Agrochemicals Lab
Course Code: BAG7425

L	T	P	Credits
0	0	2	1

Total hours- 30

Course contents:

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.
7. Estimation of nitrogen in Urea.
8. Estimation of water soluble P2 O5 and citrate soluble P2 O5 in single super phosphate.
9. Estimation of potassium in Muraite of Potash/ Sulphate of Potash by flame photometer.
10. Determination of copper content in copper oxychloride.
11. Determination of sulphur content in sulphur fungicide.
12. Determination of thiram and Determination of ziram content.

Suggested readings:

1. Buchel KH (Ed.) 1992. Chemistry of pesticides. John Wiley & Sons
2. Panda H. 2022.The Complete Technology Book on Pesticides, Insecticides, Fungicides and Herbicides (Agrochemicals) with Formulae, Manufacturing Process, Machinery & Equipment Details 2nd Revised Edition. NPCS
3. Biswas D. R. 2021. A Text Book of Fertilizers. New India Publishing Agency
4. Singh, A., 2022 Basics of Agrochemical Formulations:, Brillion Publishing, 176p.
5. Larramendy, M.L 2017Toxicity and Hazard of Agrochemicals:,INTECH, 170p.

Course title: Pesticides and Plant Protection Equipment
Course Code: BAG7426

L	T	P	Credits
3	0	0	3

Total hours- 45

Objectives:

1. Familiarization with different formulations of pesticides, their preparation and use. Toxicity to insects and plants.
2. Calculation of dosages of pesticides and fumigants.
3. Practice in the use of various types of pest-control equipments.
4. Study of factors affecting efficacy of pesticide spray.
5. Calibrations of plant protection equipments. Common troubles in the use of pest-control equipment and their remedies.
6. Estimation of pesticide residue in food commodities

Course contents:

Unit I:
Hours- 11

Pesticides- classification, properties, entry and mode of action. Formulations and toxicity of pesticides. Factors affecting toxicity of pesticides.

Unit II: **Hours- 11**

Compatibility and synergism. Antidotes. Problems associated with the use of pesticides. Role of repellents, attractants, pheromones, hormones, chemo-sterillants and antifeedants in pest control.

Unit III: **Hours- 11**

Pest control equipment – history of development, classification, constructional features and principles of working, operation, maintenance and selection.

Unit IV: **Hours- 12**

Planning of pest control operations.

Course title: Pesticides and Plant Protection Equipment Lab

Course Code: BAG7427

L	T	P	Credits
0	0	2	1

Total hours- 30

Course contents:

1. Familiarization with different formulations of pesticides, their preparation and use.
2. Toxicity to insects and plants.
3. Calculation of dosages of pesticides and fumigants.
4. Practice in the use of various types of pest-control equipments.
5. Study of factors affecting efficacy of pesticide spray.
6. Calibrations of plant protection equipments.
7. Common troubles in the use of pest-control equipment and their remedies.
8. Estimation of pesticide residue in food commodities

Suggested readings:

1. S. Jaglan, B.S. Chillar and H.D. Kaushik (2005). *Practical manual on safe and judicious use of pesticides*. Dept. of Entomology, CCS Haryana Agricultural University, Hissar, Haryana.
2. Manoj Mathew, Janardan Prasad, M. Vandana Harishchandra, C.R. Rai, T.K. Bhattacharya, Saurabh Prakash (1998). *National Council of Educational Research and Training*.
3. Dr. S. Manisegaran, Dr. R.P. Soundarajan. *Pest management in field crops, principles and practices*. Fundamentals of Agriculture.
4. Arun Katyayan. http://www.ang...u.net
5. www.agf.gov.be.ca/pesticides/calibration
6. www.pesticides.montana.edu
7. www.greenstone.org

Course Title: Advances in Apiculture and Sericulture
Course Code: BAG7428

L	T	P	Credits
3	0	0	3

Total hours- 45

Objectives:

To provide students with practical knowledge and hands-on training in advanced apiculture and sericulture by engaging them in the continuous rearing and management of honey bee colonies and silkworm culture throughout the season. This course aims to equip students with essential skills in apiary and sericulture management, fostering entrepreneurship opportunities and industry readiness in the fields of beekeeping and silk production.

Course contents:

Unit I:
Hours- 11
Importance of Honeybees – Role in organic farming, biodiversity conservation, and pollination of major crops. Beekeeping and Pollinators – Bee species, caste system, and their significance in agriculture. Bee Biology and Rearing Methods – Life cycle, colony organization, and commercial rearing techniques. Beekeeping Equipment and Seasonal Management – Hive types, modern beekeeping tools, and management practices throughout the year. Bee Pasturage, Foraging, and Communication – Preferred flora, foraging behavior, and communication through the waggle dance and pheromones.

Unit II:
Hours- 11
Pests and Diseases of Honeybees – Identification, prevention, and management of common pests, predators, and diseases. Processing and Value-Addition in Beekeeping – Extraction, purification, and commercial utilization of honey, royal jelly, propolis, bee venom, pollen, and wax. Impact of Environmental Factors on Pollinators – Effects of pesticides, climate change, habitat destruction, and conservation strategies.

Unit III:
Hours- 12

Introduction to Sericulture – Importance, history, and economic significance of silk production. Types of Silkworms and Their Biology – Mulberry (*Bombyx mori*) and non-mulberry (Eri, Tasar, Muga) species, voltinism, and life cycle. Mulberry Cultivation and Management – Varieties, agronomic practices, leaf harvesting, and preservation techniques. Silkworm Rearing and Cocoon Production – Rearing methods, environmental management, appliances, mounting, and cocoon harvesting.

Unit IV:
Hours- 11

Processing and Value-Addition in Sericulture – Cocoon boiling, reeling, spinning, weaving, dyeing, and applications in the textile industry. Pests and Diseases of Silkworms – Identification, control strategies, and methods of disinfection. Sustainability and Market Trends in Sericulture – Innovations, government schemes, and global market potential for silk and its by-products.

Suggested readings:

Abrol DP (1997). Bees and Beekeeping in India. Kalyani Publishers, Ludhiana,

450pp
Abrol DP (2013). Beekeeping a comprehensive guide to bees and beekeeping. Scientific publish-ers, Jodhpur, p 499
Angadi, B.S., 2017. 'Sericulture in India: Cultivation and Economics'. Kurukshetra, a Journal on
Anonymous. (1885). *Silk Culture: A Manual with Complete Instructions*. Retrieved from http://www.survivorlibrary.com/library/silk_culture-a_manual_with_complete_instructions_1885.pdf
Ragumoorthi KNMR, Srinivsan V, Balasubramani, Natrajan N (2007). Applied entomology. A.E. Publications, Coimbatore, pp. 26–28
Rural Development, Vol. 65 No.3, January, pp. 37-40.
The Neotia University. (2021). *ELP 812 CS Manual*. Retrieved from https://www.tnu.in/wp-content/uploads/2021/09/12.-ELP_812_CS_MANUAL-1.pdf

Course Title: Advances in Apiculture and Sericulture Lab
Course Code: BAG7429

L	T	P	Credits
0	0	2	1

Total hours- 30

Course contents:

Apiculture (Beekeeping)

1. Identification of Honey Bee Species and Castes and their seasonal management.
2. Study of Beekeeping Equipment and Their Uses
3. Pests, Diseases, and Predators of Honey Bees
4. Bee Pasturage, Foraging, and Communication
5. Extraction and Processing of Honey and Other Bee Products
6. Pollination Services and Role of Bees in Agriculture
7. Setting Up a Small-Scale Apiary

Sericulture (Silkworm Rearing)

8. Identification of Silkworm Species and Voltinism
9. Lifecycle and Rearing of Mulberry & Non-Mulberry Silkworms
10. Pests and Diseases of Silkworms & Their Management
11. Mulberry Cultivation and Leaf Harvesting Techniques
12. Rearing Appliances and Mounting of Silkworms
13. Cocoon Harvesting and Silk Reeling Techniques
14. Processing and Value Addition in Silk Production
15. Visit to Research Institutes and Training Centers

Suggested readings:

Abrol DP (1997). Bees and Beekeeping in India. Kalyani Publishers, Ludhiana, 450pp

Abrol DP (2013). Beekeeping a comprehensive guide to bees and beekeeping. Scientific publishers, Jodhpur, p 499

Angadi, B.S., 2017. 'Sericulture in India: Cultivation and Economics'. Kurukshetra, a Journal on Rural Development, Vol. 65 No.3, January, pp. 37-40.

Anonymous. (1885). *Silk Culture: A Manual with Complete Instructions*. Retrieved from http://www.survivorlibrary.com/library/silk_culture-a_manual_with_complete_instructions_1885.pdf

Ragumoorthi KNMR, Srinivsan V, Balasubramani, Natrajan N (2007). Applied entomology. A.E. Publications, Coimbatore, pp. 26–28

The Neotia University. (2021). *ELP 812 CS Manual*. Retrieved from https://www.tnu.in/wp-content/uploads/2021/09/12.-ELP_812_CS_MANUAL-1.pdf

Course Title: Biotechnology of Crop Improvement

Course Code : BAG7430
Credits Hours: 4 (3+1)

Total hours 60

Objectives:

1. To acquaint with biotechnological tools of crop improvement.
2. To know about direct and indirect methods of gene transfer.
3. To introduce gene editing in plants.
4. To provide knowledge about marker-assisted breeding and genomic selection.

Course Content

UNIT I **12 HOURS**

Impact of Biotechnology on crop improvement and the perspective of society; Various biotechnological techniques available for crop improvement – Plant Tissue Culture, Genetic Engineering, Genome editing, Marker Assisted breeding and Genomic Selection. Biosafety regulations and their application in Agricultural Biotechnology. Soma- clonal variation and its use in crop improvement; embryo culture; anther/pollen culture; somatic embryogenesis; artificial seeds; techniques of protoplast culture, regeneration and somatic cell hybridization, achievements and limitations, utility in the improvement of crop plants.

UNIT II **12 HOURS**

DirectandIndirectmethodsofgenetransferinplants-Agrobacterium-mediatedgenetransferindicots and monocots; Direct DNA delivery methods (microinjection, particle gun method, electroporation); gene targeting; Gene silencing techniques; introduction to siRNA; siRNA technology; MicroRNA; construction of siRNA vectors; principle and application of gene silencing; creation of transgenic plants; debate over GM crops; introduction to methods of genetic manipulation in different model systems.

UNIT III
11 HOURS

Introduction to genome editing – Various tools of genome editing; CRISPR-Cas9 with specific emphasis on Indian regulations; Cloning genomic targets into CRISPR/Cas9 plasmids; electroporation ofCas9 plasmids into cells; purification of DNAfromCas9 treated cells and evaluation of Cas9 gene editing; in vitro synthesis of single guide RNA (sgRNA);using Cas9/sgRNA ; evaluate Cas9activity by T7E1 assays and DNA ; Applications of CRISPR/cas9 technology in crop plants.

UNIT IV **12 HOURS**

Marker Assisted Breeding &Genomic Selection: Introduction to various DNA-based markers and their use in marker-assisted breeding; Foreground Selection,

Recombinant Selection and background Selection; Marker-assisted backcross breeding, marker-assisted selection – success stories; Introduction to Genomic Selection.

Course Title: Lab- Biotechnology of Crop Improvement

L	T	P	C
3	0	2	4

Course Code: BAG7431

Course Content

- Agrobacterium-mediated transformation in Tobacco – preparation of construct, transfer to binary vector, transform Agrobacterium, prepare explant.
- Inoculation and Co-cultivation, antibiotic based selection of putative trans-formants, validation using PCR;
- Genome editing-preparation of CRISPR/Cas construct, direct transfer to plant, analysis of the targets;
- Planning of a MABB programme – selection of parents, crossing strategies, marker analysis

Transaction Mode

Lecture, Seminar, Peer Group Discussion, Self-Learning, Collaborative Learning and Cooperative Learning.

Suggested Readings:

1. Old, R. W., Primrose, S. B., & Twyman, R. M. (2001). *Principles of Gene Manipulation and Genomics, 7th Edition*. Oxford: Blackwell Scientific Publications.
2. Green, M.R., & Sambrook, J. (2012). *Molecular Cloning: A Laboratory Manual*. Cold Spring Harbor, NY: Cold Spring Harbor Laboratory Press.
3. Brown, T.A. (2006). *Genomes* (3rd ed.). New York: Garland Science Pub.
4. Sander, J.D., & Joung, J.K. (2014). CRISPR-Cas systems for editing, regulating, and targeting genomes. *Nature Biotechnology, 32*(4), 347-355.
5. Gene Cloning and DNA Analysis (2010). Retrieved from http://biolab.szu.edu.cn/otherweb/lzc/genetic%20engineering/courseware/b1.pdf
6. Kumar, P., & Mina, U. (2015). *Biotechnology: A Problem Approach*. Pathfinder Publication.
7. Singh, K.H., Kumar, A., & Parmar, N. (2019). *Agricultural Biotechnology at a Glance*. Science Technology.
8. Ram, H.H. (2019). *Crop Breeding and Biotechnology*. Kalyani Publications.
9. Rastogi, S.C. (2020). *Biotechnology: Principles and Applications*. Narosa Publishing House.
10. Slater, A. (2008). *Plant Biotechnology: The Genetic Manipulation of Plants*. Oxford University Press.

Course Title: Commercial Plant breeding
Code: BAG 7432

L	T	P	C
3	0	0	3

Total hours 60

Objective:

1. To discuss hybrid development and various crop improvement aspects of crops such as rice, wheat, maize, pearl millet, sorghum, pigeon pea, chickpea, green gram, black gram, lentil, soybean, groundnut, rapeseed-mustard, cotton, etc.

2. To provide an understanding of tissue culture and biotechnological approaches as alternative strategies for the development of lines and cultivars.

3. To impart knowledge on seed production, release, and notification of varieties, as well as the PPV&FR Act, 2001.

Course Content

UNIT I **12 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 the development of hybrids and seed production.
Genetics of commercial hybrids.

UNIT II **12 Hours**

Advances in hybrid seed production of maize, rice, sorghum, pearl millet, castor, sunflower, cotton, pigeon pea, Brassica, etc. Quality seed production of vegetable crops under open and protected environments.

UNIT III **10 Hours**

Alternative strategies for the development of line cultivars: haploid inducer, tissue culture techniques, and biotechnological tools. IPR issues in commercial plant breeding: DUS testing and registration of varieties under the PPV&FR Act. Variety testing, release, and notification systems in India.

UNIT IV **11 Hours**

Principles and techniques of seed production, types of seeds, and quality testing in self and cross-pollinated crops.

Course Title: Lab- Commercial Plant breeding
Code: BAG 7433
Credits Hours: 4(3+1)

L	T	P	C
3	0	2	4

Course Content

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

Visit to public and private seed production and processing plants.

Transaction Mode

Lecture, Seminar, Peer Group Discussion, Self-Learning, Collaborative Learning and Cooperative Learning.

Suggested Readings:

1. *Commercial Plant Breeding at a Glance* by Phundan Singh, Pratibha Bisen, Reshu Tiwari. Daya Publishing House.
2. *Plant Breeding: Principles and Methods* by B.D. Singh. Kalyani Publishers.
3. *Principles of Plant Breeding* (1st & 2nd Edition) by R.W. Allard.
4. *Breeding Field Crops* by J.M. Poehlman.
5. *Commercial Plant Breeding Objective* by Phundan Singh, Mridula Billore, and Monika Singh, 2021. Astral Publishing, 160p.
6. *Breeding and Crop Production* by H. Padmalatha. Random.
7. *Biotechnology for Agricultural Breeding* by Mangal, S.K. GeneTech Books.

Course Title: Climate Resilient Agriculture

Course Code: BAG 7438

L	T	P	C
3	0	2	4

Total hours 60

Objectives:

1. To impart the concept of climate-resilient agriculture under the present context of climate change.
2. To study the integrated role of different sectors in building resilience to climate change in agriculture.

Course Content

UNIT I **12 Hours**

Climate change and its impacts on agriculture and food security. Crop productivity under different climate change scenarios, including extreme events such as drought, flood, pest and disease outbreaks, etc. Basics of adaptation and mitigation in the agricultural sector. Analysing and assessing climate vulnerability to identify vulnerable sectors and possible adaptation options in agriculture. Assessing biophysical and socio-economic impacts on the agricultural sector.

UNIT II **12 Hours**

Risk assessment strategies and preparedness for weather and climate risks in agriculture. Application of geospatial tools and techniques for sustainable agriculture. **Climate Resilient Agriculture (CRA):** Concept, scope, and importance, with special reference to India. Climate-resilient technologies for enhancing crop productivity and sustainability: Role of weather and climatic information, agro-advisories, ICTs, and simulation models. Climate-resilient agronomic practices: crop/cultivar selection, crop diversification, and crop mixtures.

UNIT III **10 Hours**

Water management practices: rainwater harvesting, micro-irrigation, deficit irrigation, and drainage management. Organic/natural farming, integrated farming systems (IFS). Site-specific nutrient management (SSNM). Conservation agriculture technologies to build soil organic carbon, harness microbial biodiversity, and biomass recycling. Use of renewable sources of energy. Climate-resilient pest and disease management strategies.

UNIT IV **11 Hours**

Breeding strategies for the development of climate change-resilient crops and varieties, including the development of biotic and abiotic stress-tolerant/resistant cultivars under changed climatic scenarios, including extreme weather events.

Course Title: Lab- Climate Resilient Agriculture

L	T	P	C
3	0	2	4

Course Code: BAG 7439

Course Content

- Acquaintance with meteorological instruments, including AWS (Automatic Weather Stations). Statistical techniques to study trends of climatic parameters.
- Analysis of extreme weather events using non-parametric tests. Building climate change scenarios under different futuristic emissions of GHGs.
- Designing strategies to mitigate the effects of climate change using climate-resilient crops/cultivars, climate-resilient technologies, and manipulation of cropping patterns.
- Acquaintance with ICTs for effective dissemination of local weather information and agro-advisories. Analysing carbon sequestration potential of different agro-ecosystems.
- Designing a "climate-smart village" model considering the availability of resources. Awareness programs on climate change and climate-resilient agriculture among the farming community.

Transaction Mode

Lecture, Seminar, Peer Group Discussion, Self-Learning, Collaborative Learning and Cooperative Learning**.**

Suggested Readings:

1. *Climate Resilient Animal Agriculture* by GSLHV Prasada Rao. New India Publishing Agency.
2. *Climate Resilient Agriculture: Adaptation and Mitigation Strategies* by Bhan Manish. New India Publishing Agency.
3. *Climate-Smart Agriculture Sourcebook*, FAO (2013).
4. *Implications for Climate Smart Agriculture* by Wahid Hasan, Sachin G. Mundhe, Abdul Majid Ansari, and Shivani Kumari. Biotech Books, 357p.
5. *Climate Resilient Agriculture: Adaptation and Mitigation Strategies* by Manish Bhan, 2018. New India Publishing Agency, 294p.
6. *Climate Change & Agriculture Over India* by Prasad Rao, 2010. PHI Learning, 352p.
7. *Climate Smart Agriculture for Sustaining Crop Productivity and Improving Livelihood Security* by Prakash M., 2022. Satish Serial Publishing House, 178p.

Course Title :Micro-propagation Technologies
Course Code: BAG 7434
Total hours 60

L	T	P	C
3	0	2	4

Objectives:

To educate the students in detail about the sterilization techniques for explants, preparation of stocks and working solution, culturing of explants, regeneration of whole plants from different explants and hardening procedures.

Course Content

UNIT I **12 HOURS**

Introduction, History, Advantages and limitations. Types of cultures (seed, embryo, organ, callus, cell).

UNIT II **12 HOURS**

Stages of micro propagation, Axillary bud proliferation (Shoot tip and meristem culture, bud culture),

UNIT III **1O HOURS**

Organogenesis (callus and direct organ formation), Somatic embryogenesis, cell suspension cultures, production of secondary metabolites,

UNIT IV **11 HOURS**

Soma- clonal variation, Cryopreservation.

Course Title : Lab-Micro-propagation Technologies

Course Code: BAG 7435

L	T	P	C
3	0	0	3

Course Content

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

Transaction Mode

Lecture, Seminar, Peer Group Discussion, Self-Learning, Collaborative Learning and Cooperative Learning.

Suggested readings:

1. Singh, J. *Basics of Horticulture*.
2. Kumar, N. *Introduction to Horticulture*.
3. Chadda, K.L. *Handbook of Horticulture*.
4. Jha, T.B., & Ghosh, B. (2016). *Plant Tissue Culture: Basic and Applied*. Platinum Publishers, 439p.

Course Title : Commercial Seed Production

Course Code: BAG 736

L	T	P	C
3	0	0	3

Total hours 60

Objectives: To introduce the basic principles of planting material production at commercial scale and seed quality evaluation.

Course Content

UNIT I **12 HOURS**

General Principles of Seed Production**:** Raising these seed crop, Introduction, Procurement of a class of Improved seeds, Reporting to Monitoring or certification Agency, Principles and practices of selection of area and agronomic requirement of seed production of field crops, Importance of isolation distance rouging, Principles of hybrid seed production in field crops, Principles and practices of selection of area and agronomic requirement of seed production of horticultural crops, Concept of apomixes, male sterility and self- incompatibility and its application in hybrid seed production of horticultural crops.

UNIT II **12 HOURS**

General Principles of Seed Processing: Introduction, Objectives of Seed Processing, Seed Drying, Principles of Drying, Water vapors equilibrium, Methods of drying seeds, Cleaning and grading, Air and screen machines, Dimensional separators, Density separators, Surface texture separators, Colour separators, Spiral separators, Electric separators, Vibrator separators, Separation based on Affinity to liquids, Seed treatment, Temperature treatment, Chemical treatment, Bagging and Labelling

General Principles of Seed Testing: Seed testing-Introduction, Procedure of Seed testing, components of seed quality testing genetic, physical, physiological land seed health testing, Seed sampling, Types of seed sampling, Requirements of sampling, Concept of seed viability and vigour ; dormancy, types and principles of seed dormancy, Physiological quality of seed, Principles of seed Germination ,types of germination, biochemical and genetic basis.

UNIT III **10 HOURS**

Seed Certification: History, concept and objectives of seed certification; seed certification agency/organization and staff requirement Indian Minimum Seed Certification Standards (I.M.S.C.S.) - general and specific crop standards including GM varieties, field and seed standards

SeedIndustryandSeedMarketing:Introduction,Evolutionoftheseedindustry,Development ofthevegetable and Flower seed industry, Seed marketing – concept, definition and purpose, importance and promotion of quality seed, formal and informal seed supply systems, Seed marketing intelligence and product mix, sales promotion, distribution channels, marketing costs and margins; packaging and labeling, Seed Associations, Factors influencing seed marketing, Seed marketing programs, Seed industry organizations, Marketing of public versus private players, Demand and supply of seed; role of seed replacement rate (SRR), seed multiplication ratio (SMR), economics of seed production; determining seed needs,

UNIT IV **11 HOURS**

Seed pricing and price policy, seed processing and /packaging, demand forecasting and factors affecting demand for seeds, effect of price and farm income on seed demand

Biotechnology in Seed Technology: History of plant tissue culture, Laboratory organization, Composition of nutrientmedium,Micro-propagation,Axillarybudproliferationapproach,Meristemandshoottipculture,Bud culture, Advantages of Micro-propagation, Problems associated with micro-propagation, Synthetic seed production, Types of synthetic seeds, methods of development of synthetic seeds, Components of nutrient mediaforsyntheticseeddevelopment,Storageofsyntheticseeds,Advantagesandlimitationsofsyntheticseed production.

Course Title : Lab-Commercial seed production

L	T	P	C
0	0	2	1

Course Code: BAG 7437

Course Content

- Planning of Seed Production, requirements for different classes of seeds in field crops - unit area and rate Operation and handling of mechanical drying equipment's; effect of drying temperature and duration on seed germination and storability seed processing equipment's; seed treating equipment's
- Seed production in cross pollinated crops with special reference to land, isolation, Planting ratio of male and, synchronization of parental lines and methods to achieve synchrony; supplementary pollination, pollen storage, hand emasculation and pollination in tomato,
- Hybrid seed production in Maize, detasseling in maize, identification of rogues and pollen shedders, Pollen collection,storage, viabilityandstigmareceptivity; gametocide application and visits to seed production plots etc.,
- Visit to seed processing plant and commercial controlled and uncontrolled Seed Stores, Seed industries and local entrepreneurships visit to nearby areas, Different methods of examination of seeds to assess seed-borne microorganisms and to quantify infection percentage, detection of seed borne fungi, bacteria and viruses, identification of storage fungi, control of seed borne diseases, seed treatment methods.**,**
- Maintenance of aseptic conditions and sterilization techniques, Preparation of nutrient stocks for synthetic media**,** Selection of explants for callus induction,
- Preparation of MS medium for micro-propagation and Callus induction**,** Selection of explants for callus induction**,** Preparation of MS medium for micro-propagation and Callus induction**,** Inoculation of explants for micro-propagation,
- Inoculation of explants for callus induction and subsequently regeneration of plantlets from matured seeds of field and horticultural crops**,** Synthetic seed preparation

Transaction Mode

Lecture, Seminar, Peer Group Discussion, Self-Learning, Collaborative Learning and Cooperative Learning.

Suggested readings:

1. Agarwal RL. 1997.SeedTechnology. 2ndEd. Oxford &IBH.
2. McDonald MB Jr & Copeland LO.1997. Seed Production: Principles and Practices. Chapman &Hall
3. Thompson JR. 1979. An Introduction to Seed Technology. Leonard Hill.
4. Singhal NC. 2003. Hybrid Seed Production in Field Crops. Kalyani.
5. Justice OL & Bass LN. 1978.Principles and Practices of Seed Storage. Castle House Publ. Ltd.
6. Tunwar NS & Singh SN. 1988.Indian Minimum Seed Certification

Standards. CSCB, Ministry of Agriculture, New Delhi.
7. Chawla H.S. (2008) Introduction to Plant Biotechnology second edition, Oxford &IBH publishing Co. Ltd. 113-B Shahpur Jat, New Delhi-110049

Course Title: Agri-Business Management
Course Code: BAG7440

L	T	P	Credits
3	0	0	3

Total hours- 45

Course Outcomes:

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

1. Learn the transformation of agriculture into agribusiness, key stakeholders, and components.
2. Understand agro-based industries, their classification, institutional setup, and challenges.
3. Apply business planning, PEST & SWOT analysis, financial management, and budgeting in agribusiness.
4. Develop marketing strategies, analyze consumer behavior, manage pricing, sales, and project evaluation.

Course contents Theory

Unit-I **12 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, Classification of industries and types of agro based industries. Institutional arrangement, procedures to set up agro based industries. Constraints in establishing agro-based industries.

Unit-II **11 Hours**

Agri-value chain: Understanding primary and support activities and their linkages. Business environment : PEST & SWOT analysis. Management functions: Roles & activities, Organization culture. Planning, meaning, definition, types of plans. Purpose or mission, goals or objectives, Strategies, polices procedures, rules, programs and budget.

Unit-III **10 Hours**

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.

Unit-IV **12 Hours**

Marketing Management: Segmentation, targeting & positioning. Marketing mix and marketing strategies. Consumer behavior analysis, Product Life Cycle(PLC). Sales & Distribution Management. Pricing policy, various pricing methods. Project Management definition, project cycle, identification, formulation, appraisal, implementation, monitoring and evaluation. Project Appraisal and evaluation techniques.

Transaction Method:

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

Course Title: Agri-Business Management Lab
Course Code: BAG7441

L	T	P	Credits
0	0	2	1

Total hours- 30

Course Outcomes:

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

1. Learn the transformation of agriculture into agribusiness, key stakeholders, and components.
2. Understand agro-based industries, their classification, institutional setup, and challenges.
3. Apply business planning, PEST & SWOT analysis, financial management, and budgeting in agribusiness.
4. Develop marketing strategies, analyze consumer behavior, manage pricing, sales, and project evaluation.

Practical Contents

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

Suggested Readings:

1. *Broadway, A.C. and Broadway Arif A 2002 A textbook of Agri-Business Management. Kalyani Publishers*
2. *Bairwa, S.L. 2016. Objective on fundamentals of Agri-business Management. Kalyani*
3. *Publishers*
4. *Anjan Nishra, Debasish Biswas and Arunangshu Giri, 2019. Agribusiness*
5. *Management:,Himalaya Publishing House, 220p.*
6. *Shoji Lal Bairwa, Chandra Sen, L.K.Meena and Meera Kumari, 2018. Agribusiness*
7. *Management Theory And Practices:,Write And Print Publications*
8. *Virender Kamalvanshi ,Agribisness Management:, Random.*

Transaction Method:

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

Course Title: Management of Natural Resources
Course Code: BAG7442

L	T	P	Credits
3	0	0	3

Total hours- 45

Course Outcomes:

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

1. Understand the concept, classification, and interrelationships of natural resources, along with factors influencing their availability and use.
2. Analyze land, water, and energy resources, their management challenges, and sustainable conservation techniques.
3. Evaluate resource management paradigms, conflicts, and integrated approaches for effective resource utilization.
4. Apply soil and water conservation methods, erosion control measures, and agribusiness transformation principles in resource management.

Course contents Theory

Unit-I **12 Hours**

Introduction to Natural Resource Bases: Concept of resource, classification ofnatural resources. Factors influencing resource availability, distribution and uses. Interrelationships among different types of natural resources. Concern on Productivity issues. Ecological, social and economic dimension of resource management. Land resources: Land as a resource. Dry land, land use classification, land degradation, man induced landslides, soil erosion and desertification. Landscape impact analysis, wetland ecology & management.

Unit-II **11 Hours**

Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Water ecology and management. Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources.Resource Management Paradigms: Resource management the evolution and history of resource management paradigms.

Unit-III **11 Hours**

Resource conflicts: Resource extraction, access and control system. Approaches in Resource Management: Ecological approach; economic approach; ethnological approach; implications of the approaches; integrated resource management strategies. Introduction to soil and water conservation and causes of soil erosion., Definition and agents of soil erosion, water erosion - Forms of water erosion, Gully classification and control measures.

Unit-IV **11 Hours**

Soil loss estimation by universal soil loss equation - Soil loss measurement techniques.Principles of erosion control - Introduction to contouring, strip cropping.Contour bund - Graded bund and bench terracing.Wind erosion - Mechanics

of wind erosion, types of soil movement - Principles of wind erosion control and its control measures, Water harvesting techniques - Lining of ponds, tanks and canal systems.

Suggested Readings:

1. *Sustainable Natural Resource Management by Danill R. Lynch*
2. *Management of Natural Resource for Sustainable Development, by Vijay Singh Rathor and B S Rathor , Daya Publishing House*
3. *Managing Natural Resources : Focus On Land And Water: Ed. Harikesh N. MishraPHI, 2014Learning, 496p.*
4. *Management of Resources for Sustainable Development: Sushma Goel, The Orient Blackswan, 2016,284p.*
5. *Natural Resources: Their Conservation and Management: Arvindrai Upadhyay, Aspiration Academy, 320p.*
6. *Natural Resource Management for Growth Development and Sustainability: Vasudeva Srishti Pal, 2023, Today & Tomorrows Printers And Publishers, 336p.*

Transaction Method:

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

Course Title: Management of Natural Resources Lab
Course Code: BAG7443

L	T	P	Credits
0	0	2	1

Total hours- 30

Course Outcomes:

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

1. Understand the concept, classification, and interrelationships of natural resources, along with factors influencing their availability and use.
2. Analyze land, water, and energy resources, their management challenges, and sustainable conservation techniques.
3. Evaluate resource management paradigms, conflicts, and integrated approaches for effective resource utilization.
4. Apply soil and water conservation methods, erosion control measures, and agribusiness transformation principles in resource management.

Practical Contents

Identifying natural resources and their utility. Practicing survey - Principles and educating to use pacing technique for measurement. Area calculations through chain survey - GPS demo for tracking and area measurement. Estimation of soil loss and calculation of erosion index.Leveling concepts and practical utility in agriculture. Preparation of contour maps.Concept of vegetative water ways and design of grassed water ways. Wind erosion and estimation process.Different irrigation pumps and their constructional differences. Farm pond construction and its design aspects. Visit to nearby farm pond. Visit to an erosion site. Exposure to strip cropping/contour bunding.

Suggested Readings:

1. *Sustainable Natural Resource Management by Danill R. Lynch*
2. *Management of Natural Resource for Sustainable Development, by Vijay Singh Rathor and B S Rathor , Daya Publishing House*
3. *Managing Natural Resources: Focus On Land And Water: Ed. Harikesh N. MishraPHI, 2014 Learning, 496p.*
4. *Management of Resources for Sustainable Development: Sushma Goel, The Orient Blackswan, 2016,284p.*
5. *Natural Resources: Their Conservation and Management: Arvindrai Upadhyay, Aspiration Academy, 320p.*
6. *Natural Resource Management for Growth Development and Sustainability: Vasudeva Srishti Pal, 2023, Today & Tomorrows Printers and Publishers, 336p.*

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: BAG7444

L	T	P	Credits
3	0	0	3

Total hours- 45

Course Outcomes:

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

Course Outcomes:

1. Understand the meaning, nature, types, and importance of journalism, with a focus on agricultural journalism and its role in agricultural development.
2. Develop skills in writing agricultural news, feature stories, and success stories while applying journalistic principles, readability measures, and effective storytelling techniques.
3. Learn techniques for gathering farm-related information from various sources, including research materials, interviews, and electronic media, for accurate and engaging reporting.
4. Apply principles of newspaper and magazine layout, design, photography, artwork, copy reading, proofreading, and headline writing in agricultural journalism.

Course contents Theory

Unit-I **12 Hours**

Journalism – Meaning, nature, importance, and types of journalism. Agricultural Journalism – Meaning, definition, principle, objectives, types, and scope. Similarities and difference between agricultural journalism and other types of journalism. Role of agricultural journalist, Training of agricultural journalist. Qualities of journalist, Role of journalist /journalism in agricultural development and development of newspaper and magazines readers.

Unit-II **11 Hours**

Newspaper and magazines as communication media: Characteristics, kinds and functions of newspaper and magazines, Characteristics of newspaper and magazines readers. Form, content, style and language of newspaper and magazines, Standard part of newspaper and magazines. The agricultural story: Types of Agriculture stories, subject matter of the agricultural story, structure of the agricultural story.

Unit-III **10 Hours**

Gathering farm information-Sources of farm information: abstracting from research and scientific materials, interviews, coverage of events, Other sources: electronic media, field study. Success stories-definition, nature, components, guidelines of writing a success story Writing a news story difference between news and feature story, the principle of writing a news story, Inverted pyramid structure.

Unit-IV **12 Hours**

Organizing the material, treatment of the story, writing the news lead and the body

Readability measure-readability ease score, automated readability index, gunning fog index How to improve readability of articles and stories. Use of photograph in agricultural journalism- Basic principles of photography – composition, exposure, lens, light Use of artwork (Graphs, charts maps, etc) Writing the captions Editorial mechanism: Copy reading, headline and title writing Proofreading: definition, signs and symbols of proofreading, level of proofreading, duties of a proof-reader Layout – meaning, principles of layout and design.

Suggested Readings:

1. *Introduction to Journalism-Book by Carole Fleming, Emma Hemmingway, and Gillian Moore*
2. *Basic Journalism Book by Rangaswami Parthasarathy*
3. *News Reporting and Editing Book by K. M. Shrivastava*
4. *Professional Journalism Book by MV Kamath*
5. *The Journalist's Handbook Book by MV Kamath.*
6. *Farm Journalism and Media Management – Bhaskaran et al,*
7. *Agricultural Extension and farm Journalism – A K Singh,*
8. *Farm Journalism – Jana and Mitra.*
9. *Web Materials*
10. *Prepared You Tube videos*

Transaction Method:

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

Course Title: Agricultural Journalism Lab
Course Code: BAG7445

L	T	P	Credits
0	0	2	1

Total hours- 30

Course Outcomes:

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

1. Understand the meaning, nature, types, and importance of journalism, with a focus on agricultural journalism and its role in agricultural development.
2. Develop skills in writing agricultural news, feature stories, and success stories while applying journalistic principles, readability measures, and effective storytelling techniques.
3. Learn techniques for gathering farm-related information from various sources, including research materials, interviews, and electronic media, for accurate and engaging reporting.
4. Apply principles of newspaper and magazine layout, design, photography, artwork, copy reading, proofreading, and headline writing in agricultural journalism.

Practical Contents

Practice in writing an agricultural news story. Practice in writing an agricultural feature story. Covering agricultural events for the information collection. Practice in interviewing for the information collection. Abstracting stories from research and scientific materials and wire services. Selecting pictures and artwork for the agricultural story. Practice in editing, copy reading. Practice in headline and title writing Practising proof reading. Practice in lay outing of newspaper. Testing copy with a readability formula. Visit a publishing office

Suggested Readings:

1. *Introduction to Journalism-Book by Carole Fleming, Emma Hemmingway, and Gillian Moore*
2. *Basic Journalism Book by Rangaswami Parthasarathy*
3. *News Reporting and Editing Book by K. M. Shrivastava*
4. *Professional Journalism Book by MV Kamath*
5. *The Journalist's Handbook Book by MV Kamath.*
6. *Farm Journalism and Media Management – Bhaskaran et al,*
7. *Agricultural Extension and farm Journalism – A K Singh,*
8. *Farm Journalism – Jana and Mitra.*
9. *Web Materials*

10. Prepared You Tube videos

Transaction Method:

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

Course Title: Farm Management, Production and Resource Economics

Course Code: BAG7446

L	T	P	Credits
3	0	0	3

Total hours- 45

Course Outcomes:

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

Course Outcomes:

1. Understand principles and practices of farm management for efficient resource allocation.
2. Analyze farm costs, income, and profitability to enhance economic decision-making.
3. Apply budgeting and planning tools to optimize farm production and enterprise selection.
4. Develop strategies to manage risk, uncertainty, and sustainability in agricultural production.

Course contents

Theory

Unit-I **12 Hours**

Farm management-meaning, concept and objectives. Farms-meaning, types, characteristics, factor determining types and size of farms. Principles of farm management- production function and its type, factor-product, factor-factor and product-product relationship, law of equimarginal/or principles of opportunity cost and law of comparative advantage.

Unit-II **11 Hours**

Cost- meaning, concept, types and their interrelationship. Importance of cost in managing farm business and estimation of gross farm income, net farm income, family labor income and farm business income. Farm business analysis: meaning and concept of farm income and profitability, technical and economic efficiency measures in crop and livestock enterprises.

Unit-III **11 Hours**

Farm records and accounts- importance, types , farm inventory, balance sheet, profit and loss accounts. Farm planning and budgeting- meaning, importance, partial and complete budgeting. Steps in farm planning and budgeting-linear programming, appraisal of farm resources, selection of crops and livestock's enterprises.

Unit-IV **11 Hours**

Risk and uncertainty in agriculture production- concept, nature, sources and its management strategies, Crop/livestock/machinery insurance – weather based crop

insurance, features, determinants of compensation. Resource economics, externalities in agriculture. Inefficiency, welfare loss and solutions. Important issues in economics and management of common property resources of land, water, pasture and forest resources etc**.**

Suggested Readings:

1. *Johl, S.S. & Kapoor, T.R. (2000) - Fundamentals of Farm Business Management*
2. *Heady, E.O. & Jensen, H.R. (1964) - Farm Management Economics*
3. *Raju, V.T. & Rao, D.V.S. (2014) - Economics of Farm Production and Management*
4. *Sankhayan, P.L. (1988) - Introduction to the Economics of Agricultural Production*
5. *Singh, I. (2009) - Agricultural Economics and Farm Management*

Transaction Method:

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

Course Title: Agricultural Journalism Lab
Course Code: BAG7447

L	T	P	Credits
0	0	2	1

Total hours- 30

Course Outcomes:

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

1. Understand principles and practices of farm management for efficient resource allocation.
2. Analyze farm costs, income, and profitability to enhance economic decision-making.
3. Apply budgeting and planning tools to optimize farm production and enterprise selection.
4. Develop strategies to manage risk, uncertainty, and sustainability in agricultural production.

Practical Contents

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

Suggested Readings:

1. *Johl, S.S. & Kapoor, T.R. (2000) - Fundamentals of Farm Business Management*
2. *Heady, E.O. & Jensen, H.R. (1964) - Farm Management Economics*
3. *Raju, V.T. & Rao, D.V.S. (2014) - Economics of Farm Production and Management*
4. *Sankhayan, P.L. (1988) - Introduction to the Economics of Agricultural Production*
5. *Singh, I. (2009) - Agricultural Economics and Farm Management*

Transaction Method:

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

Course Title: Financial and Project Management
Course Code: BAG7448

L	T	P	Credits
3	0	0	3

Total hours- 45

Course Outcomes:

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

Course Outcomes:

1. Understand the importance, scope, and functions of finance in agribusiness.
2. Apply capital budgeting techniques to evaluate investment decisions.
3. Develop project feasibility analysis and risk assessment skills for agribusiness ventures.
4. Manage working capital, inventory, and financial resources effectively in agribusiness projects.

Course contents

Theory

Unit-I **12 Hours**

Importance, need, scope and functions of finance. Concept of time value of money. Capital budgeting concept and steps in capital budgeting, appraisal criteria- payback period, average rate of return, net present value, benefit cost ratio and internal rate of return.

Unit-II **11 Hours**

Working Capital Management- concept, determinants and need for working capital in agribusiness. Introduction, objectives and techniques of inventory management for agribusiness.

Unit-III **11 Hours**

Introduction to cost of capital and capital structure. Project management- concept, characteristics and types of projects.

Unit-IV **11 Hours**

Project feasibility- market, technical, financial and economic feasibility. Project risk analysis. Estimating financial requirements of projects and sources of finance.

Suggested Readings:

1. *Pandey, I.M. (2015) - Financial Management*
2. *Chandra, P. (2019) - Projects: Planning, Analysis, Selection, Financing, Implementation, and Review*
3. *Weston, J.F. & Brigham, E.F. (2011) - Essentials of Managerial Finance*
4. *Gittinger, J.P. (1982) - Economic Analysis of Agricultural Projects*
5. *Van Horne, J.C. (2002) - Financial Management and Policy4. Sankhayan, P.L. (1988) - Introduction to the Economics of Agricultural Production*
5. *Singh, I. (2009) - Agricultural Economics and Farm Management*

Transaction Method:

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

Course Title: Financial and Project Management Lab
Course Code: BAG7449

L	T	P	Credits
0	0	2	1

Total hours- 30

Course Outcomes:

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

Course Outcomes:

1. Understand the importance, scope, and functions of finance in agribusiness.
2. Apply capital budgeting techniques to evaluate investment decisions.
3. Develop project feasibility analysis and risk assessment skills for agribusiness ventures.
4. Manage working capital, inventory, and financial resources effectively in agribusiness projects.

Practical Contents

Case studies related to financial management and project management. Visits to agri-business industrial houses. Numerical problems based on capital budgeting. Preparation of project report for various agri-business ventures.

Suggested Readings:

1. *Pandey, I.M. (2015) - Financial Management*
2. *Chandra, P. (2019) - Projects: Planning, Analysis, Selection, Financing, Implementation, and Review*
3. *Weston, J.F. & Brigham, E.F. (2011) - Essentials of Managerial Finance*
4. *Gittinger, J.P. (1982) - Economic Analysis of Agricultural Projects*
5. *Van Horne, J.C. (2002) - Financial Management and Policy4. Sankhayan, P.L. (1988) - Introduction to the Economics of Agricultural Production*
5. *Singh, I. (2009) - Agricultural Economics and Farm Management*

Transaction Method:

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