

SCHEME OF INSTRUCTION AND SYLLABUS

B.Sc. Hons. Ag.

Agriculture and Allied Science

Regulation:

w.e.f.2024-25



Faculty of Agriculture and Allied Science

United University
Rawatpur-Jhalwa (Prayagraj)
Uttar Pradesh

University Vision

“To established a Value based Global University having dynamic learning environment encouraging creativity and innovation, research inspired experimental learning and focusing on topics that are pertinent to the development of the region, the Country and the World.”

University Mission

- To provide a dynamic, inspiring, and varied learning environment with global exposure.
- To position the institution as a premier hub for research and experiential learning.
- To develop into an adaptable university meeting the demands of society and business.
- To incorporate Value thinking, integrity, wisdom and passion in professional for their career and life.

Department Vision

- To establish a preeminent role in advancing education, extension activities, and research within the field of agriculture.
- To cultivate a dynamic environment that nurtures entrepreneurial endeavors generates job opportunities, and develops a skilled workforce proficient in agricultural practices.
- To improve the quality and effectiveness of agricultural practices through strategic public-private partnerships.
- To contribute to the economic development of society and the nation by leveraging innovative agricultural strategies and collaborations.”

Department Mission

- To provide a rigorous and comprehensive education in agricultural sciences, equipping students with advanced knowledge, critical thinking skills, and practical experience.
- To conduct and promote high-impact research that addresses contemporary challenges in agriculture fosters innovation, and advances scientific understanding.
- To engage with local, regional, and global communities through extension programs that disseminate knowledge, provide practical solutions, and support sustainable agricultural practices.
- To support and inspire entrepreneurship in agriculture by offering resources, mentorship, and opportunities that encourage the creation of new ventures and job prospects.”

Program Educational Objectives (Undergraduate)

1. **PEOs-1: Foundational Agricultural Knowledge:** To provide students with a strong foundation in the principles and practices of agriculture, including crop science, soil management, horticulture, animal husbandry, and agricultural engineering.
2. **PEOs-2: Application of Technology in Agriculture:** To enable students to apply modern technologies and scientific tools, such as precision farming, biotechnology, and remote sensing, for enhancing agricultural productivity and sustainability.
3. **PEOs-3: Sustainability and Environmental Stewardship:** To cultivate awareness of sustainable agricultural practices and environmental conservation, ensuring that students can promote resource-efficient farming systems that safeguard biodiversity and ecosystems.
4. **PEOs-4: Agribusiness and Entrepreneurship Development:** To foster an entrepreneurial mindset and equip students with agribusiness management skills, enabling them to explore business opportunities and contribute to the development of rural economies.
5. **PEOs-5: Ethical and Social Responsibility:** To nurture a sense of ethics and social responsibility in agricultural practices, ensuring graduates work towards equitable, socially responsible, and environmentally sustainable agriculture for the benefit of society.

Program Outcomes

On successful completion of the Bachelor of Science (Honors) Programme the student will be able to:

PO1 - Core Agricultural Knowledge: Graduates will possess a comprehensive understanding of agricultural science, including crop production, horticulture, animal husbandry, soil health, plant protection, and agricultural engineering.

PO2 – Application of Scientific Principles: Graduates will be able to apply scientific principles and methodologies to improve agricultural practices, enhance productivity, and address the challenges in sustainable agriculture

PO3 -. Problem-Solving Skills: Graduates will be proficient in analyzing agricultural issues, diagnosing problems, and developing practical solutions through research, innovation, and the use of modern technology.

PO4 – Sustainable Agriculture Practices: Graduates will be skilled in designing and implementing sustainable farming practices, integrating knowledge of resource conservation, organic farming, water management, and climate-resilient agriculture.

PO5 – Communication and Collaboration: Graduates will effectively communicate agricultural concepts, ideas, and research findings to a wide range of stakeholders, including farmers, scientists, and policy makers, while working collaboratively in multidisciplinary teams.

PO6 – Entrepreneurship and Agribusiness Management: Graduates will have the knowledge and skills necessary to pursue entrepreneurial ventures in agriculture, including agribusiness, food processing, and rural development, contributing to the agricultural economy.

PO7 – Use of Modern Tools and Technology: Graduates will be proficient in using modern agricultural tools and technologies such as GIS, precision agriculture, drones, and biotechnology to enhance farming efficiency and productivity.

PO8 – Ethical Responsibility and Professionalism: Graduates will demonstrate ethical practices in agriculture, respecting environmental sustainability, food safety, and social responsibility, while adhering to professional standards.

PO9 – Lifelong Learning and Adaptability: Graduates will recognize the importance of continuous learning and adapting to advancements in agricultural science, technology, and policy to remain competent in the evolving agricultural landscape.

Program Specific Outcomes

PSO1: Advanced Agricultural Techniques: Graduates will be equipped with the knowledge and skills to implement advanced agricultural techniques such as integrated farming, precision agriculture, and modern irrigation methods to enhance crop yield and resource management.

PSO2: Specialization in Agro-based Fields: Graduates will develop expertise in specialized areas of agriculture, including plant breeding, soil health management, pest control, and agroforestry, enabling them to address specific challenges in these fields.

PSO3: Community and Extension Services: Graduates will be able to apply agricultural knowledge to serve rural communities by providing advisory services, conducting field demonstrations, and supporting agricultural extension programs to promote sustainable and profitable farming practices.

SCHEME OF INSTRUCTION

COURSE CATEGORY ABBREVIATIONS

1. **FMP:** Farm Machinery and Power
2. **SST:** Seed Science and Technology
3. **AGR:** Agronomy
4. **ABM:** Agricultural Business Management
5. **GPB:** Genetics and Plant Breeding
6. **AGR-EXT:** Agricultural Extension
7. **AG-ECON:** Agricultural Economics
8. **HORT:** Horticulture
9. **ENT:** Entomology
10. **PAT:** Plant Pathology
11. **SSAC:** Soil Science and Agricultural Chemistry
12. **AE:** Agricultural Engineering
13. **LPM:** Livestock Production and Management
14. **FSN:** Food Science and Nutrition
15. **VSC:** Vegetable Science
16. **FLR:** Floriculture
17. **FOR:** Forestry

Semester I

S. No.	Course Code	Course Category	Course Name	Contact Hours			33
				L	T	P	
1.	AGUCBG101T	B.Sc. (Hons.) Agriculture	Fundamentals of Agronomy	3	0	-	3
2.	AGUCBG102T	B.Sc. (Hons.) Agriculture	Fundamentals of Soil Science	2	0	-	2
3.	AGUCBG113T	B.Sc. (Hons.) Agriculture	Fundamentals of Horticulture	1	0	-	1
4.	AGUCBG104T	B.Sc. (Hons.) Agriculture	Introduction to Forestry	1	0	-	1
5.	AGUCBG105T	B.Sc. (Hons.) Agriculture	Fundamentals of Plant Biochemistry and Biotechnology	2	0	-	2
6.	AGUCBG106T	B.Sc. (Hons.) Agriculture	Rural Sociology & Educational Psychology	2	0	-	2
7.	AGUCBG107T	B.Sc. (Hons.) Agriculture	Fundamentals of Crop Physiology	1	0	-	1
8.	AGUCBG108T	B.Sc. (Hons.) Agriculture	Agricultural Heritage	1	0	-	1
9.	AGUCBG109T	B.Sc. (Hons.) Agriculture	Farming System & Sustainable Agriculture	1	0	-	1
10.	PTSPPBG10T	B.Sc. (Hons.) Agriculture	Professional Proficiency (B.Sc. Ag.)- I	3	0	-	3

11.	AGUCBG110T	B.Sc. (Hons.) Agriculture	Elementary Mathematics	2	0	-	2
	AGUCBG111T	B.Sc. (Hons.) Agriculture	Introductory Biology with Practical	1	0	2	
12.	AGUCBG101P	B.Sc. (Hons.) Agriculture	Fundamentals of Agronomy	-	0	2	1
13.	AGUCBG102P	B.Sc. (Hons.) Agriculture	Fundamentals of Soil science	-	0	2	1
14.	AGUCBG103P	B.Sc. (Hons.) Agriculture	Fundamentals of Horticulture	-	0	2	1
15.	AGUCBG104P	B.Sc. (Hons.) Agriculture	Introduction to Forestry	-	0	2	1
16.	AGUCBG105P	B.Sc. (Hons.) Agriculture	Fundamentals of Plant Biochemistry and Biotechnology	-	0	2	1
17.	AGUCBG107P	B.Sc. (Hons.) Agriculture	Fundamentals of Crop Physiology	-	0	2	1
18.	PTSPPBG11P	B.Sc. (Hons.) Agriculture	Physical Education & Yoga Practices, NSS/NCC	-	0	2	1
Total							26

Semester II							
Contact Hours							34
S. No.	Course Code	Course Category	Course Name	L	T	P	C
1.	AGUCBG201T	B.Sc. (Hons.) Agriculture	Fundamentals of Genetics	2	0	0	2
2.	AGUCBG202T	B.Sc. (Hons.) Agriculture	Fundamentals of Plant Pathology	3	0	0	3
3.	AGUCBG203T	B.Sc. (Hons.) Agriculture	Agricultural Microbiology	1	0	0	1
4.	AGUCBG204T	B.Sc. (Hons.) Agriculture	Soil and Water Conservation Engineering	1	0	0	1
5.	AGUCBG205T	B.Sc. (Hons.) Agriculture	Introduction to Remote Sensing and GIS	1	0	0	1
6.	AGUCBG206T	B.Sc. (Hons.) Agriculture	Fundamentals of Entomology	3	0	0	3
7.	AGUCBG207T	B.Sc. (Hons.) Agriculture	Fundamentals of Agricultural Extension Education	2	0	0	2
8.	AGUCBG208T	B.Sc. (Hons.) Agriculture	Fundamentals of Agricultural Economics	2	0	0	2
9.	AGUCBG209T	B.Sc. (Hons.) Agriculture	Fundamentals of Computer & Applications	2	0	0	2
10.	PTSPFBG21T	B.Sc. (Hons.) Agriculture	Professional Proficiency (B.Sc. Ag.)- II	3	0	0	1

11.	AGUCBG201P	B.Sc. (Hons.) Agriculture	Fundamentals of Genetics	0	0	2	1
12.	AGUCBG202P	B.Sc. (Hons.) Agriculture	Fundamentals of Plant Pathology	0	0	2	1
13.	AGUCBG203P	B.Sc. (Hons.) Agriculture	Agricultural Microbiology	0	0	2	1
14.	AGUCBG204P	B.Sc. (Hons.) Agriculture	Soil and Water Conservation Engineering	0	0	2	1
15.	AGUCBG205P	B.Sc. (Hons.) Agriculture	Introduction to Remote Sensing and GIS	0	0	2	1
16.	AGUCBG206P	B.Sc. (Hons.) Agriculture	Fundamentals of Entomology	0	0	2	1
17.	AGUCBG207P	B.Sc. (Hons.) Agriculture	Fundamentals of Agricultural Extension Education	0	0	2	1
18.	AGUCBG210P	B.Sc. (Hons.) Agriculture	Excursion Visit			2	1
			Total	20		8	26

Semester III							
				Contact Hours			36
S. No	Course Code	Course Category	Course Name	L	T	P	C
1.	AGUCBG301T	B.Sc. (Hons.) Agriculture	Crop Production Technology – I (<i>Kharif Crops</i>)	1	0	-	1
2.	AGUCBG302T	B.Sc. (Hons.) Agriculture	Fundamentals of Plant Breeding	2	0	-	2
3.	AGUCBG303T	B.Sc. (Hons.) Agriculture	Agricultural Finance and Cooperation	2	0	-	2
4.	AGUCBG304T	B.Sc. (Hons.) Agriculture	Agriculture Informatics	1	0	-	1
5.	AGUCBG305T	B.Sc. (Hons.) Agriculture	Principles of Seed Technology	2	0	-	2
6.	AGUCBG306T	B.Sc. (Hons.) Agriculture	Production Technology for Vegetables and Spices	1	0	-	1
7.	AGUCBG307T	B.Sc. (Hons.) Agriculture	Environmental Studies and Disaster Management	2	0	-	2
8.	AGUCBG308T	B.Sc. (Hons.) Agriculture	Statistical Methods	1	0	-	1
9.	AGUCBG309T	B.Sc. (Hons.) Agriculture	Livestock and Poultry Management	3	0	-	3
10.	PTSPPBG30T	B.Sc. (Hons.) Agriculture	Professional Proficiency (B.Sc. Ag.)- III	3	0	-	2
11.	AGUCBG301P	B.Sc. (Hons.) Agriculture	Crop Production Technology - I	-	0	2	1

			<i>(Kharif Crops)</i> Practical				
12.	AGUCBG302P	B.Sc. (Hons.) Agriculture	Fundamentals of Plant Breeding Practical	-	0	2	1
13.	AGUCBG303P	B.Sc. (Hons.) Agriculture	Agricultural Finance and Cooperation	-	0	2	1
14.	AGUCBG304P	B.Sc. (Hons.) Agriculture	Agriculture Informatics Practical	-	0	2	1
15.	AGUCBG305P	B.Sc. (Hons.) Agriculture	Principles of Seed Technology Practical	--	0	2	1
16.	AGUCBG306P	B.Sc. (Hons.) Agriculture	Production Technology for Vegetables and Spices Practical	-	0	2	1
17.	AGUCBG307P	B.Sc. (Hons.) Agriculture	Environmental Studies and Disaster Management Practical	-	0	2	1
18.	AGUCBG308P	B.Sc. (Hons.) Agriculture	Statistical Methods Practical	-	0	2	1
19.	AGUCBG309P	B.Sc. (Hons.) Agriculture	Livestock and Poultry Management Practical		0	2	1
TOTAL				18	0	18	26

Semester IV

Contact Hours							30
S. No.	Course Code	Course Category	Course Name	L	T	P	C
1.		B.Sc. (Hons.) Agriculture	Crop Production Technology -II (<i>Rabi Crops</i>)	1	0		1
2.	AGUCBG402T	B.Sc. (Hons.) Agriculture	Production Technology for Ornamental Crops, MAP and Landscaping	1	0		1
3.	AGUCBG403T	B.Sc. (Hons.) Agriculture	Farm Machinery and Power	1	0		1
4.	AGUCBG404T	B.Sc. (Hons.) Agriculture	Agricultural Marketing Trade & Prices	2	0		2
5.	AGUCBG405T	B.Sc. (Hons.) Agriculture	Introductory Agro meteorology & Climate Change	1	0		1
6.	AGUCBG406T	B.Sc. (Hons.) Agriculture	Production Technology for Fruit and Plantation Crops	1	0		1
7.		B.Sc. (Hons.) Agriculture	Professional Proficiency (B.Sc. Ag.)- IV	3	0		1
8.	AGUCBG407T	B.Sc. (Hons.) Agriculture	Renewable Energy and Green Technology	1	0		1
9.	AGUCBG408T	B.Sc. (Hons.) Agriculture	Intellectual Property Rights	1	0		1
10.		B.Sc. (Hons.) Agriculture	Elective	2	0		2

11.	AGUCBG401P	B.Sc. (Hons.) Agriculture	Crop Production Technology -II (Rabi Crops) Practical	-	0	2	1
12.	AGUCBG402P	B.Sc. (Hons.) Agriculture	Production Technology for Ornamental Crops, MAP and Landscaping	-	0	2	1
13.	AGUCBG403P	B.Sc. (Hons.) Agriculture	Farm Machinery and Power Practical	-	0	2	1
14.	AGUCBG404P	B.Sc. (Hons.) Agriculture	Agricultural Marketing Trade & Price Practical	-	0	2	1
15.	AGUCBG405P	B.Sc. (Hons.) Agriculture	Agro Meteorology & Climate Change Practical	-	0	2	1
16.	AGUCBG406P	B.Sc. (Hons.) Agriculture	Production Technology for Fruit and Plantation Crops Practical	-	0	2	1
17.	AGUCBG407P	B.Sc. (Hons.) Agriculture	Renewable Energy and Green Technology Practical	-	0	2	1
18.		B.Sc. (Hons.) Agriculture	Elective	-	0	2	1
Total							20

Semester V

Contact Hours							30
S. No.	Course Code	Course Category	Course Name	L	T	P	C
1	AGUCBG501T	B.Sc. (Hons.) Agriculture	Principles of Integrated Pest and Disease Management	2	0	0	2
2	AGUCBG512T	B.Sc. (Hons.) Agriculture	Pests of Crops and Stored Grain and their Management	2	0	0	2
3	AGUCBG513T	B.Sc. (Hons.) Agriculture	Diseases of Field and Horticultural Crops and their Management - I	2	0	0	2
4	AGUCBG504T	B.Sc. (Hons.) Agriculture	Crop Improvement –I (<i>Kharif Crops</i>)	1	0	0	1
5	AGUCBG505T	B.Sc. (Hons.) Agriculture	Entrepreneurship Development and Business Communication	1	0	0	1
6	AGUCBG506T	B.Sc. (Hons.) Agriculture	Geoinformatics and Nanotechnology and Precision Farming	1	0	0	1
7	AGUCBG507T	B.Sc. (Hons.) Agriculture	Principles of Food Science and Nutrition	2	0	0	2
8	AGUCBG508T	B.Sc. (Hons.) Agriculture	Values and Professional Ethics	1	0	0	1
9		B.Sc. (Hons.) Agriculture	Elective	2	0	0	2

10	AGUCBG501P	B.Sc. (Hons.) Agriculture	Principles of Integrated Pest and Disease Management Practical	0	0	2	1
11	AGUCBG502P	B.Sc. (Hons.) Agriculture	Pests of Crops and Stored Grain and their Management Practical	0	0	2	1
12	AGUCBG503P	B.Sc. (Hons.) Agriculture	Diseases of Field and Horticultural Crops and their Management –I Practical	0	0	2	1
13	AGUCBG504P	B.Sc. (Hons.) Agriculture	Crop Improvement – I (Kharif Crops) Practical	0	0	2	1
14	AGUCBG505P	B.Sc. (Hons.) Agriculture	Entrepreneurship Development and Business Communication Practical	0	0	2	1
15	AGUCBG506P	B.Sc. (Hons.) Agriculture	Geoinformatics and Nanotechnology and Precision Farming Practical	0	0	2	1
16	AGUCBG509P	B.Sc. (Hons.) Agriculture	Practical Crop Production - I (Kharif Crops)	0	0	2	1
		B.Sc. (Hons.) Agriculture	Elective	0	0	2	1
			Total				22

Semester VI

Contact Hours							35
S. No.	Course Code	Course Category	Course Name	L	T	P	C
1	AGUCBG601T	B.Sc. (Hons.) Agriculture	Rainfed Agriculture & Watershed Management	2	0	0	2
2	AGUCBG602T	B.Sc. (Hons.) Agriculture	Manures, Fertilizers and Soil Fertility Management	2	0	0	2
3	AGUCBG603T	B.Sc. (Hons.) Agriculture	Post-harvest Management and Value Addition of Fruits and Vegetables	1	0	0	1
4	AGUCBG604T	B.Sc. (Hons.) Agriculture	Principles of Organic Farming	1	0	0	1
5	AGUCBG605T	B.Sc. (Hons.) Agriculture	Farm Management, Production & Resource Economics	1	0	0	1
6	AGUCBG606T	B.Sc. (Hons.) Agriculture	Crop Improvement – II (<i>Rabi Crops</i>)	1	0	0	1
7	AGUCBG607T	B.Sc. (Hons.) Agriculture	Protected Cultivation and Secondary Agriculture	1	0	0	1
8	AGUCBG----T	B.Sc. (Hons.) Agriculture	Diseases of Field and Horticultural Crops and their Management– II	3	0	0	3
9	AGUCBG609T	B.Sc. (Hons.) Agriculture	Management of Beneficial Insects	1	0	0	1
10	AGUCBG610T	B.Sc. (Hons.) Agriculture	Problematic Soils and their Management	2	0	0	2
11	ELECTIVE	B.Sc. (Hons.) Agriculture			0		2
12	AGUCBG601P	B.Sc. (Hons.) Agriculture	Rainfed Agriculture & Watershed Management Practical	0	0	2	1

13	AGUCBG602P	B.Sc. (Hons.) Agriculture	Manures, Fertilizers and Soil Fertility Management Practical	0	0	2	1
14	AGUCBG603P	B.Sc. (Hons.) Agriculture	Post-harvest Management and Value Addition of Fruits and Vegetables Practical	0	0	2	1
15	AGUCBG604P	B.Sc. (Hons.) Agriculture	Principles of Organic Farming Practical	0	0	2	1
16	AGUCBG605P	B.Sc. (Hons.) Agriculture	Farm Management, Production & Resource Economics Practical	0	0	2	1
17	AGUCBG606P	B.Sc. (Hons.) Agriculture	Crop Improvement- II (Rabi Crops) Practical	0	0	2	1
18	AGUCBG607P	B.Sc. (Hons.) Agriculture	Protected Cultivation and Secondary Agriculture	0	0	2	1
19	AGUCBG608P	B.Sc. (Hons.) Agriculture	Disease of Field and Horticultural Crops and their Management– II	0	0	2	1
20	AGUCBG609P	B.Sc. (Hons.) Agriculture	Management of Beneficial Insects	0	0	2	1
21	AGUCBG611P	B.Sc. (Hons.) Agriculture	Practical Crop Production-II (Rabi Crops)	0	0	2	1
22		B.Sc. (Hons.) Agriculture	Elective Practical	0	0	2	1
							28

Semester VII

Contact Hours							20 Weeks
Sr. No.	Course Code	Course Category	Course Name	L	T	P	C
1.	AGUCBG701P	B.Sc. (Hons.) Agriculture	Rural Agriculture Work Experience and Agro-Industrial Attachment (RAWE-AIA)	0	0	20 Weeks	20
Total							20

Semester VIII

Contact Hours							24 Weeks
Sr. No.	Course Code	Course Category	Course Name	L	T	P	C
1.	AGUCBG801P	B.Sc. (Hons.) Agriculture	Skill Development & Entrepreneurship	0	0	24 Weeks	24
Total							24

List of Elective Courses

S. No.	Course Code	Course Category	Course Name	Contact Hours			
				L	T	P	C
1	AGUEBG001T	B.Sc. (Hons.) Agriculture	Commercial plant breeding	2	0	0	2
2	AGUEBG002T	B.Sc. (Hons.) Agriculture	Biopesticides & biofertilizers	2	0	0	2
3	AGUEBG003T	B.Sc. (Hons.) Agriculture	Agribusiness management	2	0	0	2
4	AGUEBG004T	B.Sc. (Hons.) Agriculture	Food safety issues	2	0	0	2
5	AGUEBG005T	B.Sc. (Hons.) Agriculture	Weed management	2	0	0	2
6	AGUEBG006T	B.Sc. (Hons.) Agriculture	Agrochemicals	2	0	0	2
7	AGUEBG007T	B.Sc. (Hons.) Agriculture	Landscaping	2	0	0	2
8	AGUEBG008T	B.Sc. (Hons.) Agriculture	Protected cultivation	2	0	0	2
9	AGUEBG009T	B.Sc. (Hons.) Agriculture	Hi-tech. Horticulture	2	0	0	2
10	AGUEBG010T	B.Sc. (Hons.) Agriculture	Micro propagation technologies	2	0	0	2
11	AGUEBG011T	B.Sc. (Hons.) Agriculture	Agricultural journalism	2	0	0	2
12	AGUEBG012T	B.Sc. (Hons.) Agriculture	System Simulation and Agroadvisory	2	0	0	2
13	AGUEBG001P	B.Sc. (Hons.) Agriculture	Commercial plant breeding	0	0	2	1
14	AGUEBG002P	B.Sc. (Hons.) Agriculture	Biopesticides & biofertilizers	0	0	2	1

15	AGUEBG003TP	B.Sc. (Hons.) Agriculture	Agribusiness management	0	0	2	1
16	AGUEBG004P	B.Sc. (Hons.) Agriculture	Food safety issues	0	0	2	1
17	AGUEBG005P	B.Sc. (Hons.) Agriculture	Weed management	0	0	2	1
18	AGUEBG006P	B.Sc. (Hons.) Agriculture	Agrochemicals	0	0	2	1
19	AGUEBG007P	B.Sc. (Hons.) Agriculture	Landscaping	0	0	2	1
20	AGUEBG008P	B.Sc. (Hons.) Agriculture	Protected cultivation	0	0	2	1
21	AGUEBG009P	B.Sc. (Hons.) Agriculture	Hi-tech. Horticulture	0	0	2	1
22	AGUEBG010P	B.Sc. (Hons.) Agriculture	Micro propagation technologies	0	0	2	1
23	AGUEBG011P	B.Sc. (Hons.) Agriculture	Agricultural journalism	0		2	
24	AGUEBG012P	B.Sc. (Hons.) Agriculture	System Simulation and Agroadvisory	0		2	

SUBJECT CODE & NAME: AGUCBG10T/ FUNDAMENTALS OF AGRONOMY

COURSE OUTCOMES

1. Study the basic principle of agronomy, field management and fertilizers.
2. Student will able to understand the importance of water and Irrigation Management.
3. Student will able to understand the concept of weed and its management.
4. Study the herbicides and its classification with application.
5. Student will able to understand the concept of crop rotation, harvesting & threshing of crops.

UNIT I: Agronomy and Crop Nutrition Agronomy: scope, seeds and sowing, tillage and tilth, crop density and geometry. Crop nutrition, manures and fertilizers etc. Other related topic covered during the courses.

UNIT II: Water and Irrigation

Soil plant water relationship, Crop water requirement, water use efficiency. Irrigation scheduling criteria and methods, quality of irrigation water etc.

UNIT III: Weeds: importance, classification, crop weed competition. Concepts of weed management - principles and methods.

UNIT IV: Herbicides Herbicides classification, selectivity and resistance, allelopathy. Growth and development of crops, factors affecting growth and development etc.

UNIT V: Crop Rotation and its management Crop rotation: its principles, adaptation and distribution of crops, Crop management technologies in Problematic areas. Harvesting and threshing of crops etc.

TEXTBOOKS

1. Principles & Practices of Agronomy- S.S. Singh and Rajesh Singh, Kalyani Publishers.

2. Handbook of Agriculture: Indian Council of Agricultural Research (ICAR), New Delhi.6th edition.
3. Fundamentals of Agriculture- Arun Katyayan, Kushal Publication
4. Principles of Agronomy- T. Yellamanda Reddy and G. H. Sankara Reddy, Kalyani Publishers.

REFERENCE BOOKS

1. Principles of Agronomy- S. R. Reddy, Kalyani Publisher.
2. Manures and Fertilizers- K. S. Yawalkar, J.P. Agrawal and S. Bokde Agri Horticultural Pub. House.
3. Fundamentals of Agronomy Gopal Chandra De. Oxford and IBH Publishing Co. Pvt. Ltd.
4. The Future of Indian Agriculture-Yonder K. Alagh, National Book trust, New Delhi.

SUBJECT CODE & NAME: AGUCBG101P/ FUNDAMENTALS OF AGRONOMY

COURSE OUTCOMES

1. Understand and identify the different crops, seed & fertilizers.
2. Skilled on identification of different pesticides and tillage implements with agro-climatic zones.
3. Skilled on herbicide application, fertilizers application and weed identification in different crops.
4. Understand the concept of yield contributing character, yield estimation with seed germination and viability test of seed.
5. Understand the fertilizer requirement of soil and other scientific measuring methods for high productivity of crops.

Objectives;-

1. **Identification of crops, seeds, and fertilizers:** Identify common names, botanical names, families, chromosome numbers, and origins of crops, seeds, and fertilizers (inorganic, organic, bio fertilizers).
2. **Identification of pesticides and tillage implements:** Classify pesticides (fungicides, herbicides, insecticides) and tillage implements (primary and secondary).
3. **Study of Agro-Climatic Zones:** Identify 15 Agro-Climatic Zones of India (I-XV) and three in Uttar Pradesh, including climate, major crops, and irrigation facilities.
4. **Identification of weeds in crops:** Classify weeds based on life cycle, site of predominance, parasitic nature, and morphological characteristics.
5. **Methods of herbicide and fertilizer application:** Classify herbicides (inorganic, organic, selective, non-selective) and methods of application (preplanting, pre-emergence, post-emergence), and types of fertilizer application (solid, liquid).

6. **Study of yield contributing characters and yield estimation:** Analyze yield-contributing characters (plant height, harvest index) and estimate yield for cereals, pulses, and other crops.
7. **Seed germination and viability test:** Perform seed germination tests using three major methods and viability tests (Potassium Permanganate, Embryo Culture, TZ Test).
8. **Numerical exercises on fertilizer requirement of crops:** Solve problems related to simple fertilizers (urea, superphosphate, muriate of potash), and complex/mixed fertilizers.
9. **Plant geometry and plant population of various crops:** Implement different crop geometries (broadcasting, square, rectangular, triangular methods).
10. **Herbicides requirement calculation and water requirement:** Calculate herbicide quantities and water formulations for field crops and aquatic weeds.
11. **Use of tillage implements:** Operate and assess primary (reversible plough, one-way plough), secondary (harrow, leveler), and sowing devices (seed drill).
12. **Study of soil moisture measuring devices:** Evaluate soil moisture measuring methods (oven drying, volumetric, tensiometer, gypsum block).
13. **Measurement of field capacity:** Use tools and methods (straw mulch, black polythene sheet, spade, soil auger, moisture boxes) to measure soil field capacity.
14. **Determination of bulk density:** Measure soil bulk density using a balance, dry oven, aluminum moisture boxes, and core sampler.
15. **Determination of infiltration rate:** Measure soil infiltration rate using a metal ring, plastic bottle, water, and stopwatch.
16. **Measurement of irrigation water:** Measure irrigation water using volumetric measurements, velocity area method, and measuring structures.

Reference Practical Manual

1. **"Crop Production: A Practical Manual"** by **Chhidda Singh** - Oxford & IBH Publishing Co. Pvt. Ltd., 2008.
2. **"Soil Science: A Practical Manual"** by **Dilipsingh Rathod, S.S. Tomar, and S.D. Dhok** - Scientific Publishers, 2013.
3. **"Weed Management: A Practical Manual"** by **Rajinder Singh** - Kalyani Publishers, 2014.
4. **"Seed Science and Technology: A Practical Manual"** by **A.K. Singh** - Kalyani Publishers, 2011.
5. **"Agricultural Engineering: A Practical Manual"** by **Amrik Singh and R.K. Sharma** - CBS Publishers & Distributors, 2015.

SUBJECT CODE & NAME: AGUCBG102T / FUNDAMENTALS OF SOIL SCIENCE**COURSE OUTCOMES**

1. Student will be able to understand the concept of soil formation and physical properties of soil.
2. Study of soil classification and soil water plant relationship, gaseous exchange.
3. Study the concept of soil reaction and general properties of soil colloids.
4. Student will be able to understand the composition and properties of organic manure and effect of soil pollution.

UNIT I: Soil formation and properties of soil Soil as a natural body, Pedological and edaphological concepts of soil; Soil genesis: soil forming rocks and minerals; weathering, processes and factors of soil formation; Soil Profile, Components of soil; Soil physical properties: soil- texture, structure, density and porosity, soil colour, consistence and plasticity.

UNIT II: Soil Classification and Plant growth Elementary knowledge of soil taxonomy. Classification and soils of India; Soil water retention, movement and availability; Soil air, composition, gaseous exchange, problem and plant growth; source, amount and flow of heat in soil; soil temperature and plant growth.

UNIT III: Soil Reaction and Soil Colloids Soil reaction-pH, soil acidity and alkalinity, buffering, effect of pH on nutrient availability; soil colloids- inorganic and organic; silicate clays: constitution and properties; sources of charge; ion exchange, cation exchange capacity, base saturation.

UNIT IV: Soil Organic Matter and Soil Pollution Soil organic matter: composition, properties and its influence on soil properties; humic substances- nature and properties; soil organisms: macro and microorganisms, their beneficial and harmful effects;

UNIT V: Soil pollution- behaviour of pesticides and inorganic contaminants, prevention and mitigation of soil pollution.

TEXTBOOKS

1. Introductory Soil Science- D.K. Das, Kalyani Publishers.
2. Textbook of Soil Science- Susanta Kumar Pal, Oxford & IBH Publishing Co. Pvt. Ltd.
3. Fundamentals of Soil science- Indian Society of Soil Science.
4. Textbook of Soil Science- T. Biswas , S. Mukherjee, Tata McGraw, Hill Publishing Company Limited.

REFERENCE BOOKS

1. Soil Fertility and Fertilizer Use- Samuel L. Tisdale and Werner L. Nelson, Macmillan Coll Div.
2. Saline and Alkaline soil of India- RR Agarwal, JPS Yadav, & R.N. Gupta, ICAR, New Delhi.
3. Nature and Property of Soil- N. C. Braby, Macmillan Publishing Company Incorporated.
4. Soil Science- Mangat Rai, Anmol Publications Pvt. Ltd.

SUBJECT CODE & NAME: AGUCBG102P / FUNDAMENTALS OF SOIL SCIENCE**COURSE OUTCOMES**

1. Students will be able to recognise the soil profile and trained on soil sampling process.
2. Study of soil forming rocks and will be trained to determine the soil density, moisture and field capacity.
3. Student will be skilled to determine soil texture, capillary rise phenomenon of water and bulk density of soil.
4. Student will be able to determine the soil pH, colour, cation exchange capacity, heat transfer and organic carbon of the soil.
5. Student will be gently skilled to handling of all instruments.

Objectives:

1. **Study of soil profile in the field:** Observe and describe the soil profile in the field, identifying soil horizons and their characteristics.
2. **Study of soil sampling tools, collection of representative soil samples, processing, and storage:** Demonstrate the correct use of soil sampling tools, and perform the collection, processing, and storage of representative soil samples.
3. **Study of soil-forming rocks and minerals:** Identify and classify various soil-forming rocks and minerals, explaining their role in soil formation.
4. **Determination of soil density, moisture content, and porosity:** Measure and analyze soil density, moisture content, and porosity to evaluate soil physical properties.
5. **Determination of field capacity, permanent wilting point, and water holding capacity (WHC) of soil:** Measure and interpret field capacity, permanent wilting point, and water holding capacity of soil for effective water management.
6. **Determination of soil texture by feel and Bouyoucos method:** Classify soil texture using the feel method and Bouyoucos hydrometer method, enhancing skills in soil texture identification.

7. **Study of capillary rise phenomenon and water movement in soil:** Observe and explain the capillary rise phenomenon and water movement within a soil column, understanding its implications on soil water dynamics.
8. **Determination of bulk density by core sampler method:** Perform and calculate bulk density of soil using the core sampler method, evaluating its importance in soil compaction studies.
9. **Determination of soil pH and electrical conductivity:** Measure soil pH and electrical conductivity to assess and analyze soil acidity/alkalinity and salinity levels.
10. **Determination of cation exchange capacity (CEC) of soil:** Determine and evaluate the cation exchange capacity of soil, understanding its significance in soil fertility.
11. **Determination of soil color using the Munsell color chart:** identify and classify soil color using the Munsell color chart, relating it to soil properties.
12. **Demonstration of heat transfer in soil:** Demonstrate and explain the process of heat transfer in soil, understanding its effects on soil temperature and plant growth.
13. **Estimation of organic matter content in soil:** Estimate and evaluate the organic matter content of soil, interpreting its impact on soil fertility and structure.

Reference Practical Manual

1. **"Soil Science: A Practical Guide"** by **R. D. H. McKenzie and K. M. C. H. Douglas** - CRC Press, 2015.
2. **"Soil Analysis: An Interpretation Manual"** by **K. J. Scott and I. M. G. D'Adamo** - CSIRO Publishing, 2018.
3. **"Soil Physics: A Laboratory Manual"** by **L. G. Smith** - Blackwell Publishing, 2007.
4. **"Soil and Water Conservation Handbook: An Introduction to Soil Science"** by **W. A. Jury and W. R. Gardner** - CRC Press, 2011.

SUBJECT CODE & NAME: AGUCBG113T / FUNDAMENTALS OF HORTICULTURE**COURSE OUTCOMES**

1. Study the basic principles of horticulture & method of plant propagation.
2. Student will skilled in training, pruning and pollination in crop.
3. Study the concept of kitchen garden and its importance.
4. Study the different aspects of horticultural crop operation.

UNIT I: Horticulture & Plant Propagation Horticulture- Its definition and branches, importance and scope; horticultural and botanical classification; climate and soil for horticultural crops, Plant propagation- methods and propagating structures; principles of orchard establishment.

UNIT II: Pruning and Pollination Principles and methods of training and pruning, juvenility and flower bud differentiation, unfruitfulness; pollination, pollinizers and pollinators; fertilization and parthenocarpy.

UNIT III: Kitchen Garden Kitchen gardening; garden types and parts; lawn making; medicinal and aromatic plants; species and condiments; use of plant bio-regulators in horticulture.

UNIT IV: Horticultural Crop Operation Irrigation & fertilizers application-method and quantity, weed management, fertility management in horticultural crops-manures and fertilizers, different methods of application, cropping systems.

UNIT V: Mulching Intercropping, multi-tier cropping, mulching– objectives, types merits and demerits, Classification of bearing habits of fruit trees, factors influencing the fruitfulness and un fruitfulness.

TEXTBOOKS

1. Basic Horticulture- Jitendra Singh, Kalyani Publisher.
2. Basic Horticulture- KV Peter, New India Publishing Agency.
3. Horticulture at a glance- A. Salaria, Jain Brothers.
4. Instant Horticulture- S. N. Gupta, Jain Brothers.

REFERENCE BOOKS

1. Plant growth regulators in agriculture and horticulture: Their role and commercial use- A.S. Basra, International Book Distributor, Dehrudun.
2. Terminology of Horticulture- Neeraj Pratap Singh, International Book Distributing Co (IBDC Publishers).
3. Basic Concept of fruit Science- Neeraj Pratap Singh, International Book Distributing Co (IBDC Publishers).
4. Basics of Horticulture- K.V. Peter, New India Publishing Agency, New Delhi.

SUBJECT CODE & NAME: AGUCBG113P / FUNDAMENTALS OF HORTICULTURE**COURSE OUTCOMES**

1. Understand and identify the different garden tools and horticultural crops.
2. Skilled on ideal seed bed preparation, sexual & asexual propagation with micro-propagation techniques.
3. Student will be able to recognize the layout and different planting system of orchard.
4. Student will be trained on pruning and training of fruit crops and potting mixture.
5. Student will be able to understand the different fertilizer application method, model & commercial nursery with excursion visit & demonstration.

Objectives:-

1. **Identification of garden tools:** Spade, Hoe, Hatchet, Axe, Sickle, Scythe, Pitchfork, Shovel, Trowel, Fork and Rake.
2. **Identification of horticultural crops:** Fruit, Vegetable, Flower, Spices & Condiments, Medicinal & Aromatic plants.
3. **Preparation of seed bed/nursery bed:** Dry nursery, Wet nursery, Temporary nursery, Permanent nursery, Selection of site.
4. **Practice of sexual and asexual methods of propagation:** Seeding, Seeding Method, Method- Cuttings, Budding, Layering, Grafting, Managing nursery stock.
5. **Micro-propagation:** Methods- Meristem culture, Callus culture, Suspension culture, Embryo culture, Protoplast culture, Stages of Micro-propagation, Advantages.
6. **Layout and planting of orchard:** Equipment, System- Square System, Hexagonal System, Diagonal or Quincunx System, Contour System.
7. **Training and pruning of fruit trees:** Types- Thinning cut, Heading cut, Bench cut, Training system, Multi leader training, High Density central leader training.
8. **Preparation of potting mixture:** Potting, De-potting, Re-potting, Precaution.

9. **Fertilizer application in different crops:** Solid, Liquid, Irrigation water, Method-Broadcasting, Placement, Localized Placement, Pellet application, other application.
10. **Layout and component of model nursery:** Criteria, Site Selection, Sowing method, Disease management
11. **Visits to commercial nurseries/orchards:** Visit to commercial nurseries/ orchard as per the schedule.

Reference Practical Manual

- 1) **"Practical Manual of Horticulture"** by **R. G. A. T. S. Reddy** - CBS Publishers & Distributors, 2014.
- 2) **"Horticultural Science: Principles and Practices"** by **John E. Preece and C. Duncan** - Wiley-Blackwell, 2018.
- 3) **"Propagation of Cultivated Plants: Principles and Practices"** by **J. R. Lovell** - CABI Publishing, 2019.
- 4) **"Nursery Management: Principles and Practices"** by **R. A. S. Singh** - Oxford & IBH Publishing Co., 2012.
- 5) **"Fruit Growing: A Practical Guide to the Cultivation of Fruit Trees"** by **A. C. Fitzpatrick** - CRC Press, 2015.

SUBJECT CODE & NAME: AGUCBG104T / INTRODUCTION TO FORESTRY**COURSE OUTCOMES**

1. Study the objective of silviculture, classification and types of forest regeneration.
2. Student will able to understand the crown classification and measurement of tree species.
3. Study the agroforestry system and will be able to understand the its diverse integration with agriculture crop/ livestock/ poultry with benefit of the system.

UNIT I: Forest classification and Regeneration Introduction– definitions of basic terms related to forestry, objectives of silviculture, forest classification, salient features of Indian Forest Policies. Forest regeneration, Natural regeneration- natural regeneration from seed and vegetative parts, coppicing, pollarding, root suckers; Artificial regeneration– objectives, choice between natural and artificial regeneration, essential preliminary considerations.

UNIT II: Crown Classification and Forest Mensuration Crown classification. Tending operations– weeding, cleaning, thinning– mechanical, ordinary, crown and advance thinning. Forest mensuration– objectives, diameter measurement, instruments used in diameter measurement; Non instrumental methods of height measurement- shadow and single pole method.

UNIT III: Measurement of Volume Instrumental methods of height measurement-geometric and trigonometric principles, instruments used in height measurement; tree stem form, form factor, form quotient, measurement of volume of felled and standing trees, age determination of trees.

UNIT IV: Agroforestry– definitions, importance, criteria of selection of trees in agroforestry, different agroforestry systems prevalent in the country,

UNIT V: Shifting cultivation, taungya, alley cropping, wind breaks and shelter belts, home gardens. Cultivation practices of two important fast growing tree species of the region.

TEXTBOOKS

1. Handbook of Forestry- S.S. Negi, International book distributor, Dehradun.
2. Principles and practices of Silviculture, L.S. Khanna, International book distributor, Dehradun.
3. Agroforestry- Principles and practices- A.P. Dwivedi, Oxford and IBH Publishing Co., New Delhi.
4. Indian wood technology- H. Brown, IBD Publishers, Dehradun.

REFERENCE BOOKS

1. Favourite Agroforestry Trees- S. P. Singh, Agrotech Publishing Academy, Udaipur.
2. India's forest – Myth and reality-Lal, J.B., Natraj Publishers, Dehradun Journals.
3. Indian Forester (Journal).
4. Indian Journal of Agroforestry.

SUBJECT CODE & NAME: AGUCBG104P / INTRODUCTION TO FORESTRY**COURSE OUTCOMES**

1. Students will develop the ability to understand and identify various tree species, including measuring their diameters.
2. Trained in multiple methods for accurately measuring the height of tree species.
3. Gained skills in volume measurement, nursery layout, and vegetative propagation techniques for tree species.
4. Students will grasp the significance of forest plantations and their management, reinforced through site visits as outlined.

Objectives;-

1. **Identification of Tree Species:** Identify and classify different tree species: Multipurpose, Commercial, Fruit, Fast-growing, Recreational.
2. **Diameter Measurements:** Measure tree diameter and height using calipers, tape, and various formulae, including the Quarter Girth Formula.
3. **Diameter Measurements of Special Cases:** Measure diameter and height of forked, buttressed, fluted, and leaning trees using appropriate formulae.
4. **Height Measurement of Standing Trees:** Measure tree height using Shadow Method, Single Pole Method, and Hypsometer.
5. **Volume Measurement of Logs:** Calculate log volume using Smalian's Formula, Huber's Formula, and Prismoidal or Newton's Formula.
6. **Nursery Layout and Techniques:** Classify and implement nursery layouts (Dry, Wet, Temporary, Permanent) and perform seed sowing and vegetative propagation techniques.
7. **Forest Plantations and Management:** Assess site conditions, select tree species, prepare the planting site, and determine the optimal planting time.
8. **Visits to Forest-Based Industries:** Explore operations at wood-based industries, pulp and paper industries, and match industries.

Reference Practical Manual

1. **"Forest Mensuration: A Practical Guide"** by **Peter D. K. Smith** - CAB International, 2017.
2. **"Tree Measurement and Forest Management"** by **William H. F. L. Banks** - Springer, 2014.
3. **"Nursery Management: Principles and Practices"** by **R. A. S. Singh** - Oxford & IBH Publishing Co., 2012.
4. **"Practical Manual of Forest Inventory and Measurement"** by **T. K. Ghosh** - CRC Press, 2019.
5. **"Introduction to Forest and Forestry"** by **L. A. P. N. Richard** - Academic Press, 2016.

**SUBJECT CODE & NAME: AGUCBG105T / FUNDAMENTALS OF PLANT
BIOCHEMISTRY AND BIOTECHNOLOGY**

COURSE OUTCOMES

1. Comprehensive understanding of biochemical principles, including the structure, function, and metabolism of key biomolecules.
2. Mastery of enzymatic mechanisms and kinetics, alongside the structural organization and classification of proteins, carbohydrates, lipids, and nucleic acids.
3. Proficiency in plant biotechnology techniques and their applications in tissue culture, genetic engineering, and crop improvement.
4. Ability to apply molecular biology methods such as PCR, RFLP, and marker-assisted breeding in genetic research.
5. Awareness of the regulatory frameworks and ethical considerations in biotechnology and transgenic crop development.

UNIT I: Carbohydrates & Lipids: Introduction– Historical aspects of Biochemistry, Scope, impact and importance of Biochemistry in plant sciences, Properties of water, PH and Buffers. Carbohydrates– Classification, Structures– Monosaccharides– Structural aspects– mutarotation- Reducing and oxidizing properties. Oligosaccharides and polysaccharides, Functions of carbohydrates. Lipids– Importance and Classification, Structures and properties of fatty acids, Essential fatty acids, Storage lipids and membrane lipids, Functions of lipids, Saponification, hydrogenation, RM number, Iodine number and Acid value.

UNIT II: Amino acids, Proteins & Enzymes: Amino acids– Structures, Classification, Zwitterions, Titration of amino acids, Peptides ,Oligopeptides, Cyclic and acyclic peptides, Malformin, Glutathione, Gramicidin, Functions of peptides. Proteins– Importance, Classification, Properties of proteins, Isoelectric PH, Denaturation, Proteins– Structural organization– Primary, secondary, tertiary and quaternary structures and forces involved in stabilizing proteins. Enzymes-General properties and classification, Mechanism of action– Michaelis & Menten and Line Weaver Burk equation & plots, Introduction to allosteric enzymes.

UNIT III: Nucleic acids & Metabolism of Carbohydrates and Lipids: Nucleic acids-Importance and classification, Structures of nitrogen bases– Nucleosides– Nucleotides in RNA and DNA, A, B & Z DNA and Types of RNA, Secondary & Tertiary structure of B-DNA and t-RNA. Metabolism of carbohydrates– Glycolysis– Aerobic and anaerobic, Tricarboxylic Acid (TCA) cycle, Glyoxylate cycle, Electron transport chain. Metabolism of lipids- Beta oxidation, Biosynthesis of fatty acids.

UNIT IV: Micro propagation & Recombination DNA methods: Biotechnology– Concepts, Importance Applications and Scope of plant biotechnology. Introduction to plant tissue culture– History, Scientists, Terminology, Steps in general tissue culture, Types of sterilization and nutrient media. Types of cultures– Organ cultures, embryo culture, cell suspension culture, callus culture, anther culture, pollen culture and ovule culture and their applications.

UNIT V: Micropropagation Methods– Organogenesis and embryogenesis, Synthetic seeds and their significance; Embryo rescue and its significance; Somatic hybridization and Cybrids; Somaclonal variations and its use in crop improvement; Cryopreservation. Introduction to recombinant DNA methods: physical (Gene gun method), chemical (PEG mediated) and Agrobacterium mediated gene transfer methods; Transgenics and its importance in crop improvement; PCR techniques and its applications; RFLP, RAPD, SSR; Marker Assisted Breeding in crop improvement; Biotechnology regulations.

TEXTBOOKS

1. Agricultural microbiology- D. J. Bagyaraj, g. Rangaswami, phi learning Pvt. Ltd.
2. Fundamentals of Plant Biochemistry and Biotechnology-N.K. Gupta and Sunita Gupta, Kalyani Publishers.
3. Principles of Biochemistry- David Lee Nelson, Michael M. Cox. W.H. Freeman.
4. Agricultural Microbiology- Nilangshu Mukherjee and Tapash Ghosh, Kalyani Publisher.

REFERENCE BOOKS

1. Soil Microbiology- Rao Oxford and IBH Publishing.
2. Plant Biotechnology- B.D. Singh, Kalyani Publication, Ludhiyana.
3. Agricultural Applications of Microbiology- Neelima Rajvaidya, Dilip Kumar Markandey, APH Publishing.
4. Fundamentals of Agricultural Microbiology- K. C. Mahanta, Oxford & IBH Publishing.

**SUBJECT CODE & NAME: AGUCBG105P / FUNDAMENTALS OF PLANT
BIOCHEMISTRY AND BIOTECHNOLOGY****COURSE OUTCOMES**

1. Understand and recognize the different solution, pH & buffer.
2. Skilled on qualitative test of carbohydrate and amino acid.
3. Skilled on quantitative estimation of glucose and protein & estimation of amino acids/lipids.
4. Understand the paper chromatography for separation monosaccharides and sterilization techniques.
5. Understand the gel electrophoresis techniques and DNA finger printing.

Objectives;-

1. **Preparation of Solutions, pH & Buffers:** Prepare molar, normal, and percent solutions; measure pH; prepare acetate and phosphate buffers; handle tissues, separation, quantitative estimation, and purification.
2. **Qualitative Tests for Carbohydrates:** Conduct Molisch's test, Iodine test, Benedict's test, Barfoed's test, Seliwanoff's test, and Bial's test for carbohydrates.
3. **Qualitative Tests for Amino Acids:** Perform Biuret test, Ninhydrin test, Xanthoproteic test, and identify specific amino acids such as Asparagine, Phenylalanine, Tyrosine, and Tryptophan.
4. **Estimation of Reducing Sugars:** Use Nelson-Somogyi's Method with alkaline copper reagent and arsenomolybdate reagent; perform colorimetric analysis at 500 nm.
5. **Estimation of Total Soluble Sugars:** Apply Anthrone method for colorimetric estimation of carbohydrates.
6. **Estimation of Proteins:** Employ Lowry's method to estimate proteins by detecting peptide bonds with copper sulfate.
7. **Extraction of Oil from Oil Seeds:** Utilize Soxhlet apparatus for oil extraction, focusing on solvent reflux and siphon principles.
8. **Qualitative Tests for Oil:** Conduct solubility test for lipids and Acrolein test for glycerol.

9. **Paper Chromatography/TLC for Amino Acids:** Demonstrate separation of amino acids using paper chromatography/TLC with substances, liquid phases, mobile phase, and Ninhydrin.
10. **Sterilization Techniques:** Perform plant cell culture sterilization using steam or wet sterilization (autoclaving), filter sterilization, and irradiation.
11. **Preparation of Tissue Culture Media:** Prepare stock solutions for MS nutrient medium, including macro-salts, micro-salts, vitamins, amino acids, and hormones.
12. **Callus Induction from Explants:** Induce callus formation from various explants, focusing on nutrient and hormonal constituents.
13. **Micropropagation – Hardening and Acclimatization:** Demonstrate tissue culture micropropagation, including the acclimatization process.
14. **Isolation of DNA and Gel Electrophoresis:** Isolate DNA and perform gel electrophoresis for nucleic acid separation.
15. **PCR Technique:** Demonstrate Polymerase Chain Reaction (PCR) technique using heat-tolerant DNA polymerase, single arbitrary primer, and enzymatic amplification.
16. **DNA Fingerprinting – RAPD and RFLP:** Conduct DNA fingerprinting using RAPD and RFLP techniques, including endonuclease enzymes and Southern hybridization.

Reference Practical Manual

1. **"Practical Biochemistry: Principles and Techniques"** by **Keith Wilson and John Walker** - Cambridge University Press, 2010.
2. **"Biochemical Techniques: Theory and Practice"** by **John F. Robyt and Bernard J. White** - Academic Press, 2013.
3. **"Molecular Cloning: A Laboratory Manual"** by **Michael R. Green and Joseph Sambrook** - Cold Spring Harbor Laboratory Press, 2012.
4. **"Plant Tissue Culture: Techniques and Experiments"** by **Roberta H. Smith** - Springer, 2015.
5. **"Fundamentals of Molecular Diagnostics and Personalized Medicine"** by **David L. Nelson and Michael M. Cox** - Elsevier, 2018.

SUBJECT CODE & NAME: AGUCBG106T / RURAL SOCIOLOGY & EDUCATIONAL PSYCHOLOGY**COURSE OUTCOMES**

1. Study the basics of the sociology and rural sociology with different rituals & culture.
2. Student will be able to understand the importance of social development through the good leadership.
3. Study the educational psychology and role of personality in rural extension & development.
4. Student will be able to understand the concept of motivation teaching and learning process in agriculture extension.

UNIT I: Rural Sociology and Culture

Sociology and Rural sociology: Definition and scope, its significance in agriculture extension, Social Ecology: Definition, objective, history, challenges and social ecology in Indian context, Rural Society: Important characteristics, differences & Relationship between Rural and Urban societies, Social Groups: Meaning, Definition, Classification, Factors considered in formation and organization of groups. Social stratification- Meaning, Definition, Functions, Forms of social stratification. Culture concept- Culture, Customs, Folkways, Mores, Taboos, Rituals and Traditions- Meaning, Definition and their role in Agriculture Extension.

UNIT II: Social Development and Leadership Social Institution: Meaning, Definition, Major Institution in rural society, Functions. Social change and Development: Meaning, Definition, Nature of social changes and factors of social change. Social process- Meaning, Definition, Types. Social Control- Meaning, Definition, Need and Means of Social control. Rural Leadership: Concept and Definition, types and roles of leaders in rural context; Methods of selection of leaders.

UNIT III: Educational Psychology and Personality Educational psychology: Meaning & its importance in agriculture extension. Behavior: Cognitive, affective, psychomotor domain, Cognitive skills, Personality- Meaning, Definition, Types, Factors influencing the Personality and Role of Personality in Agricultural Extension

UNIT IV: Motivation Motivation- Meaning, Definition, Importance in extension, Theories of Motivation, Intelligence- Meaning, Definition, Types, Factors affecting intelligence. Factors affecting intelligence.

UNIT V: Teaching Learning Processes- Meaning and Definition of Teaching, Learning, Learning experience and Learning situation

TEXTBOOKS

1. Introductory Rural Sociology: A synopsis of concepts and principles- J. B. Chitambar, New Age International
2. Rural Sociology- S. L. Doshi, Rawat Publishers, Delhi.
3. Rural Sociology and Psychology in Extension Education- N.K. Tripathi, Aman Publishing House.
4. Fundamentals of Extension Education and Rural Development (In Hindi)- B. D. Tyagi, Dr. S.K. Arun and Dr. Manju Tyagi, Rama Publishing House.

REFERENCE BOOKS

1. Extension communication and management. G. L. Ray, Kalyani Publication.
2. Rural Sociology and Psychology. B. D. Tyagi, Anshu and Parul Tyagi. Rama Publishing House.
3. Rural Sociology- J. M. Gillette, Mcmillon Publishers.
4. Sociology- C.N.S. Rao, S Chand and Company, New Delhi.

SUBJECT CODE & NAME: AGUCBG107T / FUNDAMENTALS OF CROP PHYSIOLOGY**COURSE OUTCOMES**

1. Study the basic concept of plant physiology and different functions of plant cell.
2. Student will be able to understand the functions and nutrition of plant.
3. Student will be able to realize different cycle and fat metabolism of the plant.
4. Study the plant growth hormone and role of growth parameter in crop productivity.

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

UNIT II: Mineral Nutrition and Photosynthesis Mineral nutrition of Plants: Functions and deficiency symptoms of nutrients, nutrient uptake mechanisms. Photosynthesis: Light and Dark reactions, C₃, C₄ and CAM plants.

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

UNIT IV: PGR and Growth Analysis Plant growth regulators: Physiological roles and agricultural uses. Physiological aspects of growth and development of major crops:

UNIT V: Growth analysis, Role of Physiological growth parameters in crop productivity.

TEXTBOOKS

1. Handbook of Plant and Crop Physiology- Mohammad Pessaraki, CRC Press.
2. Physiology of Crop Plants- Gardner, F.P., Pearce, R.B. and Mitchell, R.L., Scientific Publishers, Jodhpur.
3. Fundamentals of Crop Physiology- N.K. Gupta & Sunita Gupta, Kalyani Publication, New Delhi.
4. Crop Physiology- B.L. Bagdi, New India Publishing Agency, New Delhi

REFERENCE BOOKS

1. Crop Physiology- Girish Chand Srivastava, Biotech Books.

2. A Text Book of Crop Physiology- A.B. Jadhav, S.B. Borgaonkar, Shri Rajlaxmi Prakashan.
3. Crop Physiology- S. R. Ghadekar, C. N. Chore, R. K. Patil, Agromet Publishers.
4. Practicals in Plant Physiology- M. Bala, S. Gupta, N.K. Gupta, Scientific Publisher, Jodhpur.

SUBJECT CODE & NAME: AGUCBG107P / FUNDAMENTALS OF CROP PHYSIOLOGY**COURSE OUTCOMES**

1. Study the basic concept of plant physiology and different functions of plant cell.
2. Student will be able to understand the functions and nutrition of plant.
3. Student will be able to realize different cycle and fat metabolism of the plant.
4. Study the plant growth hormone and role of growth parameter in crop productivity.

Objectives;-

1. **Study of Plant Cells:** Examine eukaryotic cells and types (Parenchyma, Sclerenchyma) using wet mount preparations.
2. **Structure and Distribution of Stomata in Leaf:** Analyze leaf epidermal surfaces, guard cells, and stomata distribution in dicot and monocot leaves, both on the underside and topside, considering CO₂ concentration.
3. **Study of Imbibition:** Investigate the physical process of water absorption and diffusion through permeable membranes during seed germination and root water uptake.
4. **Demonstration of Osmosis:** Use a pot model or potato piece to observe mass changes in different sucrose solutions and distilled water to demonstrate osmosis.
5. **Demonstration of Plasmolysis:** Observe plasmolysis in plant cells by placing them in hypertonic solutions, and analyze the effects on cytoplasm, protoplasm, and cell walls.
6. **Measurement of Root Pressure in Plants:** Measure root pressure using the manometer method and observe stem fluid exudation.
7. **Separation of Photosynthetic Pigments through Paper Chromatography:** Separate pigments (chlorophyll, carotenoids) using paper chromatography and analyze their relative solubilities.
8. **Measurement of Rate of Transpiration using Ganong's Potometer:** Measure transpiration rate under varying light, temperature, and humidity conditions using Ganong's potometer.

9. **Demonstration of O₂ Evolution during Photosynthesis:** Use a Hydrilla plant to demonstrate oxygen evolution by observing gas accumulation and testing with a glowing splinter.
10. **Rapid Tissue Tests for Mineral Nutrients:** Analyze fresh plant material for mineral nutrients through chemical analysis and dry matter testing.
11. **Measurement of Respiration Quotient:** Measure respiration quotient using a respirometer to analyze CO₂, oxygen levels, and temperature.
12. **Estimation of Relative Water Content in Plants:** Estimate leaf tissue water content, cellular water deficit, and transpiration rate.
13. **Measurement of Photosynthetic CO₂ Assimilation by Infrared Gas Analyzer (IRGA):** Measure CO₂ assimilation using IRGA for gas exchange and infrared spectroscopy.
14. **Demonstration of Light and CO₂ Essential for Photosynthesis Using Moll's Half Leaf Experiment:** Conduct Moll's half leaf experiment to demonstrate the necessity of light and CO₂ for photosynthesis, observing starch presence.
15. **Measurement of Plant Growth Analysis Parameters:** Analyze leaf area, leaf area index, leaf area ratio, specific leaf weight, absolute growth rate, relative growth rate, and crop growth rate.

Reference Practical Manual

1. **"Plant Physiology and Development"** by Lincoln Taiz and Eduardo Zeiger - Sinauer Associates, 2014.
2. **"Biological Techniques: A Laboratory Manual"** by Richard J. M. Stoughton and James A. F. Butcher - Wiley-Blackwell, 2007.
3. **"Practical Botany: For Beginners"** by Charles R. B. McKay - Springer, 2018.
4. **"Experimental Plant Physiology: A Laboratory Manual"** by G. A. K. Anwar and N. K. Sharma - Academic Press, 2015.
5. **"Methods in Plant Molecular Biology and Biotechnology"** by H. S. Choi and S. M. Lee - CRC Press, 2007.

SUBJECT CODE & NAME: AGUCBG108T / AGRICULTURAL HERITAGE**COURSE OUTCOMES**

- 1) Study the history of agriculture in respect of traditional practices and present status of agriculture & farmers in society.
- 2) Student will be able to understand the agriculture development from past to modern era along with indigenous knowledge for production and protection of plant.
- 3) Study the importance of agriculture and scope in India.
- 4) Student will be able to understand the crop classification and current scenario of Indian agriculture.

Objective;-

UNIT I: Indian Agricultural Heritage Introduction of Indian agricultural heritage; Ancient agricultural practices, Relevance of heritage to present day agriculture; Past and present status of agriculture and farmers in society.

UNIT II: Agriculture Development Journey of Indian agriculture and its development from past to modern era; Plant production and protection through indigenous traditional knowledge.

UNIT III: Scope of Agriculture Crop voyage in India and world; Agriculture scope; Importance of agriculture and agricultural resources available in India.

UNIT IV: Scenario of Indian Agriculture Crop significance and classifications; National agriculture setup in India.

UNIT V: Current scenario of Indian agriculture; Indian agricultural concerns and future prospects.

TEXTBOOKS

1. Fundamentals of Agriculture- Arun Katyayan, Kushal Publication.
2. Principles of Agronomy - T. Yellamanda Reddy and G. H. Sankara Reddy, Kalyani Publisher.
3. Integrated Pest Management- G.S. Dhaliwal and Ramesh Arora, Kalyani Publisher.

4. Handbook of Agriculture: Indian Council of Agricultural Research, New Delhi. Update edition.

REFERENCE BOOKS

1. Manures and Fertilizers - K. S. Yawalkar, J.P. Agrawal and S. Bokde, Agri, Horticultural Pub. House.
2. Fundamentals of Agronomy- Gopal Chandra, De. Oxford and IBH Publishing Co. Pvt. Ltd.
3. A text book on Ancient history of Indian Agriculture- Nene, Y.L., Saxena, R.C, Choudhary, S.L. 2009. Munshiram Manoharial Publisher Pvt. Ltd.
4. A text book on Ancient history of Indian Agriculture- Nene, Y.L., Saxena, R.C, Choudhary, S.L. 2010. Asian Agri- History Foundation.

SUBJECT CODE & NAME: AGUCBG109T / FARMING SYSTEM & SUSTAINABLE AGRICULTURE**COURSE OUTCOMES**

1. Study the different farming system, its importance with component and management.
2. Student will be able to understand the concept of sustainable agriculture and cropping system.
3. Student will be able to understand the agriculture conservation strategies, technology and integrated farming system.
4. Study the resource use efficiency and flow of energy in different farming system.

UNIT I: Farming System Farming System- scope, importance, and concept, Types and systems of farming system and factors affecting types of farming, Farming system components and their maintenance, Cropping system and pattern, multiple cropping system.

UNIT II: Cropping System and Sustainable Agriculture Efficient cropping system and their evaluation, Allied enterprises and their importance, Tools for determining production and efficiencies in cropping and farming system; Sustainable agriculture-problems and its impact on agriculture, indicators of sustainability.

UNIT III: Agriculture Strategies Adaptation and mitigation, conservation agriculture strategies in agriculture, HEIA, LEIA and LEISA and its techniques for sustainability, Integrated farming system- historical background, objectives and characteristics, components of IFS and its advantages, Site specific development of IFS model for different agro-climatic zones.

UNIT IV: Agricultural Resource Resource use efficiency and optimization techniques, Resource cycling and flow of energy in different farming system, farming system and environment,

UNIT V: Visit of IFS model in different agro-climatic zones of nearby states University/ institutes and farmers field. cycling and flow of energy in different farming system, farming system and environment, Visit of IFS model in different agro-climatic zones of nearby states University/ institutes and farmers field.

TEXTBOOKS

1. Fundamentals of Agriculture- Arun Katyayan, Kushal Publication.
2. Principles of Agronomy- T. Yellamanda Reddy and G. H. Sankara Reddy, Kalyani Publisher.

3. Handbook of Agriculture- Indian Council of Agricultural Research (ICAR), New Delhi.Update edition.
4. Cropping system and Farming System- Panda S.C. 2004. Agrobios (India) Jodhpur.

REFERENCE BOOKS

1. Fundamentals of Agronomy- Gopal Chandra De, Oxford and IBH Publishing Co. Pvt. Ltd.
2. A Handbook of Organic Farming- Arun K. Sharma, Agribios. (India) Ltd. Jodhpur.
3. Cropping Systems in the Tropics: Principles and Management- Palaniappan, S.P. and
4. Sivaraman, K. 1996. New AgePubl.
5. Sustainable Agriculture- Rajeev K. Shukla. 2004. Surbhee Publication, Jaipur.

SUBJECT CODE & NAME: PTSPPBG10T / PROFESSIONAL PROFICIENCY**(B.Sc. Ag.)- I****COURSE OUTCOMES**

1. Better representation of himself/ herself in terms of communication skills, overall personality development and aptitude building required for Government & Non-government jobs.
2. This program will help students employable and ready for Seed Company, Fertilizer Company, Agro-Industries/ Dairy & Poultry based Industries /Corporate/ CSR project and other Public and Private Sector, Non -Governmental Organization jobs.

UNIT I: Hard skill includes Basic Grammar, Vocabulary, Articles, Tenses, Construction of Sentences and Reading Comprehension etc.

UNIT II: Communication Skill

Efforts should be made to overcome the initial hesitation of speaking English of students and hence improve their fluency in English. Suggested methods include:

- Follow only English language in the class.
- Class should be interactive and students should always be engaged in some kind of conversation.
- Each student should speak 5 minutes, 3-4 times in 1st semester on topics of his choice selected from Social, Global Warming & Climate Change, Environment & Disaster Management, Agricultural Issues, Agri- Entrepreneurship and Agri-Economics, Dairy, Poultry and Agro-Industries, Agriculture Journalism, Politics, World Affairs and Religion etc.

In the above process students should be regulated towards better Vocabulary and Pronunciation.

UNIT III:**Aptitude****Building****Quantitative****Aptitude**

Basic Calculations: BODMAS rule, Square and square root, Cube and cube root, Different types of numbers, Divisibility rule, Fraction and comparison of fraction.

Number System: Multiples, Factors Remainder, Remainder Theorem, Unit Place, Number formation, Factorial, LCM and HCF Finding and its application. Percentage: Basics of percentage and its calculation, Comparison of percentage, How to use in data interpretation, Venn diagram. Logical Reasoning, Coding and decoding Number Series Blood Relation.

SUBJECT CODE & NAME: AGUCBG110T / ELEMENTARY MATHEMATICS**COURSE OUTCOMES**

1. Study the basics of straight line, general, normal and angles with equation of line.
2. Student will be able to understand the equation of circle along with the problem.
3. Understand the concept of differential calculus its functions with inverse trigonometric function.
4. Study the integral calculus, matrices, addition, subtraction and multiplication with determinants & their evaluation

UNIT I: Line and Equation

Straight lines: Distance formula, section formula (internal and external division), Change of axes (only origin changed), Equation of co-ordinate axes, Equation of lines parallel to axes, Slope-intercept form of equation of line, Slope-point form of equation of line, Two point form of equation of line, Intercept form of equation of line, Normal form of equation of line, General form of equation of line, Point of intersection of two st. lines, Angles between two st. lines, Parallel lines, Perpendicular lines, Angle of bisectors between two lines.

UNIT II: Circle and Equation Area of triangle and quadrilateral. Circle: Equation of circle whose centre and radius is known, General equation of a circle, Equation of circle passing through three given points, Equation of circle whose diameters is line joining two points (x_1, y_1) & (x_2, y_2) , Tangent and Normal to a given circle at given point (Simple problems), Condition of tangency of a line $y = mx + c$ to the given circle $x^2 + y^2 = a^2$.

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

UNIT IV: Integral Calculus Maxima and Minima of the functions of the form $y=f(x)$ (Simple problems based on it). Integral Calculus: Integration of simple functions, Integration of Product of two functions, Integration by substitution method, Definite Integral (simple problems based on it), Area under simple well-known curves (simple problems based on it).

UNIT V: Matrices Matrices and Determinants: Definition of Matrices, Addition, Subtraction, Multiplication, Transpose and Inverse up to 3rd order, Properties of determinants up to 3rd order and their evaluation.

TEXTBOOKS

1. Mathematics text books for class XII (2018)- NCERT, New Delhi.
2. A text books for Elementary Mathematics- Yogesh D. Zanzane and Anand R. Reshimkar, Universal Prakashan, Pune.
3. Mathematics textbooks for class X (2018), NCERT, New Delhi.

REFERENCE BOOKS

1. Understanding Geometry for a Changing World: Seventy-first Yearbook- Tim Craine and Rheta Rubenstein, National Council of Teachers of Mathematics.
2. Vectors, Matrices and Geometry- K. T. Leung & S. N. Suen, Hong Kong University Press.
3. What is Mathematics? An Elementary Approach to Ideas and Methods- Richard Courant & Herbert Robbins, Oxford University Press.
4. The Book of Squares- Leonardo Pisano Fibonacci, Academic Press, Inc.

SUBJECT CODE & NAME: AGUCBG201T/ FUNDAMENTALS OF GENETICS**COURSE OUTCOMES**

1. Study the Mendelian Principles and law of inheritance with the cell cycle & cell division.
2. Student will be able to understand the Probability and Sex determination and linkage along with the chromosome mapping.
3. Student will be able to understand the chromosome, variation of chromosome and mutation and its classification & technique.
4. Student will be able to understand traits, genetic material & disorders along with concept of gene.

UNIT I:**Mendelian Principles and Theory of inheritance**

Pre and Post Mendelian concepts of heredity, Mendelian principles of heredity. Architecture of chromosome; chromonematic, chromosome matrix, chromomeres, centromere, secondary constriction and telomere; special types of chromosomes. Chromosomal theory of inheritance- cell cycle and cell division- mitosis and meiosis.

UNIT II**Probability and Sex determination**

Probability and Chi-square, Dominance relationships, Epistatic interactions with example. Multiple alleles, pleiotropism and pseudo alleles, Sex determination and sex linkage, sex limited and sex influenced traits, Blood group genetics, Linkage and its estimation, crossing over mechanisms, chromosome mapping.

UNIT III:**Chromosome and Mutation**

Structural and numerical variations in chromosome and their implications, Use of haploids, diploids and doubled haploids in Genetics. Mutation, classification, Methods of inducing mutations & CIB technique, mutagenic agents and induction of mutation.

UNIT IV:

Traits

Qualitative & Quantitative traits, Polygenes and continuous variations, multiple factor hypothesis, Cytoplasmic inheritance. Genetic disorders. Nature, structure & replication of genetic material. Protein synthesis, Transcription and translational

UNIT V:

Genetic Material

mechanism of genetic material, Gene concept: Gene structure, function and regulation, Lac and Trp operons. Transcription and translational mechanism of genetic material, Gene concept: Gene structure, function and regulation, Lac and Trp operons.

TEXTBOOKS

1. Fundamentals of Genetics- B.D. Singh, Kalyani Publishers.
2. Genetics- P.K. Gupta, Rastogi Publication.
3. Genetics- Robert I. Booker, McGraw Hill Deep Learning by Ian Goodfellow, Yoshua Bengio, and Aaron Courville, 1st Edition (2016)

REFERENCE BOOKS

1. Genetics (3rd edn.)- M.W, Strickberger, Mac Millan Publishing Co., New Delhi.
2. Concepts of Genetics- W.S. Klug. and M.R Cummings, Charles E. Merill Publishing Co., London.
3. Genetics- M.W. Strickberger, Prentice Hall of India Pvt. Ltd., New Delhi.
4. Concept of Genetics- W.S. Klug, and M.R Cummings, Pearson Education (Singapore) Pvt. Ltd., New Delhi.

E-RESOURCES AND OTHER DIGITAL MATERIALS:

1. Coursera: Courses like "Machine Learning" by Andrew Ng, "AI For Everyone," and "Deep Learning Specialization" are widely regarded.
2. edX: Offers courses such as "CS50's Introduction to Artificial Intelligence with Python" from Harvard, and "Principles of Machine Learning" from Microsoft.
3. Udacity: Known for its "Artificial Intelligence Nanodegree," "Deep Learning Nanodegree," and other specialized AI courses.
4. MIT Open Course Ware: Offers free courses like "Artificial Intelligence," "Deep Learning for Self-Driving Cars," and "Advanced Machine Learning."

Subject code & name: AGUCBG201P / FUNDAMENTALS OF GENETICS**Course outcome**

1. The aim of indicated course lab is to elaborate the student theoretically with emphasized on skilling of practical for deep & knowledgeable understanding of basic process and purposes of the cell structure, meiosis, and mitosis, as well as predict the outcomes.
2. The course will consist of lecture (both theory and practical) in the lab.
3. Illustrate the mainly practical oriented topics.
4. Evaluation will be done not on the theory but on the basis of field practical & assignment.
5. Aim of study to practically skilled the student on the scale of learning by doing.

Objectives:

1. Study of microscope: parts and types
2. Eye piece, body tube, objective lens, coarse adjustment knob, fine adjustment knob, nose piece, hole clip, vertical arm, types.
3. Study of cell structure onion peel
4. Stained temporary mount of onion, record and draw labelled diagram, apparatus, compound microscope.
5. Preparation of microscopic slides of mitosis -onion root tips
6. Mount of onion root tips cells, compound microscope, acetocarmine stain, water, burner, n/10 hydrochloric acid, filter paper, coverslip, aceto alcohol.
7. Preparation of microscopic slides of meiosis –tradercantia/onion /wheat inflorescence
8. Plant material, multistage staining, compound microscope, cell division, tradercantia/onion/ wheat inflorescence, acetocarmine stain, glass slides, cover slips.
9. Methods of finding out the gametes and gametic recombination
10. Bracket method, checker board method.
11. Problems on monohybrid and dihybrid cross
12. Monohybrid, contrasting character, phenotypic ratio, dihybrid, parents, law of independent, normal dihybrid ratio.
13. Experiments on trihybrid cross
14. Parents, three pairs of contrasting characters, trihybrid cross. Phenotypic ratio.
15. Experiments on test cross and back cross hybrid (f1), homozygous recessive parent, f1, parents, typical monohybrid, dihybrid and trihybrid test cross ratio.
16. Gene interaction– i gene interaction without modification of f2 ratio (comb-shape) and complementary gene interaction typical dihybrid ratio, complementary gene action.

17. Gene interaction– ii
18. Gene interaction with modification of f2 ratio: supplementary factor, epistasis factor, inhibitory factor supplementary gene action (9:3:4), inhibitory gene action (13:3).
19. Gene interaction– iii gene interaction with modification of f2 ratio: additive factor, duplicate factor and lethal factor additive factors (9:6:1), duplicate factors (15: 1 ratio), lethal factor (2:1 ratio).
20. Problems on probability
21. Principles of classical genetics: segregation, independent assortment, independent events.
22. Problems on chi-square test
23. Significance test, closely observed data, predicted ratio, experimental condition, biased sampling.
24. Determination of linkage and cross over analysis (though two point test cross and three point test cross data)
25. Non crossover, single cross over (sco), double cross over (dco), coefficient of coincidence, observed double crossover frequency, expected double crossover frequency, interference.
26. Study on sex linked inheritance in drosophila
27. Sex chromosomes, non-sexual characters, colour blindness, haemophilia in human, white-eye colour, sex linked inheritance.
28. Study of models on dna and rna structure
29. Model of watson and crick, double helix, mrna, rna and clover leaf structure of trna.

Manual

1. "microscopy and cell study" by david m. Freifelder, 4th edition – a comprehensive guide on microscope parts and usage.
2. "basic practical manual of cell biology" by robert a. Meyers, 3rd edition – covers cell structure study, including onion peel preparation.
3. "techniques in plant cytogenetics" by p.k. Gupta, 2nd edition – focuses on preparing mitosis slides using onion root tips.
4. "laboratory manual in genetics" by d.c. Sharma, 1st edition – includes experiments on meiosis in tradescantia and genetic recombination methods.
5. "classical genetics problems and solutions" by a.j. Simmons, 5th edition – a manual for solving monohybrid, dihybrid, and trihybrid crosses.

SUBJECT CODE & NAME: AGUCBG202T/ FUNDAMENTALS OF PLANT PATHOLOGY**COURSE OUTCOMES**

1. Student will be able to understand the plant diseases and its classification with causing pathogens.
2. Study of nomenclature, fungi and bacteria with sexual and asexual reproduction system of plants.
3. Study of viruses, nematodes and its replication, transmission with types of pathogens.
4. Student will be understanding the concept of dispersal of pathogens, roles of enzymes, formulation of fungicide and antibiotics with plant disease management.

Unit 1- Plant Pathology and Disease Classification

Introduction: Importance of plant diseases, scope and objectives of Plant Pathology. History of Plant Pathology with special reference to Indian work. Terms and concepts in Plant Pathology. Pathogenesis. Causes / factors affecting disease development: disease triangle and tetrahedron and classification of plant diseases. Important plant pathogenic organisms, different groups: fungi, bacteria, fastidious vesicular bacteria, phytoplasmas, Spiro plasmas, viruses, viroid's, algae, protozoa, phanerogamic parasites and nematodes with examples of diseases caused by them. Diseases and symptoms by abiotic stress.

Unit 2- Fungi and Bacteria

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

Unit 3- Viruses and Nematodes

Viruses: nature, structure, replication and transmission. Study of phanerogamic plant parasites. Nematodes: General morphology and reproduction, classification, symptoms and nature of damage caused by plant nematodes (Heterodera, Meloidogyne, Anguina, Radopholus etc.) Growth and reproduction of plant pathogens. Liberation / dispersal and survival of plant pathogens. Types of parasitism and variability in plant pathogens.

Unit 4- Pathogenesis and Disease Management

Liberation/ dispersal and survival of plant pathogens. Types of parasitism and variability in plant pathogens. Pathogenesis. Role of enzymes, toxins and growth regulators in disease development. Defense mechanism in plants. Epidemiology: Factors affecting disease development.

Unit 5- Disease Management

Principles and methods of plant disease management. Nature, chemical combination, classification, mode of action and formulations of fungicides and antibiotics.

Recommended Text Books

1. Plant Pathology- P.D. Sharma, Rastogi Publications.
2. Plant Pathology- G.N. Agrios, 5th edition. Academic Press, Network.
3. Essentials of Plant Pathology- V. N. Pathak. 1972. Prakash Publ., Jaipur.
4. Recommended Reference Books
5. Introductory Plant Pathology- M. N. Kamat. 1967. Prakash n, Jaipur.
6. Plant diseases by R. S. Singh, Oxford and IBH Publishing.
7. Soil Microbiology- Rao Oxford and IBH Publishing.
8. Plant Pathology- G. N. Agrios, Elsevier Academic press, London.

REFERENCE BOOK

1. "Plant Pathology" by George N. Agrios, 5th Edition – A widely recognized textbook covering the fundamentals of plant diseases.
2. "Introduction to Principles of Plant Pathology" by R.S. Singh, 4th Edition – A detailed guide on the basic concepts of plant pathology.
3. "Essentials of Plant Pathology" by V.N. Pathak, 2nd Edition – An essential manual that discusses various plant diseases and their management.
4. "Plant Pathology: Concepts and Laboratory Exercises" by Bonnie H. Ownley and Robert N. Trigiano, 3rd Edition – Focuses on both theory and practical applications in plant pathology.
5. "Fundamentals of Plant Pathology" by N.G. Ravichandra, 1st Edition – A comprehensive reference that explains key plant pathology principles and practices.

E-RESOURCES AND OTHER DIGITAL MATERIALS:

1. "Plant Pathology" by George N. Agrios, 5th Edition, Available on: Google Books or Elsevier ScienceDirect.
2. "Introduction to Principles of Plant Pathology" by R.S. Singh, 4th Edition, Available as an e-book on: Google Books or Springer Link.
3. "Essentials of Plant Pathology" by V.N. Pathak, 2nd Edition, Available on: Google Scholar or ResearchGate.
4. "Plant Pathology: Concepts and Laboratory Exercises" by Bonnie H. Ownley, 3rd Edition, Available through: Google Books or Wiley Online Library.
5. "Fundamentals of Plant Pathology" by N.G. Ravichandra, 1st Edition, Available on: Google Books or academic platforms like Springer Link.

SUBJECT CODE & NAME: AGUCBG202P/ FUNDAMENTALS OF PLANT PATHOLOGY

COURSE OUTCOMES

1. Understand the importance of laboratory equipment and study the different diseases with collection and preservation of insects.
2. Skilled on preparation of media and study of different structure of fungi, symptoms of different diseases.
3. Study and identification of plant pathogenic bacteria, viruses and plant parasitic nematodes.
4. Study of fungicide, pesticide application & skilling on spray with extraction of nematodes from soil and plant materials

OBJECTIVES

1. Acquaintance with various laboratory equipments and microscopy microscope, autoclave, pressure cooker, hot air oven, bod incubator, refrigerator, fermentor, inoculation chamber/ laminar flow, centrifuge, Spectrophotometer or colorimeter, ph meter.
2. Collection and preservation of disease specimen field trips, collect specimens, leaf specimens, dry specimens, mounting, Paper board, preservative solution, water, formaldehyde (40 percent), ethyl alcohol (95 percent).
3. Preparation of media, isolation and koch's postulates agr medium, powder form, tubes, sterilize, sterile petri dishes, fruit/ vegetable/plant tissue, plate, organism, symptoms shown, suspected pathogen, pure culture, original observation, re-isolate organism.
4. General study of different structures of fungi yeast, nucleus, vacuole, mitochondria, golgi apparatus, endoplasmic Reticulum, hyphae, mycelium.

5. Study of symptoms of various plant diseases mold or fungal spores, bacterial ooze, syndrome, local infection, systemic infection, lesion, local lesion, morphological symptoms, histological symptoms.
6. Study of representative fungal generaphycomycetes (lower fungi), ascomycetes (sac fungi), basidiomycetes (club fungi), deuteromycetes (fungi imperfecti).
7. Staining and identification of plant pathogenic bacteria characteristics; gram reaction, cell wall composition, susceptibility to penicillin, basic dyes, dark violet or purple, red or brown, more Resistant, less resistant.
8. Transmission of plant viruses non persistent (style borne), semi persistent (fore gut borne), persistent Circulative, persistent propagative.
9. Study of phanerogamic plant parasites parasitic plant, haustorium, phanerogamic parasitic plant, symptoms, systematic position, control.
10. Study of morphological features and identification of plant parasitic nematodes symptoms, above ground: chlorosis (yellowing), stunted top growth, wilt more readily, below ground: stunted root growth, root rotting, root lesions, field history, laboratory assay of soil /plant samples.
11. Sampling and extraction of nematodes from soil and plant material, preparation of nematode mounting dissection, baermann funnel, funnel spray method, blender nematode filter method, blender centrifugal flotation method, nematode cotton wool filter method, decanting and sieving: cobb's method.
12. Study of fungicides and their formulations fungistat, antisporeulant, protectant, therapeutant, eradicant, based on general uses, based on chemical composition, sulphur fungicides, copper fungicides, mercury fungicides, systemic fungicides, other Fungicides, emulsifiable concentrates (ec), wettable powders (wp), granules (pellets), dispersing agents, emulsifying agents.
13. Methods of pesticide application and their safe Use dusting, spraying, granular application, seed pelleting/seed dressing, Seedling root dip, sett treatment, trunk/ stem injection, padding.

14. Calculation of fungicide sprays concentrations LD_{50} values, extremely toxic, highly toxic, moderately toxic, slightly Toxic (least toxic)

PRACTICAL MANUAL

1. "Practical Manual of Plant Pathology" by P.D. Sharma, 2nd Edition – A hands-on guide for conducting experiments in plant pathology.
2. "Laboratory Manual for Plant Pathology" by S. Shukla and S. K. Agarwal, 1st Edition – Offers practical techniques and protocols for studying plant diseases.
3. "Plant Pathology: A Practical Approach" by J. W. Kloepper, 1st Edition – Focuses on practical applications and methodologies in plant pathology.
4. "Field and Laboratory Methods for General Ecology" by S. J. McGowan, 3rd Edition – While broader in scope, includes essential techniques applicable to plant pathology.
5. "Plant Disease Management: A Practical Guide" by H. C. Kelsey, 1st Edition – Covers practical approaches to managing plant diseases in the field.

SUBJECT CODE & NAME: AGUCBG203T/ AGRICULTURAL MICROBIOLOGY**COURSE OUTCOMES**

1. Study the Prokaryotic and eukaryotic microbes with bacterial autotrophy and growth.
2. Study the bacterial genetics and role of microbes in soil fertility and crop production.
3. Student will be able to understand the concept of different nutrient cycle and symbiotic and asymbiotic nitrogen fixation of the crop.
4. Study about the azolla, different Blue green algae and microbes used in agro-industry for the human welfare.

Unit 1- Prokaryotic and eukaryotic microbes

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

Unit 2- Bacterial Genetics and Role of microbes

Bacterial genetics: Genetic recombination transformation, conjugation and transduction, plasmids, transposon. Role of microbes in soil fertility and crop production.

Unit 3- Nutrient cycle and Nitrogen fixation

Carbon, Nitrogen, Phosphorus and Sulphur cycles. Biological nitrogen fixation- symbiotic, associative and a symbiotic.

Unit 4- BGA

Azolla, blue green algae and mycorrhiza. rhizosphere and phyllo sphere. Microbes in human welfare: silage production, biofertilizers, biopesticides, biofuel production and biodegradation of agro-waste.

Unit 5- Microbes in human welfare

Silage production, biofertilizers, biopesticides, biofuel production and biodegradation of agro-waste.

RECOMMENDED TEXT BOOKS

1. Agricultural Microbiology- G. Rangaswamy and D.J. Bhagyaraj, Prentice Hall of India Pvt. Ltd. New Delhi.
2. Agricultural Microbiology- Nilangshu Mukherjee, Tapash Ghosh, Kalyani Publishers.
3. Microbiology- E.C.S. Chan, Michael J. Pelczar, Jr., Noel R. Krieg, 1998. Tata McGraw- Hill Edition Pvt. Ltd., India.
4. Soil microbiology- N.S. Rao, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

5. Recommended Reference Books
6. Agricultural Applications of Microbiology- Neelima Rajvaidya, Dilip Kumar Markandey, APH Publishing.
7. Fundamentals of Agricultural Microbiology- K. C. Mahanta, Oxford & IBH Publishing.
8. Plant Pathology- G. N. Agrios, Elsevier Academic press, London.
9. Introductory Plant Pathology- M. N. Kamat. 1967. Prakash Publication, Jaipur.

REFERENCE BOOK

1. "Agricultural Microbiology" by M.J. K. Thomas, 2nd Edition – A comprehensive reference covering the role of microbes in agriculture and soil health.
2. "Microbiology for Sustainable Agriculture" by S.M. S. R. S. Ghosh, 1st Edition – Focuses on sustainable agricultural practices and the microbiological aspects involved.
3. "Principles of Agricultural Microbiology" by S.B. Mehrotra, 3rd Edition – Discusses key principles and applications of microbiology in agriculture.
4. "Soil Microbiology, Ecology, and Biochemistry" by Eldor Paul, 4th Edition – A detailed exploration of soil microorganisms and their impact on agricultural practices.

E-RESOURCES

1. "Agricultural Microbiology" by M.J. K. Thomas, 2nd Edition, Available on: Google Books or Springer Link.
2. "Microbiology for Sustainable Agriculture" by S.M. S. R. S. Ghosh, 1st Edition, Available as an e-book on: Google Scholar or ResearchGate.
3. "Principles of Agricultural Microbiology" by S.B. Mehrotra, 3rd Edition, Available on: Google Books or Wiley Online Library.
4. "Soil Microbiology, Ecology, and Biochemistry" by Eldor Paul, 4th Edition, Available through: Google Books or Taylor & Francis.

SUBJECT CODE & NAME: AGUCBG203P/ AGRICULTURAL MICROBIOLOGY**COURSE OUTCOMES**

1. Understand the microbiology laboratory and its equipment with method of sterilization.
2. Skilled on preparation of nutritional media and isolation & purification of microbial culture.
3. Skilled on staining & microscopic examination with isolation of different bacteria.
4. Understand the method of staining and enumeration of microbes in soil in scientific manner.

OBJECTIVES

1. Introduction to microbiology laboratory and its Equipment's-Common Glassware, Tools, Sterilization of essentials/ glassware, Uses, Precautions in Handling.
2. Study of Compound Microscope- Identification of different parts, Resolving power and numerical apertures, Examination of animate and inanimate objects.
3. Methods of sterilization-Dry heat sterilization, Steam or Wet sterilization.
4. Nutritional media and their preparations-Carbohydrates, Proteins, Beef extract and yeast extract, Amino acids, Growth factors, Solidifying agents, Mineral salts, Liquid Media, Solid Media, semi solid media, Synthetic Media, Non-synthetic Media, Enriched media, Selective media and Differential media.
5. Methods of isolation and purification of microbial cultures-Streaking, Plating, Dilution, Enriched procedure, Single cell techniques.
6. Isolation of Rhizobium, Azotobacter and BGA- Rhizobium: Legume plant root, 70% ethanol, 0.1% mercurous chloride solution, Sterile distilled water, Pipette, YEMA plate, Test tubes. Azotobacter: Nitrogen free medium, Burk's medium. BGA: N₂ free inorganic medium (Pringsheims Medium, 1964).

7. Staining and microscopic examination of microbes-Primary stain, Mordant, Decolorizing agent, Counter stain, clean slides, Inoculation needle, Bacterial cultures, Microscope, Immersion oil, Wet mount and Hanging drop technique.
8. Enumeration of Microbial population in soil bacteria, fungi and actinomycetes- Nutrient agar, Jensen's media, Savoured media, Enumeration of heterotrophic bacteria, Fungi, Pour plating technique, Colony counter, CFU.

Practical manual

1. "Bergey's Manual of Determinative Bacteriology" by John G. Holt, 9th Edition – A comprehensive reference for identifying and classifying bacteria.
2. "Laboratory Manual of Microbiology" by K. J. K. B. Thambiraja, 1st Edition – Offers practical techniques and experiments in microbiology.
3. "Microbiology: A Laboratory Manual" by James G. Cappuccino and Natalie R. Sherman, 10th Edition – A detailed manual with protocols and exercises for microbiology students.
4. "Clinical Microbiology Procedures Handbook" by Lynne S. Garcia, 4th Edition – A practical guide for laboratory procedures in clinical microbiology.
5. "Practical Microbiology: A Laboratory Manual" by N. R. E. R. Shivshankar, 1st Edition – Focuses on hands-on techniques and practical applications in microbiology.

**SUBJECT CODE & NAME: AGUCBG204T/ SOIL AND WATER
CONSERVATION ENGINEERING****OBJECTIVE:**

This course is developed to facilitate students a broad & deep understanding about the conservation and management of Soil and Water Resources with maximum sustained level of production from a given area of land by preventing soil degradation and environmental pollution.

Course Outcomes

1. Study the soil and water erosion its causes with different forms of erosion.
2. Student will be able to understand the concept of gully formation, land degradation and soil loss estimation.
3. Study of principle of erosion, control methods with contouring, different bunds along with design.
4. Student will be able to understand the concept & technology of water harvesting along with wind erosion and its control.

Unit 1- Soil Erosion & Water Erosion

Introduction to Soil and Water Conservation, causes of soil erosion. Definition and agents of soil erosion, water erosion: Forms of water erosion.

Unit 2- Gully & Soil Loss Measurements

Gully classification and control measures. Soil loss estimation by universal Loss Soil Equation. Soil loss measurement techniques.

Unit 3- Erosion Control

Principles of erosion control: Introduction to contouring, strip cropping. Contour bund. Graded bund and bench terracing. Grassed water ways and their design.

Unit 4- Water Harvesting and Wind Erosion

Water harvesting and its techniques. Grassed water ways and their design

Unit 5- Wind Erosion

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

RECOMMENDED TEXT BOOKS

1. Principles of soil conservation and water management Hanumappa Ramappa Arakeri, Roy Luther Donahue Rowman & Allan held.
2. Land and water management engineering-V.V.N. Murthy (1982), Kalyani Publishers, New Delhi.
3. Watershed Management- Vijay P. Singh, Ram Narayan Yadava, Allied Publishers.
4. Handbook of Agriculture- ICAR, New Delhi.

REFERENCE BOOK

1. "Soil and Water Conservation Engineering" by R. K. Sharma, 1st Edition – A comprehensive guide covering the principles and practices of soil and water conservation.
2. "Soil and Water Conservation Engineering" by R. F. D. T. DeVries, 2nd Edition – Discusses engineering techniques for effective soil and water conservation.
3. "Principles of Soil and Water Conservation" by H. H. B. Wilkerson, 3rd Edition – Focuses on the fundamental principles of conserving soil and water resources.
4. "Soil and Water Conservation: A Global Perspective" by H. H. B. Wilkerson and R. E. D. Moore, 1st Edition – Explores soil and water conservation strategies worldwide.

E-RESOURCES

1. "Soil and Water Conservation Engineering" by R. K. Sharma, 1st Edition, Available on: Google Books or Springer Link.
2. "Principles of Soil and Water Conservation" by R. H. Gardner, 2nd Edition, Available as an e-book on: Google Scholar or Wiley Online Library.
3. "Soil Conservation: A World Perspective" by J. M. McGregor, 1st Edition, Available on: Google Books or ResearchGate.
4. "Water Resources Engineering" by Larry W. Mays, 3rd Edition, Available through: Google Books or Taylor & Francis.
5. "Soil and Water Conservation Engineering" by P. C. Mohan, 1st Edition, Available on: Google Books or Amazon Kindle.

SUBJECT CODE & NAME: AGUCBG204P/ SOIL AND WATER CONSERVATION ENGINEERING**OBJECTIVE:**

The aim of this lab is to teach the student theoretically as well as with more emphasized on practically for better skilling of students with basic knowledge of soil and water conservation and/or improvement of soil and water resources for economic and recreational purposes.

1. The course will consist of lecture (both theory & practical) in the lab.
2. Prime aim of study to practically skilled the student in field level as well as in machinery.
3. Evaluation will be done not on the theory basis but on the basis of field and numerical exercises.
4. Emphasized mainly the field practical oriented topics.

COURSE OUTCOMES

1. Understand and recognize the status and importance of soil conservation in India and U.P.
2. Skilled on calculation and estimation of erosion and soil loss along with preparation of map.
3. Skilled on design of contour & numerical of contour bunds, power heads, velocity heads, horse power etc.
4. Skilled on measurement of irrigation water, drip irrigation and sprinkler irrigation with its components.

OBJECTIVE

1. General status of soil conservation in India and Uttar Pradesh- Soil, detachment, transportation, Deposition, Status, Importance
2. Calculation of erosion index-Empirical Models, Semi Empirical Models, Physical Process-based Model.
3. Estimation of soil loss-Simulation model, USLE model-4- Preparation of contour maps Estimating Contour Intervals, Engineering scale.

4. Numerical on design of contour bunds- Vertical interval, Horizontal interval, Bund cross-section, Earth work, Bunding.
5. Numerical problems on friction heads, velocity heads, total heads and horse power calculation of pumps, Concrete lined (100mm), Cast iron (100mm), P.V.C. (100mm & 25mm), Galvanised iron (25mm), Polyethylene (25mm).
6. Measurement of irrigation water in the field by different methods and related numerical- Desired flow rate, Measure the height the water, estimate friction losses from the pipe, Measure the flow rate, Specific gravity of the fluid, Values into the water horsepower formula.
7. Study of different component of drip irrigation system-Point-source emitters (drip bubbler), In-line drip emitter, Basin bubblers, Micro spray sprinkler.
8. Study of different component of Sprinkler Irrigation system-Pump and prime mover, Water source, Pipe network, Emitting devices, Control devices, Filtration devices, Chemical injectors.
9. Visit to nearby Watersheds- Nearest Watershed.

PRACTICAL MANUAL

1. "Soil and Water Conservation Engineering" by R. K. Sharma, 1st Edition – A practical manual providing techniques and practices for soil and water conservation.
2. "Manual of Soil and Water Conservation" by C. H. R. Hill, 2nd Edition – Offers comprehensive guidelines for implementing soil and water conservation measures.
3. "Engineering Principles of Water Resources" by S. K. Gupta, 1st Edition – Focuses on engineering solutions for water resource management and conservation.
4. "Soil Conservation: A Practical Manual" by R. E. B. Brown and D. L. Smith, 1st Edition – A hands-on manual that discusses practical approaches to soil conservation.
5. "Soil and Water Conservation Engineering: A Practical Guide" by P. C. Mohan, 1st Edition – Details practical applications and methodologies for effective soil and water conservation.

SUBJECT CODE & NAME: AGUCBG205T/ INTRODUCTION TO REMOTE SENSING AND GIS**COURSE OUTCOMES**

1. Study the remote sensing with its fundamental principles and interaction processes.
2. Student will be to understand the remote sensing platforms, sensors with scattering.
3. Study the visual image interpretation, resolution along with application of GPS and GIS & its components.
4. Student will be able to understand the concept of GPS principles, services with GPS positioning system.

Topic 1- Remote Sensing and types

Introduction to remote sensing- Definitions, types of remote sensing, Fundamental principle of remote sensing, Remote sensing interaction processes.

Topic 2- Platforms and sensors

Electromagnetic energy, Remote sensing platforms and sensors, Resolutions and their types, EMR- Atmosphere interaction, Radiation matter and interaction, Scatterings.

Topic 3- Visual Image Interpretation and Digital Image

Visual Image interpretation, Pattern, Tone, Texture, Shadow, Site, Resolution, Digital Image and Digital Image Processing Applications of Remote sensing, Introduction of GPS.

Topic 4- GPS and GIS

GPS segments, GPS Principle, GPS services, GPS positioning system, GPS antennas Application of GPS.

Topic 5- GIS

Introduction of GIS, Definitions, History of GIS, GIS data. DBMS and Applications of GIS Components of GIS.

RECOMMENDED TEXT BOOKS

1. Text book of Remote Sensing and Geographical Information System- M. Anji Reddy, Fourth edition, B.S. Publication.
2. Text book of Remote Sensing and Geographical Information System- Kali Charan Sahu, Atlantic Publishers & Distributors (P) Ltd.
3. Remote Sensing and GIS- Basudeb Bhatta, Oxford higher education, Oxford University Press.
4. Fundamentals of Remote Sensing- George Joseph and C Jeganathan, Third edition, University Press.

RECOMMENDED REFERENCE BOOKS

1. Concept of Cartography Remote Sensing and GIS- K.K. Maltiar & S.R. Maltiar, Rajesh Publication.
2. Remote Sensing Principles and Applications- B.C. Panda, Viva Books Private Limited.
3. An Introduction to Geographic Information Technology- Sujit Choudhury, D. Chakrabarti & S. Choudhury, I K International.
4. Advanced Surveying: Total Station GPS, GIS & Remote Sensing, Second Edition- Gopi Satheesh, R. Sathikumar & N. Madhu, Pearson Paperback.

E-Resources

1. "Introduction to Remote Sensing" by James B. Campbell and Randolph H. Wynne, 5th Edition, Available on: Google Books or Wiley Online Library.
2. "Geographic Information Systems and Science" by Paul A. Longley *et al.*, 4th Edition, Available as an e-book on: Google Scholar or ResearchGate.
3. "Remote Sensing and Image Interpretation" by Thomas Lillesand *et al.*, 7th Edition Available through: Google Books or Wiley Online Library.
4. "Fundamentals of Geographic Information Systems" by Michael N. DeMers, 5th Edition. Available on: Google Books or Springer Link.

SUBJECT CODE & NAME: AGUCBG205P/ INTRODUCTION TO REMOTE SENSING AND GIS**COURSE OUTCOMES**

1. Student will be able to understand the concept of electromagnetic spectrum with study of abbreviation and full forms of remote sensing and GIS.
2. Study the basic terms and definitions related with remote sensing and GIS for better understanding of the subject.
3. Skilled on Arc-GIS, ERDAS- Imagine and Gram++ with its working and application in agricultural field.
4. Trained on identification of Global Positioning System, Differential Global Positioning System along with tools application.

OBJECTIVE

1. Electromagnetic spectrum - Radio waves (e.g., commercial radio and Television, microwaves, radar), Infrared radiation, Visible light, Ultraviolet radiation, X-rays, and Gamma rays.
2. Full forms of abbreviation related with RS and GIS-Decodes, Abbreviations and Acronyms.
3. Write the 25 terms and definitions related with RS and GIS- Almanac, Altitude, Annotation, Analysis, Band, Arc, ArcCatalog, ArcGIS, ArcMap.
4. To study about the Arc-GIS, History, working and applications- GIS evolving, ArcGIS database, Key database concept, Geodatabase storage.
5. To study about the ERDAS-Imagine, History, working and applications - The Intelligent Viewer, LiDAR Tools, Terrain Tools, Spectral Tools, Radar Tools, Spatial Model Editor, History.
6. To study about the Gram++, History, working and applications - Software, GRAM++ GIS, Low-cost, GIS software -CSRE.
7. Identification of GPS tools - Mapping Tools, Google Maps, Google Earth.

8. Identification of DGPS tools- Differential Correction, Geodetic/ High Precision Applications, Differential GPS survey, Differential GPS Positioning, Limitation & Errors of GPS/ DGPS.
9. GIS software- Desktop GIS, Other geospatial tools, Web map servers, Spatial database management systems, Cataloging application.

PRACTICAL MANUAL

1. "Manual of Remote Sensing" by M. H. David, 3rd Edition – A practical guide covering the techniques and applications of remote sensing in various fields.
2. "Remote Sensing: Principles and Applications" by R. A. Schowengerdt, 2nd Edition – Offers detailed methodologies for remote sensing data collection and analysis.
3. "GIS and Remote Sensing Applications in the Environment" by R. A. H. Dale and J. E. M. T. W. Hu, 1st Edition – Focuses on integrating GIS and remote sensing for environmental applications.
4. "Remote Sensing and GIS for Ecologists: A Practical Guide" by A. S. H. Parrott, 1st Edition – Provides practical techniques for using remote sensing and GIS in ecological research.
5. "Introduction to Remote Sensing and GIS: A Practical Approach" by R. K. J. L. Naidu and K. A. D. R. L. Rao, 1st Edition – A hands-on manual that integrates remote sensing and GIS methodologies for practical applications.

SUBJECT CODE & NAME: AGUCBG206T/ FUNDAMENTALS OF ENTOMOLOGY FUNDAMENTALS OF ENTOMOLOGY**COURSE OUTCOMES**

1. Study the history of insect with classification of phylum with animal kingdom & morphology of insect.
2. Student will be able to understand the insect digestive, respiratory & reproductive system with other physiological.
3. activities along with environment & ecology of insect.
4. Student will be able to understand the concept of integrated pest management its scope with the recent method of pest control.
5. Study the taxonomy with nomenclature and classification of class insect upto order.
6. Study the important order and families with special emphasis on Agricultural importance.

Topic 1- Animal Kingdom and Morphology of Insect

History of Entomology in India. Major points related to dominance of Insecta in Animal kingdom. Classification of phylum Arthropoda up to 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. 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.

Topic 2- Insect Physiology and Insect Ecology

Structure and functions of digestive, circulatory, excretory, respiratory, nervous, secretary (Endocrine) and reproductive system, in insects. Types of reproduction in insects. Major sensory organs like simple and compound eyes, chemoreceptor. Insect Ecology: Introduction, Environment and its components. Effect of abiotic factors–

temperature, moisture, humidity, rainfall, light, atmospheric pressure and air currents. Effect of biotic factors– food competition, natural and environmental resistance.

Topic 3- IPM and Insecticides

Categories of pests. Concept of IPM, Practices, scope and limitations of IPM. Classification of insecticides, toxicity of insecticides and formulations of insecticides. Chemical control importance, hazards and limitations. Recent methods of pest control, repellents, anti-feed ants, hormones, attractants, gamma radiation. Insecticides Act 1968- Important provisions. Application techniques of spray fluids. Symptoms of poisoning, first aid and antidotes.

Topic 4- Taxonomy and Classification of Insecta

Systematics: Taxonomy –importance, history and development and binomial nomenclature. Definitions of Biotype, Subspecies, Species, Genus, Family and Order. Classification of class Insecta upto Orders, basic groups of present day insects with special emphasis to orders and families of Agricultural importance like Orthoptera: Acrididae, Tettigonidae, Gryllidae, Gryllotalpidae; Dictyoptera: Mantidae, Blattidae; Odonata; Isoptera: Termitidae; Thysanoptera: Thripidae; Hemiptera: Pentatomidae, Coreidae, Cimicidae, Pyrrhocoridae, Lygaeidae.

Topic 5- Important Orders and Families

Cicadellidae, Delphacidae, Aphididae, Coccidae, Lophophidae, Aleurodidae, Pseudococcidae; Neuroptera: Chrysopidae; Lepidoptera: Pieridae, Papilionidae, Noctuidae, Sphingidae, Pyralidae, Gelechiidae, Arctiidae, Saturnidae, Bombycidae; Coleoptera: Coccinellidae, Chrysomelidae, Cerambycidae, Curculionidae, Bruchidae, Scarabaeidae; Hymenoptera: Tenthredinidae, Apidae. Trichogrammatidae, Ichneumonidae, Braconidae, Chalcididae; Diptera: Cecidomyiidae, Tachinidae, Agromyziidae, Culicidae, Muscidae, Tephritidae.

RECOMMENDED TEXT BOOKS

1. The Insect: Structure and Function- R.F. Chapman, Cambridge University Press.
Elements of Entomology- Rajendra Singh, Rastogi Publications.
2. General entomology- M.S. Mani. 1968. Oxford and IBH Publishing Co. Pvt Ltd.,
New Delhi, 912p.
3. Principles of Insect Morphology- R.E. Snodgrass. 2001. CBS Publishers and
Distributors, New Delhi.

RECOMMENDED REFERENCE BOOKS

Integrated Pest Management- G.S. Dhaliwal and Ramesh Arora, Kalyani Publisher.

Principles of Insect Morphology- R. E. Snodgrass, Cornell University Press.

Entomology and pest management- L.P. Pedigo, 1999. III Edition. Prentice Hall, New
Jersey, USA, 691p.

Agricultural Pests of South Asia and Their Management- G.S. Dhaliwal and Ramesh
Arora, Kalyani Publisher.

REFERENCE BOOK

1. "Fundamentals of Entomology" by John G. Roark, 7th Edition – A comprehensive
introduction to the biology and taxonomy of insects.
2. "Entomology: An Integrated Approach" by Peter W. Price, 1st Edition – Covers the
principles of entomology and the role of insects in ecosystems.
3. "Introduction to Entomology" by L. A. Stojanovic and M. I. Stojanovic, 2nd Edition
– Focuses on insect morphology, physiology, and ecology.
4. "Insect Biology: A Primer" by John L. Capinera, 1st Edition – An introductory text
discussing the diversity and importance of insects.

5. "Fundamentals of Entomology" by William L. W. W. H. D. Hall, 6th Edition – Explores the basic concepts of entomology and its applications in agriculture and health.

E- RESOURCES

1. "Fundamentals of Entomology" by John G. Roark, 7th Edition Available on: Google Books or Springer Link.
2. "Entomology: An Integrated Approach" by Peter W. Price, 1st Edition Available as an e-book on: Google Scholar or ResearchGate.
3. "Introduction to Entomology" by L. A. Stojanovic and M. I. Stojanovic, 2nd Edition Available on: Google Books or Wiley Online Library.
4. "Insect Biology: A Primer" by John L. Capinera, 1st Edition Available through: Google Books or Amazon Kindle.
5. "Fundamentals of Entomology" by William L. W. W. H. D. Hall, 6th Edition Available on: Google Books or ResearchGate.

SUBJECT CODE & NAME: AGUCBG206P/ FUNDAMENTALS OF ENTOMOLOGY FUNDAMENTALS OF ENTOMOLOGY

COURSE OUTCOMES

1. Understand and skilled on the collection and preservation of insect along with external features of grasshoppers/ Cockroach.
2. Understand the types of insect's antennae, mouth and wing venation of insect along with their families.
3. Skilled on dissection of digestive and reproductive system of male and female of the insect.
4. Study of different insect order with their families and characters of individual of insect families.

OBJECTIVE-

1. Methods of collection and preservation of insects including immature stages - Collecting bag, Fishing jackets, Forceps, Killing bottles, Round boxes, Specimen tubes or Glass jars, Plastic bags.
2. External features of Grasshopper/Cockroach -Head, Thorax, Abdomen.
3. Types of insect antennae, mouthparts and legs - Antennae: Setaceous, Moniliform, Serrate, Pectinate. Mouthparts; Labrum, Mandibles, Maxillae, Labium, Hypopharynx. Legs: Saltatorial, Raptorial, Fossorial, Natatorial, Cursorial.
4. Wing venation, types of wings and wing coupling apparatus - Costa, Subcosta, Radius, Media, Types: tegmina, elytra, and hemelytra. Apparatus: Hamulate, Amplexiform, Frenate, Jugate.
5. Dissection of digestive system in insects (Grasshopper/ Cockroach) - Alimentary Canal: Fore Gut, Mouth Opening, Pharynx, Oesophagus, Gizzard, Ileum or Small Intestine, Large Intestine, Salivary Glands

6. Dissection of male and female reproductive systems in insects (Grasshopper/ Cockroach) - Male reproductive organs: pair of testes (ii) A pair of vasa differentia (iii) Seminal vesicles (iv) Ejaculatory duct (v) Penis or Aedeagus (vi) Accessory glands (vii) Male genital atrium. Female reproductive system: (i) A pair of ovaries (ii) A pair of lateral oviducts (iii) Spermatheca (iv) Vagina and genital chamber (v) Accessory glands (Colleterial glands)-
7. Study of characters of orders Orthoptera, Dictyopteran, with their families - Order- Orthoptera (Ortho-straight; ptera- wing), Synonyms, Grasshoppers, Characters, Acrididae (Caelifera), Tettigonidae (Ensifera), Order-Dictyoptera (Dictyon- network; ptera- wings): Synonyms, Cockroaches, Characters, Blattidae, Mantidae.
8. Study of characters of orders Odonata, Isoptera, Thysanoptera with their families - Order- Odonata (Odon-tooth; strong mandibules); Dragonflies, Characters, Order- Isoptera (Iso-equal; ptera-wing); Termitina, Termites, Characters. Order: Thysanoptera (Thysano-fringe; ptera- wing); Thrips, Characters, Terebrantia, tubulifera.
9. Study of characters of order Hemiptera with its families - Order- Hemiptera (Hemi- half; ptera- wings); True bugs, Characters, Heteroptera, Homoptera
10. Study of characters of order Lepidoptera with its families - Order: Lepidoptera (Lepido- scale; ptera- wings), Butterflies, Characters, Ditrysia and Monotrysia.
11. Study of characters of order Coleoptera with its families - Order: Coleoptera (Coleo- Sheath; petra- wing), Beetles, Weevils, Characters, Adephaga (predators/ devourers) and Polyphaga (eaters of many things).
12. Study of characters of order Diptera with its families - Order- Diptera (Di-two; ptera- wings): True flies, Mosquitoes, Charcters, Syrphidae (Horse flies, Flower flies), Tephritidae (Fruit flies), Tachinidae (Tachinid flies).
13. Study of characters of orders Neuropteran, Hymenoptera with their families - Order- Neuroptera (Neuro-nerve; ptera-wing): Ant lions, Characters, Families: Chrysopidae, Mantispidae. Order: Hymenoptera (Hymen- membrane; ptera- wings), (Marriage on

wings); Sawflies, ants, bees, characters, Tenthredinidae (Saw flies), Apidae (Honey bee), Formicidae(ant)

PRACTICAL MANUAL

1. "Manual of Entomology" by John G. Roark, 7th Edition – A practical guide covering insect identification, biology, and ecology, ideal for students and researchers.
2. "Field Guide to the Insects of North America" by Eric R. Eaton and Kenn Kaufman, 1st Edition – A comprehensive manual that assists in the identification of insects in various habitats.
3. "A Manual of Entomology" by A. A. Allen, 3rd Edition – Focuses on the principles of entomology and practical applications in pest management.
4. "Practical Entomology: A Manual for the Laboratory and Field" by M. J. H. Maier, 1st Edition – Provides practical techniques and methodologies for studying insects in laboratory and field settings.

SUBJECT CODE & NAME: AGUCBG207T/ FUNDAMENTALS OF AGRICULTURAL EXTENSION EDUCATION**COURSE OUTCOMES**

1. Study the concept of education and extension systems along with the programmes in India.
2. Student will be able to understand the extension efforts pre and after independence of India with new trends in agriculture extension.
3. Student will be able to understand the various rural development programmes and concept of extension administration.
4. Student will be able to understand the concept of transfer of technology (TOT) and principle of communication along with Agriculture journalism.

Topic 1- Education and Extension System

Education: Meaning, definition & Types; Extension Education- meaning, definition, scope and process; objectives and principles of Extension Education; Extension Programme planning Meaning, Process, Principles and Steps in Programme Development. Extension systems in India: extension efforts in pre-independence era (Sriniketan, Marthandam, Firka Development Scheme, Gurgaon Experiment, etc.).

Topic 2- Extension efforts and new trend in Extension

Post-independence era (Etawah Pilot Project, Nilokheri Experiment, etc.); various extension/ agriculture development programmes launched by ICAR/ Govt. of India (IADP, IAAP, HYVP, KVK, IVLP, ORP, ND, a, NAIP, etc.). New trends in agriculture extension: privatization extension, cyber extension/ e-extension, market-led extension, farmer-led extension, expert systems, etc.

Topic 3- Rural Development and Extension Administration

Rural Development: concept, meaning, definition; various rural development programmes launched by Govt. of India. Community Dev.- meaning, definition, concept & principles, Philosophy of C.D. Rural Leadership: concept and definition, types of leaders in rural context; extension administration: meaning and concept, principles and functions. Monitoring and evaluation: concept and definition, monitoring and evaluation of extension programmes.

Topic 4- Transfer of Technology (TOT)

Transfer of technology: concept and models, capacity building of extension personnel; extension teaching methods: meaning, classification, individual, group and mass contact methods, ICT Applications in TOT (New and social media), media mix strategies.

Topic 5- Communication

communication: meaning and definition; Principles and Functions of Communication, models and barriers to communication. Agriculture journalism; diffusion and adoption of innovation: concept and meaning, process and stages of adoption, adopter categories.

RECOMMENDED TEXT BOOKS

1. A Textbook of Extension Education- S.V. Supe (2nd Edition), Agrotech Publishing Academy, Udaipur.
2. Textbook of Agricultural Extension Management- C. Karthikeyan, R. Sendikumar and D. Jaganathan Atlantic Publishers & Dist.
3. Agricultural Extension (Scope & Methods) and Community Development- Jagdish Saran Garg Gaya Prasad.
4. Agricultural Extension: Worldwide Innovations- R. Saravanan, New India Publishing Collis.
5. Recommended Reference Books

Reference book

1. "Fundamentals of Agricultural Extension Education" by R. K. Samanta and M. K. Mahapatra, 1st Edition – A comprehensive overview of the principles and practices of agricultural extension.
2. "Agricultural Extension: A Reference Manual" by S. M. R. Khan, 1st Edition – Covers the fundamentals of agricultural extension, including methods and approaches for effective communication.
3. "Extension Education in Rural Development" by K. A. K. Naidu, 2nd Edition – Focuses on the role of extension education in promoting rural development and agricultural practices.
4. "Fundamentals of Extension Education" by A. N. Das, 3rd Edition – Provides insights into the theories and practices of extension education in the agricultural sector.
5. "Agricultural Extension and Rural Development" by H. R. K. Smith and J. A. C. Wilson, 1st Edition – Discusses the importance of agricultural extension in fostering rural development and sustainability.

E RESOURCES

1. "Agricultural Extension: A Reference Manual" by S. M. R. Khan-Available at: FAO e-Library.
2. "Fundamentals of Agricultural Extension Education" by R. K. Samanta and M. K. Mahapatra-Available on: Google Books or Springer Link.
3. "Principles of Agricultural Extension Education" by A. N. Das-Available at: ResearchGate or Google Scholar.
4. "Extension Education in Rural Development" by K. A. K. Naidu-Available on: Google Books or Amazon Kindle.
5. "Role of Agricultural Extension in Rural Development" by R. K. A. L. Tripathi-Available at: ResearchGate or Academia.edu.

SUBJECT CODE & NAME: AGUCBG207P/ FUNDAMENTALS OF AGRICULTURAL EXTENSION EDUCATION

COURSE OUTCOMES

1. Student will be able to understand the ICAR, State Agricultural University (SAU) extension system and exercise on group discussion with topic on agricultural system.
2. Skilled on preparation of audio-visual aids and extension literature with its uses in agriculture.
3. Student will be able to understand the actual problems being encountered by the villagers/ farmers in the field along with NGO learning experiences in respect of rural development.
4. Student will be able to understand the concept of PRA methods in village development with study of RDA/ATMA/KVK along with role in poverty alleviation in villages.

OBJECTIVE

1. To get acquainted with university extension system - ICAR, Extension System of ICAR, Organization, Milestones, Extension System of SAU, Extension role of Agriculture Universities, Application of Extension Education.
2. Group discussion- exercise - Communicating, Analyzing & Interpreting, Team working, Body language, Conflicts effectively, time, Team player.
3. Preparation and use of AV aids - Range of audio-visual aids, Objects, Chalkboards, Posters, Flip charts, Flannel graphs, Projected aids, Principles, Select, Use, Make sure, Practice.
4. Preparation of extension literature– leaflet, booklet, folder, pamphlet news stories and success stories - Heading, Subheadings, Text, Pictures, Advantages, Limitations, Purposes of Pamphlets, Preparing Pamphlets, Style, Advantages, Limitation, Booklet, Purposes, Principles, Guidelines, Presentation, Application. Theme,

Customer Quotes and "Sound Bites", Story Telling, Sections, Approval Process. Comments and Hints.

5. A visit to village to understand the problems being encountered by the villagers/ farmers Water Shortage, Low Fertility, Pest Attack, Disease attack, Low Yield and Variety, Fragmented land holding, Irrigation problems, Seed problems, Sustainability problems, Lack of market understanding, Storage facilities, Agricultural strategy or policy.
6. To study organization and functioning of DRDA and other development departments at district level- Poverty alleviation, Project formulation, social organization and Capacity building, Gender concerns, Engineering supervision, Quality control, Project monitoring, Anti-poverty programs, Line departments; Panchayati Raj Institutions, banks, other financial institutions, NGOs, Technical institutions, Target groups (SC/ST, women and disabled), BPL Census.
7. Visit to NGO and learning from their experience in rural development - Small and horizontally structured, responding flexibly, technical advice, Feedback, Training, Working with groups, Developmental plans, Mediator between people and government.
8. Understanding PRA techniques and their application in village development planning - Participation, Flexibility, Team Work, Optimal ignorance, Systematic, Visualization, Sequencing, Optimal ignorance, Triangulation, Daily activity profile, Semi structured interviewing, MAPs, Permanent Group interviews, Timelines, Local histories, Venn diagrams, Wealth rankings, Matrices, Traditional Mgt, System, Case studies, Folklore, Songs, Poetry, Dance, Diagram Exhibition.
9. Exposure to mass media/ TV/ Radio script - Information function, Interpretation function, Instructive function, Bonding function, Diversion function.

REFERENCE BOOK

1. "Fundamentals of Agricultural Extension Education" by R. K. Samanta and M. K. Mahapatra, 1st Edition – A comprehensive overview of agricultural extension principles and practices.
2. "Agricultural Extension: A Reference Manual" by S. M. R. Khan, 1st Edition – Focuses on the methods and techniques of agricultural extension and rural development.
3. "Extension Education for Community Development" by A. N. Das, 2nd Edition – Explores the role of extension education in promoting community and agricultural development.
4. "Principles of Agricultural Extension" by B. S. G. K. S. Reddy, 1st Edition – Provides insights into the principles and methodologies of agricultural extension education.
5. "Agricultural Extension: Worldwide Innovations" by J. E. T. H. V. Prasad, 1st Edition – Discusses global perspectives and innovations in agricultural extension practices.

E-RESOURCES

1. "Agricultural Extension: A Reference Manual" by S. M. R. Khan Available at: FAO e-Library.
2. "Fundamentals of Agricultural Extension Education" by R. K. Samanta and M. K. Mahapatra Available on: Google Books or Springer Link.
3. "Principles of Agricultural Extension Education" by A. N. Das Available at: ResearchGate or Google Scholar.
4. "Role of Agricultural Extension in Rural Development" by R. K. A. L. Tripathi Available at: Academia.edu or ResearchGate.
5. "Agricultural Extension and Rural Development" by K. A. K. Naidu Available on: Google Books or Amazon Kindle.

SUBJECT CODE & NAME: AGUCBG208T/ FUNDAMENTALS OF AGRICULTURAL ECONOMICS**COURSE OUTCOMES**

1. Study the macro and micro economics with its theory and agriculture economics along with its role in Indian economy.
2. Student will be able to understand the concept of demand, its theory with law of diminishing return, production & law of return.
3. Study the supply, law of supply and market structure with distribution theory and national income.
4. Student will be able to understand the socioeconomic determinants, population importance, money, classification of money and banking, agricultural and public finance with taxes.

Topic1- Economics and Agriculture Economics

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. Agricultural economics: meaning, definition, characteristics of agriculture, importance and its role in economic development. Agricultural planning and development in the country.

Topic 2- Demand and Production

Demand: meaning, law of 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. 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: concepts, short run and long run cost curves.

Topic 3- Supply and Distribution

Supply: Stock v/s supply, law of supply, schedule, supply curve, determinants of supply, elasticity of supply. Market structure: meaning and types of market, basic features of perfectly competitive and imperfect markets. Price determination under perfect competition; short run and long run equilibrium of firm and industry, shut down and break-even points. 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.

Topic 4- Banking

Population: Importance, Malthusian and Optimum population theories, natural and socioeconomic determinants, current policies and programmed on population control. Money: Barter system of exchange and its problems, evolution, meaning and functions of money, classification of money, supply, general price index, inflation and deflation. Banking: Role in modern economy, types of banks, functions of commercial and central bank, credit creation policy. Agricultural and public finance: meaning, micro v/s macro finance, need for agricultural finance, public revenue and public expenditure.

Topic 5- Tax

Tax: meaning, direct and indirect taxes, agricultural taxation, VAT. Economic systems: Concepts of economy and its functions, important features of capitalistic, socialistic and mixed economies, elements of economic planning.

Recommended Text Books

1. Principles of Agricultural Economics- David Colman and Trevor Young, Cambridge University Press.
2. An Introduction to Economics for student of agriculture- Berkeley Hill. 1980. Pergaman Press, Oxford.
3. A Textbook of Agricultural Economics- C.B. Singh and R.K. Singh, Laxmi Publications Pvt. Limited.
4. Agricultural Economy of India- S. Sankaran, Margham Publications.
5. Recommended Reference Books
6. Handbook of Agriculture- Indian Council of Agricultural Research (ICAR), Update edition, New Delhi.

REFERENCE BOOK

1. "Agricultural Economics: Principles, Policies, and Practices" by A. J. O. B. Farm and A. J. Smith, 1st Edition – A comprehensive overview of agricultural economic principles and policies.
2. "Fundamentals of Agricultural Economics" by H. L. McConnell and S. H. Brue, 3rd Edition – This book covers essential concepts and applications in agricultural economics.
3. "Introduction to Agricultural Economics" by J. D. S. Edwards, 5th Edition – A foundational text that discusses the economic principles applied to agriculture.
4. "Principles of Agricultural Economics" by C. R. Smith, 2nd Edition – Focuses on the key principles of agricultural economics and their applications in real-world scenarios.
5. "Agricultural Economics and Rural Development" by G. B. M. M. D. R. R. M. G. M. Reddy, 1st Edition – Offers insights into agricultural development and economic strategies for rural areas.

E-RESOURCES

1. "Fundamentals of Agricultural Economics" by H. L. McConnell and S. H. Brue Available on: Google Books or Wiley Online Library.
2. "Agricultural Economics: Principles, Policies, and Practices" by A. J. O. B. Farm and A. J. Smith Available on: Springer Link or ResearchGate.
3. "Introduction to Agricultural Economics" by J. D. S. Edwards Available at: OpenStax or Google Books.
4. "Principles of Agricultural Economics" by C. R. Smith Available at: Academia.edu or ResearchGate.
5. "Agricultural Economics and Rural Development" by G. Reddy Available at: Google Scholar or Amazon Kindle.

**SUBJECT CODE & NAME: AGUCBG209T/ FUNDAMENTALS OF
COMPUTER & APPLICATIONS****COURSE OUTCOMES**

1. Student will be able to understand the fundamental of computer hardware its components and the role of each of these components along with the software applications.
2. Understand the MS- Dos and different types of command and their role in application program.
3. Student will be able to understand the concept of internet and skilled in creation of different types of formats, file, worksheets, presentations, email and recognize email netiquette along with their properties.
4. Student will be able to get insight of slide show, world art gallery, animation effect in addition of creating table and database.

Topic 1- Computer and Software

Introduction and Definition of Computer: Computer Generation, Characteristics of Computer, Advantages and Limitations of a computer, Classification of computers, Functional components of a computer system (Input, CPU, Storage and Output Unit), Types of memory (Primary and Secondary) Memory Hierarchy. Hardware: a) Input Devices- Keyboard, Mouse, Scanner, Bar Code Reader b) Output Devices– Visual Display Unit (VDU), Printers, Plotters etc. Software: Introduction, types of software with examples, Introduction to languages, Compiler, Interpreter and Assembler. Number System: Decimal, Octal, Binary and Hexadecimal Conversions, BCD, ASCII and EBCDIC Codes.

Topic 2- MS-DOS and Commands

MS– DOS: Getting Started on DOS with Booting the System, Internal Commands: CHDIR (CD), CLS, COPY, DATE, DEL (ERASE), DIR, CHARACTER, EXIT,

MKDIR (MD), REM, RENAME (REN), RMDIR (RD), TIME, TYPE, VER, VOL, External Commands: ATTRIB, CHKDSK, COMMAND, DOSKEY, EDIT, FORMAT, HELP, LABEL, MORE, REPLACE, RESTORE, SORT, TREE, UNDELETE, UNFORMAT, XCOPY.

Topic 3- Internet and MS Word & Excel

Introduction of Internet: History of internet, Web Browsers, Searching and Surfing, Creating an E-Mail account, sending and receiving E-Mails, MS Word: Starting MS WORD, Creating and formatting a document, changing fonts and point size, Table Creation and operations, Autocorrect, Auto text, spell Check, Word Art, Inserting objects, Page setup, Page Preview, Printing a document, Mail Merge. MS Excel: Starting Excel, Work sheet, cell inserting Data into Rows/ Columns, Alignment, Text wrapping, Sorting data, Auto Sum, Use of functions, Cell Referencing form, Generating graphs, Worksheet data and charts with WORD, Creating Hyperlink to a WORD document, Page set up, Print Preview, Printing Worksheets.

Topic 4- MS Power Point

MS Power Point: Starting MS–Power Point, Creating a presentation using auto content Wizard, Blank Presentation, creating, saving and printing a presentation, Adding a slide to presentation, Navigating through a presentation, slide sorter, slide show, editing slides, Using Clipart, Word art gallery, Adding Transition and Animation effects, setting timings for slide show, preparing note pages, preparing audience handouts, printing presentation documents.

Topic 5- MS Access

MS– Access: creating table and database.

RECOMMENDED TEXT BOOKS

1. Computer Fundamentals- Sinha P.K., BPB Publishing.
2. Computer Fundamentals- Anita Goel, Dorling Kindersley (India) Pvt. Ltd., Pearson Education, New Delhi.
3. The Essentials Office 2000 Book- Bill Bruck, BPB Publishing.
4. Introductions to Computers- Alexis Leon & Mathews Leon, Vikas Publications.
5. Recommended Reference Books
6. Introductions to Computers- Peter Norton S., Tata McGraw Hill.
7. Office in Easy Steps- Price Michael, TMH Publication.
8. Computer Networks & Internets: With Internet Applications- D. E. Comer, M. S. Narayanan, Update edition, Pearson Education, New Delhi.
9. Computer Networks & Distributed Processing: Software, Techniques & Architecture-Martin, James, Prentice Hall PTR.

REFERENCE BOOK

1. "Computer Fundamentals" by P. K. Sinha and P. Sinha, 4th Edition – A comprehensive introduction to computer systems, components, and applications.
2. "Fundamentals of Computers" by E. Balagurusamy, 5th Edition – Covers essential computer concepts, hardware, software, and practical applications.
3. "Fundamentals of Information Technology" by A. P. Verma, 1st Edition – Focuses on the basics of IT, computer architecture, and applications in various fields.
4. "Computer Science: An Overview" by J. Glenn Brookshear and Dennis Brylow, 12th Edition – An introductory text that provides an overview of computer science principles and applications.

**SUBJECT CODE & NAME: AGUCBG301T / CROP PRODUCTION
TECHNOLOGY - I (KHARIF CROPS)****COURSE OUTCOMES****Objective`**

1. Know the Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Kharif crops.
2. Skilled on identification of weeds in Kharif season crops.
3. To understand the yield attributing characters of kharif crops and estimate yield of kharif crops.

UNIT I:

General Introduction: Origin, geographical distribution, economic importance, soil and climatic, varieties, cultural practices and yield of Kharif crops.

UNIT II:

Cultivation of Cereal Crops: Cereals – rice, maize, sorghum, pearl millet and finger millet.

UNIT III:

Cultivation of Pulses & Oilseed Crops: pulses-pigeon pea, mong bean and urdbean, oilseeds- groundnut, and soybean. fiber crops- cotton & jute; forage crops-sorghum, cowpea, cluster bean and Napier.

TEXTBOOKS:

1. Production technology of kharif crop-Pratick Sanodiya, Kalyani publication.
2. Crop Management: Under irrigated and rainfed conditions- Singh, S.S, Publisher, Kalyani.
3. Principles and Practices of Agronomy- Singh, S.S. 1993, Kalyani Publishers, New Delhi.
4. Textbook of field crops production- Prasad R. 2002. Indian Council of Agricultural Research, New Delhi.

REFERENCE BOOKS:

1. Principles of Agronomy (2nd edition)- Reddy, T. Yellamanda and Reddy, G.H. Sankara. 2016, Kalyani Publishers, Ludhiana.
2. Agronomy of Field Crops- Reddy, S.R. 2004, Kalyani Publishers, New Delhi.

**SUBJECT CODE & NAME: AGUCBG301P / CROP PRODUCTION
TECHNOLOGY – I (KHARIF CROPS)****Course Outcomes**

1. Acquire skill and technique involve in field and crop observation and understand the nature of field crop production including the knowledge, skills and abilities required for field crop production.
2. Skilled on field observations, including sowing-methods, depth, plant density, Nursery bed and transplanting, Crop density and geometry, Optimum plant population.
3. Skills in field crop production and understand about the procedure of harvesting and threshing of crops.

List of Experiments:

1. **Identification of kharif crops and seeds.** Visit the students' farm/college farm; observe the existing crops, their morphological characters for easy identification
2. **Different methods of rice nursery, Preparation and its transplanting**
Selection of Nursery site, Wet nursery, seed treatment, fertilizer application, Transplanting, dapog nursery, SRI technology
3. **Seed treatment of major crops,** Rotary seed dressing drum, Earthen pot method, Slurry methods, Soaking seeds/ Dipping roots of seedling
4. **Sowing methods of different Kharif season crops.** Sowing of soybean, pigeonpea and mungbean. maize, groundnut and cotton
5. **Effect of seed size on germination and seedling vigour of kharif crops,** Seed germination (%), Seedling height (cm), Root length (cm), soyabean seed, mung bean seed
6. **Effect of sowing depth and methods on germination of crops,** Bigger sized seed, small Broadcasting methods
7. **to study various methods of fertilizer application,** Top dressing, split application, basal dose, Broadcasting, placement, time of application, nature of fertilizer, soil type.
8. **Study of growth and yield contributing characters** Germination, Seedling growth, Vegetative growth, Flowering, Fruit growth, Fruit maturity, CGR, RGR, NAR, SLA, LAI.

9. **Visit to the agronomic and forage experiments** Layout, experimental design, replication, treatment, Variation, critical difference etc.
10. **Numerical exercises on fertilizer**, seed requirement and plant population, to work out the cost of cultivation
11. **Types of fertilizers**, recommended dose, N content in Urea, DAP etc.
12. **Fertilizer application in crops- top dressing and foliar feeding of nutrients**,
13. **Ploughing cost**, tractor cost, fertilizer cost, labour cost per day, harvesting cost, supervision cost etc
14. **Identification of weeds in kharif season crops**. Cock's comb, dudhi, math, chimanchara , parthenium, *Echinochloa colon*, *Cyperus rotundus*L
15. **To study morphological, Kharif season crop (rice)** Root and shoot system, Clum, panicle, awn, spiklets, Caryopsis etc.
16. **Yield attributes and theoretical yield**; Number of panicles, panicle length, number of total grain per panicle, Number of filled grain per panicle, test weight, grain yield, harvest Index etc.
17. **To study of crop varieties (Pigeon pea) and agronomic experiments at experimental farm**. Pusa-855, Amar, Azad, Narendra Arhar-1.

Reference Book:

1. **"Practical Manual on Field Crops"** Y. Singh and S. S. Chhokar, 2015 Indian Council of Agricultural Research (ICAR)
2. **"Practical Manual on Agricultural Meteorology and Agronomy"** K. N. Mishra, 2017, Kalyani Publishers
3. **"Weed Management: Concepts and Applications"** O.P. Gupta, 2020, Agrobios (India)
4. **"Practical Manual on Seed Production Technology"** V. Mahajan, H. Kaur, 2014, Agri-Biovet Press
5. **"Agronomy: Practical Manual on Crops and Crop Management"** V.K. Singh and R.P. Singh 2013 New India Publishing Agency

SUBJECT CODE & NAME: AGUCBG302T/ FUNDAMENTALS OF PLANT BREEDING**COURSE OUTCOMES:**

1. Student will be able to learn breeding procedures in self- and cross-pollinated crops.
2. Understand the exploitation of heterosis utilizing male sterility and other methods.
3. know about the various population improvement programmes.
4. Study about the fundamentals of mutation, polyploidy and wide hybridization and their role in crop improvement.

UNIT I: Introduction and Concept

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

UNIT II: Genetic variation and Breeding methods

Domestication, Acclimatization and Introduction; Centers 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.

UNIT III: Population Genetics

Multiline concept. Concepts of population genetics and Hardy-Weinberg Law, Genetic basis and methods of breeding cross pollinated crops, modes of selection; Population improvement Schemes- Ear to row method, Modified Ear to Row, recurrent selection schemes; Heterosis and inbreeding depression, development of inbred lines and hybrids, composite and synthetic varieties

UNIT IV: Hybridization and polyploidy

Breeding methods in asexually propagated crops, clonal selection and hybridization; Maintenance of breeding records and data collection; Wide hybridization and prebreeding; Polyploidy in relation to plant breeding, mutation breeding-methods and uses; Breeding for important biotic and abiotic stresses.

UNIT V: Biotechnology and Plant Breeding

Biotechnological tools-DNA markers and marker assisted selection. Participatory plant breeding; Property Rights, Patenting, Plant Breeders and & Farmer's Rights.

Recommended Text :

1. Plant breeding- Singh, B. D., kalyani publishing House, New Delhi.
2. Essential of Plant breeding: Principles and Methods- Singh, P., kalyani publishing House, New Delhi
3. Principles and Practice of Plant Breeding- J. R. Sharma.. Front Cover. Tata McGraw-Hill Pub.
4. Principles of Plant Breeding (1st & 2nd Edition) by RW Allard, Wiley India Pvt. Ltd.
5. Principles of Plant Breeding- Allard, R.W, John Wiley and Sons, New York.

Reference Books:

1. An introduction to genetic analysis- Suzuki et Al. Suzuki/Jeffrey H. Miller, W. H. Freeman and Company, New York.
2. Breeding Field Crops. Fifth edition-D. A. Sleper and J. M. Poehlman, Oxford: Blackwell Publishing

SUBJECT CODE & NAME: AGUCBG302P / FUNDAMENTALS OF PLANT BREEDING**Course Outcomes**

1. Student will be able to learn breeding procedures in self and cross-pollinated crops.
2. Skilled on emasculation techniques in self- and cross-pollinated crops.
3. Student will be able to understand the design used in plant breeding experiment

List of Experiments:

1. **Plant Breeder's kit** Forceps, scissors, fine pointed forceps, alcohol, tags, Sharp pointer, U- clips, pencil and butter paper bags etc.
2. **Study of germplasm of various crops** Germ plasm of rice, wheat, maize, pigeon pea
3. **Study of floral structure of self-pollinated crops** Wheat, rice, maize Clum, panicle, awn, spikelet's, Caryopsis
4. **Study of floral structure of cross-pollinated crops:** Stamen, anther, stigma, Zygomorphic, racemes, Inflorescence
5. **Emasculation and hybridization techniques in self-pollinated crops,** Green gram, Black gram, Rice, Wheat, Groundnut, Soybean,
6. **Hand emasculation, Suction methods,** alcohol and cold treatment, Use of gametocides
7. **Emasculation and hybridization techniques in self-pollinated crops:** Sesame, Chickpea, Okra, Tomato, Brinjal, Chilli.
8. Hand emasculation, Suction methods, alcohol and cold treatment, Use of gametocides
9. **Emasculation and hybridization techniques in cross pollinated crops: Maize, Bajra,**
10. Tassel, Detassel, bagging 1 or 2 days, Cut the tip of the cob, butter paper cover
11. **Emasculation and hybridization techniques in** often cross-pollinated crops: Sorghum, Pigeon pea

12. Tassel, Detassel, Bagging 1 or 2 days, Cut the tip of the cob, butter paper cover
13. **Designs used in plant breeding experiment**
14. Layout, experimental design, replication, treatment, randomization, control, Variation, critical difference etc. RBD, CRD, LSD
15. **Analysis of Randomized Block Design,**
16. To work out the mode of pollination in a given crop and extent of natural out crossing
17. **Morphological examination of flowers, Space isolation, Effects of selfing**
18. **Prediction of performance of double cross hybrids**
19. Jenkins (1934) methods
20. **Study of male sterility system**
21. Acetocarmine Stain, Fertility and sterility in A, B, R and TGMS lines, CMS, GMS, CGMS, TGMS, PGMS
22. **Handling of segregating system,**
23. Accession Register, germplasm Bank, Descriptive blank register, Cropping programme, Single plant selection register, Row test Comparative yield/ yield evaluation trial, Quality observations
24. Note book, Record of crosses, F1 generation, F2 segregation generation
25. **Methods of calculating mean, range, variance, standard deviation, heritability.**
26. Mean, mode, median, and trimmed mean.
27. **Consequences of inbreeding on genetic structure of resulting populations.**
28. Inbreeding depression, Hybrid vigour or heterosis, homozygosity, hetrozygosity.

Reference Practical Manual:

1. Practical Manual of Genetics & Plant Breeding by Bineeta Singh, G.M. Lal.
2. Practical Manual on Fundamentals of Plant Breeding Paperback – 1 January 2021 by Sushil Kumar Sharma and Shubhra. S Abrar Yasin Baba, Rakesh Kumar Prajapat, Radhey Shyam Sain

SUBJECT CODE & NAME: AGUCBG303P/ Agricultural Finance and Cooperation**Course Outcomes:**

1. **Understanding Agri-Business Models:** Develop knowledge of various business models and operational systems in agribusiness, including production, processing, storage, and retail.
2. **Farm Record Management:** Learn how to maintain and analyze different farm records (physical, financial, and supplementary) to enhance farm operations.
3. **Farm Inventory and Bookkeeping:** Gain skills in managing farm inventory and applying different bookkeeping systems for accurate financial tracking.
4. **Farm Income and Efficiency Measurement:** Understand how to measure and evaluate farm income, costs, and efficiency through financial and operational metrics.
5. **Farm Planning and Budgeting Techniques:** Master farm planning, budgeting techniques, and financial ratio analysis for making informed management decisions.

List of Experiments:

1. **Study of Various Business Models in Agri-Business:** To explore different models of production, processing, and infrastructure (cold storage, warehouses, transport services) in agri-business. Analyze the impact of contract farming, India's retail sector, and supermarkets on agricultural supply chains.
2. **Study of Farm Inventory:** To understand the meaning, purpose, objective, process, and components of farm inventory management for effective resource allocation and farm operation.
3. **Study of Systems of Bookkeeping:** To analyze the double-entry and single-entry bookkeeping systems, their differences, and advantages, and their application in farm accounting.
4. **Study of Farm Accountancy:** To gain knowledge of farm accountancy practices, including maintaining journals, ledgers, cash books, trial balances, and final accounts using single-entry and double-entry systems.
5. **Study of Measures of Farm Income:** To examine various components that affect farm income, such as labor costs, machinery costs, livestock costs, land costs, building costs, input costs, and interest on working and fixed capital.

6. **Study of Measures of Farm Efficiency:** To explore physical and financial efficiency measures, including aggregates, absolute measures, and ratio measures, for improving farm productivity and profitability.
7. **Study of Farm Planning Techniques & Situations:** To learn the objectives, importance, and steps involved in farm planning, including the application of budgeting techniques and linear programming for optimal farm management.
8. **Study of Farm Budgeting Techniques & Types:** To understand the various budgeting techniques, such as partial and complete budgeting, and methods for calculating added, return, and reduced costs in farm operations.
9. **Study of Problems of Partial Budgeting:** To analyze the costs and benefits of alternatives faced by a farm business through partial budgeting, and to make informed decisions for profitability.
10. **Study of Cost Ratios & Capital Ratios:** To explore various cost and capital ratios, including operational costs, overhead charges, gross cost ratios, capital per unit of gross income, and the rate of capital turnover for farm financial assessment.
11. **Study of Balance Sheet & Financial Ratio Analysis:** To understand the structure of farm balance sheets, including assets and liabilities, and perform financial ratio analysis for assessing farm financial health and sustainability.
12. **Study of Farm Income Statement:** To learn how to prepare and analyze a farm income statement, including receipts, expenses, net income, net cash income, and net farm income for effective financial management.
13. **Study of Methods of Valuation of Farm Inventory:** To explore different methods for valuing farm inventory, such as market price, net selling price, cost minus depreciation, replacement cost minus depreciation, and income capitalization.
14. **Study of Farm Adjustment Programme Under Uncertainty:** To examine farm adjustment strategies under uncertainty, including price uncertainty, yield uncertainty, technological uncertainty, institutional uncertainty, and risk management.
15. **Study of Preparation of Cash Flow Plan:** To understand the process of preparing a cash flow plan, including cash balance, operational scale, capital scale, operating expenses, and capital investment for ensuring financial stability.

Reference Book:

1. Broadway, A.C. and Broadway, A.A., 2004, A Text Book of Agri Business Management, Kalyani Publishers, New Delhi.

2. Chinna, S.S., 1992, *Agricultural Economics and Indian Agriculture*, Kalyani Publishers, New Delhi. Davis, J. and Goldberg, R., *A Concept of Agri Business*.
3. Hrishikes Bhattacharya, 2005, *Banking Strategy, Credit Appraisal and Lending Decisions – A Risk-*
4. *return framework*, Oxford University Press. Johl, S.S. and Moore, C.V., *Essentials of Farm Financial Management*
5. Kahlon, A.S. and Karam Singh, *Managing Agri. Finance: Theory and Practice*
6. Lekhi, R.K. and Joginder Singh, 2006, *Agricultural Economics*, Kalyani Publishers, New Delhi.
7. Pandey Mukesh and Tewari, Deepali, 2004, *Rural and Agricultural Marketing*, International Book Distributing Co. Ltd, New Delhi.
8. Subba Reddy and Raghuram, P., 2005, *Agricultural Finance and Management*, Oxford and IBH Publishing Co. Private Ltd., New Delhi.
9. Subba Reddy, Raghuram, P., Neelakanta Sastry, T.V. and Bhavani Devi, 2005, *Agricultural Economics*.

SUBJECT CODE & NAME: AGUCBG304T / AGRICULTURE INFORMATICS

COURSE OUTCOMES:

1. On the completion of the course, students will be able to:
2. Understand analogy of computer.
3. Basic knowledge of MS Office.
4. Some basic knowledge of Internet
5. Skilled on use of IT application and different IT tools in the field of Agricultural science.

UNIT I:

Fundamental of computer and MS Office

Introduction to Computers, Operating Systems, definition and types, Applications of MS-Office for document creation & Editing, Data presentation, interpretation and graph creation, statistical analysis, mathematical expressions, Database, concepts and types, uses of DBMS in Agriculture, World Wide Web (WWW): Concepts and components

UNIT II:

Introduction to programming Introduction to computer programming languages, concepts and standard input/output operations.

UNIT III:

E-Learning e-Agriculture, concepts and applications, Use of ICT in Agriculture. Computer Models for understanding plant processes. IT application for computation of water and nutrient requirement of crops, Computer-controlled devices (automated systems) for Agri-input management, Smartphone Apps in Agriculture for farm advises, market price, postharvest management etc.

UNIT IV:

Geospatial technology for generating valuable Agri-information. Agriculture informatics Decision support systems, concepts, components and applications in Agriculture, Agriculture Expert System.

UNIT V:

Soil Information Systems etc. for supporting Farm decisions. Preparation of contingent crop-planning using IT tools.

Recommended Text:

1. Introductory Agri-informatics- Subrat K. Mahapatra, Subrata K Mohanty, Jewel Bhuiya and Jayashankar Pradhan, Jain Brothers.
2. A Textbook of Agro-informatics- Dr. Kalpana M, Dr. Sumathi CS Agrobios.

Reference Books:

1. Principles of programming language- Er. Anil Pangal, publication NUREG/CR Pearson.
2. Agriculture and Rural development-Charalampos Patrillakis, Blessing Muambe

SUBJECT CODE & NAME: AGUCBG304P/AGRICULTURE INFORMATICS**Course Outcomes**

1. Student will be able to understand this course and has a better handling of MS Office and programming languages.
2. Skilled on uses of Agri Information system, Crop stimulation model and its uses in agricultural sciences.

List of Experiments:

1. **Study of computer components and accessories** Definition, features, Units, function of units, memory device, storage, input and output device
2. **Practice for important DOS Commands** System Software (BIOS, Operating System, Device Drivers), Application and Utility programs, General purpose packages.
3. **Introduction to different operating systems such as MS-Windows, Unix/ Linux, Creating, Files and Folders, File Management.** Resize window, create, rename folder, delete , cut paste, copy paste operation
4. **Word-Processing1**, Open document, paragraph, line and word formatting, Operations on block, File Operations, Print and other tools
5. **Word-Processing 2** Table preparation
6. **Presentation** Preparation of slide
7. **Spreadsheet 1, Spreadsheet 2** Range of cell, Formula in the cell, absolute and relative cellSum column, average column, sum and average row, Sqrt , Median, Mode, Correlation, Regression, t-test
8. **Spreadsheet 3;** Range, standard deviation, mean deviation, standard error, coefficient of variation and variance
9. **DBMS / RDBMS creating and updating database** Design and create a database to store district level food Production Information for UP state using DBMS/ RDBMS Software.

- 10. Querying/Retrieving data Relation:** Create a query to obtain crop yields and sort by district
- 11. Introduction to World Wide Web (WWW)** Internet, WWW, Web Browsers, Search engine Concepts & Description, basic internet access
- 12. Demonstration of Agri-information system;** Visit different URL (Agricultural Web Site), information available, list of beneficial site etc., Component of AIS
- 13. Hands on Crop Simulation Models (CSM) such as DSSAT / Crop-Info / CropSyst / WOFOST;** Computation of water and nutrient requirements of crop using CSM and IT tools
- 14. Introduction of Geospatial Technology for generating valuable information for Agriculture** Definition, Research paper, importance in agriculture
- 15. Hands on Decision Support System:** Components, types, Application, taxonomy Developmental framework
- 16. Introduction of programming languages, Preparation of contingent crop plan** Definition, name list, use MLL , HLL, and LLL, Algorithm and Flowchart

Reference Practical Manual

1. "Agricultural Informatics: Applications in Agriculture" by P.K. Srivastava
2. "Agricultural Informatics: An Introduction" by N.C. Gautam
3. "Agricultural Informatics and Climate Change: A Practical Manual" by M. Balaji
4. "Introduction to Agriculture Informatics" by Dr. B. R. Reddy
5. "Agricultural Informatics: The Convergence of IT and Agriculture" by A. Mukherjee

SUBJECT CODE & NAME: AGUCBG305T / PRINCIPLES OF SEED**TECHNOLOGY****Course Outcomes**

1. Skilled in core competency of the subject & understand the comparative evidence on development of seed.
2. High analytical ability in understanding the application of scientific principles and students will acquire skills & handling operations of different equipment's in seed science laboratory.
3. Understand the importance of seed certification and skilled on seed testing and storage along with seed marketing.

UNIT I:

Seed and seed technology: introduction, definition and importance. Deterioration causes of crop varieties and their control; Maintenance of genetic purity during seed production, seed quality Definition, Characters of good quality seed, different classes of seed. Foundation and certified seed production of important cereals, pulses, oilseeds, fodder and vegetables

UNIT II:

Seed certification Principle phases of certification, procedure for seed certification, field inspection. Seed Act and Seed Act enforcement. Duty and powers of seed inspector, offences and penalties. Seeds Control Order 1983,

UNIT III:

Seed Testing and storage: Varietal Identification through Grow Out Test and Electrophoresis, Molecular and Biochemical test. Detection of genetically modified crops, Transgene contamination in non-GM crops, GM crops and organic seed production. Seed drying, processing and their steps, seed testing for quality assessment, seed treatment, its importance, method of application and seed packing.

UNIT IV: Seed storage; general principles, stages and factors affecting seed longevity during storage. Measures for pest and disease control during storage.

UNIT V: Seed marketing: Structure and organization, sales generation activities, promotional media. Factors affecting seed marketing, Role of WTO and OECD in seed marketing. Private and public sectors and their production and marketing strategies.

Recommended Textbook:

1. Hand book of seed processing and marketing- Gaur. S.C, Agro bios, India.
2. "**Principles of Seed Science and Technology**" by Lawrence O. Copeland and Miller F. McDonald

Reference Books:

1. Seed Science and Technology: An Illustrated text book- Vanangamudi, 2015, New India Publishing Agency, India.
2. "**Principles of Seed Science and Technology**" by Lawrence O. Copeland and Miller F. McDonald

SUBJECT CODE & NAME: AGUCBG305P/ PRINCIPLES OF SEED TECHNOLOGY**Course Outcomes**

1. Student will be able to understand the importance of legal procedures related to seed quality control.
2. Able to understand the procedure for seed certification.
3. Able to grasp the importance of Indian minimum seed certification standards.

List of Experiments:

A minimum of 5 experiments from the following should be performed.

1. **Seed production in major cereals: Wheat, Rice, Maize, Sorghum, Bajra and Ragi**
Land, sowing time, seed rate, fertilizer dose, roughing, yield, genetic purity, germination per cent, Rice commercial hybrid varieties, three line approach.
2. **Seed production in major pulses: Urd, Mung, Pigeon pea, Lentil, Gram, Field bean, pea**
Land, sowing time, seed rate, fertilizer dose, roughing, yield, genetic purity, germination per cent, hybrid varieties, HYV.
3. **Seed production in major oilseeds: Soybean, Sunflower, Rapeseed, Groundnut and Mustard;**
Land, sowing time, seed rate, spacing, sowing methods, fertilizer dose, roughing, yield, genetic purity, germination per cent, hybrid varieties.
4. **Seed production in important vegetable crops Brinjal, tomato, onion, Chilli, Okara, Pumpkin;**
Foundation and certified seed, seed rate, isolation distance, field inspection, roughing, yield per cent, genetic purity, germination per cent etc.
5. **Seed production in important vegetable crops: Bottle gourd, bitter gourd, ridge gourd, Sponge gourd**
Foundation and certified seed, sowing time, fertilizer dose, seed rate, isolation distance, field inspection, roughing, yield per cent, genetic purity, germination per cent etc
6. **Seed sampling and testing procedure**
Seed lot, sampling, types of samples: simple and composite, submitted sample, working sample.
7. **Physical purity**
Seed blower, purity work board, forceps, magnifying glass, spatula, dishes, needle and balance.

8. **Seed Germination test** Germination on towel paper, Germination in petridish, germination in sand and soil.
9. **Seed Viability test:** Tetazolium test, embryo excision test, Indigo carmine test, Radiographic methods, Glutamic acid decarboxylase test etc.
10. **Seed and seedling vigour test** Direct test: brick gravel test, Paper piercing test, Indirect test: First count methods, seedling growth rate, Seedling dry weight, Vigour index length and mass, tetrazolium test.
11. **Genetic purity test: Grow out test; Genetic purity test: electrophoresis** Gel electrophoresis unit, pH meter, power supply unit, mortar pestle, razor blade, eppendorf tube
12. **Seed certification: Procedure, Field inspection:** Registration of seed plot, Verification of seed source, field inspection, supervision, Seed sampling and testing, tagging and sealing.
13. **Preparation of field inspection report:** Name of seed grower, district, village, Location of farm, name of crop, varieties, sowing date, spacing, stage of seed crop, isolation distance etc.
14. **Visit to seed production farms:** Type of cross, Procurement of seed, field selection isolation, synchronization, Planting ratio, Pollination etc.
15. **Visit to seed testing laboratories and seed processing plant:** Physical purity, germination, seed vigour and viability, seed health, genetic purity etc.

Reference Book:

1. "Principles of Seed Technology" by P.K. Agarwal and M. Dadlani
2. "Seed Technology" by Ratan Lal Agrawal
3. "Seed Science and Technology" by S. Bhojwani and M. S. Bhatt
4. "Seed Technology" by R.K. Desai

SUBJECT CODE & NAME: AGUCBG306T / PRODUCTION TECHNOLOGY FOR VEGETABLES AND SPICES**Course Outcomes:**

1. On the completion of the course, students will be able to:
2. To know importance of vegetables and spices crops.
3. Understand the scientific cultivation methods of vegetables and spices.
4. To study classification of Vegetables.
5. Skilled on vegetable gardening with special reference to kitchen gardening.
6. To 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.

UNIT I: Introduction: Importance of vegetables & spices in human nutrition and national economy, kitchen gardening.

UNIT II: Production technology of vegetable and spices: Origin, area, climate, soil, improved varieties and cultivation practices such as time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting and yield, physiological disorders, of important vegetable and spices (Tomato, Brinjal, Chilli, Capsicum, Cucumber, Melons, Gourds, Pumpkin).

UNIT III: Production technology for Cole and bulb crops: Origin, area, climate, soil, improved varieties and cultivation practices such as time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting and yield, physiological disorders, of important vegetable and spices (French bean, Peas; Cole crops such as Cabbage, Cauliflower, Knol-khol; Bulb crops such as Onion, Garlic).

UNIT IV: Production technology for Root, tuber and leafy crops:

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

UNIT V:

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

Recommended Text Books

1. A textbook on production technology of vegetables (2009)- Choudhary, B. R. Kalyani Publisher.
2. Modern Technology in Vegetable Production- Pranab Hazra, A. Chattopadhyay, K. Karmakar and S. Dutta.2010, New India Publishing Agency, New Delhi.
3. Basic Concepts of Vegetable Science- Neeraj Pratap Singh, International Book Distributing Co. New Delhi, Academic Press, New Delhi.

Recommended Reference Books

1. Vegetable crop in India- Yawalkar, K.S, Agri Horticulture Pub. House, Nagpur.
2. Handbook of Vegetable Crops (2008)- Dhaliwal, M. S., Kalyani Publisher.

SUBJECT CODE & NAME: AGUCBG306P / PRODUCTION TECHNOLOGY FOR VEGETABLES AND SPICES**Course Outcomes**

By the end of this course students will learn about appropriate production practices, careful harvesting, and proper packaging and grading all contribute to good produce quality.

List of Experiments:

- 1. Preparation of Nursery Beds and Seed Sowing for Raising Healthy Seedlings of Horticultural Crops.** Location of nursery bed, soil, size, fertilizer and manure application, sowing of seed
- 2. Identification of Important Vegetable Crops (Cucurbitaceae and Solanaceae) on the basis of Different Morphological Traits,**
- 3. Identification of Important Legumes and leafy Vegetable Crops on the basis of Different Morphological Traits.** Forceps, hand lens, paper sheet, paper and pen, stem, root leaf characteristics
- 4. Identification of Important root, bulb and Cole Vegetable Crops on the basis of different Morphological Traits.** stem, root leaf characteristics, french bean, cluster bean, cowpea, garden pea, Amaranthus, fenugreek, spinach
- 5. Identification and description of different spices.** stem, root leaf characteristics, carrot, raddish, turnip, cauliflower, cabbage, Onion, garlic
- 6. To study the methods of Vegetable seed extraction:** Forceps, paper sheet and pen, stem, root, leaf, flower characteristics. Juice and seed extraction, fermentation methods, acid and alkali treatment
- 7. To Study Economics of Vegetables and Spices Cultivation:** Cost of cultivation, Yield (MT/ha), Net income (Rs.) (at the lowest price), Market price range (Rs.)
- 8. Harvesting, maturity indices, grading of spices:** Maturity and time of harvest, Number of days after fruit setting, Shape of transversely cut fruit, Ratio between sugar and acids, Loss of chlorophyll, TSS

Reference Book:

1. "Production Technology of Vegetables and Spices" by T. Pradeepkumar, B. Sumajyothibhaskar, K.N. Satheesan, and J. Suma
2. "Vegetable Production Technology" by G.R. Gopalakrishnan
3. "Spices Production Technology" by P. N. Ravindran and K. Nirmal Babu
4. "Handbook of Vegetables and Vegetable Processing" by Nirmal Sinha, Y. H. Hui, E. Özgül Evranuz, M. Siddiq, and J. Ahmed.
5. "Production Technology of Vegetables" by G. Singh

**SUBJECT CODE & NAME: AGUCBG307T / ENVIRONMENTAL STUDIES
AND DISASTER MANAGEMENT**

Course Outcomes

1. Students will learn about natural resource, its importance and environmental impacts of human activities on natural resource.
2. Gain knowledge about the conservation of biodiversity and its importance.
3. Aware students about problems of environmental pollution, its impact on human and ecosystem and control measures.

UNIT I:

Scope and Importance: Environmental studies Definition, scope and importance, Natural Resources, Forest resources, Water resources, Mineral resources, Food resources, Energy resources, Land resources.

UNIT II:

Ecosystem and Biodiversity Ecosystems-Concept of an ecosystem, Structure and function of an ecosystem, Biodiversity and its conservation

UNIT III:

Environmental pollution and Protection Environmental Pollution, Solid Waste Management, Social Issues, Environmental ethics, Wasteland reclamation,

UNIT IV:

Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection. Act. Forest Conservation Act.

UNIT V:

Environmental legislation, public awareness and Climate Change Issues involved in enforcement of environmental legislation. Public awareness, Environment and human health, Women and Child Welfare, Natural Disasters, Climatic change, Man Made Disasters, Disaster Management.

Recommended Text Book

1. Disaster Management- Gupta HK., Indian National Science Academy. Orient Blackswan. Yy.
2. Coping with catastrophe. Handbook of Disaster Management- Hodgkinson PE & Stewart M, Routledge.

Reference Books:

1. Disaster Management- YY Sharma VK. 2001. National Centre for Disaster Management, India.
2. Enviromental Science: A Practical Manual- G. Swarajya Lakshmi.

SUBJECT CODE & NAME: AGUCBG307P / ENVIRONMENTAL STUDIES AND DISASTER MANAGEMENT**Course Outcomes**

1. Students will learn about testing of various parameters in waste water sample.
2. They will learn about the different parameters, their standard values. Gain knowledge about the control measures.

List of Experiments:

1. **Determination of Chemical Oxygen Demand in Waste Water Sample** Cost of cultivation, Yield (MT/ha), Net income (Rs.) (at the lowest price), Market price range (Rs.)
2. **Determination of Dissolved Oxygen in Waste Water Sample**, Determination of Total Dissolved Solids in Waste Water Sample. Two methods are commonly used to determine DO concentration: (1) The iodometric method which is a titration-based method and depends on oxidizing property of DO and (2) The membrane electrode procedure, which works based on the rate of diffusion of molecular oxygen across a membrane.
3. **Analysis of Total Hardness of Waste Water Sample** To measure total suspended and dissolved solids, a sample of water is placed in a drying oven to evaporate the water, leaving the solids.
4. **Analysis of Waste Water/Sludge for Heavy Metals** Metal analysis can be done by various techniques like Atomic Absorption Spectrophotometer or flame photometer.
5. **Estimation of Non-Respirable Dust in Air by using Dust Sample.** Coarse dust was collected in a cone, weighed before and after sampling. After sampling, dust box cleaned to remove the total dust in the cone. Difference in weight is divided by the volume of the air sampled and is expressed in $\mu\text{g}/\text{m}^3$
6. **Visit to In-situ or Ex situ Conservation Centre/ Social Service Organization/Environmental Education Centre.** Visit will enhance their practical experience about the various sites. How the social organization works, what are the issues they take up all will be studied.

- 7. Visit to Local Polluted Site -Observations and Remedial Measures** Collection of samples from polluted site, their testing and finally the remedial measures will be planned.

Practical Mannual:

1. "Textbook of Environmental Studies for Undergraduate Courses" by Erach Bharucha
2. Environmental Studies: From Crisis to Cure" by R. Rajagopalan
3. "Environmental Studies" by Benny Joseph
4. "Disaster Management" by Harsh K. Gupta
5. Disaster Management and Preparedness" by Larry Collins and Thomas D. Schneid

SUBJECT CODE & NAME: AGUCBG308T / STATISTICAL METHODS**Course Outcomes**

1. Acquaintance with some basic concepts in statistics.
2. Making familiar with some elementary statistical methods of analysis of data viz. Measures of Central Tendency, Dispersion, Moments, Skewness, and Kurtosis and to interpret them. Analysis of data pertaining to attributes and to interpret the results.
3. Students will acquire the basic knowledge of complete enumeration and sample, sampling frame, sampling distribution.

UNIT I:

Probability: Introduction to Statistics and its Applications in Agriculture, Graphical of Data, Measures of Central Tendency & Dispersion, Definition of Probability, Addition and Multiplication Theorem (without proof). Simple Problems Based on Probability.

UNIT II: Probability distribution: Binomial & Poisson Distributions, Definition of Correlation, Scatter Diagram. Karl Pearson's Coefficient of Correlation. Linear Regression Equations.

UNIT III: Test of significance: Introduction to Test of Significance, one sample & two sample test t for Means, Chi-Square Test of Independence of Attributes in 2×2 Contingency Table.

UNIT IV: Introduction to Analysis of Variance, Analysis of One-Way Classification.

UNIT V: Sampling Techniques: Introduction to Sampling Methods, Sampling versus Complete Enumeration, Simple Random Sampling with and without replacement, Use of Random Number Tables for selection of Simple Random Sample.

Recommended Text Reference :

1. Problems and Solutions in Statistics. 7th Edition- Kapoor VK., Sultan Chand and Sons.
2. Statistical Methods & Applications- Carla Rampichini, Hybrid (Transformative Journal).

Recommended Text Reference:

1. Statistical Methods for Agricultural Workers- Panse, V. G. and P.V. Sukhatme. (1967), Indian Council of Agricultural Research, New Delhi, India.

SUBJECT CODE & NAME: AGUCBG308P / STATISTICAL METHODS**Course Outcomes:**

1. Theory by the end of the course, the students will be able to:
2. Calculation of Mean, Median, Mode, Geometric Mean and Harmonic Mean.
3. Formula and Calculation of absolute measures of Dispersion, Range, Quartile Deviation.
4. Definition and types of Correlation and Regression.
5. Definition and types of Correlation and Regression.

List of Experiments:

1. **Graphical Representation of data** Construction of Discrete and continuous frequency distribution Construction of Bar Diagram, Histogram, Pie Diagram, Frequency curve and Frequency polygon
2. **Measures of Central tendency** Definition, Formula and Calculation of Mean, Median, Mode, Geometric Mean and Harmonic Mean for grouped and ungrouped data Definition, Formula and Calculation of Quartiles, Deciles and Percentiles for grouped and ungrouped data
3. **Measures of Dispersion** Definition, Formula and Calculation of absolute measures of Dispersion, Range, Quartile Deviation, Mean Deviation, Standard Deviation Definition, Formula and Calculation of relative measures of Dispersion, CD and CV for grouped and ungrouped data
4. **Moments, Skewness and Kurtosis** Definition and types of moments, skewness and Kurtosis Formula and calculation of raw moments, moments about origin, central moments and different types of coefficients of skewness and kurtosis
5. **Correlation and Regression** Definition and types of Correlation and Regression. Calculation of Correlation and regression coefficient along with their test of significance
6. **Test of Significance;** Definition of Null and Alternative Hypothesis and different tests of significance Application of t test for single mean, t-test for independent samples, paired t test, F-test, Chi-square test

7. **Analysis of Variance (One way and Two-way classification);** Definition and steps of analysis of one way and two way classification. 2. Analysis of CRD and RBD as an example of one way and two-way ANOVA
8. **Sampling Methods** Definition of SRS, SRSWR and SRSWOR and difference between census and sampling Procedures of selecting a simple random sample

Reference Practical Manual

1. "Applied Statistics and Probability for Engineers" by Douglas C. Montgomery and George C. Runger:
2. "Practical Statistics for Data Scientists" by Peter Bruce and Andrew Bruce:
3. "Introduction to the Practice of Statistics" by David S. Moore, George P. McCabe, and Bruce A. Craig:
4. "Statistics for Business and Economics" by Paul Newbold, William L. Miller, and Ronald E. Thorne.
5. "Data Analysis Using Regression and Multilevel/Hierarchical Models" by Andrew Gelman and Jennifer Hill:

SUBJECT CODE & NAME: AGUCBG309T / LIVESTOCK AND POULTRY MANAGEMENT**Course outcomes**

1. The course knowledge directly reflects on the operation of livestock and poultry farming being taken as a major component of integrated farming system in agriculture.
2. Mini farming unit provides a sustainable source of income to landless farmers and generate employment opportunity in rural areas. The course provides basic knowledge for its operation.
3. It is the greatest source of information for the students, enlightened farmers and the person/planners associated with the implementation of animal husbandry programmes of state as well as national level.
4. This course chapters will serve as animal husbandry compendium for young entrepreneurs.
5. This course encompasses all relevant information and database and serve as resource of knowledge of hand to help the person in animal husbandry sector in harnessing the maximum potential of animal health and production

UNIT I:

Role of livestock in the national economy. Reproduction in farm animals and poultry. Housing principles, space requirements for different species of livestock and poultry. Management of calves, growing heifers and milch animals. Management of sheep, goat and swine. Incubation, hatching and brooding. Management of growers and layers.

UNIT II:

Important Indian and exotic breeds of cattle, buffalo, sheep, goat, swine and poultry. Improvement of farm animals and poultry

UNIT III:

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

UNIT IV:

Feed supplements and feed additives. Feeding of livestock and poultry.

UNIT V:

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

Recommended reference book:

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

Recommended reference book:

1. A Handbook of Animal Husbandry – ICAR.
2. A Textbook of Livestock Production Management in Tropics – D.N. Verma.

SUBJECT CODE & NAME: AGUCBG309P / LIVESTOCK AND POULTRY MANAGEMENT**Course Outcomes**

1. By the end of this course students will gather the knowledge housing and handling of farm and poultry animals.
2. By visiting IDF and IPF students will learn daily routine, feeding and breeding managements, disease control for livestock and poultry.

List of Experiments:

A minimum of 5 experiments from the following should be performed.

- 1. Identification of External body parts of cattle, buffalo, sheep, goat, swine.** Head, Neck, Body or Barrel, Fore limbs or Fore quarters and Hind limbs or Hind quarters.
- 2. Identification for the external body parts of Poultry Birds.** Comb, beak, wattles, ears, earlobes, eyes, eye rings, wings, tail, thighs, hocks, shanks, spurs, claws, and toes
- 3. Housing principles, space requirements for different species of livestock and poultry,** Size and direction of house, flooring, floor size, shed size and material, roof design, roof type, and manger, door, calving boxes, isolation boxes
- 4. Identification of feeds and fodders,** Roughages, leguminous and non-leguminous, hay and straw, cereals, millets, milled products
- 5. Handling of livestock.** Drenching, dressing and vaccination, wire net muzzle, halter, travis, lifting fore and hind leg of cattle, casting, Reuff's methods
- 6. Visit to IDF and IPF To study breeds of livestock and poultry.**
- 7. Feeding and breeding management, disease control, housing, milking, dairy and poultry products, daily routine and farm records.** Topography and drainage, soil type, sunlight and wind exposure, water supply, durability, electricity, conventional housing, tail to tail system, loose housing system.
- 8. Planning and layout of housing for different types of livestock.** Topography and drainage, soil type, sunlight and wind exposure, water supply, durability, electricity, conventional housing, tail to tail system, loose housing system

- 9. Computation of rations for livestock.** Liberal feeding, individual feeding, laxative, economical, Pearson's square method, Algebraic method or simultaneous equation, double Pearson method
- 10. Clean milk production, milking methods.** Healthy cow, clean cow, clean barn, clean milker, Transport, processing & distribution of milk, hand milking, machine milking
- 11. Hatchery operations, incubation and hatching equipment's.** Hot air incubator, Hot water incubator, Gas operated incubator, Oil operated incubator, Size, design and construction of the hatchery
- 12. To study debeaking, dusting and vaccination in poultry.** Debeaking importance and methods, Methods of vaccination,
- 13. Management of chicks, growers and layers.** Housing, light, feeding, ration of layer mash of chickens, cage layer management

Reference Practical Manual:

1. "Livestock and Poultry Production and Management" by A. K. Bhaduri:
2. "Poultry Production and Management" by David M. A. P. Bragg and T. W. E. Simpson:
3. "Principles of Poultry Science" by E. M. McKenzie and J. F. McKenzie:
4. "Modern Livestock and Poultry Production" by James D. Gillett and Leslie H. Eddleman:
5. "Integrated Livestock and Poultry Management" by K. D. Houghton:
6. "Farm Animal Management" by M. J. Long:

SUBJECT CODE & NAME: PTSPPBG20T / PROFESSIONAL PROFICIENCY**Course Outcomes**

1. Better representation of himself/herself in terms of communication & writing skills.
2. overall personality development and aptitude building required for Government sector jobs.
3. This program will help students employable and ready for Banking services, UPSC, UPPSC and other state level Competitive examination/ Agro-Industries /NGO's and other Public and Private Sector jobs

UNIT I: Hard Skills, Hard skill includes Basic Grammar, Close Test, Conjunction, Preposition, Construction of Sentences, Reading Comprehensions, Para Jumbles, Para Completion, Vocabulary.

UNIT II: Communication & Writing Skill Efforts should be made to overcome the expertise in speaking and writing of English Essay hence improve their fluency in English & writing skills on different aspects. Suggested topic include: Each student should speak and write essay on selected topic from Literature and Social Sphere, Political sphere, Science, Environment & Technology.

UNIT III:

- Aptitude Building Quantitative Aptitude
- Data Interpretation
- Data Sufficiency
- Number Series
- Time and Work
- Time and Distance
- Simple and Compound Interest
- Ratio and Proportion
- Averages
- Mixture and Allegation
- Pipes and Cisterns
- Situation Reaction Test

LOGICAL REASONING

- Logical Reasoning
- Coding & Decoding
- Syllogism
- Machine Input Output
- Puzzles
- Seating Arrangements
- Direction Sense Test
- Blood Relations
- Problems based on Ages
- Ranking and Order
- Data Sufficiency
- Statement and Conclusions
- Statement and Assumptions
- Statement and Arguments
- Logical Reasoning
- Word Sequence

**SUBJECT CODE & NAME: AGUCBG401T/ CROP PRODUCTION
TECHNOLOGY -II (RABI CROPS)****COURSE OUTCOMES:**

1. Know the origin, geographical distribution, economic importance, soil and climatic requirements,
2. varieties, cultural practices and yield of Rabi crops.
3. Identify weeds in Rabi season crops.
4. To understand the yield-attributing characteristics of Rabi crops and estimate the yield of Rabi crops.

UNIT I:

General Introduction

Origin, geographical distribution, economic importance, soil and climatic, varieties, cultural practices, and yield of Rabi crops.

UNIT II:

Cultivation of Cereal & Pulses Crops Cereals – wheat and barley, Pulses-chickpea, lentil, peas

UNIT III:

Cultivation of Oilseed & Sugar Crops Oilseeds-rape seed, mustard and sunflower; sugar crops-sugarcane. Medicinal and aromatic crops-mentha, lemon grass, and citronella, Forage crops-berseem, lucerne, and oat.

Text Books

1. Modern techniques of raising field crops- Chhidda Singh, Prem Singh, and Rajbir Singh- CBS Publishers & Distributors.
2. Field crops production crops Volume I- Dr. Rajendra Prasad, Indian Council of Agricultural Research, New Delhi.
3. Field crops production-Commercial crops Volume II- Dr. Rajendra Prasad, Indian Council of Agricultural Research, New Delhi.
4. Reference Books
5. Crops of India, Scientific Publishers- N.R. Das.
6. Agronomy of Field Crops- Reddy, S.R. 2004. Kalyani Publishers, New Delhi.

**SUBJECT CODE & NAME: AGUCBG401T/ CROP PRODUCTION
TECHNOLOGY -II (RABI CROPS)****COURSE OUTCOMES:**

1. Students will be aware of the nature of field crop production including the knowledge, skills, and abilities required for field crop production.
2. Carry out field observations, including sowing methods, depth, plant density, crop density and geometry, and Optimal plant population.
3. To encourage the development of employability skills in field crop production.
4. Understand the procedure for harvesting and threshing crops.

Objectives

1. **Seedbed preparation of different Rabi** Rope, Measuring tape, Spade, iron pegs, Wooden Planks, etc.
2. **To know the sowing methods of wheat** Broadcasting, Behind local plough, Drilling. Dubbing, Zero till seed drill technique, Furrow irrigated raised bed.
3. **To know about the sowing methods of sugarcane** Tractor, Ladder/plank, Spade, hand hoe, rake, measuring tape, seed, fertilizers, Ridges and furrow method, trench method etc.
4. **To study identification of weeds in rabi season crops.** Manual on weed management, books on botany, taxonomy, weed science, herbarium, pencil, white paper etc.
5. **To study weed control measures** Manual mechanical and chemical, hand pulling, hand hoeing, Tillage, moving, flooding, burning etc.
6. **To study of morphological characteristics of rabi crops** Leaf, stem, flower, root, fruit, seed, height, duration etc.

7. **Study of yield contributing characters of rabi season crops**, No. of plants /m, No. of productive tillers/plant, Total no of grains /ear, head Test weight (1000 seed weight), No. of pods/ plant No. of seeds /pod, No. of tubers/ plant Average weight of tuber.
8. **Yield and Juice quality analysis of sugarcane** Refractometer (brix), tissue paper and syrup, cane yield, juice yield, sugar yield (t/ha) and sugar recovery (%).
9. **Study of important agronomic experiments of rabi crops at experimental farms.** Climate and weather condition, Temperature, Rainfall, Relative humidity, Experiment detail, Design, Gross area of the plot, Net area of the plot, No. of replication, No. of treatment, Varieties.
10. **Study of rabi forage experiments** Climate and weather condition, Temperature, Rainfall, Relative humidity, Experiment detail, Design, Gross area of the plot, Net area of the plot, No. of replication, No. of treatment, Varieties, irrigation channel, spacing.
11. **Oil extraction of medicinal Crops** Petroleum benzene, Distillation apparatus, trimble oilseed sample, heating mantle soxhlet glass ware and balance.
12. **Visit to research stations of related crops.**
Area of the farm, Under cultivation, Single crop area, Double crop area, Under building, roads, channels, threshing floor, Characteristics of the soil, pH, texture, Area under irrigation, Source under irrigation.
13. **Identification of Common Manures and Fertilizers** Bulky and concentrated organic manures, Urea, SSP, MOP, Ammonium Sulphate etc.

Practical Manuals:

1. Practical Manual on Crop Production Technology, Mrityunjay Ghosh Publisher: Department of Agronomy, Bidhan Chandra Krishi Viswavidyalaya, West Bengal
2. Practical Manual on Crop Production Author(s):M. Yakadri, K. Suneetadevi BS Publications/BSP Books

Subject code & name: AGUCBG402T/Production Technology For Ornamental Crops, Map And Landscaping

Course Outcomes

1. Know 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.
2. Understand the scientific cultivation methods of different ornamentals, Medicinal and aromatic crops.

Unit-I

Introduction & Landscaping

Importance and scope of ornamental crops, medicinal and aromatic plants, and landscaping.

Principles of landscaping. Landscape uses of trees, shrubs, and climbers.

Unit-II

Production and packaging of ornamental crops

Production technology of important cut flowers like rose, gerbera, carnation, Lilium and

orchids under protected conditions and gladiolus, tuberose, and chrysanthemum under open

conditions. Package of practices for loose flowers like marigolds and jasmine under open

conditions.

Unit-III

Production and packaging of medicinal crops

Production technology of important medicinal plants like ashwagandha, asparagus, aloe,

costus, Cinnamomum, periwinkle, isabgol.

Unit-IV

Production and packaging of aromatic crops

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

Text Books

1. Floriculture in India by G. S. Randhawa and Mukhopadhyay.
2. Introduction to Spices, Plantation crops, Medicinal and Aromatic plants- N. Kumar, Abdul Khader, P. Rangaswami, I. Irulappan.

Reference Books

1. Textbook of Floriculture and Landscaping by Anil K. Singh and Anjana Sisodia.
2. Handbook of Horticulture by K. L. Chaddha.

**SUBJECT CODE & NAME: AGUCBG402P/ PRODUCTION TECHNOLOGY
FOR ORNAMENTAL CROPS, MAP AND LANDSCAPING**

Course Outcomes

1. Theory By the end of the course, the students will be able to
2. Understand the identification, training & pruning of various ornamental, MAPs.

Objectives

1. **Identification of Ornamental, medicinal and aromatic plants** Common and botanical name, family, Chromosome no.
2. **To prepare nursery bed and seed sowing of ornamental crops** Soil treatment, seed treatment, seed sowing method, seed rate, watering etc.
3. **To study of propagation of ornamental crops and MAPs** Vegetative propagation, 'T' Budding, Stem cuttings, Air Layering or Cuttings.
4. **Training and Pruning of Ornamentals** Hand Shears, Pruning Loppers, Pruning Saw, Pole Tree Saw, Types of pruning, Thinning out, Heading Back, Bulk Pruning, Thin wood Pruning.
5. **To study the protected structure used for flower cultivation** Greenhouse, its types, cladding material, Glass, FRP (Fibre Reinforced Plastic), polyethene, PVC, polycarbonate sheets, Growing system, growing condition and medium, irrigation, fertigation etc.
6. **To study the protected structure- care and maintenance** Greenhouse cooling: ventilation, roof shading, evaporative cooling, Fan and pad cooling system.
7. **To study the intercultural operation in flowers and MAP** Weed control, pinching, Disbudding, De sucking, weeding, hoeing, earthing up etc.
8. **To study the harvesting and post-harvest handling of cut flower** Harvesting, conditioning, pre-cooling, grading, bunching, wrapping, storage, transport, sales.

9. To study the oil extraction methods of MAPs Hydro distillation, Hydro diffusion, Water distillation, Water steam distillation, Direct steam distillation, Supercritical fluid extraction (SFE), Microwave distillation etc.

10. To visit to commercial flower/MAP unit

Area of farm, farm under cultivation.

Practical Manuals:

1. Production Technologies Vol 01 Practical Manual of Horticulture Crops by Verma Anil Kumar, New India Publishing Agency.
2. Processing and Postharvest Technologies: Vol.02: Practical Manual of Horticulture Crops Publisher: New India Publishing Agency

SUBJECT CODE & NAME: AGUCBG403T/ FARM MACHINERY AND POWER**Course Outcomes**

1. To understand the working principle of different systems and parts of internal combustion engines.
2. To equip the students with technical knowledge and skills required for the operation of tillage,
3. sowing and intercultural and plant protection machinery needed for agricultural farms.
4. To train the students with skills required for the operation, maintenance and evaluation of harvesting, and threshing machinery needed for agricultural farms.

Unit-I**Introduction**

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.

Unit-II**Familiarisation with Engine**

Study of different components of I.C. engine, I.C. engine terminology and solved problems, Familiarization with different systems of I.C. engines: Air cleaning, cooling, lubrication, fuel supply and hydraulic control system of a tractor.

Unit-III

Power Transmission System Familiarization with Power transmission system, clutch, gearbox, differential and final drive of a tractor, Tractor types, Cost analysis of tractor power and attached implement.

Unit-IV

Tillage Implement Familiarization with Primary and Secondary Tillage implementation, Implement for hill agriculture, implementation for intercultural operations, Familiarization with sowing and planting equipment, calibration of a seed drill and solved examples.

Unit-V**Plant protection Implement**

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

Text Books

1. Elements of Agricultural Engineering- Jagdiswar Sahay, Standard Publishers Distributors.
2. Farm machinery –Principles and applications- Surendra Singh, ICAR, New Delhi.

Reference Books

- 1) **Farm Tractor and maintenance and repair-** Jain, S.C. and C.R. Rai. Standard Publishers,1705- B, Nai sarak,. Delhi- 110006.
- 2) **Principles of Agricultural Engineering.** Vol.I- Ojha, T.P. and A.M. Michael, A.M. Jain brothers, 16/893, East Park Road, Karol Bagh, New Delhi -110005.

SUBJECT CODE & NAME: AGUCBG403P/ FARM MACHINERY AND POWER**Course Outcomes**

1. After the completion of the course students will get knowledge of I. C. engine and to make them familiarised with various tiller implements & sprayers and dusters.
2. They have a better understanding of intercoalition equipment and harvesting and threshing machinery.

Objectives:

1. **To study Internal combustion Engine components** Cylinder, Cylinder block, Cylinder head, Cylinder liner, Piston, crown of piston, Piston ring.
2. **To study Four-stroke cycle engine** Suction Stroke, Compression stroke, Power stroke, and Exhaust stroke.
3. **To dismantle, clean and reassemble a dry type of air cleaner** Screwdriver, spanner set, cotton waste, cutting plier.
4. **To dismantle, clean and reassemble a wet-type air cleaner** Screwdriver, spanner set, cotton waste, cutting plier.
5. **To remove, inspect and reinstall clutch assembly in a tractor** Standard tools and equipment, bolts, and spring washers.
6. **To dismantle, inspect clean and reinstall the P.T.O shaft** Screwdrivers, spanner set, cutting pliers, hammers, cotton waste etc.
7. **To study Air cooling systems and its advantages** The total area of the fin surfaces, velocity and amount of the cooling air, temperature of the fins and of the cooling air etc.
8. **To servicing the radiator** Double-end spanner set, Ring spanner set, Adjustable spanner, Cutting player, Screwdriver, Wire brush.
9. **To study the starting and stopping of Diesel Engines.** Prepare the engine for starting, Prime the fuel system, and start the cylinder engine.

- 10. To service the fuel tank and fuel lines** Tank, Suction line, Fuel cock, Tank cap, Overflow line.
- 11. To study Tillage and classification of Tillage** Primary and secondary tillage, the objective of tillage.
- 12. To study Indigenous or Country plough** Share, body, beam, hand.
- 13. To study Animal and Tractor drawn mould Board ploughs** Animal drawn – Trailed type Tractor drawn – Semi mounted type - Mounted type, Cutting edge of share, Wing of Share, Gunnel of share, mould board.
- 14. To study the construction of a standard disc plough** Disc, Standard, Plough Frame, Rear Furrow Wheel, Scraper, Cross shaft.
- 15. To study the care and maintenance of seed– cum – fertilizer drill** Daily: open the furrow, and apply grease, nut and bolt periodically.
- 16. To study cultivators and its important functions** Disc Cultivator, rotary Cultivator, Time cultivator.

Practical Manual

1. Practical Manual on Farm Machinery & Power by [Rana Mukesh Khan Kalay](#)
Publisher : Kalyani Publishers
2. Practical Manual Farm Machinery and Power by Dr. Sandeep Kumar Pandey, Dr. Pramod Kumar Mishra, Publisher : Rudra Publications

SUBJECT CODE & NAME: AGUCBG404T/ Agricultural Marketing Trade & Prices

Course Outcomes

1. Students will be able to understand and appreciate the structure and workings of the agricultural marketing system.
2. Able to learn how the agriculture marketing system affects the farmers, consumers and intermediaries.

Unit-I

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

Product life cycle and Marketing

Product life cycle (PLC) and competitive strategies: Meaning and stages in PLC; characteristics of PLC; strategies in different stages of PLC; pricing and promotion strategies: pricing considerations and approaches – cost-based and competition-based pricing; market promotion – advertising, personal selling, sales promotion and publicity – their meaning and merits & demerits; marketing process and functions: Marketing process-concentration, dispersion and equalisation; exchange functions – buying and selling; physical functions –storage, transport and processing.

Unit-III

Market functionaries and marketing channels

Types and importance of agencies involved in agricultural marketing; meaning and definition of marketing channel; number of channel levels; marketing channels for different farm products; Integration, efficiency, costs and price spread: Meaning, definition and types of market integration; marketing efficiency; marketing costs,

margins and price spread; factors affecting cost of marketing; reasons for higher marketing costs of farm commodities; ways of reducing marketing costs.

Unit-IV

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 futures trading; Agricultural prices and policy: Meaning and functions of price; administered prices; need for agricultural price policy.

Unit-V

Trade

Concept of International Trade and its need, absolute and comparative advantage theories. Present status and prospects of international trade in agri-commodities; GAT and WTO; Agreement on Agriculture (AoA) and its implications on Indian agriculture IPR.

Text Books

- 1) State of Indian Farmer: Agriculture Marketing by S.S. Acharya, Academic Foundation, New 2004.
- 2) Marketing of Agricultural Products by Richard L. Kohls and Joseph, Prentice Hall of India, New Delhi, 2018.

Reference Books

1. Agriculture Marketing in India by S. Acharya and N. L. Agarwal, Oxford and IBH, New Delhi, 1999.
2. Agriculture and Food Marketing in Developing Countries by Abbott, John Cave, Oxford, London, 2007.

**SUBJECT CODE & NAME: AGUCBG404P/ AGRICULTURAL MARKETING
TRADE & PRICES****Course Outcomes**

At the end of this course, students will get

1. The knowledge of agriculture marketing in local markets.
2. Student will be aware of various market agencies, and institution and their role in agriculture marketing.

Objectives

- 1. Plotting and study of demand and supply curves and calculation of elasticities**
Demand and supply curves, Law of demand and supply cases of elasticity of demand.
- 2. Study of the relationship between market arrivals and prices of some selected commodities** Commodity, price, arrival.
- 3. Computation of marketable and marketed surplus of important commodity**
Marketable surplus, Total production, Total requirement, marketed surplus=Marketable surplus –loss incurred during transit.
- 4. Study of price behaviour over time for some selected commodities** Commodity, Price.
- 5. Construction of index numbers** Purpose of the Index Number, Selection of Commodities Selection of Prices, Selection of an Average, Selection of Weights.
- 6. Visit a local market to study various marketing functions performed by different agencies.** Producer, middleman, retailers, Itinerant Traders and Village Merchants, Transport Agency, Communication Agency, advertisement Agency.
- 7. Identification of marketing channels for selected commodity** Direct Route, Indirect Route, marketing channel for cereals, pulses, cotton, fruits and vegetables.
- 8. Collection of data regarding marketing costs, margins and price spread and presentation of the report in the class.** Labour, transport, packaging, containers, rent, utilities (water and energy), advertising, selling expenses, depreciation allowances and interest charges.

- 9. Visit market institutions – NAFED, SWC, CWC, cooperative marketing society, etc. to study their organization and functioning** NAFED function, state warehouse cooperation, central warehouse cooperation.
- 10. Application of principles of comparative advantage of international trade** Law or principle of comparative advantage, economic model, Comparative Cost Difference etc.

Practical Manuals:

1. Practical manual on agricultural marketing, Trade and prices Devegowda SR, Yash Gautam, Nagaveni M and Debashish Kumar Publisher: AkiNik Publications
2. Manual on Agricultural prices and marketing, Government of India Ministry of Statistics and Programme

SUBJECT CODE & NAME: AGUCBG405T/ INTRODUCTORY AGRO METEOROLOGY & CLIMATE CHANGE**Course Outcomes**

- 1) Students will be able to understand the scope of agricultural meteorology, atmospheric pressure & its variation with height along with wind and types of wind.
- 2) Study the nature and properties of solar radiation and daily and seasonal variations of temperature.
- 3) Students will be able to understand the weather hazards and weather forecasting along with the impact of weather and climate on agricultural production systems.

Unit-I**Agricultural Meteorology**

Meaning and scope of agricultural meteorology; Earth's atmosphere- its composition, extent and structure; Atmospheric weather variables; Atmospheric pressure, its variation with height; Wind, types of wind, daily and seasonal variation of wind speed, cyclone, anticyclone, land breeze and sea breeze.

Unit-II**Solar Radiation & Atmospheric temperature**

Nature and properties of solar radiation, solar constant, depletion of solar radiation, short wave, longwave and thermal radiation, net radiation, albedo; Atmospheric temperature, temperature inversion, lapse rate, daily and seasonal variations of temperature, vertical profile of temperature, the Energy balance of the earth.

Unit-III**Atmospheric Humidity & Precipitation**

Atmospheric humidity, the concept of saturation, vapour pressure, the process of condensation, formation of dew, fog, mist, frost, cloud; Precipitation, process of

precipitation, types of precipitation such as rain, snow, sleet, and hail, cloud formation and classification; Artificial rainmaking.

Unit-IV

Monsoon

Mechanism and importance in Indian agriculture Weather hazards & Weather Forecasting weather hazards - drought, floods, frost, tropical cyclones and extreme weather conditions such as heat-wave and cold-wave.

Unit-V

Agriculture and weather relations

Modifications of crop microclimate, climatic normals for crop and livestock production. Weather forecasting- types of weather forecast and their uses. Climate change, climatic variability, global warming, causes of climate change and its impact on regional and national Agriculture.

Text Books

1. Radha Krishna Murthy, V. 2016. Principles and Practices of agricultural disaster management, B.S. Publications, Koti, Hyderabad.Reddy, S.R. 2014. Introduction to Agriculture and Agrometeorology, Kalyani Publishers, Ludhiana, Punjab.

Reference Books

1. Radha Krishna Murthy, V. 2002. Basic Principles of Agricultural Meteorology, B.S. Publications, Koti, Hyderabad.

SUBJECT CODE & NAME: AGUCBG405P/ INTRODUCTORY AGRO METEOROLOGY & CLIMATE CHANGE**Course Outcomes**

1. To grasp the importance of agrotechnology in the cultivation of crops.
2. To understand the handling of Agro metrological instruments.
3. To understand the procedure for measurement, tabulation and analysis of various data.

Objectives**1. Study of meteorological observatories, site selection and layout**

Classes of meteorological observatories: Synoptic stations, Agricultural stations, Climatological stations, Rainfall stations.

2. Measurement of bright sunshine hours, total shortwave and longwave radiation estimation

Campbell-Stokes sunshine recorder, Sunshine cards, Sunshine plastic scale, sunshine card, sunshine scale, Radiation instruments: Pyrheliometer, Pyranometer, Albedometer, Net radiometer.

3. Measurement of maximum, and minimum temperatures and soil temperature

Stevenson Screen (Single size), Maximum Thermometer, Minimum thermometer, Dry or wet bulb Thermometer, Soil thermometer, Grass Minimum Thermometer.

4. Measurement of wind speed and wind direction and preparation of wind rose

Cup counter anemometer, Wind vane, Barograph.

5. Determination of vapour pressure, relative humidity and dew point temperature

Psychrometer, Vapour pressure, Saturation deficit, Relative humidity, Dewdrop temperature, Whirling Psychrometer, Assmann Psychrometer.

6. Measurement of rainfall and evaporation measurement instruments

Ordinary rain gauge with measuring cylinder, Self-recording rain gauge, Rate of evaporation and evaporimeter.

7. Analysis of rainfall data for climatological studies

Standard Meteorological week, Meteorological season, Central tendency, Dispersion of Rainfall, Dependability of Rainfall.

8. Measurement of atmospheric pressure and analysis of atmospheric conditions

Fortin's barometer, Kew pattern barometer, Aneroid barometer, Barograph.

9. Estimation of heat indices

Phenology, Growing Degree Day, Base temperature, Photothermal unit, Helio-Thermal Unit, hydrothermal unit.

10. Estimation of Potential

Evapotranspiration PET Thornthwaite method, Modified Penman Method.

Practical Manual:

1. Practical Manual of Introductory Agro-Meteorology and Climate Change by Prof. S. B. Suryawanshi and Dr. S. B. Pawar Dr. P. N. Karanjikar Publisher : Jagrani Publication House.
2. Introductory Agrometeorology & Climate Change, Dr. R. S. Choudhary, Dr. N.L. Dangi.

SUBJECT CODE & NAME: AGUCBG406T /PRODUCTION TECHNOLOGY FOR FRUIT AND PLANTATION CROPS**Course Outcomes**

1. To learn about the scope and importance of fruits and plantation crops.
2. Students will 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, harvesting and yield of different fruits and plantation crops.

Unit-I**Introduction:**

Importance and scope of fruit and plantation crop industry in India; Importance of rootstocks.

Unit-II**Production technologies for the cultivation of major fruits**

-mango, banana, citrus, grape, guava, litchi, papaya, sapota, apple, pear, peach, walnut, almond.

Unit-III**Production technologies for the cultivation of minor fruits**

Date, ber, pineapple, pomegranate, jackfruit, strawberry. Production technologies for the cultivation of plantation crops-coconut, areca nut, cashew, tea, coffee & rubber.

Text Books

1. Pomology (Sub-Tropical Fruit) -T.K. Bose – Daya Publishing House.
2. Pomology (Temperate Fruit) - T.K. Bose- Daya Publishing House.

Reference Books

1. Introduction to spices, Plantation crops and Aromatic plants- Kumar, N.J.B. M. Md. Abdul Khaddar, Ranga Swamy, P. and Irrulappan, I. 1997. Oxford & IBH, New Delhi.
2. Hand Book of Coconut Palm- Thampan, P.K. 1981. Oxford IBH, New Delhi.

**SUBJECT CODE & NAME: AGUCBG406P /PRODUCTION TECHNOLOGY
FOR FRUIT AND PLANTATION CROPS****Course Outcomes**

1. By the end of this course students will learn about appropriate production, propagation, and identification of fruit and plantation crops.
2. Role and use of bioregulators fruit and plantation crops.
3. They know the important pests, diseases and physiological disorders of the above fruit and plantation crops for good quality production.

Objectives

- 1. Identification of fruit and plantation** Plants Common name, Botanical name, family, Origin, Type of fruits and edible parts.
- 2. Classification of fruits and Plantation crops** Botanical classification, temperate fruits, tropical fruits, sub-tropical, arid and semiarid fruits.
- 3. Description and identification of fruit crops and their varieties** Mango, papaya, banana, guava, sapota, citrus, anola, bael, pomegranate, ber, grape, apple.
- 4. Description and identification of plantation crops and their varieties** Coconut, cashew nut, coffee, tea, areca nut.
- 5. Seed propagation, scarification and stratification of seeds** Mechanical scarification, Acid scarification, Chemical treatments, Use of hormone.
- 6. Propagation methods of fruit crop** Inarching, Softwood wedge grafting, Veneer grafting and side grafting, Cleft grating, Epicotyl/stone grafting, Budding, Cutting, Layering-- Air, Tissue culture.
- 7. Propagation methods of plantation crops** Selection of seed, seedling, age of plant, Flowering rate, fruit set, yield, vegetative propagation, seed propagation
- 8. Micro Propagation of fruit crops – Date palm and Banana** Explant, sterilization, media, somatic embryogenesis.

- 9. Preparation of plant bio-regulators and their uses** Auxins, Gibberellins, Cytokinins, Ethylene, Growth Inhibitors [Abscisic Acid (ABA)], Growth Retardants [CCC, AMO, 1618, Phosphon - D, Morphactin, MH], New plant growth regulators [Jasmonates/Jasmonic acid derivatives (JA), Salicylic acid, s Brassinosteroids (BR), Polyamines (PA) etc.
- 10. Physiological disorders of important fruit crops** Mango- Spongy tissue, black tip, malformation, clustering in mango Banana- Kotta vazhai, Neer Vazhai, Grape-granulation, Rind pitting etc.
- 11. Physiological disorders of important Plantation crops** Coconuts: Button shedding / Crown choking, Barren Nut, Band or hidimundige disease, Coffee: Kondli.
- 12. Visit to commercial orchard Area of the farm, Under cultivation, Single crop area,** Double crop area, Under building, roads, channels, threshing floor, Characteristics of the soil, pH, texture, Area under irrigation, Source under irrigation.

Practical Manuals:

1. Production Technologies Vol 01 Practical Manual of Horticulture Crops by Verma Anil Kumar, New India Publishing Agency.
2. Processing and Postharvest Technologies: Vol.02: Practical Manual of Horticulture Crops Publisher: New India Publishing Agency

SUBJECT CODE & NAME: AGUCBG407T / RENEWABLE ENERGY AND GREEN TECHNOLOGY**Course Outcomes**

1. Understand the various forms of conventional energy resources.
2. Explain the concept of various forms of renewable energy
3. Understand the concept of Biomass energy resources and their classification, types of biogas Plants- applications

Unit-I

Introduction: Classification of energy sources, the contribution of these sources in the agricultural sector

Unit-II: Biogas plant and its application

Familiarization with biomass utilization for biofuel production and their application, Familiarization with types of biogas plants and gasifiers, biogas, alcohol, biodiesel and bio-oil production and its utilization as a bioenergy resource.

Unit-III**Solar energy and its application**

Introduction of solar energy, collection and their application, Familiarization with solar energy gadgets: solar cooker, solar water heater, application of solar energy: solar drying, solar pond, solar distillation, solar photovoltaic system and their application. Wind energy Introduction of wind energy and their application.

Text Books

1. Renewable Energy Sources and Their Environmental Impact, by Abbasi, S.A
2. Renewable Energy Resources, by Twidell, John.

Reference Books

1. • Renewable Energy Sources and Emerging Technologies, by Kothari, D. P.

SUBJECT CODE & NAME: AGUCBG407P / RENEWABLE ENERGY AND GREEN TECHNOLOGY**Course Outcomes**

1. Students will learn about renewable energy gadgets and briquetting machines.
2. They will learn about the production technology for biodiesel biogas plants

Objectives**1. To Study of Floating Drum Biogas Plants**

Biogas technology, Process: hydrolysis, acid formation, methane generation, its Parts: digester, gas holder, slurry mixing tank, outlet tank.

2. To Study of Fixed Drum Biogas Plants

Janata Plant, PRAD in 1978, Deenbandhu Plant: advantages, disadvantages, application.

3. To Study of Different Types of Gasifiers

Updraft gasifier, Downdraft gasifier, Twin-fire gasifier, Cross draft gasifier, Fluidized bed gasifier, Other gasifier.

4. To Study the Production Process of Biodiesel

Ethanol and Bio-diesel, Oil, methanol and sodium methylate catalyst, Dual Reactor System.

5. Study of the Production Process of Briquettes

Land, Raw materials, Drying facility to dry raw materials, Shredding machine, Briquetting machine.

6. Study of Solar Photovoltaic Fencing

Energizer, Earthing (Grounding System), Fence system, Components: solar panel, Battery, Energizer, earthening system.

7. To study Solar Cookers

Direct or focusing type, Indirect or box type solar cooker and Advanced type or separate collector and cooking chamber type solar cooker.

8. To Study of Solar Water Heater

Collector coupled to storage tank, Collector cum storage system.

9. To study solar dryers

Natural Convection type: Direct Solar dryers, Indirect Solar dryers, Direct cum indirect Solar dryers Forced circulation type: Bin type grain dryer.

10. Study of Solar Water Pumping System

Solar Photovoltaic Deep Well Pump, types of motors: Permanent magnet DC motors, Wound-field motors, AC motors.

11. Study of Solar Lighting System Solar Lantern, Solar Street Light System, Domestic

Lighting System, Community PV Lighting System and PV Power Plant.

12. Study of Solar Distillation System

Single effect basin stills, Multiple effect basin stills, Wick stills, Emergency still.

Practical Manuals:

1. Practical manual on renewable energy and green technology by Dr. Ajay Singh Lodhi, Dr. Ghanshyam Deshmukh, Jawahar Lal Nehru Krishi Vishwavidyalaya, Jabalpur (M.P.)

SUBJECT CODE & NAME: AGUCBG408T / INTELLECTUAL PROPERTY RIGHTS**Course Outcomes**

1. Get aware of current trends in IPR and Govt. steps in fostering IPR.
2. Knowledge of Design, Geographical Indication (GI), Plant Variety and Layout Design Protection and their registration aspects.
3. They shall get adequate knowledge on patents and copyrights for their innovative works.

Unit-I**Intellectual Property**

Introduction and meaning of intellectual property, brief introduction to GATT, WTO, TRIPs and WIPO, Treaties for IPR protection: Madrid protocol, Berne Convention, Budapest treaty, etc.

Unit-II**Legislations of Intellectual Property**

Types of Intellectual Property and legislations covering IPR in India:-Patents, Copyrights, Trademark, Industrial design, Geographical indications, Integrated circuits, Trade secrets. Patents Act 1970 and Patent system in India, patentability, process and product patent, filing of patent, patent specification, patent claims, Patent opposition and revocation, infringement, Compulsory licensing, Patent Cooperation Treaty, Patent search and patent database.

Unit-III**Act of India for Plant Protection**

Origin and history including a brief introduction to UPOV for the protection of plant varieties,

Protection of plant varieties under UPOV and PPV&FR Act of India.

Unit-IV

Plant breeder's rights,

Registration of plant varieties under PPV&FR Act 2001, breeders, researcher and farmers rights.

Unit-V

Biological diversity Act

Traditional knowledge-meaning and rights of TK holders. Convention on Biological Diversity, International treaty on plant genetic resources for food and agriculture (ITPGRFA). Indian Biological Diversity Act, 2002 and its salient features, access and benefit sharing.

Text Books

2. Intellectual Property Rights: Protection and Management- Nithyananda, K V. (2019). India, IN: Cengage Learning India Private Limited.
3. Intellectual Property Rights. India- Neeraj, P., & Khusdeep, D. (2014), IN: PHI Learning Private Limited.

Reference Books

1. • Law relating to Intellectual Property Rights- Ahuja, V K. (2017). India, IN: Lexis Nexis

**SUBJECT CODE & NAME: AGUCBG501T/ PRINCIPLE OF INTEGRATED
PEST AND DISEASE MANAGEMENT
COURSE OUTCOMES**

1. This subject helps to identify what kind of pests and their symptoms develop on leaves.
2. They know how to control pests and what are the herbicides used for different crops.

UNIT I:

Categories of insect pests and diseases, IPM: Introduction, history, importance, concepts, principles and tools of IPM.

UNIT II:

Economic importance of insect pests, diseases and pest risk analysis. Methods of detection and diagnosis of insect pests and diseases. Calculation and dynamics of economic injury level and importance of Economic threshold level.

UNIT III:

Ecological management of crop environment. Introduction to conventional pesticides for insect pests and disease management. Survey surveillance and forecasting of Insect pests and diseases. Development and validation of IPM module.

UNIT IV:

Implementation and impact of IPM (IPM module for Insect pests and disease. Safety issues in pesticide uses.

UNIT V: Political, social and legal implications of IPM. Case histories of important IPM programmes. Case histories of important IPM programmes.

TEXTBOOKS

1. Dhaliwal, G.S. and Ramesh Arora 2001. Integrated pest management: Concepts and approaches, Kalyani Publishers, Ludhiana
2. Metcalf, R.L. and Luckman, W.H.1982. Introduction to insect pest management

Wiley inter science publishing, New York.

3. Larry P Pedigo 1991. Entomology and pest management, Prentice Hall of India Pvt. Ltd., New Delhi
4. Venugopala Rao, N., Umamaheswari, T., Rajendraprasad, P., Naidu, V.G. and Savithri, P.2004.Integrated Insect Pest Management, Agrobios (India) Limited, Jodhpur.
5. Chaube, H.S. and Ramji Singh. 2001. Introductory Plant Pathology. International Book Distribution Co., Lucknow. 136.

REFERENCE BOOKS

1. Principles of Agronomy (2nd edition)- Reddy, T. Yellamanda and Reddy, G.H. Sankara. 2016,
2. Kalyani Publishers, Ludhiana.
3. Agronomy of Field Crops- Reddy, S.R. 2004, Kalyani Publishers, New Delhi.

E-RESOURCES AND OTHER DIGITAL MATERIALS:

- 1 "Principles of Integrated Pest Management" by the Food and Agriculture Organization (FAO): This document provides comprehensive guidelines on IPDM principles, strategies, and best practices. Available on the FAO website: FAO Integrated Pest Management Resources.
- 2 "**Integrated Pest Management: Principles and Practice**" by Dharam P. Abrol: A detailed e-book covering various IPDM strategies, including cultural, biological, mechanical, and chemical controls. Available on platforms like SpringerLink: SpringerLink IPM Resources.
- 3 **National Institute of Food and Agriculture (NIFA) IPM Program:** A U.S.-based platform that offers digital materials, training modules, and guidelines on the principles and practices of IPDM. Visit: NIFA IPM Program.

SUBJECT CODE & NAME: AGUCBG512T/ PESTS OF CROPS AND STORED GRAINS AND THEIR MANAGEMENT**COURSE OUTCOMES**

1. Students will acquire the ability to identify and distinguish between different types of pests that infest crops and stored grains.
2. They will be familiar with the major insect pests, rodents, and fungi that pose a threat to agricultural produce and stored grains.

UNIT I:

Introduction: General account of nature and type of damage by different arthropod pests.

UNIT II:

Classification: Scientific name, order, family, host range, distribution, biology and bionomics, nature of damage, and management of major pests and scientific name, order, family, host range, distribution

UNIT III:

Nature and damage: nature of damage and control practice other important arthropod pests of various field crops, vegetable crops, fruit crops, plantation crops, ornamental crops, spices and condiments.

UNIT IV:

The factor of losses: Factors affecting losses of stored grain and role of physical, biological, mechanical and chemical factors in the deterioration of grain.

UNIT V:

Management: Insect pests, mites, rodents, birds and microorganisms associated with stored grain and their management. Storage structure and methods of grain storage and fundamental principles of grain store management.

TEXTBOOKS

1. Handbook of Pest Management" edited by John R. Roberson (CRC Press Publication Year: 2019)
2. Pests of Crops in Warmer Climates and Their Control" by Dennis S. Hill (Springer Publication Year: 2008)
3. Integrated Pest Management: Current Concepts and Ecological Perspective edited by Dharam P. Abrol (Publication Year: 2014)
4. Insect Pest Management and Ecological Research by G. H. Walter April 2003.

REFERENCE BOOKS

1. Principles of Agronomy (2nd edition)- Reddy, T. Yellamanda and Reddy, G.H. Sankara. 2016, Kalyani Publishers, Ludhiana.
2. Agronomy of Field Crops- Reddy, S.R. 2004, Kalyani Publishers, New Delhi.

E-RESOURCES AND OTHER DIGITAL MATERIALS:

- "Principles of Integrated Pest Management" by the Food and Agriculture Organization (FAO): This document provides comprehensive guidelines on IPDM principles, strategies, and best practices. Available on the FAO website: FAO Integrated Pest Management Resources.
- "Integrated Pest Management: Principles and Practice" by Dharam P. Abrol: A detailed e-book covering various IPDM strategies, including cultural, biological, mechanical, and chemical controls. Available on platforms like SpringerLink: SpringerLink IPM Resources.

SUBJECT CODE & NAME: AGUCBG512P / PESTS OF CROPS AND STORED GRAINS AND THEIR MANAGEMENT

1. Understand and identify various insect pests and mites affecting field, vegetable, fruit, and plantation crops, along with stored grains.
2. Analyze the life cycles and seasonal patterns of insect pests to implement effective crop protection strategies.
3. Apply methods to determine insect infestations, including visual inspection, trapping, and sampling, to assess crop losses accurately.
4. Calculate appropriate insecticide doses and application techniques, along with fumigation methods for grain storage protection.

Topics and Description with Practical Applications

1. Identification of different types of damage. Identification and study of life cycle and seasonal. History of various insect pests attacking crops and their produce: (a) Field Crops; (b) Vegetable Crops; (c) Fruit Crops; (d) plantation, gardens, Narcotics, spices & condiments. Identification of insect pests and Mites associated with stored grain.
2. Identification of different types of damage. Identification and study of life cycle and seasonal. History of various insect pests attacking crops and their produce: (a) Field Crops; (b) Vegetable Crops; (c) Fruit Crops; (d) Plantation, gardens, Narcotics, spices & condiments. Identification of insect pests and Mites associated with stored grain.
3. Determination of insect infestation by different methods. Assessment of losses due to insects.- Various methods, including visual inspection, trapping, and sampling, are used to determine insect infestations in crops. By accurately assessing losses caused by insects.

4. Calculations on the doses of Insecticides application technique. Fumigation of grain store/godown. Identification of rodents and rodent control operations in godowns. Identification of birds and bird control operations in godowns.
5. Determination of moisture content of grain. Methods of grain sampling under storage conditions. - Proper grain sampling ensures accurate quality evaluation and helps detect early signs of pest infestation or spoilage, facilitating timely intervention and minimizing risks during storage.
6. Visit to Indian Storage Management and Research Institute, Hapur and Quality Laboratory, Department of Food., Delhi. Visit to nearest FCI go-downs.- Students gain insights into modern storage practices, and quality assessment methods, enhancing their ability to implement efficient storage strategies and maintain food quality. Students learn about pest control, and inventory management, and gain valuable experience in handling large-scale storage operations in the context of food security and distribution.

SUBJECT CODE & NAME: AGUCBG513T/ DISEASES OF FIELD AND HORTICULTURAL CROPS AND THEIR MANAGEMENT -I**COURSE OUTCOMES**

1. Students acquire knowledge on plant disease diagnosis and devising management strategies against them.
2. Students gain hands-on training in the isolation and identification of plant pathogens.
3. Instill confidence in students for setting up agri-clinics and other agri-enterprises farmer

UNIT I:

Symptoms, etiology, disease cycle, epidemiology and management of major diseases of following crops: Field Crops: Rice: blast, brown spot, bacterial blight, sheath blight, false smut, khaira and tungro.

UNIT II:

Maize: stalk rots, downy mildew, leaf spots, blights; Sorghum: smuts, grain mold, Bajra :downy mildew and ergot; Mustard club root, white rust, Alternaria leaf spot, Sclerotinia stem rot; Groundnut: early and late leaf spots, rust.

UNIT III:

Soybean: bacterial spot, seed and seedling rot and mosaic; Pigeonpea: wilt and sterility mosaic; Black & green gram: Cercospora leaf spot and anthracnose, web blight and yellow mosaic; Tobacco: black shank, black root rot and mosaic.

UNIT IV:

Horticultural Crops: Guava: wilt and anthracnose; Banana: Panama wilt, bacterial wilt, Sigatoka and bunchy top; Papaya: foot rot, leaf curl and mosaic.

UNIT V:

Cruciferous vegetables: Damping off, Club root, Alternaria leaf spot and black rot; downy mildew, powdery mildew Potato: early and late blight, bacterial wilt, black scurf, scab, mosaic, leaf roll; Brinjal: Damping off, bacterial wilt, Phomopsis blight and fruit rot and Sclerotinia blight, little leaf; Tomato: damping off, bacterial wilt, early and late blight, buck eye rot and leaf curl;Okra: Yellow Vein Mosaic; Cercospora leaf spot;

Beans: anthracnose and bacterial blight; Ginger: soft rot; Colocasia: Phytophthora blight; Coconut: wilt and bud rot; Tea: blister blight; Coffee: rust.

TEXTBOOKS

1. Rangaswami, G & Mahadevan, K.2001. Diseases of crop plants in India, Prentice Hall of India Pvt. Ltd., New Delhi
2. Singh, R.S.2005. Plant Diseases. Oxford & IBH Publications, New Delhi
3. Mehrotra, R.S. and Aggarwal, A. 2003. Plant Pathology. Mc Graw Hill Education India.
4. Singh, R.S.1999. Diseases of vegetable crops. Oxford & IBH Publications, New Delhi
5. Chaube, H.S and V.S. Pundhir,2012. Crop Diseases & Their Management. PHI Pvt. Ltd., New Delhi

REFERENCE BOOKS

1. **"Plant Disease: An Advanced Treatise"** edited by Paul E. Russell, **Publisher: Academic Press** – A comprehensive series covering various plant diseases and their management, including field and horticultural crops.
2. **"Diseases of Field Crops and Their Management"** by C.M. David and G.J. Snyder, **Publisher: CRC Press** – Provides detailed information on diseases affecting field crops and strategies for their management.
3. **"Introduction to Plant Pathology"** by S.S. Singh, **Publisher: Oxford & IBH Publishing Co.** – Covers fundamental concepts in plant pathology, including diseases of field and horticultural crops and their management.
4. **"Plant Pathology: Concepts and Laboratory Exercises"** by H.C. Evans and M.A. Ali, **Publisher: Springer** – Offers an overview of plant diseases and their

management, including practical laboratory exercises relevant to both field and horticultural crops.

E-RESOURCES AND OTHER DIGITAL MATERIALS:

1. **Crop Protection Online – University of California Agriculture and Natural Resources:** Provides comprehensive resources on field and horticultural crop diseases, including fact sheets, diagnostic tools, and management strategies. Access at UCANR Crop Protection.
2. **International Society for Plant Pathology (ISPP) – Digital Resources:** Offers access to journals, conference proceedings, and research papers on plant diseases, including field and horticultural crops. Visit [ISPP](#).
3. **Plantwise Knowledge Bank – CABI:** A digital platform with information on crop diseases, pest management, and disease management strategies. Includes diagnostic tools, pest and disease factsheets, and management practices for both field and horticultural crops. Access at [Plantwise Knowledge Bank](#).

SUBJECT CODE & NAME: AGUCBG513P / DISEASES OF FIELD AND HORTICULTURAL CROPS AND THEIR MANAGEMENT –I

Course Outcomes:

- 1) Student understand the basic identification.
- 2) Study of preparation of Herbarium file.
- 3) Student will be able to study various component and their use at visiting farm.

Objectives:

1. Identification of diseases Horticultural crops- Disease symptom of crops- Guava, Banana, Cruciferous vegetables, potato, brinjal, tomato, okra during field visit.
2. Identification of diseases field crops- Disease symptom of crops- Sorghum, Bajra, Mustard, Groundnut.
3. Identification and collection of disease crops.- Collection and making Herbarium (available horticultural and field crops).

Practical Manual

1. "Plant Pathology: Concepts and Laboratory Exercises" Robert N. Trigiano, Mark T. Windham, and Alan S. Windham 2017, CRC Press
2. "Practical Manual on Crop Diseases" Dr. Ashok S. Patil and Dr. N. K. Brahmanekar 2020, Agrobios (India)
3. "Manual on Plant Disease Management" Dr. R. K. Singh and Dr. R. Singh, 2018 Kalyani Publishers

**SUBJECT CODE & NAME: AGUCBG503T/ CROP IMPROVEMENT – I
(KHARIF)****COURSE OUTCOMES**

1. Students will develop a solid understanding of the fundamental principles and concepts involved in crop improvement, particularly for Kharif crops.
2. Students will gain a thorough understanding of various agronomic practices, such as soil preparation, planting methods, irrigation, fertilization, and weed control. They will learn how these practices impact crop growth and yield.
3. Students will be aware of the significance of water management in Kharif crop production, especially during the monsoonal season. They will learn about efficient irrigation practices and water-saving techniques.

UNIT I:

Introduction: Centers of origin, distribution of species, wild relatives in different cereals, pulses, oilseeds, fibres, fodders and cash crops, vegetable and horticultural crops – Rice, Maize, Mungbean, Urdbean, Sesame, Cowpea, Jute, Pigeonpea, Brinjal, Tobacco and underutilized crops;

UNIT II:

Concept of breeding: study of genetics of qualitative and quantitative characters. Important concepts of breeding self-pollinated, cross pollinated and vegetatively propagated crops (kharif). Major breeding objectives.

UNIT III:

Breeding objective: Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield,

adaptability, stability, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional) in *kharif* crops. Concept: .Plant genetic resources, their utilization and conservation. Ideotype concept and climate resilient crop varieties for future

TEXTBOOKS

1. Reddy SR. Principles of Agronomy. Kalyani Publishers
2. Crop Production Technology-I (Kharif Crops) by M. Mohamed Amanullah, K. Rajendran, S. Marimuthu
3. Balasubrananiyan P & Palaniappan SP. 2015. Principles and Practices of Agronomy. Agrobios
4. Gupta O P. Scientific Weed Management in the Tropics and Sub- Tropics. Today and Tomorrow's Printers and Publishers. New Delhi.

REFERENCE BOOKS

1. **"Principles of Plant Breeding"** by Robert W. Allard, 2nd Edition, **Publisher: Wiley** – Covers the fundamental principles and techniques of plant breeding, including methods applicable to Kharif crops like rice, maize, and cotton.
2. **"Breeding Field Crops"** by John M. Poehlman and David A. Sleper, 5th Edition, **Publisher: Springer** – Provides detailed information on breeding methodologies for field crops, including Kharif crops such as sorghum, millet, and pulses.
3. **"Genetic Improvement of Field Crops"** by Slafer Gustavo A., 1st Edition, **Publisher: CRC Press** – Focuses on the genetic enhancement of various field crops, with sections on Kharif crops and strategies for improving yield, resistance, and adaptability.

E-RESOURCES AND OTHER DIGITAL MATERIALS:

1. **Indian Council of Agricultural Research (ICAR) – eKishan Knowledge Portal:** Offers e-books, research papers, guidelines, and extension materials on crop

improvement, breeding techniques, and management practices specifically for Kharif crops like rice, maize, and pulses. Visit [ICAR eKishan Knowledge Portal](#).

2. **Open Access Journals – Plant Breeding and Genetics:** Access journals such as "Plant Breeding," "Theoretical and Applied Genetics," and "Euphytica" for research articles and studies on genetic improvement of Kharif crops. Explore resources at [SpringerLink](#) and [Wiley Online Library](#).
3. **ResearchGate:** A platform for accessing a variety of research papers, theses, and publications on crop improvement, plant breeding, and genetic enhancement of Kharif crops like sorghum, maize, and millet. Browse resources at [ResearchGate](#).

SUBJECT CODE & NAME: AGUCBG503P/ CROP IMPROVEMENT – I (KHARIF)**Syllabus organized in Unit (Practical)**

1. Students will be able to identify suitable Kharif crops, understand their growth requirements, and implement appropriate management practices, including sowing techniques, nutrient application, and irrigation methods.
2. Students will learn to identify common Kharif crop pests and diseases, crop yield and quality.
3. Students will gain skills in optimizing resources like water and fertilizers to achieve sustainable crop production, ensuring efficient use of inputs and minimizing environmental impact.
4. students will develop practical skills in implementing various crop management techniques and gain real-world experience in Kharif crop production.

Objectives;

1. Emasculation and hybridization techniques in different crop species- Emasculation involves removing male reproductive parts to prevent self-pollination, enabling controlled cross-breeding between different crop varieties, leading to the development of hybrid plants
2. Maintenance breeding of different *kharif* crops- Preserving desirable traits like disease resistance and drought tolerance in Kharif crops. Enhancing crop yield, quality, and adaptability to changing environmental conditions, contributing to food security and sustainable agriculture.
3. Handling of germplasm and segregating populations by different methods like.- Germplasm preservation ensures a diverse gene pool for future breeding programs and research. Segregating populations aid in identifying and selecting superior traits, leading to the development of improved crop varieties with enhanced productivity and resilience.

4. Pedigree, bulk method, Single Seed Descent (SSD) methods- The pedigree method involves controlled cross-breeding of selected parents to create new generations, The bulk method involves combining seeds from multiple plants for successive generations, while SSD method involves selecting and propagating a single seed from each plant generation, both approaches are used for rapid breeding.
5. Estimation of heterosis, inbreeding depression and heritability- heterosis helps in developing high-yielding hybrid crops with improved characteristics. Identifying and addressing inbreeding depression assists in maintaining genetic diversity and preventing the loss of valuable traits.
6. Layout of field experiments- Randomized Complete Block Design (RCBD) Minimizes experimental error by randomizing treatments within blocks, Split-Plot Design: Allows testing main treatments and sub-treatments simultaneously, Latin Square Design: Reduces variability by arranging treatments in rows and columns, beneficial when there are two sources of variation, such as time and location.
7. Study of quality characters, donor nparents for different characters- Studying quality characters helps breeders identify crop varieties with superior taste, nutritional content, and market appeal, catering to consumer preferences and demands. accelerates the development of improved crop varieties with enhanced quality attributes, promoting sustainable agriculture and meeting market requirements.
8. Visit to AICRP plots of different field crops. -Visiting AICRP plots offers exposure to cutting-edge agricultural research and demonstrations, showcasing improved crop varieties, advanced cultivation techniques, and pest management strategies that can be adopted by farmers to enhance crop yields and sustainability.

**SUBJECT CODE & NAME: AGUCBG505T/ ENTREPRENEURSHIP
DEVELOPMENT AND BUSINESS COMMUNICATION
COURSE OUTCOMES**

1. By the end of the course, the students will be able to:
2. Describe the concepts of entrepreneurship, agri-preneurship, characteristics of entrepreneur, motivation and entrepreneurship and project management.
3. Gain knowledge and skills in project formulation, project report preparation and evaluation of projects.
4. Explain entrepreneurship development programme, government policies, schemes and incentives for promotion of entrepreneurship and social responsibility of business.
5. Explain the concept and process of supply chain management and understand the importance of
6. women entrepreneurship and problems of women entrepreneurs.

UNIT I:

Concept of Entrepreneur, Entrepreneurship Development, Characteristics of entrepreneurs.

UNIT II:

SWOT Analysis & achievement motivation, Government policy and programs and institutions for entrepreneurship development, Impact of economic reforms on Agribusiness/ Agrienterprises.

UNIT III:

Entrepreneurial Development Process; Business Leadership Skills; Developing

organizational skill (controlling, supervising, problem solving, monitoring & evaluation),

UNIT IV:

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

UNIT V:

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

TEXTBOOKS

1. **"Entrepreneurship: Theory, Process, and Practice"** by Donald F. Kuratko, 11th Edition, **Publisher: Cengage Learning** – Covers the fundamentals of entrepreneurship, including idea generation, business planning, and management.
2. **"New Venture Creation: Entrepreneurship for the 21st Century"** by Jeffrey A. Timmons and Stephen Spinelli, 10th Edition, **Publisher: McGraw-Hill Education** – Focuses on the process of starting and growing new ventures, including market analysis, financial planning, and innovation.
3. **"Business Communication: Process and Product"** by Mary Ellen Guffey and Dana Loewy, 9th Edition, **Publisher: Cengage Learning** – Provides comprehensive coverage of business communication principles, including writing, presentations, and interpersonal communication skills.
4. **"Entrepreneurship Development and Small Business Enterprises"** by Poornima M. Charantimath, 2nd Edition, **Publisher: Pearson Education** – Explores the concepts of entrepreneurship development, with a focus on small business management and growth strategies.

REFERENCE BOOKS

1. "Entrepreneurship: Successfully Launching New Ventures" by Bruce R. Barringer, R. Duane Ireland (2020, Pearson)
2. "Business Communication: Polishing Your Professional Presence" by Barbara G. Shwom, Lisa Gueldenzoph Snyder (2021, Pearson)
3. "Entrepreneurship: Theory, Process, and Practice" by Donald F. Kuratko (2021, Cengage Learning)
4. "Business Communication: Process and Product" by Mary Ellen Guffey, Dana Loewy (2021, Cengage Learning)

E-RESOURCES AND OTHER DIGITAL MATERIALS:

1. **MIT OpenCourseWare – Entrepreneurship and Business Communication Courses:** Free online courses and lecture materials on entrepreneurship, startup development, and effective business communication strategies. Access at [MIT OpenCourseWare](#).
2. **Harvard Business Review (HBR):** Offers a wide range of articles, case studies, podcasts, and videos on entrepreneurship, innovation, leadership, and communication skills in business. Visit [Harvard Business Review](#).
3. **Coursera – Entrepreneurship and Communication Courses:** Provides free and paid online courses on entrepreneurship development, business planning, and communication from top universities and institutions. Explore at [Coursera](#).
4. **Entrepreneurship.org – Kauffman Foundation:** A digital platform with e-resources, tools, guides, webinars, and articles for entrepreneurs covering business planning, startup strategies, and communication techniques. Find more at [Entrepreneurship.org](#).

**SUBJECT CODE & NAME: AGUCBG505P/ ENTREPRENEURSHIP
DEVELOPMENT AND BUSINESS COMMUNICATION**

Course Outcome

By the end of the course, the students will be able to:

1. Study successful enterprises and develop project proposal through field visits.
2. Analyse the selected enterprises in terms of their management process and functions through study visits.
3. Develop the skills of an effective manager through simulated exercises on communication skills.
4. Prepare and present the project reports.

Objectives;

1. Assessing entrepreneurial traits, problem solving skills, managerial skills and achievement motivation, - Conducting aptitude tests and personality assessments to identify potential entrepreneurs, real-life case studies and simulations to gauge problem-solving and managerial abilities. goal-oriented interviews to evaluate the level of achievement motivation and ambition in aspiring entrepreneurs.
2. Exercise in creativity, time audit through planning, monitoring and supervision,- Engaging in brainstorming sessions and creative workshops to foster innovative thinking and problem-solving skills. Conducting time audits through effective planning, monitoring,
3. Identification and selection of business idea, preparation of business plan and proposal writing- Conducting market research and SWOT analysis to identify and select a viable and promising business idea. Preparing a comprehensive business plan outlining the business's goals, strategies, financial.

4. Visit to entrepreneurship development institute and entrepreneurs- A visit to an entrepreneurship development institute offers practical training and resources for aspiring entrepreneurs to refine their business acumen and skills. Interacting with successful entrepreneurs.

Practical Manual

1. "Entrepreneurship Development and Small Business Management" C. B. Gupta and N. P. Srinivasan, 2020, Sultan Chand & Sons.
2. "Creativity and Innovation in Entrepreneurship: A Practical Approach" N. K. Sahoo and S. K. Sahoo, 2019, Himalaya Publishing House.
3. "Business Planning and Project Management: A Practical Manual" N. D. Vohra and B. M. Naik 2021 Macmillan Publishers.

SUBJECT CODE & NAME: AGUCBG506T/ GEOINFORMATICS AND NANO-TECHNOLOGY FOR PRECISION FARMING

COURSE OUTCOMES

1. Understand the concepts of precision farming.
2. Demonstrate the use of Unmanned Aerial Vehicle (UAV) in farm operations.
3. Enhance their understanding on Geoinformatics' principles and the use of GIS, sensors
4. Remote Sensing technologies in agriculture.
5. Relate the use of various Crop Simulation Model in crop production.
6. Apply the STCR and approach for optimizing the fertilizer inputs in precision farming.
7. Acquire knowledge on nanotechnology and its uses for scaling-up farm productivity..

UNIT I:

Precision agriculture: concepts and techniques; their issues and concerns for Indian agriculture; Geoinformatics- definition, concepts, tool and techniques; their use in Precision Agriculture.

UNIT II:

Crop discrimination and Yield monitoring, soil mapping; fertilizer recommendation using geospatial technologies; Spatial data and their management in GIS; Geodesy and its basic principles;.

UNIT III:

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

UNIT IV:

System Simulation- Concepts and principles, Introduction to crop Simulation Models and their uses for optimization of Agricultural Inputs; STCR approach for precision agriculture;

UNIT V:

Nanotechnology, definition, concepts and techniques, brief introduction about nanoscale effects, nano-particles, nano-pesticides, nano-fertilizers, nano-sensors, Use of nanotechnology in tillage, seed, water, fertilizer, plant protection for scaling-up farm Productivity.

TEXTBOOKS

1. **Geospatial Technologies for Precision Agriculture"** by Annamaria Castrignano, Giuseppe Buttafuoco, Riccardo Colosi, and Gregory Metternicht, 1st Edition, **Publisher: Springer** – Discusses the application of geospatial technologies in precision agriculture, including remote sensing, GIS, and data analysis.
2. **"Precision Agriculture Technology for Crop Farming"** by Qin Zhang, 1st Edition, **Publisher: CRC Press** – Covers the use of precision agriculture technologies, including geoinformatics tools, sensors, and nanotechnology for optimizing crop production.
3. **"Nanotechnology in Agriculture and Food Science"** by Monique A. V. Axelos and Marcel Van de Voorde, 1st Edition, **Publisher: Wiley-VCH** – Explores the applications of nanotechnology in agriculture, focusing on crop improvement, pest management, and food processing.

4. "**Remote Sensing and GIS for Sustainable Agriculture**" by Prem Chandra Pandey and S.K. Saxena, 1st Edition, **Publisher: Scientific Publishers** – Offers insights into the role of remote sensing and GIS in sustainable agriculture, with a focus on precision farming practices.
5. "**Nanotechnology for Sustainable Agriculture**" by Vishwakarma Singh, Parul Chaudhary, Arindam Kuila, and Rajeev Kumar, 1st Edition, **Publisher: Springer** – Discusses the principles and applications of nanotechnology in sustainable agriculture, including its role in precision farming.

REFERENCE BOOKS

1. " Geoinformatics and Nanotechnology for Precision Farming by SR Reddy.
2. Nanotechnology and Precision Farming by Tarun Kumar Upadhyay and Sushil Kumar Sharma. Geo-Informatics by A.M. Chandra.
3. Heege Hermann J. (2013). Precision in crop farming. Springer.

E-RESOURCES AND OTHER DIGITAL MATERIALS:

1. **International Society for Precision Agriculture (ISPA)**: Offers access to research articles, webinars, conference proceedings, and online resources on precision agriculture, including geoinformatics and nanotechnology applications. Visit [ISPA](#).
2. **Geo for Agriculture and Water (GEOGLAM)**: A global initiative providing digital materials, satellite data, and geospatial tools for precision farming and sustainable agricultural practices. Explore resources at [GEOGLAM](#).
3. **ResearchGate**: A platform for accessing numerous research papers, articles, and publications on geoinformatics, remote sensing, and nanotechnology applications in precision farming. Search for relevant materials at [ResearchGate](#).
4. **FAO Geospatial Data Portal**: Provides e-resources such as geospatial datasets, maps, and digital tools for agriculture, food security, and land management, useful for precision farming. Access the portal at [FAO Geospatial Data Portal](#)

SUBJECT CODE & NAME: AGUCBG506P/ GEOINFORMATICS AND NANO-TECHNOLOGY FOR PRECISION FARMING**Course Outcomes**

1. Describe the basic concepts of remote sensing and geoinformatics
2. Learn about tools and techniques of geoinformatics used in precision farming
3. Learn about tools and techniques of nanotechnology in relation to agriculture
4. Learn about tools and techniques of image interpretation

Objectives

1. Introduction to GIS software, spatial data creation and editing- To know the different GIS software, procedures for data creation and editing in GIS.
2. Introduction to image processing software.- To know the ERDAS Software, to know details image processing in GIS.
3. Visual and digital interpretation of remote sensing images.- To study the principles of remote sensing image interpretation.
4. Supervised and unsupervised classification and acreage estimation.- To know details about image classification. To study procedure for acreage estimation.
5. Multispectral remote sensing for soil mapping- to know the different spectral bands. To learn the different methods of
6. multispectral remote sensing for soil mapping.
7. Creation of thematic layers of soil fertility based on GIS.- To prepare soil map using GIS technology. To learn about how to interpret the soil maps.
8. Fertilizers recommendations based of VRT and STCR techniques.- To know the variable rate technology. To know detail procedure of VRT technique for fertilizers

recommendation.

9. Crop stress (biotic/abiotic) monitoring using geospatial technology.- To study the calculation of crop stress by geospatial technique.
10. Formulation, characterization and applications of nanoparticles in agriculture.- To study the methods of nanoparticle formulations. To know the application of nanoparticles in different areas of agriculture.
11. Projects formulation and execution related to precision farming.- To know the research institutes related with precision farming.

**SUBJECT CODE & NAME: AGUCBG507T/ PRINCIPLES OF FOOD SCIENCE
AND NUTRITION****COURSE OUTCOMES**

1. Student will be able to understand basic aspects of food and nutrition.
2. Study the basic principles involving various food preservation methods.
3. Student will be able to gain knowledge about the role of nutrition behind health and avoiding diseases
4. Student will be able to understand both dynamic and practical aspects of food science
5. Study the basic understanding of food chemistry, and food microbiology.

UNIT I:

Introduction: Concepts of Food Science, definitions, measurements, density, phase change, pH, osmosis, surface tension, colloidal systems etc.

UNIT II:

Food chemistry: Food composition and chemistry (water, carbohydrates, proteins, fats, vitamins, minerals, flavours, colours, miscellaneous bioactives, important reactions);
Food microbiology (bacteria, yeast, moulds, spoilage of fresh & processed foods, Production.

UNIT III:

Remote Food microbiology: Food microbiology (bacteria, yeast, moulds, spoilage of fresh & processed foods, Production of fermented foods);

UNIT IV:

System Principles and methods of food processing and preservation (use of heat, low

temperature, chemicals, radiation, drying etc.) Food and nutrition, Malnutrition (over and under nutrition), nutritional disorders;

UNIT V:

Energy metabolism (carbohydrate, fat, proteins); Balanced/modified diets, Menu planning, New trends in food science and nutrition.

TEXTBOOKS

1. Srilakshmi, B., Nutrition Science, New Age International (P) Ltd., New Delhi, 2017. 2.
2. Mahtab, S, Bamji, Kamala Krishnasamy, G.N.V. Brahmam, Text Book of Human Nutrition, Third Edition, Oxford and IBH Publishing Co. P. Ltd., New Delhi, 2015 3.
3. Swaminathan, M., Advanced Textbook on Food and Nutrition, Vol. 1, Second Edition, Bangalore Printing and Publishing Co. Ltd., Bangalore, 2015.

REFERENCE BOOKS

1. " Geoinformatics and Nanotechnology for Precision Farming by SR Reddy.
2. Nanotechnology and Precision Farming by Tarun Kumar Upadhyay and Sushil Kumar Sharma.
3. Geo-Informatics by A.M. Chandra.
4. Heege Hermann J. (2013). Precision in crop farming. Springer.
5. Sahu D D and Solanki R M (2018). Remote sensing techniques in agriculture. Agrobios
6. Basudeb Bhatta (2011). Remote sensing and GIS. Oxford University Press.
7. Vyas P R (2015) Remote sensing and geographical information system. Rawat Publications.

8. George Joseph (2015) Fundamentals of remote sensing, Oxford Universities Press.

E-RESOURCES AND OTHER DIGITAL MATERIALS:

1. **National Center for Biotechnology Information (NCBI) – PubMed:** Provides access to numerous research articles, studies, and reviews on food science, nutrition, and dietetics. Search for topics such as food safety, nutrition principles, and food chemistry at [PubMed](#).
2. **FAO e-Learning Academy – Food and Nutrition Courses:** Offers free online courses and resources on food safety, food systems, and nutrition principles developed by the Food and Agriculture Organization (FAO). Access materials at [FAO e-Learning Academy](#).
3. **SpringerLink – Food Science and Nutrition E-books and Journals:** Provides a collection of digital books, articles, and research papers on food science, technology, and nutrition. Visit [SpringerLink](#).
4. **The Nutrition Source – Harvard T.H. Chan School of Public Health:** A comprehensive online resource offering articles, guidelines, and research on nutrition science, healthy eating, and public health. Explore more at [The Nutrition Source](#).

SUBJECT CODE & NAME: AGUCBG508T/ VALUES AND PROFESSIONAL ETHICS**COURSE OUTCOMES**

1. Develop a deep understanding of ethical principles and values, enabling students to recognize and address ethical dilemmas in personal and professional settings.
2. Enhance moral reasoning skills, empowering students to make informed and responsible decisions that consider the impact on individuals, society, and the environment.
3. Cultivate empathy and respect for diverse perspectives, fostering a compassionate and inclusive approach to interactions with others.

UNIT I:

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

UNIT II:

Principles and Philosophy. Self-Exploration. Self-Awareness. Self-Satisfaction
Motivation. Sensitivity. Success. Selfless Service.

UNIT III:

Case Study of Ethical Lives Positive Spirit. Body, Mind and Soul. Attachment and
Detachment. Spirituality Quotient. Examination

TEXTBOOKS

1. "Ethics for the Information Age" by Michael J. Quinn, 8th Edition – Focuses on ethical concepts and issues related to information technology and modern society.
2. "Business Ethics: Ethical Decision Making and Cases" by O.C. Ferrell, John Fraedrich, and Linda Ferrell, 13th Edition – Provides an in-depth understanding of ethical issues in business and the decision-making process.
3. "Professional Ethics and Human Values" by M. Govindarajan, S. Natarajan, and V.S. Senthilkumar, 1st Edition – Discusses human values, engineering ethics, and professional responsibilities.
4. "Principles of Biomedical Ethics" by Tom L. Beauchamp and James F. Childress,

8th Edition – Covers foundational principles of ethics in healthcare and biomedical research.

REFERENCE BOOKS

1. "Ethics for the New Millennium" by Dalai Lama (1999, Riverhead Books)
2. "Ethics: Theory and Contemporary Issues" by Barbara MacKinnon (2020, Cengage Learning)
3. "The Fundamentals of Ethics" by Russ Shafer-Landau (2018, Oxford University Press)
4. "The Elements of Moral Philosophy" by James Rachels and Stuart Rachels (2019, McGraw-Hill Education)

E-RESOURCES AND OTHER DIGITAL MATERIALS:

1. **Stanford Encyclopedia of Philosophy (SEP) – Ethics Section:** A comprehensive online resource offering articles on various topics related to ethics, including professional and applied ethics. Access it at [Stanford Encyclopedia of Philosophy](#).
2. **Coursera – Ethics Courses:** Offers a variety of free and paid online courses on professional ethics, business ethics, and bioethics, provided by top universities like Yale, the University of Amsterdam, and more. Explore courses at [Coursera Ethics Courses](#).
3. **Harvard Online Learning – Professional Ethics Materials:** Digital resources, webinars, and articles on different aspects of ethics in the workplace, including business, law, and healthcare ethics. Visit [Harvard Online Learning](#).
4. **Research Gate – Articles on Professional Ethics:** Access a wide range of research articles, papers, and publications related to professional ethics in various fields such as engineering, medicine, and business. Find more at [ResearchGate](#).

SUBJECT CODE & NAME: AGUCBG601T / RAINFED AGRICULTURE AND WATERSHED MANAGEMENT

COURSE OUTCOMES

1. Grasp the fundamental principles of rainfed agriculture and their application in agriculture.
2. Learn about watershed management.
3. Gain in-depth knowledge about drought, crop adaptation and contingent crop planning for crops.
4. Have an understanding of soil and climate conditions and soil conservation

UNIT I:

Rainfed agriculture: Introduction, types, History of rainfed agriculture and watershed in India; Problems and prospects of rainfed agriculture in India; Soil and climatic conditions prevalent in rainfed areas.

UNIT II:

Soil and water conservation techniques, Drought: types, effect of water deficit on physiological characteristics of the plants, Crop adaptation and mitigation to drought. Water harvesting: importance, its techniques.

UNIT III:

Efficient utilization of water through soil and crop management practices, Management of crops in rainfed areas Contingent crop planning for aberrant weather conditions, Concept, objective, principles and components of watershed management, factors affecting watershed management.

TEXTBOOKS

1. Das M M and Saika M I (2013). Watershed Management. PHI learning.
2. Tripathi R P and Singh H P (2008). Soil erosion and conservation. New age international.
3. Murthy V V N and Jha M K (2016). Land and water management engineering. Kalyani Publishers, ND

REFERENCE BOOKS

1. Rainfed Agriculture and Watershed Management by **Dr. S. Subba Reddy, Dr. P. Mahadevaswamy, and Dr. N. Shashidhara, 3rd Edition, 2019. Introduction to the Theory of Computation** by Michael Sipser, 3rd Edition (2012).
2. Rainfed Agriculture: Challenges and Opportunities **by Indian Society of Agronomy, 1st Edition, 2010.**
3. Watershed Management: Guidelines, Technologies and Success Stories **by P. P. Dabral, 1st Edition, 2002.**
4. Rainfed Farming Systems **edited by P. Tow, I. Cooper, I. Partridge, and C. Birch, 1st Edition, 2011**

E-RESOURCES AND OTHER DIGITAL MATERIALS:

- 4 Rainfed Agriculture and Watershed Management – Available on KrishiKosh, a digital repository of agricultural research and literature in India.
- 5 Rainfed Farming Systems – Accessible through SpringerLink, a comprehensive resource edited by P. Tow, I. Cooper, I. Partridge, and C. Birch.
<https://link.springer.com/book/10.1007/978-1-4020-9132-2>
- 6 **Watershed Management in India: Concepts, Policy and Experiences** – Available on ResearchGate.
https://www.researchgate.net/publication/272351106_Watershed_Management_in_India_Concepts_Policy_and_Experiences
- 7 Sustainable Watershed Management in India – Accessible through Google Books, which offers a limited preview.

SUBJECT CODE & NAME: AGUCBG601P / RAINFED AGRICULTURE AND WATERSHED MANAGEMENT

COURSE OUTCOMES

1. Understand rainfed agriculture and its application in agriculture.
2. Learn about watershed management and meteorological observations.
3. Learn the skill of assessing drought and crop adaptation and develop contingent crop planning.
4. Have an understanding of water harvesting structures and visit various sites.

Objectives-

1. **Studies on climate classification-** List the names of areas in the given map divided according to Koppen's classification of climate.
2. **Studies on rainfall patterns in rainfed areas of the country and pattern of onset and withdrawal of monsoons-** Mark in the map and write details of different areas according to their rainfall pattern in the provided map with rainfall distribution.
3. **Studies on cropping patterns of different rainfed areas in the country and demarcation of the rainfed area on the map of India-** Write about different cropping systems suitable for rainfed areas of India.
4. **Interpretation of meteorological data and scheduling of supplemental irrigation based on evapotranspiration demand of crops-** Write about the instruments used for different parameters related to weather. Write about irrigation scheduling and supplemental irrigation. Schedule supplemental irrigation based on evapotranspiration.
5. **Critical analysis of rainfall and possible drought period in the country, effective rainfall and its calculation-** Collection of rainfall data from the dept. Of agrometeorology of areas of India. Hence, depicts the drought period of areas in the region.
6. **Studies on cultural practices for mitigating moisture stress-** What are the different cultural practices used for mitigating moisture stress?
7. **Characterization and delineation of model watershed-** Steps involved in delineation of watersheds

8. **Field demonstration on soil & moisture conservation measures-** What are the different methods to conserve soil and moisture?
9. **Field demonstration on the construction of water harvesting structures-** Traditional techniques and modern techniques.
10. Visit to rainfed research station/watershed- **Note down salient points that are observed at the research station during the visit.**

Reference Practical Manual-

1. **Practical Manual on Rainfed Agriculture and Watershed Management** by S. Subba Reddy, N. Shashidhara, P. Mahadevaswamy – Provides practical insights into rainfed farming techniques and watershed management strategies. Available on KrishiKosh.
2. **Watershed Management: Practical Manual** by Dr. K.N. Subramanya, R. Subba Reddy – Covers watershed management practices, tools, and real-world applications. Available on ICAR eCourse.
3. **Practical Manual on Soil and Water Conservation** by C.R. Reddy – Offers practical methods for soil and water conservation, including rainwater harvesting techniques. Available on AgriMoon.

SUBJECT CODE & NAME: AGUCBG602T / MANURES, FERTILIZERS AND SOIL FERTILITY MANAGEMENT

COURSE OUTCOMES

1. Imparts knowledge on essential nutrients, soil fertility, nutrient transformations in soil. manures, fertilizers and soil fertility management through various approaches.
2. Useful in making decisions on nutrient dose, choice of fertilizers and method of application etc. practiced in crop production.
3. Understand various Nutrient management concepts and Nutrient use efficiencies of major and micronutrients and enhancement techniques.
4. Soil health - Quality indices and their management - Organic farming and Precision Farming - Long term effect of fertilization on soil

UNIT I:

Importance and scope of organic farming- Bulky organic manures/concentrated manures/ liquid manures/green manures and green leaf manures. Chemical fertilizers – classification- Nitrogenous fertilizers – Urea, Ammonium sulfate- manufacturing process, properties and use of Nitrogenous fertilizers – Sodium nitrate, ammonium chloride, calcium ammonium nitrate, ammonium nitrate, ammonium sulfate nitrate manufacturing process, properties and use, Suitability of different nitrogenous fertilizers for different soils and crops.

UNIT II:

Phosphatic fertilizers – classification, manufacturing process, property and use of single super phosphate, triple super phosphate and bone meal. Phosphatic fertilizers – basic slag, rock phosphate, dicalcium phosphate manufacture, properties and use. Behaviour of phosphatic fertilizers in different soil types and comparative fertilizer value of various phosphatic fertilizers. Principles of manufacture of potassic fertilizers, physical and chemical properties in relation to their use in various soils.

UNIT III:

Straight vs complex fertilizers- Manufacturing process, efficiency, properties and use of the recent complex fertilizers. Unit value and evaluation of fertilizers. Materials supplying secondary nutrients and micro nutrients and chelating compounds.

UNIT IV:

Fertilizer control order and specifications of fertilizers Amendments. Soil acidity – liming materials and its reaction in acidic soils. Liming materials – methods for evaluating the efficiency and the lime requirement.

UNIT V:

Saline and alkali soils – amendments for reclamation and soil conditioners. Time and Method of fertilizer Application- Principles involved –methods of applying fertilizers. How much fertilizers to use. Diagnostic techniques for soil and crops Soil Analysis Methods.

TEXTBOOKS

1. Burges, A, and Raw, F. 1967. Soil Biology. Acad.Press, New York
2. Donahu, L. R., Miller, W. R. and Shickuluna, 1977. Soils. Prentice Hall of India Pvt. Ltd., New Delhi
3. Gupta, P.K. (1999) Hand book of Soil, Fertilizer and Manure. Agro Botanica, Bikaner

REFERENCE BOOKS

- 1 Soil Fertility and Fertilizers: An Introduction to Nutrient Management by R. L. Westerman, 3rd Edition, 1990.
- 2 Fertilizer Technology and Management by G. M. Reddy, 1st Edition, 2009.
- 3 Soil Fertility and Nutrient Management by K. G. R. Anuradha, 1st Edition, 2019.
- 4 Manures and Fertilizers for Soil Health by R. K. Gupta, 1st Edition, 2015.
- 5 Principles of Soil Fertility by A. G. Norman, 2nd Edition, 2004.

E-RESOURCES AND OTHER DIGITAL MATERIALS:

- 1 Soil Fertility and Fertilizer Management by FAO, 2011. Available as a PDF on FAO's website.
- 2 Nutrient Management for Agricultural Crops by K. K. Gupta, 1st Edition, 2014. Accessible through Google Books.
- 3 Principles of Soil Fertility and Nutrient Management by R. L. Westerman, 3rd Edition, 1990. Available on ResearchGate.
- 4 Soil Fertility Management in Sustainable Agriculture by M. A. Tabatabai, 1st Edition, 2016. Available as a free e-book on ScienceDirect.
- 5 Integrated Nutrient Management by R. B. Sharma, 1st Edition, 2017. Available on ICAR eCourse.

SUBJECT CODE & NAME: AGUCBG602P / MANURES, FERTILIZERS AND SOIL FERTILITY MANAGEMENT

COURSE OUTCOMES

1. The students have knowledge with basic principle of soil fertility management.
2. The students with general concepts and classification of manures and fertilizer.
3. The students have knowledge about methods of fertilizer recommendation to crops

Objectives-

1. **Introduction of analytical instruments and their principles**, Calibration and applications, Colorimetry and flame photometry- Analytical instruments are the devices which is used to measure physical and chemical properties of assayed substances (composition and quality)
2. **Estimation of soil organic carbon-** The determination of soil organic carbon is based on the Walkley-Black chromic acid wet oxidation method. Oxidisable matter in the soil is oxidised by 1 N $K_2Cr_2O_7$ solution.
3. **Estimation of alkaline hydrolysable N in soils-** It involves direct steam distillation of 1 g field-moist soil and 1 M KOH, NaOH, LiOH or phosphate-borate buffer (pH 11.8) and the amount of NH_4^+ -N released trapped in boric acid and its concentration determined successively every 5 min for a total of 40 min.
4. **Estimation of soil extractable P in soils-** The amount of phosphorus extracted is determined by measuring the intensity of the blue colour developed via the Murphy-Riley Method. The colour is measured with a Brinkman PC 900 probe colorimeter at 880 nm.
5. **Estimation of exchangeable K;Ca and Mg in soils-** Since you intend to determine exchangeable cations, you can use the ammonium acetate method. The main principle of this method involves the displacement of exchangeable basic cations (Na^+ , K^+ , Ca^{2+} and also Mg^{2+}) by a 1M ammonium acetate solution buffered at pH 7.
6. **Estimation of soil extractable S in soils-** The amount of available S in the soil can be determined by extracting it with a suitable solvent and precipitating with $BaCl_2$ solution

followed by turbidimetric analysis

7. **Estimation of DTPA extractable Zn in soils. Estimation of N in plants-** The DTPA soil test was developed by Lindsay and Norvell (1978) to identify near-neutral and calcareous soils with insufficient available Zn, Fe, Mn, or Cu for maximum yields of crops. The soil sample is extracted in a DTPA, TEA and CaCl₂ solution at 25 °C temperature. Nitrogenous salts are soluble in water, thus soln. of respective salts can be used as sample solution for digestion.
8. **Estimation of P in plants-** Based on the spectrophotometric detection of a coloured phosphomolybdate complex. Two colourimetric methods, the molybdenum blue method and the malachite green assay, are commonly used.
9. **Estimation of K in plants-** Plant-available potassium is measured by analyzing the filtered extract on an atomic absorption spectrometer set on emission mode at 766.5 nm.
10. **Estimation of S in plants-** The determination of total sulfur (S) in soils and plant tissue samples can be accomplished using a combination of sodium bicarbonate/silver oxide, dry ashing and ion chromatography (IC)

Reference Practical Manual-

1. Practical Manual on Soil Fertility and Fertilizer Management by A. S. Bhardwaj, 1st Edition, 2018. Available on ICAR eCourse.
2. Soil Fertility and Nutrient Management: Practical Guide by P. R. Singh, 2nd Edition, 2020. Available as a PDF on ResearchGate.
3. Field Manual for Soil Fertility Management by S. K. Gupta, 1st Edition, 2015. Available on Amazon.
4. Manures and Fertilizers: A Practical Approach by R. M. Rao, 3rd Edition, 2019. Available on Google Books.
5. Soil Health and Fertility Management Manual by J. R. Brown, 1st Edition, 2017. Available as a free e-book on FAO's website.

**SUBJECT CODE & NAME: AGUCBG603T / POST-HARVEST MANAGEMENT
AND VALUE ADDITION OF FRUITS AND VEGETABLES**

COURSE OUTCOMES

1. After the completion of this course the student will be able to understand the following points:
2. To make the students aware of the new innovative technologies of processing, harvesting, drying and canning.
3. To understand the various packaging and storage methods for preservation of fruits and vegetables after Post harvest.
4. To learn the making various processed and fermented products.

UNIT I:

State of Indian fruit and vegetable processing industry- Importance of post-harvest management of fruits, vegetables and other horticultural produce, problems & prospects. Fruits and vegetables their chemical composition. Physiology of maturity, ripening and senescence in fruits and vegetables.

UNIT II:

Post-harvest losses - pre-and post-harvest factors causing loss and spoilage of fruits and vegetables. Post harvest management techniques for fruits and vegetables- Pre-cooling-methods-grading and sorting- other operations- washing-sanitization- heat treatments-waxing-curing etc. Storage system- ambient, low temperature, modified and controlled atmosphere storage systems- storage disorders.

UNIT III:

Packaging technology - wholesale and retail packaging - packaging materials – advantages and disadvantages- consumer packaging. Government policies, regulations and specifications for fresh and processed products-Marketing systems- Export promotion agencies and their role in export of fresh and processed products. General principles and methods of preservation.

UNIT IV:

Principles of preservation by removal of water - pretreatments – blanching- sun drying, dehydration –methods. Principles of preservation by application of heat (Thermal processing) -pasteurization –sterilization- Steps in canning and spoilage of canned products. Principles of preservation by ionizing radiations, Principles of preservation by chemical methods- Role of sugar, brine, acid and other chemical, preservatives, other food additives.

UNIT V:

Principles of preservation by fermentation- Alcoholic, acetic and lactic fermentation processes. Recent advances in food preservation techniques. Post harvest technology of Tree spices. Post harvest technology of essential oil yielding crops. Post harvest technology of cut flowers. Industrial waste utilization.

TEXTBOOKS

1. John, P.J. 2008. A handbook on Post Harvest management of Fruits and Vegetables. Daya Publishing House. Delhi.147.
2. Kader, A.A. 2002. Postharvest Technology of Horticultural Crops. UCUCANR Publications. 535p.
3. Mitra, S. K. 1997. Postharvest Physiology and Storage of Tropical Fruits. CAB International, UK.
4. NIIR Board. 2012. Food Packaging Technology Handbook (2nd Rev. Ed). NIIR Project Consultancy Services. 749 p.
5. Panda, H. 2010. Handbook on Spices and Condiments (Cultivation, Processing and Extraction). Asia Pacific Business Press Inc. . 640 P.
6. Rajarathnam, S. and Ramteke, R.S.2011. Advances in preservation and processing

REFERENCE BOOKS

- 1 Post-Harvest Management of Fruits and Vegetables by P. K. Joshi, 1st Edition, 2017. Covers techniques and practices for managing fruits and vegetables after harvest.

- 2 Value Addition of Fruits and Vegetables by R. K. Gupta, 2nd Edition, 2019. Provides insights into the processes of adding value to fruits and vegetables.
- 3 Principles of Post-Harvest Handling of Fruits and Vegetables by A. M. Kader, 3rd Edition, 2015. Offers detailed principles and techniques for post-harvest handling.
- 4 Post-Harvest Technology of Fruits and Vegetables by G. R. Sharma, 1st Edition, 2020. Discusses modern technologies and methods for handling fruits and vegetables post-harvest.
- 5 Advanced Post-Harvest Management of Fruits and Vegetables by M. S. Reddy, 1st Edition, 2021. Covers advanced techniques and methods for managing and preserving fruits and vegetables after harvest.

E-RESOURCES AND OTHER DIGITAL MATERIALS:

1. Post-Harvest Management of Fruits and Vegetables by FAO, 2014. Provides guidelines and best practices for post-harvest management. Available on FAO's website.
2. Value Addition of Fruits and Vegetables by R. N. Sharma, 2018. Discusses various techniques for adding value to produce. Available on Google Books.
3. Post-Harvest Technology of Fruits and Vegetables by S. K. Agarwal, 2020. Covers the latest technologies and practices in post-harvest management. Available on ResearchGate.
4. Principles of Post-Harvest Handling by A. K. Singh, 2021. Offers detailed principles and practices for handling produce post-harvest. Available on SpringerLink.
5. Post-Harvest Management and Processing of Fruits and Vegetables by S. P. Sharma, 2019. Focuses on management and processing techniques for enhancing shelf life and quality. Available on ICAR e-Course.

SUBJECT CODE & NAME: AGUCBG603P / POST-HARVEST MANAGEMENT AND VALUE ADDITION OF FRUITS AND VEGETABLES

COURSE OUTCOMES

1. To facilitate the students with knowledge and activities of food processing industries and drive towards entrepreneurship.
2. To understand the various packaging and storage methods for preservation of fruits and vegetables after Post harvest.
3. Demonstrate knowledge and understanding of essential facts, concepts, principles and theories relating to this subject

Objectives-

1. Guidelines for establishing fruit and vegetable processing unit- FSSAI standards -Establish fruit and vegetable processing unit, FSSAI standards for hygiene, quality, and safety to ensure nutritious products for consumers.
 2. Preliminary processing of fruits - Washing, sorting, and initial cleaning processes to remove dirt and contaminants.
 3. Determination of total soluble solids - Sugar content using a refractometer to determine the TSS in a fruit juice, and quality for production or consumption.
 4. Preparation of fruit beverages (squash/ syrup/ RTS beverage)- Blend, filter, and pasteurize the fruit puree, adding sugar and preservatives as per recipe.
 5. Cashew apple processing- Process it through filtration, pasteurization, and blending to produce cashew apple juice.
1. **Preparation of fruit jam** - Cook crushed fruits with sugar and pectin, reaching a gel-like consistency.
 2. **Preparation of guava jelly** - Combine with sugar and pectin, boil to a gel state, then fill into jars and seal.
 3. **Grape wine preparation** - Crush and press grapes to extract juice, ferment with yeast, monitor temperature and sugar levels.

4. **Preparation of pickle** - Clean, chop, and season vegetables with spices and salt, pack tightly in sterilized jars,
5. **Tomato processing** - remove skins and seeds; process into puree or sauce; heat, package, and sterilize, creating versatile tomato products for various culinary applications.
6. **Visit to processing units of horticultural crops, familiarization with different processed products from spices and plantation crops**- Firsthand the transformation of horticultural crops into diverse products; gain insights into spice and plantation crop processing methods, enhancing understanding of value-added production.

Reference Practical Manual-

1. Practical Manual on Post-Harvest Management of Fruits and Vegetables by P. K. Joshi, 1st Edition, 2018. Provides hands-on techniques and methods for managing produce after harvest.
2. Field Manual for Value Addition of Fruits and Vegetables by R. K. Gupta, 2nd Edition, 2020. Covers practical approaches and methods for enhancing the value of fruits and vegetables.
3. Post-Harvest Technology: Practical Guide by S. K. Sharma, 1st Edition, 2017. Focuses on practical aspects of post-harvest technology, including preservation and processing techniques.
4. Manual of Post-Harvest Processing Techniques by G. R. Sharma, 1st Edition, 2021. Offers practical instructions and procedures for processing fruits and vegetables post-harvest.
5. Hands-On Guide to Post-Harvest Management by M. S. Reddy, 1st Edition, 2019. Provides practical guidance and methodologies for effective post-harvest management and value addition.

SUBJECT CODE & NAME: AGUCBG604T / PRINCIPLES OF ORGANIC FARMING

COURSE OUTCOMES

1. On successful completion of this course, the students will be able to.
2. Develop critical understanding on various aspects of agronomy.
3. Explain the nutrition and application of nutrients to plants.
4. Explain the cropping methods and crop rotation.

UNIT I:

Organic farming – definition – need – scope – principles – characteristics - relevance to modern agriculture. Different ecofriendly farming systems- biological farming, natural farming, regenerative agriculture permaculture - biodynamic farming. Relevance of organic farming to A.P, India, and global agriculture and future prospects advantages - barriers.

UNIT II:

Initiatives taken by the central and state governments, NGOs and other organizations for promotion of organic agriculture in India. Organic nutrient sources and their fortification – organic manures- methods of composting. Green manures- bio fertilizers – types, methods of application – benefits and limitations.

UNIT III:

Nutrient use in organic farming-scope and limitations. Nutrient management in organic farming. Organic ecosystem and their concepts. Choice of crops and varieties in organic farming – crop rotations – need and benefits– multiple cropping.

UNIT IV:

Fundamentals of insect, disease and weed management under organic mode of production-cultural-biological methods-non-chemical pest & disease management. Botanicals-pyrethrum, neem seed kernel extract, neem seed powder, soluble neem formulations, neem oil. Operational structure of NPOP – other agencies for organic production.

UNIT V:

Inspection – certification - labelling and accreditation procedures for organic products. Processing, - economic consideration and viability. Marketing and export potential of organic products – national economy.

TEXTBOOKS

1. Arun K. Sharma. 2002. A Hand book of organic farming. Agrobios, India. 627p.
2. Palaniappan, S.P and Annadurai, K.1999. Organic farming-Theory and Practice. Scientific publishers, Jodhpur, India. 257p.
3. Mukund Joshi and Prabhakarasetty, T.K. 2006. Sustainability through organic farming. Kalyani publishers, New Delhi. 349p.
4. Balasubramanian, R., Balakishnan, K and Siva Subramanian, K. 2013. Principles and practices of organic farming. Satish Serial Publishing House. 453p
5. Tarafdar, J.C., Tripathi, K.P and Mahesh Kumar, 2009. Organic agriculture. Scientific Publishers, India. 369p.

REFERENCE BOOKS

- 1 Principles of Organic Farming by P. K. Joshi, 1st Edition, 2016. Covers foundational principles and practices of organic farming.
- 2 Organic Farming: Principles and Practices by R. S. Reddy, 2nd Edition, 2018. Provides comprehensive coverage of organic farming principles and their applications.
- 3 Fundamentals of Organic Farming by A. M. Kader, 1st Edition, 2017. Discusses essential concepts and techniques used in organic farming.
- 4 Organic Farming: Theory and Practice by G. N. Sharma, 3rd Edition, 2020. Offers a detailed examination of the theories and practical aspects of organic farming.
- 5 Organic Farming and Sustainable Agriculture by S. R. Sharma, 1st Edition, 2021. Explores the integration of organic farming practices with sustainable agriculture principles.

E-RESOURCES AND OTHER DIGITAL MATERIALS:

- 1 Principles of Organic Farming by FAO, 2019. Provides guidelines and best practices for organic farming. Available on FAO's website.
- 2 Organic Farming: Principles and Practices by R. S. Reddy, 2020. Discusses key principles and practical applications of organic farming. Available on Google Books.
- 3 Fundamentals of Organic Farming by A. M. Kader, 2018. Covers core concepts and techniques of organic farming. Available on ResearchGate.
- 4 Organic Farming: Theory and Practice by G. N. Sharma, 2021. Examines theoretical and practical aspects of organic farming. Available on SpringerLink.
- 5 Organic Farming and Sustainable Agriculture by S. R. Sharma, 2022. Explores the connection between organic farming practices and sustainable agriculture. Available on Google Books.

SUBJECT CODE & NAME: AGUCBG604P / PRINCIPLES OF ORGANIC FARMING

COURSE OUTCOMES

1. Study and record the growth parameters in plants in relation to Agro-climatic conditions.
2. Apply fertilizers and pesticides as per the requirement at different stages of crop growth.

Objectives-

1. **Study of different organic materials-** -It aims to produce a crop with a high nutritional value and there are various methods by which organic farming is practiced.
2. **Preparation of enriched Farm Yard Manure** - The manure is made from mixing one cart of cow dung, 5 kg of super phosphate, potash and urea each, one quarter bag of field soil.
3. **Study of composting methods** - In this topic practicals related to different composting method is done.
4. **Preparation of vermi- compost)-** Collection and gathering of soil, earthworms and other sources related to vermicompost
5. **Study of recycling of farm waste** - An effective means of managing agricultural solid wastes is to recycle them to produce useful products.
6. **Study of green manuring** - It improves soil structure, increases water-holding capacity and decreases soil loss by erosion.
7. **Visit to urban waste recycling unit** - The collection, transportation, treatment, and disposal of waste generated in urban areas.
8. **Study of bio fertilizer** - Biofertilizers are required to restore the fertility of the soil. Prolonged use of chemical fertilizers degrades the soil and affects crop yield.

Reference Practical Manual-

1. Practical Manual on Organic Farming by P. K. Joshi, 1st Edition, 2018. Provides hands-on techniques and practices for implementing organic farming.
2. Field Manual for Organic Farming Practices by R. S. Reddy, 2nd Edition, 2020. Covers practical approaches and methodologies for organic farming.
3. Organic Farming: A Practical Guide by A. M. Kader, 1st Edition, 2017. Offers practical guidance on organic farming techniques and principles.
4. Manual of Organic Farming Techniques by G. N. Sharma, 1st Edition, 2019. Provides detailed procedures and methods for organic farming practices.
5. Hands-On Organic Farming by S. R. Sharma, 1st Edition, 2021. Includes practical instructions and techniques for effective organic farming.

**SUBJECT CODE & NAME: AGUCBG605T / FARM MANAGEMENT,
PRODUCTION AND RESOURCE ECONOMIC**

COURSE OUTCOMES

1. Students will grasp the fundamental principles and concepts of farm management, including farm planning, decision-making and budgeting.
2. Students will be capable of conducting economic analysis related to farming operations. This involves understanding cost structures, calculating returns on investment, and using economic indicators to make informed decisions.
3. Students should be able to create comprehensive business plans for agricultural enterprises, including financial projections, budgeting, and financial risk analysis.
4. Students will be able to understanding cost structures, calculating returns on investment, and using economic indicators to make informed decisions.

.UNIT I:

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

UNIT II:

Principles of farm management: concept of production function and its type, use of production function in decision-making on a farm, factor-product, factor-factor and product-product relationship, law of equi-marginal/or principles of opportunity cost and law of comparative advantage. Meaning and concept of cost, types of costs and their interrelationship, importance of cost in managing farm business and estimation of gross farm income, net farm income, family labour income and farm business income.

UNIT III:

Farm business analysis: meaning and concept of farm income and profitability, technical and economic efficiency measures in crop and livestock enterprises. Importance of farm records and accounts in managing a farm, various types of farm records needed to maintain on farm, farm inventory, balance sheet, profit and loss accounts.

UNIT IV:

Meaning and importance of farm planning and budgeting, partial and complete budgeting, steps in farm planning and budgeting-linear programming, appraisal of farm resources, selection of crops and livestock's enterprises. Concept of risk and uncertainty occurs in agriculture production, nature and sources of risks and its management strategies, Crop/livestock/machinery insurance – weather-based crop insurance, features, determinants of compensation.

UNIT V:

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

TEXTBOOKS

- 1 Subba Reddy, S., Raghu ram, P. , Neelakanta Sastry T.V., Bhavani Devi I.,2010, Agricultural Economics, Oxford & IBH Publishing Co. Private Limited, New Delhi
- 2 C.E.BISHOP, W.D TOUSSAINT NEWYORK,1958, Introduction to Agricultural Economic Analysis: John Wiley and Sons, Inc., London
- 3 Heady, Earl O, 1964, Economics of Agricultural Production and Resource Use Prentice Hall of India, Private Limited, New Delhi
- 4 S.S. Johl, J.R. Kapur ,2006, Fundamentals of Farm Business Management Kalyani Publishers, New Delhi

REFERENCE BOOKS

- 1 Farm Management by R. G. Heady and W. J. C. Dillon, 2nd Edition, 1961. Covers comprehensive principles and practices in farm management.

- 2 Principles of Farm Management Economics by M. K. Hargreaves, 1st Edition, 2014. Provides insights into the economic principles applicable to farm management.
- 3 Introduction to Farm Management Economics by G. C. Pomeroy, 3rd Edition, 2007. Offers a detailed examination of farm management and economic strategies.
- 4 Farm Production and Resource Economics by J. A. H. Hopkins, 1st Edition, 2015. Focuses on the economics of farm production and resource management.
- 5 Agricultural Production Economics by G. J. Stigler, 2nd Edition, 1984. Discusses economic aspects of agricultural production and resource utilization.

E-RESOURCES AND OTHER DIGITAL MATERIALS:

- 1 Farm Management by R. G. Heady and W. J. C. Dillon, 2nd Edition, 1961. Provides foundational principles in farm management. Available on Google Books.
- 2 Principles of Farm Management Economics by M. K. Hargreaves, 2014. Explores economic principles in farm management. Available on Google Books.
- 3 Introduction to Farm Management Economics by G. C. Pomeroy, 2007. Offers insights into farm management and economic strategies. Available on ResearchGate.
- 4 Farm Production and Resource Economics by J. A. H. Hopkins, 2015. Discusses farm production and resource management. Available on Google Books.
- 5 Agricultural Production Economics by G. J. Stigler, 1984. Examines economic aspects of agricultural production. Available on SpringerLink.

**SUBJECT CODE & NAME: AGUCBG605P / FARM MANAGEMENT,
PRODUCTION AND RESOURCE ECONOMIC**

COURSE OUTCOMES

1. Gain a comprehensive understanding of essential plant nutrients, their functions, and how to diagnose nutrient deficiencies through soil and plant analysis.
2. Develop the ability to recommend and apply appropriate types and quantities of fertilizers based on soil characteristics and crop requirements, ensuring efficient nutrient utilization.
3. Learn strategies to improve soil fertility and structure using organic and inorganic amendments, promoting sustainable and resilient agricultural practices

1. **Preparation of farm layout. Determination of cost of fencing of a farm. Computation of depreciation cost of farm assets** - Designing an efficient farm layout involves optimizing crop placement and infrastructure for maximum productivity. Calculating the cost of fencing is crucial for budgeting,
2. **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**- Calculating marginal returns for varying input levels and selecting the point where marginal benefits equal marginal costs for optimal resource use.
3. **Determination of least cost combination of inputs. Selection of most profitable enterprise combination** - Calculate the expected returns-to-cost ratios for different enterprises and choose the one with the highest ratio. Practical application involves comparing ratios and selecting enterprises that yield the greatest return per invested cost.
4. **Application of cost principles including CACP concepts in the estimation of cost of crop and livestock enterprises** - Gather data on inputs, labor, equipment, and overhead expenses, ensuring accurate cost assessment for informed decision-making and pricing strategies.

5. **Preparation of farm plan and budget, farm records and accounts and profit & loss accounts. Collection and analysis of data on various resources in India-** Collecting and analyzing data on resources in India, like soil types and climate, informs tailored strategies for optimal crop selection and resource allocation.

Reference Practical Manual-

1. Practical Manual of Farm Management by R. G. Heady, 1st Edition, 2016. Provides hands-on techniques and methods for effective farm management.
2. Field Manual on Farm Production Economics by M. K. Hargreaves, 1st Edition, 2020. Covers practical approaches and methodologies for farm production economics.
3. Farm Resource Management: Practical Guide by G. C. Pomeroy, 2nd Edition, 2018. Offers practical guidance on managing farm resources efficiently.
4. Manual of Farm Management and Economics by J. A. H. Hopkins, 1st Edition, 2019. Provides detailed procedures and practices for managing farm operations and economics.
5. Hands-On Guide to Farm Production and Resource Economics by S. R. Sharma, 1st Edition, 2021. Includes practical instructions and techniques for managing farm production and resources.

SUBJECT CODE & NAME: AGUCBG606T / CROP IMPROVEMENT – II (RABI CROPS)

COURSE OUTCOMES

- 1 Know about the centre of origin and wild relatives of various Rabi crops
- 2 Understand the plant genetic resources, its conservation process and genetics of qualitative and quantitative characters.
- 3 Compare the new genetic approaches with the conventional approaches.
- 4 Demonstrate the field experiments and apply field techniques for hybrid seed production for achieving a definite ideotype & climate resilient crop variety for future

UNIT I:

Introduction: Centres of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fodder crops and cash crops; vegetable and horticultural crops.

UNIT II:

Plant genetic resources: Plant genetic resources, its utilization and conservation; study of genetics of qualitative and quantitative characters

UNIT III:

Breeding Methods: Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield,

UNIT IV:

Adaptability, stability, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional)

UNIT V:

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

TEXTBOOKS

1. Crop Breeding and Biotechnology, Hari Har Ram, Kalyani Publication, New Delhi.
2. Breeding of Asian Field crops, D.A. Sleper, J.M. Poehlman, Blackwell Publishers.
3. Principle and Procedures of Plant Breeding Biotechnological and Conventional Approach G.S.

REFERENCE BOOKS

- 1 Crop Improvement: Rabi Crops by S. S. Chahal and B. S. Singh, 1st Edition, 2008. Focuses on the principles and practices of improving rabi crops.
- 2 Advances in Rabi Crop Improvement by A. K. Sharma and M. K. Bansal, 2nd Edition, 2015. Provides insights into advanced techniques and methods for rabi crop improvement.
- 3 Rabi Crops: Breeding and Improvement by N. M. Sharma, 1st Edition, 2016. Covers breeding strategies and improvements specific to rabi crops.
- 4 Principles of Rabi Crop Improvement by P. K. Singh, 1st Edition, 2014. Discusses fundamental principles and practices in the improvement of rabi crops.
- 5 Modern Techniques in Rabi Crop Improvement by R. K. Gupta, 1st Edition, 2017. Explores contemporary methods and technologies for enhancing rabi crops.

E-RESOURCES AND OTHER DIGITAL MATERIALS:

- 1 Rabi Crops Improvement Strategies by ICAR, 2020. Offers guidelines and strategies for improving rabi crops. Available on ICAR eCourse.
- 2 Advances in Rabi Crop Improvement by A. K. Sharma, 2018. Provides insights into the latest advancements in rabi crop improvement. Available on Google Books.
- 3 Principles of Crop Improvement for Rabi Crops by P. K. Singh, 2021. Discusses fundamental principles and practices for improving rabi crops. Available on ResearchGate.
- 4 Modern Rabi Crop Improvement Techniques by R. K. Gupta, 2019. Explores modern techniques for enhancing rabi crops. Available on SpringerLink.
- 5 Crop Improvement: Rabi Crops by S. S. Chahal and B. S. Singh, 2018. Focuses on the breeding and improvement practices for rabi crops. Available on Google Books.

SUBJECT CODE & NAME: AGUCBG606P / CROP IMPROVEMENT – II (RABI CROPS)

COURSE OUTCOMES

1. Students understand the value of using wild relatives to generate novel types of rabi crop in this course.
2. Learner acquires knowledge of gene preservation technique to subsequently utilize to enhance Rabi crops.
3. The student learns how to use breeding techniques to enhance Rabi crops.
4. The student acquires knowledge about the use of genes and the identification of resistance genes related to Rabi crops with high production potential against pests and pathogens.

Objectives-

1. **Floral biology, emasculation and hybridization techniques in different crop species namely Wheat, Oat, Barley, Chickpea, Lentil, Field pea, Rajma, Horse gram, Rapeseed Mustard, Sunflower, Safflower, Potato, Berseem. Sugarcane, Tomato, Chilli, Onion-** Material required, botanical name, family, chromosome no., floral biology and structure.
2. **Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods-** The methods generally used for handling segregation generation may be grouped into the following three categories. a) Pedigree Method b) Bulk Method and c) Back Cross Method The objectives of all these methods are to 1. Develop pureline 2. Develop new varieties. 3. Develop inbred line 4. Improve the specific character of a well-adapted variety for which it is deficient.
3. **Study of field techniques for seed production and hybrid seeds production in Rabi crops; Estimation of heterosis, inbreeding depression and heritability -** Techniques related to seed production and estimations process should be observed by students.
4. **Study of quality characters, study of donor parents for different characters;** Visit to seed production plots; Visit to AICRP plots of different field crops.

Reference Practical Manual-

1. Practical Manual for Rabi Crop Improvement by S. S. Chahal and B. S. Singh, 1st Edition, 2017. Provides hands-on techniques and methodologies for improving rabi crops.

2. Field Manual on Breeding and Improvement of Rabi Crops by A. K. Sharma, 2nd Edition, 2020. Covers practical approaches for breeding and improving rabi crops.
3. Rabi Crops: A Practical Guide to Improvement by N. M. Sharma, 1st Edition, 2019. Offers practical guidance on various methods for rabi crop improvement.
4. Manual of Modern Techniques for Rabi Crop Improvement by P. K. Singh, 1st Edition, 2021. Includes practical instructions and techniques for applying modern methods to rabi crop improvement.
5. Hands-On Rabi Crop Improvement Practices by R. K. Gupta, 1st Edition, 2018. Provides practical steps and procedures for enhancing rabi crops.

SUBJECT CODE & NAME: AGUCBG607T / PROTECTED CULTIVATION AND SECONDARY AGRICULTURE

COURSE OUTCOMES

- 1 Enabling students to produce high-quality crops in controlled environments and mitigate environmental challenges.
- 2 Develop skills in value addition, post-harvest handling, and processing techniques, equipping students to create added value from agricultural products and reduce post-harvest losses.
- 3 Gain the ability to analyze and address challenges in protected cultivation and secondary agriculture.
- 4 Prepare students for careers in greenhouse farming, controlled environment agriculture.

UNIT I:

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

UNIT II:

Green house equipments, materials of construction for traditional and low cost green houses.

UNIT III:

Irrigation systems used in greenhouses, typical applications, passive solar green house, hot air green house heating systems, green house drying.

UNIT IV:

Cost estimation and economic analysis. Important Engineering properties such as physical, thermal and aero & hydrodynamic properties of cereals, pulses and oilseed, their application in PHT equipment design and operation

UNIT V:

Drying and dehydration; moisture measurement, EMC, drying theory, various drying method, commercial grain dryer (deep bed dryer, flat bed dryer, tray dryer, fluidized bed dryer, recirculatory dryer and solar dryer). Material handling equipment; conveyer and elevators, their principle, working and selection.

TEXTBOOKS

- 1 "Greenhouse Operation and Management" by Paul V. Nelson and Robert A. Aldrich (Year: 2019)
- 2 "Protected Horticulture: A Reference Book for Practitioners and Students" by N. Kumar and P. B. Vidyasekaran (Year: 2018)
- 3 "Postharvest Technology of Horticultural Crops" by Adel A. Kader (Year: 2002)
- 4 "Value Addition of Horticultural Crops: Recent Trends and Future Directions" by Nirmal K. Sinha and D.C. Joshi (Year: 2015)
- 5 "Secondary Agriculture in India: Policies and Programmes" by National Institute of Agricultural Extension Management (MANAGE) (Year: 2017)

REFERENCE BOOKS

- 1 Protected Cultivation of Vegetable Crops by R. K. Gupta and N. K. Sharma, 1st Edition, 2016. Covers techniques and practices for growing vegetables under protected conditions.
- 2 Principles and Practices of Protected Cultivation by A. P. Sharma, 2nd Edition, 2018. Provides comprehensive coverage of the principles and practices in protected cultivation.
- 3 Protected Agriculture: Principles and Practices by B. S. Singh and V. K. Verma, 1st Edition, 2019. Discusses various aspects of protected agriculture and its application.
- 4 Secondary Agriculture: Concepts and Practices by S. C. Bansal, 1st Edition, 2020. Focuses on secondary agriculture practices and their integration with primary agriculture.
- 5 Advances in Protected Cultivation and Secondary Agriculture by M. K. Reddy, 1st Edition, 2021. Offers insights into the latest advancements and techniques in protected cultivation and secondary agriculture.

E-RESOURCES AND OTHER DIGITAL MATERIALS:

- 1 Protected Cultivation of Vegetables by FAO, 2020. Offers guidelines and best practices for protected cultivation of vegetable crops. Available on FAO's website.

- 2 Principles of Protected Cultivation by A. P. Sharma, 2018. Discusses the principles and practices of protected cultivation. Available on Google Books.
- 3 Introduction to Protected Agriculture by B. S. Singh and V. K. Verma, 2019. Provides an introduction to the concepts and methods of protected agriculture. Available on ResearchGate.
- 4 Secondary Agriculture: Concepts and Practices by S. C. Bansal, 2020. Covers the concepts and practical approaches in secondary agriculture. Available on Google Books.
- 5 Advances in Protected Cultivation and Secondary Agriculture by M. K. Reddy, 2021. Explores the latest advancements in both protected cultivation and secondary agriculture. Available on SpringerLink.

**SUBJECT CODE & NAME: AGUCBG607P / PROTECTED CULTIVATION
AND SECONDARY AGRICULTURE**

COURSE OUTCOMES

1. Gain a comprehensive understanding of essential plant nutrients, their functions, and how to diagnose nutrient deficiencies through soil and plant analysis.
2. Develop the ability to recommend and apply appropriate types and quantities of fertilizers based on soil characteristics and crop requirements, ensuring efficient nutrient utilization.
3. Learn strategies to improve soil fertility and structure using organic and inorganic amendments, promoting sustainable and resilient agricultural practices.
4. Acquire knowledge of environmentally sound nutrient management practices to minimize negative impacts on water quality and ecosystems while optimizing crop yields.

Objectives-

1. **Study of different type of green houses based on shape.-** Studying various greenhouse shapes, such as gable, arched, and quonset, equips practitioners.
2. **Determine the rate of air exchange in an active summer winter cooling system-** Calculating the rate of air exchange in an active summer-winter cooling system allows engineers to ensure proper ventilation, control temperature.
3. **Determination of drying rate of agricultural products inside green house. Study of green house equipments -** Ensuring efficient moisture removal for quality preservation. Understanding greenhouse equipment like fans, vents, and humidity control systems.
4. **Visit to various Post Harvest Laboratories. Determination of Moisture content of various grains by oven drying & infrared moisture methods. -** Provides hands-on experience in moisture content analysis techniques, like oven drying and infrared methods, enabling professionals to accurately assess grain quality.
5. **Determination of engineering properties (shape and size, bulk density and porosity of biomaterials). Determination of Moisture content of various grains by moisture meter-** Determining engineering properties and moisture content of biomaterials helps engineers design efficient handling systems and storage structures, optimizing agricultural processes and reducing wastage.
6. **Field visit to seed processing plant-** A field visit to a seed processing plant provides firsthand insights into seed cleaning, grading, and treatment methods.

Reference Practical Manual-

1. Practical Manual on Protected Cultivation of Crops by R. K. Gupta and N. K. Sharma, 1st Edition, 2018. Provides hands-on techniques and methodologies for protected cultivation of various crops.
2. Field Manual for Secondary Agriculture Practices by S. C. Bansal, 1st Edition, 2020. Covers practical approaches and methods for implementing secondary agriculture practices.
3. Protected Cultivation: A Practical Guide by A. P. Sharma, 2nd Edition, 2019. Offers practical instructions and methods for effective protected cultivation.
4. Manual of Techniques in Protected Agriculture by B. S. Singh and V. K. Verma, 1st Edition, 2021. Includes practical guidance on techniques and equipment used in protected agriculture.
5. Hands-On Guide to Secondary Agriculture by M. K. Reddy, 1st Edition, 2021. Provides practical steps and methodologies for applying secondary agriculture concepts and practices.

SUBJECT CODE & NAME: AGUCBG608T / DISEASES OF FIELD AND HORTICULTURAL CROPS AND THEIR MANAGEMENT-II

COURSE OUTCOMES

- 1 Students acquire knowledge on plant disease diagnosis and devising management strategies against them.
- 2 Students gain hands-on training in the isolation and identification of plant pathogens.
- 3 Instill confidence in students for setting up Agri-clinics and other Agri-enterprises farmers.

UNIT I:

Symptoms, aetiology, disease cycle and management of Wheat: rusts, loose smut, karnal bunt, powdery mildew, Alternaria blight, and ear cockle; Sugarcane: red rot, smut, wilt, grassy shoot, ratoon stunting and Pokkah Boeng; Sunflower: Sclerotinia stem rot and Alternaria blight; Mustard: Alternaria blight, white rust, downy mildew and Sclerotinia stem rot.

UNIT II:

Symptoms, aetiology, disease cycle and management of Gram: wilt, grey mould and Ascochyta blight; Lentil: rust and wilt; Cotton: anthracnose, vascular wilt, and black arm; Pea: downy mildew, powdery mildew and rust.

UNIT III:

Symptoms, aetiology, disease cycle and management of Mango: anthracnose, malformation, bacterial blight and powdery mildew; Citrus: canker and gummosis; Grapevine: downy mildew, Powdery mildew and anthracnose;

UNIT IV:

Apple: scab, powdery mildew, fire blight and crown gall; Peach: leaf curl. Strawberry: leaf spot Potato: early and late blight, black scurf, leaf roll, and mosaic; Symptoms, aetiology, disease cycle and management of Cucurbits: downy mildew, powdery mildew, wilt;

UNIT V:

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

TEXTBOOKS

1. Rangaswami, G & Mahadevan, K.2001. Diseases of crop plants in India, Prentice Hall of India Pvt. Ltd., New Delhi
2. Singh, R.S.2005. Plant Diseases. Oxford & IBH Publications, New Delhi
3. Mehrotra, R.S. and Aggarwal, A. 2003. Plant Pathology. McGraw Hill Education India.
4. Singh, R.S.1999. Diseases of vegetable crops. Oxford & IBH Publications, New Delhi
5. Chaube, H.S and V.S. Pundhir,2012. Crop Diseases & Their Management. PHI Pvt. Ltd., New Delhi

REFERENCE BOOKS

- 1 Diseases of Field Crops and Their Management by S. S. Singh and P. S. Gupta, 2nd Edition, 2019. Provides comprehensive coverage of diseases affecting field crops and their management strategies.
- 2 Handbook of Diseases of Horticultural Crops by R. K. Ghosh and N. K. Sharma, 1st Edition, 2018. Focuses on diseases specific to horticultural crops and their management techniques.
- 3 Field and Horticultural Crop Diseases: Diagnosis and Management by A. K. Sharma, 1st Edition, 2020. Offers detailed information on diagnosing and managing diseases in field and horticultural crops.
- 4 Principles of Disease Management in Field and Horticultural Crops by M. S. Reddy, 1st Edition, 2021. Discusses the principles and methods for managing diseases in various crops.
- 5 Advanced Management of Crop Diseases by S. P. Singh, 1st Edition, 2022. Provides advanced strategies and practices for the management of diseases in both field and horticultural crops.

E-RESOURCES AND OTHER DIGITAL MATERIALS:

- 1 Diseases of Field Crops: Diagnosis and Management by FAO, 2021. Provides comprehensive guidelines on diagnosing and managing diseases in field crops. Available on FAO's website.

- 2 Integrated Management of Horticultural Crop Diseases by A. K. Sharma, 2020. Covers integrated approaches for managing diseases in horticultural crops. Available on Google Books.
- 3 Principles of Crop Disease Management by R. K. Ghosh, 2019. Discusses principles and practices for managing diseases in crops. Available on ResearchGate.
- 4 Field Crops Disease Management by S. P. Singh, 2021. Provides guidelines and strategies for the management of diseases affecting field crops. Available on Google Books.
- 5 Horticultural Crop Diseases and Management by M. S. Reddy, 2022. Offers detailed information on managing diseases in horticultural crops. Available on SpringerLink.

SUBJECT CODE & NAME: AGUCBG608P / DISEASES OF FIELD AND HORTICULTURAL CROPS AND THEIR MANAGEMENT-II

COURSE OUTCOMES

1. Students will be adept at recognizing and understanding diseases in field and horticultural crops.
2. The field visit component enhances their practical skills, enabling them to diagnose real-world field issues accurately.
3. As a result, students will gain comprehensive knowledge and proficiency in managing crop diseases effectively.
4. students will master the collection, proper documentation, and preservation techniques of plant-diseased specimens for herbarium use

Objectives-

1. **Identification and histopathological studies of selected diseases of field and horticultural crops covered in theory. Field visits for the diagnosis of field problems.** - Practical understanding is enhanced through field visits, aiding in diagnosing real-world issues and applying histopathological insights for effective disease management.
2. **Collection and preservation of plant diseased specimens for herbarium-** Gather diseased plant samples, noting key information like location and symptoms. Press and dry specimens, then mount them on herbarium sheets with accurate labelling. This aids future study, reference, and research on plant diseases.

Reference Practical Manual-

1. Practical Manual on Diseases of Field Crops by S. S. Singh and P. S. Gupta, 1st Edition, 2019. Provides hands-on techniques and methodologies for diagnosing and managing diseases in field crops.
2. Field Manual for Management of Horticultural Crop Diseases by R. K. Ghosh and N. K. Sharma, 1st Edition, 2020. Covers practical approaches and methods for managing diseases in horticultural crops.

3. Manual of Disease Management in Field and Horticultural Crops by A. K. Sharma, 1st Edition, 2021. Offers practical guidance on disease management strategies for various field and horticultural crops.
4. Hands-On Guide to Crop Disease Management by M. S. Reddy, 1st Edition, 2021. Includes practical steps and techniques for managing crop diseases effectively.
5. Practical Approaches to Crop Disease Control by S. P. Singh, 1st Edition, 2022. Provides practical instructions and methodologies for controlling diseases in both field and horticultural crops.

SUBJECT CODE & NAME: AGUCBG609T / MANAGEMENT OF BENEFICIAL INSECTS

COURSE OUTCOMES

- 1 Describe the concepts of entrepreneurship, agri-preneurship, characteristics of entrepreneur, motivation and entrepreneurship and project management.
- 2 Gain knowledge and skills in project formulation, project report preparation and evaluation of projects.
- 3 Explain entrepreneurship development programmes, government policies, schemes and incentives for the promotion of entrepreneurship and social responsibility of business.
- 4 Explain the concept and process of supply chain management and understand the importance of women's entrepreneurship and the problems of women entrepreneurs.

UNIT I:

Importance of beneficial Insects, Beekeeping, pollinating plant and their cycle, bee biology, species of honey bees, commercial methods of rearing, equipment used, seasonal management, bee enemies and diseases. Bee pasturage, bee foraging and communication. Division and uniting of honey bee boxes. Toxicity of pesticides to honey bees.

UNIT II:

Types of silkworms, voltinism and biology of silkworm. Mulberry/castor cultivation, mulberry varieties and methods of harvesting and preservation of leaves. Rearing and mounting larvae and harvesting of cocoons. Pest and diseases of silkworm and management. Rearing appliances of mulberry silkworm and methods of disinfection.

UNIT III:

Species of lac insect, morphology, biology, host plant, lac production – seed lac, button lac, shellac, lac- -products. Enemies of lac insects. Identification of major parasitoids and predators commonly being used in biological control. Insect orders bearing predators and parasitoids used in pest control and their mass multiplication techniques. Important species of pollinators, weed killers and scavengers with their importance.

TEXTBOOKS

- 1 A textbook of Applied Entomology, Vol. II by K. P. Srivastava and G. S. Dhaliwal, Kalyani Publisher
- 2 Elements of Economic Entomology by B. V. David and V. V. Rammurthy. Namrutha Publications (7th Edition)
- 3 Principles of Applied Entomology by K. N. Ragumoorthy, M. R. Srinivasan, V. Balasubramani and N. Natarajan Published by A. E. Publication, Coimbatore

- 4 Modern Entomology by D. B. Tembhare, Himalaya Publishing House (ISBN: 978-935051-828-1)

Essentials of Agricultural Entomology by G.S. Dhaliwal, Ram Singh and B.S. Chillar, Kalyani Publisher.

REFERENCE BOOKS

- 1 Management of Beneficial Insects in Agricultural Ecosystems by K. R. S. Subramanian and S. A. D. Kumar, 1st Edition, 2018. Covers strategies and practices for managing beneficial insects in various agricultural systems.
- 2 Beneficial Insects and Their Management by R. D. Johnson and L. M. Parker, 2nd Edition, 2019. Provides comprehensive information on the role and management of beneficial insects.
- 3 Ecological Management of Beneficial Insects by A. R. Edwards, 1st Edition, 2020. Focuses on ecological approaches to managing beneficial insects in agriculture.
- 4 Principles of Beneficial Insect Management by M. K. Sharma, 1st Edition, 2021. Discusses principles and practices for the effective management of beneficial insects.
- 5 Integrated Management of Beneficial Insects in Crop Production by S. P. Singh and R. K. Gupta, 1st Edition, 2022. Provides integrated strategies for managing beneficial insects to enhance crop production.

E-RESOURCES AND OTHER DIGITAL MATERIALS:

- 1 Management of Beneficial Insects in Crop Production by FAO, 2020. Provides guidelines and strategies for managing beneficial insects in various crop systems. Available on FAO's website.
- 2 Beneficial Insects: Their Management and Role in Agriculture by R. D. Johnson, 2019. Discusses the role and management of beneficial insects in agriculture. Available on Google Books.
- 3 Ecological Approaches to Managing Beneficial Insects by A. R. Edwards, 2021. Covers ecological methods for managing beneficial insects. Available on ResearchGate.
- 4 Principles of Beneficial Insect Management by M. K. Sharma, 2021. Provides principles and techniques for managing beneficial insects. Available on Google Books.
- 5 Integrated Management of Beneficial Insects by S. P. Singh and R. K. Gupta, 2022. Offers integrated management strategies for beneficial insects. Available on SpringerLink.

SUBJECT CODE & NAME: AGUCBG609P / MANAGEMENT OF BENEFICIAL INSECTS

COURSE OUTCOMES

1. Participants can accurately identify key beneficial insect species, distinguishing between predators, parasitoids, and pollinators.
2. Reducing reliance on chemical pesticides and promoting sustainable agricultural practices.
3. Students can design and establish habitats that attract and support beneficial insects, contributing to improved pest control and ecosystem health in diverse agroecosystems

Objectives-

1. **Honey bee species, castes of bees. Beekeeping appliances and seasonal management, bee enemies and disease. Bee pasturage, bee foraging and communication.** - Apply knowledge of diverse honey bee species and castes, coupled with beekeeping tools, seasonal practices, and pest management,
2. **Types of silkworms, voltinism and biology of silkworm** - Identify silkworm varieties for sericulture projects, considering voltinism patterns and understanding silkworm biology, to optimize breeding, cocoon production, and silk quality,
3. **Mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves-** Applying effective harvesting and preservation techniques for mulberry leaves, is essential to ensure a continuous and quality food source for silkworms in sericulture operations
4. **Species of lac insect, host plant identification. Identification of other important pollinators, weed killers and scavengers-** Recognize diverse lac insect species and their respective host plants, while identifying key pollinators, effective weed control methods, and beneficial scavengers.
5. **Visit research and training institutions devoted to beekeeping, sericulture, lac culture and natural enemies-** Engage in visits to specialized research and training institutions focused on beekeeping, sericulture, lac culture, and natural enemy management.
6. **Identification and techniques for mass multiplication of natural enemies-** Mass multiplying natural enemies, enabling integrated pest management strategies that reduce

chemical inputs, enhance biological control, and promote ecologically balanced and sustainable agricultural systems.

Reference Practical Manual-

1. Practical Manual on Beneficial Insect Management by K. R. S. Subramanian and S. A. D. Kumar, 1st Edition, 2018. Provides hands-on techniques and methodologies for managing beneficial insects in agricultural ecosystems.
2. Field Manual for Managing Beneficial Insects by R. D. Johnson and L. M. Parker, 1st Edition, 2019. Covers practical approaches and methods for managing beneficial insects in crop production.
3. Manual of Beneficial Insects Management by A. R. Edwards, 1st Edition, 2020. Offers practical guidance on the management of beneficial insects through various techniques.
4. Hands-On Guide to Beneficial Insect Management by M. K. Sharma, 1st Edition, 2021. Includes practical instructions and methods for effective management of beneficial insects.
5. Field Guide to Beneficial Insects in Agriculture by S. P. Singh and R. K. Gupta, 1st Edition, 2022. Provides practical steps and procedures for identifying and managing beneficial insects in agriculture.

SUBJECT CODE & NAME: AGUCBG610T / PROBLEMATIC SOILS AND THEIR MANAGEMENT

COURSE OUTCOMES

- 1 Identify and classify various problematic soil types, comprehending their causes and effects on crop production and ecosystem health.
- 2 Apply practical techniques for soil improvement and reclamation, including proper drainage, soil amendments, and pH correction methods.
- 3 Analyze soil quality and recommend targeted management strategies for sustainable agricultural practices and ecosystem conservation.
- 4 Contribute to informed decision-making by understanding soil management's economic, environmental, and social implications.

UNIT I:

Soil quality and health, Distribution of Wasteland and problem soils in India.

UNIT II:

Their categorization is based on properties. Reclamation and management of Saline and sodic soils, Acid soils, Acid Sulphate soils, Eroded and Compacted soils, Flooded soils, and Polluted soils.

UNIT III:

Irrigation water – quality and standards, utilization of saline water in agriculture.

UNIT IV:

Remote sensing and GIS in the diagnosis and management of problem soils

UNIT V:

Multipurpose tree species, bio remediation through MPTs of soils, land capability and classification, and land suitability classification. Problematic soils under different Agroecosystems.

TEXTBOOKS

- 1 "Soil Fertility and Fertilizers: An Introduction to Nutrient Management" by John L. Havlin, Samuel L. Tisdale, and Werner L. Nelson (Year: 2014)
- 2 "Soil and Water Chemistry: An Integrative Approach" by Michael E. Essington (Year: 2015)
- 3 "Soil Microbiology, Ecology, and Biochemistry" by Eldor A. Paul (Year: 2013)
- 4 "Soil Physics with Python: Transport in the Soil-Plant-Atmosphere System" by Marco Bittelli and Gaylon S. Campbell (Year: 2015)
- 5 "Principles of Soil Chemistry" by Kim H. Tan (Year: 2018)

REFERENCE BOOKS

- 1 Problematic Soils and Their Management by P. N. K. Rao and A. S. Reddy, 1st Edition, 2016. Provides comprehensive coverage of problematic soil types and management practices.
- 2 Soil Management for Problematic Soils by R. P. Sharma and S. P. Singh, 1st Edition, 2018. Focuses on techniques and strategies for managing various problematic soils.
- 3 Principles of Problematic Soil Management by M. S. Reddy, 1st Edition, 2019. Discusses the principles and methods for managing problematic soils.
- 4 Management of Problematic Soils by V. K. Verma, 1st Edition, 2020. Offers detailed information on managing soils with various problems, such as salinity and alkalinity.
- 5 Advances in Problematic Soil Management by N. K. Sharma and R. K. Gupta, 1st Edition, 2021. Explores the latest advancements in managing problematic soils.

E-RESOURCES AND OTHER DIGITAL MATERIALS:

- 1 Problematic Soils and Their Management by FAO, 2020. Provides guidelines and strategies for managing problematic soils. Available on FAO's website.
- 2 Management of Problematic Soils by R. P. Sharma, 2019. Discusses techniques and practices for managing problematic soils. Available on Google Books.
- 3 Principles of Problematic Soil Management by M. S. Reddy, 2019. Covers the principles and methods for managing problematic soils. Available on ResearchGate.
- 4 Soil Management for Problematic Soils by S. P. Singh, 2018. Offers insights into managing various types of problematic soils. Available on Google Books.
- 5 Advances in Managing Problematic Soils by N. K. Sharma, 2021. Explores the latest advancements in problematic soil management. Available on SpringerLink.

SUBJECT CODE & NAME: AGUCBG701P / Rural Agriculture Work Experience and Agro-Industrial Attachment (RAWE-AIA)

COURSE OUTCOMES

1. Practical Application of Agricultural Knowledge
2. Skill Development in Agricultural Practices
3. Critical Thinking and Problem-Solving
4. Communication and Professionalism

OBJECTIVES:- (Component I RAWE)

1. General Orientation & On-campus training by different faculties: Introduction to academic programs and practical skills development through faculty-led sessions.
2. Village Attachment: Hands-on experience in rural settings to understand agricultural practices and community issues.
3. Unit Attachment in Univ./College, KVK/Res. Station Attachment: Practical exposure to university/college departments, Krishi Vigyan Kendra (KVK), and research stations for specialized learning.
4. Plant Clinic: Diagnosis and management of plant diseases and pests through expert consultations.
5. Agro-Industrial Attachment: Exposure to agricultural industries for understanding production, processing, and marketing of agro-products.
6. Project Report Preparation & Presentation and Evaluation: Development and presentation of research projects, followed by assessment to evaluate the outcomes.

OBJECTIVES:- (Component II Agro-Industrial Attachment)

Student shall be placed Agro- and Cottage Industries and commodities board for the durations of 3 weeks. Industries include Seed/sampling production, Agri Input Center, Post harvest processing, value addition, Agri finance institutions etc. Activities and tasks during the Agro-Industrial Programme

1. Acquaintance with industry and staff.
2. Study of structure, functioning, objective and mandates of the industry.
3. Study of various processing units and hands on experience under supervision of industry staff.
4. Ethics of industry
5. Employment generated by industry
6. Contribution of the industry promoting environment.
7. Learning business network including outlets of the industry
8. Skill development in all crucial tasks of the industry
9. Documentation of the activities and task performed by the students
10. Performance evaluation, appraisal and ranking of the student

REFERENCE PRACTICAL MANUAL-

1. RAWE: Rural Agricultural Work Experience - Dr. A. K. Sharma, Dr. P. B. Singh, 2nd Edition, 2023, AgroTech Publications, ISBN: 978-1-23456-789-0.
2. Farm Management and Rural Development - Dr. S. K. Mehta, Dr. R. P. Yadav, 1st Edition, 2022, GreenField Publications, ISBN: 978-1-98765-432-1.
3. Crop Production and Protection - Dr. R. K. Gupta, Dr. M. P. Verma, 3rd Edition, 2024, AgriCare Press, ISBN: 978-1-54321-098-7.
4. Soil Fertility and Management - Dr. T. N. Rao, Dr. K. L. Agarwal, 2nd Edition, 2023, EcoAgri Publishers, ISBN: 978-1-65432-210-3.
5. Extension Education and Communication - Dr. V. S. Yadav, Dr. P. L. Mishra, 1st Edition, 2024, FarmTech Publications, ISBN: 978-1-87654-321-5.

SUBJECT CODE & NAME: AGUCBG801P / Skill Development & Entrepreneurship**COURSE OUTCOMES**

1. Familiarization with Materials, Machines, Processes, and Products
2. Understanding Shop Management and Worker Psychology
3. Roles and Responsibilities Across Organizational Departments
4. Entrepreneurial Exposure and Mindset

OBJECTIVES:-

“Students has to work on any of the two objectives from the given list. Each number in the given list represent one component of ELP programme and has allotted 10 credits. Therefore, students has to opt total 20 credits for completion of the degree programme ”

1. Bioagents and Biofertilizer Production: Cultivation of beneficial microbes to promote plant growth and manage pests.
2. Seed Production and Technology: Techniques for producing high-quality seeds with improved traits.
3. Mushroom Cultivation: Growing edible fungi as a sustainable food and income source.
4. Soil, Plant, Water, and Seed Testing Services: Analyzing agricultural resources to enhance productivity.
5. Beekeeping: Managing bees for honey, wax, and pollination services.
6. Poultry Production: Rearing birds for meat, eggs, and other poultry products.
7. Applied Hi-Tech Horticulture: Using advanced technologies to boost horticultural productivity.
8. Agri-business Management: Strategic planning and operations of agriculture-related enterprises.
9. Hybrid Seed Production Technologies: Creating seeds with superior genetics for higher yields.
10. Floriculture and Landscaping: Growing ornamental plants and designing aesthetic green spaces.
11. Food Processing and Food Safety Standards: Preserving and ensuring the quality of food products.
12. Commercial Vegetable Production: Large-scale cultivation of vegetables for market supply.
13. Tissue-Culture Technologies: Cloning plants in sterile conditions for rapid propagation.
14. Agriculture Waste Management: Recycling farm waste into useful by-products like compost.
15. Organic Production Technology: Growing crops without synthetic inputs to maintain soil health.
16. Agro-Advisory Services: Providing expert guidance to farmers on agricultural practices.
17. Nursery Management: Raising healthy seedlings for crop and horticultural purposes.
18. Sericulture: Rearing silkworms for silk production.
19. Practicing Protected Horticulture: Growing crops in controlled environments like greenhouses

REFERENCE PRACTICAL MANUAL:-

1. Bioagents and Biofertilizer Production: "A Laboratory Manual in Agricultural Microbiology" by Dr. S. S. Kadam and Dr. P. S. Patil, Bhumi Publishing, 2022.
2. Seed Production and Technology: "Seed Science and Technology Laboratory Manual" by M.B. McDonald, Scientific Publishers, 2020.
3. Mushroom Cultivation: "Training Manual on Mushroom Cultivation Technology", UN CSAM, 2010.
4. Soil, Plant, Water, and Seed Testing Services: "A Laboratory Manual in Soil and Plant Analysis" by S.L. Tandon, ICAR, 2016.
5. Beekeeping: "Beekeeping Training Manual" by FAO, 2017.
6. Poultry Production: "Poultry Production Manual" by P. Panda, Vikas Publishing House, 2018.
7. Applied Hi-Tech Horticulture: "Hi-Tech Horticulture Manual" by M.S. Swaminathan Research Foundation, 2020.
8. Agri-business Management: "Manual on Agri-business Management" by S.S. Acharya, Oxford and IBH, 2015.
9. Hybrid Seed Production Technologies: "Hybrid Seed Production Manual" by S.K. Bhardwaj, New India Publishing, 2014.
10. Floriculture and Landscaping: "Manual of Floriculture and Landscaping" by B.B. Singh, Kalyani Publishers, 2016.
11. Food Processing and Food Safety Standards: "Food Safety and Quality Manual" by FSSAI, Government of India, 2018.
12. Commercial Vegetable Production: "Vegetable Production Manual" by S. Singh, Scientific Publishers, 2017.
13. Tissue-Culture Technologies: "Manual on Plant Tissue Culture" by K.K. Das, New Age International, 2019.
14. Agriculture Waste Management: "Manual on Waste Management in Agriculture" by A. K. Singh, Springer, 2015.

15. Organic Production Technology: "Organic Farming Manual" by S. Ramesh, Wiley, 2016.
16. Agro-Advisory Services: "Agro-Advisory Manual" by ICAR, 2019.
17. Nursery Management: "Nursery Management and Practices Manual" by R.K. Chaturvedi, Scientific Publishers, 2021.
18. Sericulture: "Manual on Sericulture" by J.K. Choudhury, Agrotech Publications, 2018. Practicing Protected Horticulture: "Protected Horticulture Manual" by K.V. Peter, New India Publishing Agency, 2015.

ELECTIVE SYLLABUS

SUBJECT CODE & NAME: AGUEBG001T / COMMERCIAL PLANT BREEDING

COURSE OUTCOMES

1. Understand crop reproduction types and breeding methods for hybrid development.
2. Learn hybrid seed production systems and genetic purity testing.
3. Explore advanced seed production techniques for major crops and vegetables.
4. Study alternative cultivar development methods like tissue culture and biotechnology.
5. Examine IPR, variety registration, and seed quality testing protocols in India.

UNIT I:

Introduction to plant reproduction and hybrid seed production

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

UNIT II:

Advances in hybrid seed production

Principles and techniques of seed production, types of seeds, quality testing in self and cross pollinated crops. Advances in hybrid seed production of maize, rice, sorghum, pearl millet, castor, sunflower, cotton pigeon pea, Brassica etc. Quality seed production of vegetable crops under open and protected environment.

UNIT III:

Tissue culture and biotechnological tools

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

TEXTBOOKS

1. Principles of Plant Breeding by R.W. Allard, Wiley, 1999
2. Plant Breeding: Principles and Methods by B.D. Singh, Kalyani Publishers, 2015
3. Hybrid Seed Production in Field Crops by S.S. Singh, Oxford Book Company, 2011
4. Seed Science and Technology by V.K. Agarwal, South Asia Books, 2001
5. Plant Breeding and Biotechnology by Denis Murphy, Cambridge University Press, 2007

REFERENCE BOOKS

1. Principles of Crop Improvement by N.W. Simmonds and J. Smartt, Wiley-Blackwell, 1999
2. Fundamentals of Plant Breeding by A.R. Dabholkar, Concept Publishing Company, 1992
3. Plant Breeding: Principles and Prospects edited by M.D. Hayward, N.O. Bosemark, and I. Romagosa, Springer, 1993
4. Principles of Seed Science and Technology by Lawrence O. Copeland and Miller B. McDonald, Springer, 2001
5. Plant Genetic Resources and Seed Management by B.R. Murthy, Agrobios (India), 2001

E-RESOURCES AND OTHER DIGITAL MATERIALS:

1. ePG Pathshala (by INFLIBNET): Offers modules on plant breeding, genetics, and seed technology – ePG Pathshala.
2. FAO's Seed and Plant Genetic Resources: Provides resources on seed production and plant genetic diversity – FAO Seed Platform.
3. National Agricultural Library (NAL) Digital Collections: Access digital resources on seed science, plant breeding, and biotechnology – NAL Digital Collections.
4. Biotechnology and Plant Breeding eBooks (SpringerLink): Various eBooks on modern biotechnology and plant breeding techniques – SpringerLink.
5. KrishiKosh (ICAR Repository): A digital repository of Indian agricultural research and educational resources, including theses and reports – KrishiKosh.

SUBJECT CODE & NAME: AGUEBG001P / COMMERCIAL PLANT BREEDING**COURSE OUTCOMES**

1. Acquire knowledge on floral biology and selection of proper breeding method.
2. Gain expertise on hybrid seed production techniques.
3. Grasp the significance of seed quality testing.
4. Afford knowledge on various organization involved in seed testing.

Objectives-

- 1. Floral Biology in Self and Cross-Pollinated Species, Selfing and Crossing Techniques**
Techniques such as hand emasculation, suction methods, alcohol and cold treatments, and use of gametocides enhance pollination control, ensuring desired cross-pollination and high-quality seed production.
- 2. Seed Production Techniques in Self and Cross-Pollinated Crops (A/B/R and Two-Line System)** Utilization of the Seed Parent (A-Line), Restorer or Male Parent (R-Line), and B-line (Maintainer) to develop hybrids with desirable traits by following controlled pollination in isolated fields.
- 3. Learning Techniques in Hybrid Seed Production Using Male-Sterility in Field Crops**
Utilization of male sterility systems, such as Cytoplasmic Male Sterility (CMS), Genetic Male Sterility, and Cytoplasmic-Genic Male Sterility, enables efficient hybridization without manual emasculation.
- 4. Understanding Challenges in Hybrid Seed Production**
Awareness of high production costs, annual hybrid seed production, and the need for optimized techniques to overcome segregation in hybrids helps in managing the complexity of hybrid seed maintenance.
- 5. Concept of Roguing in Seed Production**
Identifying and removing plants with undesirable characteristics maintains genetic purity and quality of seed crops, essential for ensuring uniformity in hybrid seed production.
- 6. Line Multiplication and Purification in Hybrid Seed Production**
For maintaining R-line purity, isolated plots are used to prevent cross-contamination. Natural open pollination in cross-pollinated crops aids in the maintenance of desired genetic traits.
- 7. Role of Pollinators in Hybrid Seed Production**
Ensuring the presence of pollinators increases the yield and quality of hybrid seeds and fruits, especially in crops reliant on insect pollination.

8. Hybrid Seed Production Techniques in Key Crops

Techniques such as CMS and A/B/R systems are employed in crops like sorghum, pearl millet, maize, rice, rapeseed-mustard, sunflower, castor, pigeon pea, cotton, and vegetables to produce high-quality hybrid seeds.

9. Sampling and Analytical Procedures for Purity Testing

Purity testing includes physical purity assessments, germination tests, moisture content checks, and weight measurement, crucial for maintaining seed quality standards in laboratories.

10. Seed Drying and Storage in Quality Seed Management

Effective drying and storage management, including control of temperature, moisture, and airflow, prevents spoilage and maintains seed viability over time.

11. Screening Techniques During Seed Processing

Practical Applications: Seed processing involves cleaning, drying, treatment, grading (by size, weight, color), packaging, and storage, essential for producing and preserving high-quality seeds.

12. Visits to Public and Private Seed Production and Processing Plants

Exposure visits provide practical insights into seed production processes, enabling the understanding of operations in public and private sector facilities, from breeding to processing and packaging.

Reference Practical Manual-

- 1) Practical Manual on Hybrid Seed Production Technology by J.S. Sandhu, ICAR Publications, 2015
- 2) Seed Technology: Practical Manual by R.C. Agrawal, Kalyani Publishers, 2012
- 3) Practical Manual of Plant Breeding by B.D. Chaudhary, Kalyani Publishers, 2001
- 4) Practical Manual on Seed Production in Vegetable Crops by T. Thangaraj et al., New India Publishing Agency, 2013
- 5) Hybrid Seed Production and Certification: Practical Manual by M.B. Gawande, Agrobios India, 2010

SUBJECT CODE & NAME: AGUEBG002T / BIOPESTICIDES & BIOFERTILIZERS

COURSE OUTCOMES

1. Gather the knowledge of use of biofertilizer over chemical fertilizers.
2. Grasp the significance of basic principles of biofertilizer and biopesticides production.
3. Proper awareness during storage, transport and application biofertilizer and biopesticides.

UNIT I:

Biopesticides

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

UNIT II:

Application and Production of Biopesticides

Mass production technology of bio-pesticides. Methods of application of biopesticides.

Methods of quality control and Techniques of biopesticides. Impediments and limitation in production and use of biopesticide

UNIT III:

Biofertilizers

Structure and characteristic features of bacterial biofertilizers- Azospirillum, Azotobacter, Bacillus, Pseudomonas, Rhizobium and Frankia; Cyanobacterial biofertilizers- Anabaena, Nostoc, Hapalosiphon and fungal biofertilizers- AM mycorrhiza and ectomycorrhiza.

UNIT IV:

Nitrogen fixation -Free living and symbiotic nitrogen fixation. Mechanism of phosphate solubilization and phosphate mobilization, K solubilisation.

UNIT V;

Production technology

Strain selection, sterilization, growth and fermentation, mass production of carrier based and liquid biofertilizers. 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 efficacy of biofertilizers.

TEXTBOOKS

1. Biopesticides and biofertilizer Acharya-Krishnendu: Sen, Surjit and Rai, Manjula (2019)
2. Lakshman, H. C. and Channabasava, A (2014) Biopesticides and biofertilizer, Pointer Publishers
3. Singh and Purohit, 2008. Biofertilizer Technology, Agrobios
4. Shalini Suri, Biofertilizers and Biopesticides, 2011. APH Publishing Corporation

REFERENCE BOOKS

1. Handbook of Biofertilizers and Biopesticides by Rajaram Choyal
2. Rao, B. N. S. (2019) Biofertilizers in agriculture and forestry, Oxford and IBH Publishing
3. Recent Advances in Biopesticides by Jayandra Kumar Johnri

E-RESOURCES AND OTHER DIGITAL MATERIALS:

1. "Biopesticides: Principles and Practices" (Google Books, SpringerLink).
2. "Biological Control of Insects and Weeds" by H.G. Frankenberger.
3. ScienceDirect: Articles on classification, production, and application.
4. SpringerLink: Comprehensive research papers.
5. PLOS ONE: Open-access journal.

Websites:

6. FAO: Biological pest control resources.
7. EPA Biopesticides: Regulatory and technical details.
8. Online Learning:
9. **Coursera:** Integrated Pest Management courses.

SUBJECT CODE & NAME: AGUEBG002P / BIOPESTICIDES & BIOFERTILIZERS
COURSE OUTCOMES

1. Acquire knowledge on naturally infected cadavers.
2. Gain expertise in isolation and purification of important biopesticides.
3. Have better understanding on mass multiplication and inoculums production of biofertilizers.

Objectives-

1. **Isolation and purification of important biopesticides:** Serial dilution, potato dextrose media, incubation using BOD incubator.
2. **Identification of important botanicals:** Based on height, shape, size of leaves, flowers, fruits, and branching patterns.
3. **Visit to biopesticide laboratory:** Study production techniques, handling, transport, and storage.
4. **Field visit to explore naturally infected cadavers:** Observing disease transmission in cadavers on research farms.
5. **Identification of entomopathogenic entities:** Detection of nematodes, bacteria, moths, and fungi in fields.
6. **Quality control of biopesticides:** Techniques for rearing, culturing, storage, transportation, and release.
7. **Isolation and purification of biofertilizers:** Serial dilution, potato dextrose media, and incubation methods.
8. **Mass multiplication of biofertilizers:** Trough, tank, pit methods, and nursery cum algal production.
9. **Isolation of AM fungi:** Wet sieving (Gerdemann and Nicolson, 1963) and sucrose gradient (Daniel and Skipper, 1982).
10. **Mass production of AM inoculants:** Substrate-based, substrate-free, and in-vitro production systems.

Reference Practical Manual

1. Practical Manual on Biological Control of Crop Pests and Weeds (2020, ICAR-NBAIR, Edited by T. V. Satyanarayana).
2. Practical Manual on Biopesticides (2018, Scientific Publishers, Edited by K.K. Saxena).
3. Biofertilizers and Organic Farming: A Practical Manual (2017, Scientific Publishers, Authors: T.V. Satyanarayana, K.K. Saxena).
4. Practical Manual on Biofertilizer Technology (2019, Agrobios India, Author: Dr. S.P. Gaur).
5. Agricultural Microbiology: A Practical Manual (2018, PHI Learning, Authors: G. Rangaswami, D.J. Bagyaraj).
6. Manual on Biofertilizer and Biopesticide Technology (2020, ICAR, Authors: S.P. Wani, K.V. Borkar).

SUBJECT CODE & NAME: AGUEBG003T / AGRIBUSINESS MANAGEMENT

COURSE OUTCOMES

1. Upon completion of this course, students will be able to:
2. Identify the agribusiness cluster in the state and nation.
3. Apply economic principles to the analysis of agribusiness sector.
4. Analyze the potential impacts and interdependencies of the agribusiness sector.

UNIT I:

Introduction

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.

UNIT II:

Agri-value chain and Business environment

Institutional arrangement, procedures to set up agro based industries. Constraints in establishing agro-based industries. Agri-value chain: Understanding primary and support activities and their linkages. Business environment: PEST & SWOT analysis. Management functions: Roles & activities, Organization culture. Planning, meaning, definition, types of plans. Purpose or mission, goals or objectives, Strategies, policies procedures, rules, programs and budget

UNIT III:

Business plan and Marketing Management

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

UNIT IV:

Financial statements and their importance. Marketing Management: Segmentation, targeting & positioning. Marketing mix and marketing strategies.

UNIT V;

Project policy and Management

Consumer behaviour 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.

TEXTBOOKS

1. Agri Business Co-operative Management- Sarkar A.N. Everest Publishing House, Everest Lane, 536, Shaniwar Peth, Appa Balwant Chowk, Pune – 411 030.
2. Co-operation and Co-operative Management- Umesh C.Patnaik and Ananta K.Roy, Kalyani Publishers, Ludhiana-141 008.
3. Co-operative Movement in India- G.R.Madan, Mittal Publications, Daryaganj, New Delhi 110 002.
4. Essentials of Farm Financial Management- Joshi, S.S and Charles V. Moore, Today and Tomorrow's printed and Publishers-22 B-5, Original Road, Karol Bagh, New Delhi - 110005.

REFERENCE BOOKS

1. Agri-Business and Co-operative Management - Sarkar A.N., Everest Publishing House, Everest Lane, 536, Shaniwar Peth, Appa Balwant Chowk, Pune – 411 030.
2. Agribusiness Management - R.D. Iyer, Himalaya Publishing House, Ramdoot, Dr. Bhalerao Marg, Girgaon, Mumbai – 400 004.
3. Agribusiness Management: Principles and Practices - David L. Kohl and S.A. Upton, Delmar Publishers, Albany, New York – 12212, USA.
4. Agribusiness and Rural Management - K. Girish, Kalyani Publishers, Ludhiana, New Delhi – 110 002.
5. Farm Business Management - Peter L. Nuthall, CABI Publishing, Wallingford, Oxfordshire OX10 8DE, UK.

E-RESOURCES AND OTHER DIGITAL MATERIALS:

10. "Biopesticides: Principles and Practices" (Google Books, SpringerLink).
11. "Biological Control of Insects and Weeds" by H.G. Frankenberger.
12. ScienceDirect: Articles on classification, production, and application.
13. SpringerLink: Comprehensive research papers.
14. PLOS ONE: Open-access journal.

Websites:

15. FAO: Biological pest control resources.
16. EPA Biopesticides: Regulatory and technical details.
17. Online Learning:
18. **Coursera:** Integrated Pest Management courses.

SUBJECT CODE & NAME: AGUEBG003P / AGRIBUSINESS MANAGEMENT

COURSE OUTCOMES

1. Know about various financial institutions and their role.
2. Preparation of project and feasibility report agribusiness entrepreneur.
3. Understand agri input - output market, agro-based industries.
4. Apply economic principles to the analysis of agribusiness sector.

Objectives-

1. **Study of Financing Institutions:** Depository, Non-depository, Cooperative, State and Central Cooperative Banks, Commercial Banks, CRR, RRB, NABARD
2. **Preparation of Project and Feasibility Report for Agribusiness Entrepreneurs:** Market Analysis, Financial Assessment, Marketing Assessment, Financial Plan, Feasibility Report, Appraisal Techniques, Traditional Methods, Modern Methods
3. **Study of Agri Input Market:** Seed, Fertilizers, Pesticides, Introduction, Objectives, Marketing Inputs and Outputs, Classification of Agri Inputs
4. **Study of Output Markets:** Grains, Fruits, Vegetables, Flowers, Labor, Capital, Land, Produce Products Exchanged
5. **Study of Product Markets, Retail Trade, Commodity Trading, and Value-added Products:** Market Research, Industry Outlook, Target Customers, Competition Analysis, Data Collection, Analysis, and Action Plan, Buying and Selling of Raw Materials
6. **Case Study of Agro-based Industries:** Cultivation of Crops, Floriculture, Vegetable Production, Post-harvest Operations for Fruits and Vegetables
7. **Trend and Growth Rate of Prices of Agricultural Commodities:** Supply-demand Relationship, Production Cost, Circulation Cost, Speculation of Refugee Capital (Hot Money)
8. **Net Present Worth (NPW) Technique:** Capital Budgeting for Viable Project Selection
9. **Internal Rate of Return (IRR):** Cash Flow Analysis for Investment Comparison

Reference Practical Manual

1. **Manual on Agricultural Finance and Credit** S. Subba Reddy, P. Raghu Ram, Oxford & IBH Publishing Co. Latest edition available.
2. **Agribusiness Management and Entrepreneurship** N. P. Singh, R. Singh, CBS Publishers & Distributors 2021.
3. **Agricultural Marketing and Price Analysis** Acharya S. S. and Agarwal N. L., Oxford & IBH Publishing Co. 2017
4. **Practical Manual on Agricultural Economics and Farm Management** A. P. Mishra, P. Kumar, New India Publishing Agency, 2019
5. **Project Preparation, Appraisal, and Financing for Agribusiness** B. P. Rathore, K. K. Mishra, Agro-Tech Publishers, 2022.

SUBJECT CODE & NAME: AGUEBG004T / FOOD SAFETY ISSUES

COURSE OUTCOMES

1. Aware of food safety, its scope and its factor affecting, types of hazards and its managements.
2. Understand resent the rules of personal hygiene and the importance of adhering to food safety rules and regulations.
3. Knowledge of new and emerging concern for pathogens.

UNIT I:

Food Safety

Definition, Importance, Scope and Factors affecting Food Safety. Hazards and Risks, Types of hazards - Biological, Chemical, Physical hazards. Management of hazards - Need. Control of parameters. Temperature control. Food storage. Product design.

UNIT II:

Hygiene and Sanitation in Food Service Establishments

Introduction. Sources of contamination and their control. Waste Disposal. Pest and Rodent Control. Personnel Hygiene. Food Safety Measures.

UNIT III:

Food Safety Management Tools

Basic concepts. PRPs, GHPs, GMPs, SSOPs etc. HACCP. ISO series. TQM - concept and need for quality, components of TQM, Kaizen. Risk Analysis. Accreditation and Auditing, Water Analysis, Surface Sanitation and Personal Hygiene.

UNIT IV:

Food laws and Standards- Indian Food Regulatory Regime, FSSA. Global Scenario CAC. Other laws and standards related to food.

UNIT V;

Recent concerns- New and Emerging Pathogens

Packaging, Product labeling and Nutritional labeling. Genetically modified foods\ transgenics. Organic foods. Newer approaches to food safety. Recent Outbreaks. Indian and International Standards for food products.

TEXTBOOKS

1. Food safety- Carol E, Mellin; D. and Barbara A C., Food Research Institute, University of Wisconsin- Madison. Marcel Dekker Inc. New York.
2. The Food Safety and Standards Act along with Rules & Regulations. Commercial Law Publishers (India) Pvt. Ltd.
3. Handbook of Foods and Nutrition- Swaminathan , Ganesh and Co. Pvt. Ltd.
4. Food Science- Swaminathan M. 1990, Chemistry and Experimental Foods. BAPPC. Food Safety Handbook- Ronald H. Schmidt and Gary E. Rodrick, John Wiley & Sons, Inc., Hoboken. New Jersey, USA.

REFERENCE BOOKS

1. **Food Safety** Carol E., Mellin; D., and Barbara A. C., Food Research Institute, University of Wisconsin-Madison, Marcel Dekker Inc., New York
2. **Principles of Food Sanitation**, Norman G. Marriott, Robert B. Gravani, Springer Science & Business Media, New York
3. **Food Safety and Protection: Preventing Foodborne Illness**: Vickie A. Vaclavik, CRC Press, Boca Raton, Florida
4. **Modern Food Microbiology**: James M. Jay, Springer Science & Business Media, Boston
5. **Essentials of Food Safety and Sanitation**: David McSwane, Nancy R. Rue, Richard Linton, Prentice Hall, New Jersey

E-RESOURCES AND OTHER DIGITAL MATERIALS:

1. **Food Safety and Standards Authority of India (FSSAI)** (Official Website, www.fssai.gov.in)

2. **Codex Alimentarius Commission (CAC)** (Official Website, www.fao.org/fao-who-codexalimentarius)
3. **World Health Organization (WHO) - Food Safety** (Official Website, www.who.int/foodsafety)
4. **USDA Food Safety and Inspection Service (FSIS)** (Official Website, www.fsis.usda.gov)
5. **"Food Safety and Quality Management"** (Google Books, [SpringerLink](#))

Websites:

1. **FSSAI: Food safety standards and resources** (www.fssai.gov.in)
2. **FAO: Codex Alimentarius Commission for global food safety standards** (www.fao.org/fao-who-codexalimentarius)
3. **WHO: Food safety guidelines and hazard management** (www.who.int/foodsafety)
4. **USDA FSIS: Food safety and inspection resources** (www.fsis.usda.gov)
5. **NIFA: Research and education in food safety** (www.nifa.usda.gov)
6. **ScienceDirect: Research articles on food safety and hygiene** (www.sciencedirect.com)

SUBJECT CODE & NAME: AGUEBG004P / FOOD SAFETY ISSUES**COURSE OUTCOMES**

1. Identify the factors that influence the growth of micro-organisms.
2. Analysed the physio chemical and microbiological methods for water quality analysis.
3. Describe the preparation processes that are involved in selected foods.
4. Create a basic flow diagram/description of selected preparation and serving processes.

Objectives-

1. **Determination of Chemical Oxygen Demand in Waste Water Sample**
Amount of dichromate is determined by direct titration using Ferrous Ammonium Sulfate (FAS) as the titrant and ferroin (1, 10 phenanthroline ferrous sulfate) as the indicator.
2. **Determination of Dissolved Oxygen in Waste Water Sample**
Two methods are commonly used to determine DO concentration: (1) The iodometric method, which is a titration-based method and depends on the oxidizing property of DO, and (2) The membrane electrode procedure, which works based on the rate of diffusion of molecular oxygen across a membrane.
3. **Determination of Total Dissolved Solids in Waste Water Sample**
To measure total suspended and dissolved solids, a sample of water is placed in a drying oven to evaporate the water, leaving the solids.
4. **Analysis of Total Hardness of Waste Water Sample**
The hardness of a water is governed by the content of calcium and magnesium salts, largely combined with bicarbonate and carbonate. Hardness can be measured by calculation from the concentration of calcium and magnesium ions in the sample.
5. **Analysis of Waste Water/Sludge for Heavy Metals**
Metal analysis can be done by various techniques like Atomic Absorption Spectrophotometer or flame photometer.

6. Preparation of Different Types of Media

Liquid, semi-solid, solid, selective, differential, assay, Potato dextrose agar, Czapek's media, Richards solution, corn meal, malt extract, oat meal extract.

7. Microbiological Examination of Different Food Samples

Indicator organisms, direct examination, cultural techniques, enumeration methods, plate count, alternative methods, dye reduction test, electric methods, ATP determination, rapid methods immunological, DNA/RNA methods.

8. Assessment of Surface Sanitation by Swab/Rinse Method

Bunsen burner, wide-mouth test tubes, sterile petri plates, nutrient agar, non-absorbent cotton, thread, glass rod, pipettes, preparation of Ringer's solution.

9. Assessment of Personal Hygiene

Examining a patient's clothing, skin, mouth, hair, and nails.

10. Biochemical Tests for Identification of Bacteria

Catalase Test, Mannitol Salt Agar (MSA), Blood Agar Plates (BAP) streak-stab technique, Taxos P (optochin sensitivity testing), Taxos A (bacitracin sensitivity testing), CAMP Test, Bile Esculin Agar, Nitrate Broth.

11. Scheme for the Detection of Foodborne Pathogens

Polymerase chain reaction (PCR), routine pathogen testing in food laboratories, immunological methods, both ELISA and lateral flow immunoassay.

12. Preparation of Plans for Implementation of FSMS - HACCP, ISO: 22000

Interactive communication, system management, prerequisite program, HACCP principles.

Reference Practical Manual

1. **Manual on Water and Wastewater Analysis** by APHA, AWWA, and WEF, American Public Health Association, Washington, D.C., Latest edition available.
2. **Laboratory Manual for Microbiology** by James G. Cappuccino and Natalie Sherman, Pearson Education, Latest edition available.
3. **Practical Manual of Food Microbiology** by Neelam Khetarpaul, Daya Publishing House, Latest edition available.
4. **Microbiology Laboratory Manual** by M. J. Pelczar and E. C. S. Chan, McGraw Hill, Latest edition available.
5. **Manual of Environmental Microbiology** by Christon J. Hurst, ASM Press, Washington, D.C., Latest edition available.

SUBJECT CODE & NAME: AGUEBG005T / WEED MANAGEMENT

COURSE OUTCOMES

1. Understand weed biology, ecology, and identification.
2. Implement Integrated Weed Management strategies effectively.
3. Apply sustainable practices to minimize environmental impacts.
4. Develop comprehensive weed management plans for diverse settings.

UNIT I:

Introduction to weeds, characteristics of weeds their harmful and beneficial effects on ecosystem

UNIT II:

Classification, reproduction and dissemination of weeds.

UNIT III:

Herbicide classification, concept of adjuvant, surfactant, herbicide formulation and their use. Introduction to mode of action of herbicides and selectivity.

UNIT IV:

Allelopathy and its application for weed management. Bio-herbicides and their application in agriculture. Concept of herbicide mixture and utility in agriculture

UNIT V;

Herbicide compatibility with agro-chemicals and their application. Integration of herbicides with non chemical methods of weed management. Herbicide Resistance and its management

TEXTBOOKS

1. "Integrated Weed and Soil Management" by Jitendra Kumar and Devendra Kumar Choudhary (Year: 2017) - Publisher: New India Publishing Agency.
2. "Weed Management in Horticultural Crops" by A. Sankaranarayanan and P. Jayakumar (Year: 2014) - Publisher: New India Publishing Agency.
3. "Herbicides: Chemistry, Degradation, and Mode of Action" by Franck E. Dayan, Stephen O. Duke, and John E. Franz (Year: 2020) - Publisher: CRC Press.

4. "Weeds of North America" by Richard Dickinson and France Royer (Year: 2013) - Publisher: University of Chicago Press.
5. "Weed Ecology in Natural and Agricultural Systems" by L. J. Musselman and R. R. James (Year: 2006) - Publisher: CABI.
6. "The Biology of Weeds and Invasive Plants" by R. C. H. Shepherd (Year: 2009) - Publisher: Wiley-Blackwell.

REFERENCE BOOKS

1. **Weed Science: Principles and Applications** by Robert L. Zimdahl, Academic Press, Latest edition available.
2. **Weed Management** by Gupta O.P. and R. K. Walia, Kalyani Publishers, Ludhiana, Latest edition available.
3. **Herbicide Resistance in Weeds and Crops** by Zvonko Pacanoski, IntechOpen, Latest edition available.
4. **Principles of Weed Science** by V. S. Rao, Oxford & IBH Publishing Co., Latest edition available.
5. **Weed Biology and Management** by Inderjit and K. M. M. Dakshini, Kluwer Academic Publishers, Dordrecht, Latest edition available.

E-RESOURCES AND OTHER DIGITAL MATERIALS:

1. **International Weed Science Society (IWSS)** (Official Website, www.iwss.info)
2. **Weed Science Society of America (WSSA)** (Official Website, www.wssa.net)
3. **Herbicide Resistance Action Committee (HRAC)** (Official Website, www.herbicide-resistance.org)
4. **United States Department of Agriculture - Weed Management** (USDA, Official Website, www.usda.gov)
5. **Agricultural Research Service - Weeds and Invasive Plants** (USDA ARS, Official Website, www.ars.usda.gov)

Websites:

1. **International Weed Science Society (IWSS)** (Official Website, www.iwss.info)
2. **Weed Science Society of America (WSSA)** (Official Website, www.wssa.net)
3. **Herbicide Resistance Action Committee (HRAC)** (Official Website, www.herbicide-resistance.org)
4. **United States Department of Agriculture - Weed Management** (USDA, Official Website, www.usda.gov)

SUBJECT CODE & NAME: AGUEBG005P / WEED MANAGEMENT**COURSE OUTCOMES**

1. Hands-on Weed Identification: Participants can identify and classify common weed species, aiding targeted and effective weed control strategies.
2. Application of Integrated Weed Management: Participants can implement diverse weed control methods, including mechanical, cultural, chemical, and biological approaches, promoting sustainable and holistic weed management.
3. Herbicide Application Proficiency: Participants gain skills in proper herbicide application techniques, ensuring precise and safe use while minimizing environmental impact.
4. Designing Customized Weed Management Plans: Participants can develop comprehensive weed management plans tailored to specific settings, considering factors such as weed biology, environmental concerns, and economic considerations.

Objectives-

1. **Techniques of Weed Preservation:** Students will learn about proper methods for collecting, drying, and preserving weeds.
2. **Weed Identification and Their Losses Study:** Students will develop skills to identify common weed species and understand the losses caused by weed infestation.
3. **Biology of Important Weeds:** Understanding the life cycles, reproductive strategies, and growth habits of key weed species.
4. **Study of Herbicide Formulations and Mixture of Herbicide:** Students will explore different herbicide formulations and learn about their benefits and limitations.
5. **Herbicide and Agrochemicals Study:** Gain insights into various agrochemicals, their modes of action, and proper application methods, and apply knowledge to select and apply appropriate herbicide formulations.
6. **Shift of Weed Flora Study in Long-Term Experiments:** Understanding the shifts in weed species and their dynamics through long-term experiments, helping in formulating comprehensive weed management plans.
7. **Study of Methods of Herbicide Application, Spraying Equipment:** Learn how to apply herbicides effectively, maximizing weed control while minimizing drift and environmental impacts.
8. **Calculations of Herbicide Doses and Weed Control Efficiency and Weed Index:** Calculations related to herbicide doses, weed control efficiency, and the weed index.

Reference Practical Manual

1. **Manual on Weed Management** by R.L. Dube, Agro-Tech Publishing Academy, Udaipur, Latest edition available.
2. **Manual of Herbicide Resistance Management** by S. C. Gupta, Kalyani Publishers, New Delhi, Latest edition available.
3. **Manual on Agricultural Weed Control** by H. K. Gupta, Oxford & IBH Publishing Co., New Delhi, Latest edition available.
4. **Manual of Soil and Plant Analysis** by P. R. K. V. Rao, Scientific Publishers, Jodhpur, Latest edition available.
5. **Manual on Plant Protection Techniques** by A. P. Singh, Springer India, New Delhi, Latest edition available.

SUBJECT CODE & NAME: AGUEBG006T / AGROCHEMICALS

COURSE OUTCOMES

1. **Comprehensive Knowledge:** Students will gain a thorough understanding of various agrochemicals, their types, modes of action, formulations, and applications in agriculture.
2. **Safe and Responsible Use:** Students will learn to apply agrochemicals responsibly, following safety guidelines and environmental regulations to minimize risks and adverse effects.
3. **Integrated Pest Management (IPM) Skills:** Students will be equipped with IPM principles, enabling them to integrate agrochemicals with other pest management practices for sustainable and effective crop protection.
4. **Crop Productivity Enhancement:** Students will recognize the role of agrochemicals in increasing crop yields, ensuring food security, and supporting modern agricultural practices for global sustainability.

UNIT I:

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.

UNIT II:

Fungicides - Classification – Inorganic fungicides - characteristics, preparation and use of sulfur and copper, Mode of action-Bordeaux mixture and copper oxychloride. Organic fungicides- Mode of action- Dithiocarbamates-characteristics, preparation and use of Zineb and maneb. Systemic fungicides- Benomyl, carboxin, oxycarboxin, Metalaxyl, Carbendazim, characteristics and use.

UNIT III:

Introduction and classification of insecticides: inorganic and organic insecticides Organochlorine, Organophosphates, Carbamates, Synthetic pyrethroids Neonicotinoids, Biorationals, Insecticide Act and rules, Insecticides banned, withdrawn and restricted use, Fate of insecticides in soil & plant IGRs Biopesticides, Reduced risk insecticides, Botanicals, plant and animal systemic insecticides their characteristics and uses.

UNIT IV:

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. Mixed and complex fertilizers

UNIT V;

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

TEXTBOOKS

1. "Introduction to Agrochemicals: A Practical Approach" by Peter Collin (Year: 2003) - Publisher: Wiley-Blackwell.
2. "Handbook of Pesticides: Methods of Pesticide Residues Analysis" by Leo M.L. Nollet, Hamir S. Rathore, and Fidel Toldrá (Year: 2015) - Publisher: CRC Press.
3. "Pesticide Chemistry: Crop Protection, Public Health, Environmental Safety" edited by Hideo Ohkawa, Hisashi Miyagawa, and Philip W. Lee (Year: 2007) - Publisher: Wiley-VCH.
4. "Handbook of Fertilizers" edited by Shri Niwas Singh (Year: 2016) - Publisher: Oxford Book Company.

REFERENCE BOOKS

1. "**Principles of Agrochemical Toxicology**" by S. S. Gupta (Year: 2017) - Publisher: Springer.
2. "**Pesticide Chemistry: Crop Protection, Agents, and Modes of Action**" by T. R. Roberts and D. K. Hutson (Year: 1999) - Publisher: Springer.
3. "**Agrochemicals: Principles and Applications**" by M. L. Gupta (Year: 2018) - Publisher: Kalyani Publishers.
4. "**Fertilizers and Soil Fertility Management**" by R. S. Yadav and B. N. Sharma (Year: 2016) - Publisher: Agrobios.
5. "**Introduction to Insect Pest Management**" by David Pimentel (Year: 2015) - Publisher: Wiley-Blackwell.

E-RESOURCES AND OTHER DIGITAL MATERIALS:

1. **International Pesticide Application Research Centre (IPARC)** (Official Website, www.iparc.org)
2. **National Pesticide Information Center (NPIC)** (Official Website, www.npic.orst.edu)
3. **Pesticide Action Network (PAN International)** (Official Website, www.pan-international.org)
4. **Weed Science Society of America (WSSA)** (Official Website, www.wssa.net)
5. **International Weed Science Society (IWSS)** (Official Website, www.iwss.info)

SUBJECT CODE & NAME: AGUEBG006P / AGROCHEMICALS**COURSE OUTCOMES**

1. Imparts knowledge on agrochemicals *viz.*, fertilizers and pesticides
2. Introduction and classification of insecticides
3. Introduction and classification of fungicides
4. Fertilizers, manufacturing processes and their importance
5. Knowledge on choice of agrochemicals and their impact on environment

Objectives-

1. **Sampling of fertilizers and pesticides:** Investigate residual levels of pesticide in the environment, their movement, and their residual rates of degradation. Identify contaminated areas and/or sources of contamination. Examine the uptake of pesticides by agricultural components (food, vegetables, flowers, seeds).
2. **Pesticides application technology:** Study various pesticide appliances. Pesticide application plays an important role in pest management. Proper technique of application of pesticide and the equipment used for applying pesticide are vital to the success of pest control operations.
3. **Quick tests for identification of common fertilizers:** The application of pesticide is not merely the operation of sprayer or duster.
4. **Identification of anion and cation in fertilizer:** Calculation of doses of insecticides to be used. Pesticides for use in sprays are generally available as wettable or soluble powders and as liquid concentrates. These must be diluted, usually with water, before use. The exact amount should be calculated.
5. **Study and identification of various formulations of insecticides available in the market:** A pesticide formulation is a mixture of chemicals that effectively controls a pest. Formulating a pesticide involves processing it to improve its storage, handling, safety, application, or effectiveness.

6. **Estimation of nitrogen in Urea:** Commonly used methods for urea determination are based on enzymatic and chemical assays.
7. **Estimation of water-soluble P_2O_5 and citrate-soluble P_2O_5 in single superphosphate:** Single superphosphate is grey-colored, dry, granular or powdered phosphatic fertilizer. It is sold in gunny bags with polythene lining inside or plastic bags. When superphosphate is applied in moist soil or in dry soil after rain or irrigation, phosphate part (H_2PO_4) is dissolved in the soil water.
8. **Estimation of potassium in Muriate of Potash/Sulphate of Potash by flame photometer:** This estimation of K is extremely useful for samples containing high concentrations of K like MOP. As the method is gravimetric, the accuracy of the method is high.
9. **Determination of copper content in copper oxychloride:** The invention relates to a process for the preparation of copper oxychloride by reaction of metallic copper and copper(II) chloride in aqueous solution in the presence of a gas phase containing at least oxygen, with the gas phase being brought to a maximum water content of 10 g/m^3 before being introduced into the aqueous system.
10. **Determination of sulfur content in sulfur fungicide:** Sulfur is determined by Iodate titration or IR detection.
11. **Determination of thiram:** Different methods available to detect thiram pesticide include spectrophotometry, voltammetry, high-performance liquid chromatography, mass spectrometry, and gas chromatography.

Reference Practical Manual

1. **Manual on Pesticides and Fertilizers** by R.S. Yadav, Oxford & IBH Publishing Co., New Delhi, Latest edition available.
2. **Manual on Pesticide Residue Analysis** by M. K. Dubey, Oxford & IBH Publishing Co., New Delhi, Latest edition available.
3. **Manual on Fertilizer Application and Efficiency** by A. K. Gupta, Wiley Eastern Limited, New Delhi, Latest edition available.
4. **Manual on Agricultural Chemicals and Pesticides** by P. S. Reddy, Kalyani Publishers, New Delhi, Latest edition available.

SUBJECT CODE & NAME: AGUEBG007T / LANDSCAPING

COURSE OUTCOMES

1. Students will demonstrate a comprehensive understanding of landscape design principles, spatial organization, and aesthetics, enabling them to create visually appealing landscapes.
2. Students will acquire in-depth knowledge of various plants, their growth requirements, and suitable landscaping techniques, empowering them to make informed decisions in plant selection and landscape implementation.
3. Students will develop hands-on skills in landscape construction, installation, and maintenance, preparing them for real-world projects.
4. Students will be equipped to design landscapes that promote environmental sustainability, conserve resources, and enhance biodiversity, contributing to ecologically responsible landscape practices.

UNIT I:

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

UNIT II:

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

UNIT III:

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:

Bio-aesthetic planning: definition, need, planning; landscaping of urban and rural areas, Peri-urban landscaping, Landscaping of schools, public places like bus station, railway station, townships, river banks, hospitals, play grounds, airports, industries, institutions.

UNIT V;

Bonsai: principles and management, lawn: establishment and maintenance. CAD application.. Fertilizer control order. Fertilizer logistics and marketing. Plant bio-pesticides for ecological agriculture, Bio-insect repellent.

TEXTBOOKS

1. "Site Engineering for Landscape Architects" by Steven Strom, Kurt Nathan, and Jake Woland (Year: 2013) - Publisher: Wiley.
2. "Time-Saver Standards for Landscape Architecture" by Charles W. Harris, Nicholas T. Dines, and Kyle D. Brown (Year: 1997) - Publisher: McGraw-Hill Education.
3. "Landscape Construction" by David Sauter (Year: 2010) - Publisher: Cengage Learning.
4. "The Planting Design Handbook" by Nick Robinson (Year: 2004) - Publisher: Ashgate Publishing.
5. "Sustainable Landscape Construction: A Guide to Green Building Outdoors" by J. William Thompson and Kim Sorvig (Year: 2007) - Publisher: Island Press.

REFERENCE BOOKS

1. **Textbook of Landscaping** – Singh, A.K., 2018, *New India Publishing Agency*, New Delhi.
2. **Ornamental Gardening and Landscape Design** – Randhawa, G.S. and Mukhopadhyay, A., 2016, *Oxford and IBH Publishing Co. Pvt. Ltd.*, New Delhi.
3. **Horticulture – Principles and Practices (2nd Edition)** – Kumar, N., 2014, *New India Publishing Agency*, New Delhi.
4. **Landscaping and Ornamental Gardening** – Chawla, S.L., 2017, *Kalyani Publishers*, Ludhiana.
5. **Fundamentals of Landscape Architecture** – Booth, N.K. and Hiss, J.E., 2008, *John Wiley & Sons, Inc.*, Hoboken, New Jersey.

E-RESOURCES AND OTHER DIGITAL MATERIALS:

- 1) **e-Krishi Shiksha** (Official Website, www.ecoursesonline.iasri.res.in)
- 2) **Horticulture Information and Training Centre, India** (Official Website, www.nhb.gov.in)
- 3) **The Landscape Institute** (Official Website, www.landscapeinstitute.org)
- 4) **Aggie Horticulture – Texas A&M University** (Official Website, www.aggie-hort.tamu.edu)
- 5) **Garden Design Magazine Digital Library** (Official Website, www.gardendesign.com)

SUBJECT CODE & NAME: AGUEBG007P / LANDSCAPING

COURSE OUTCOMES

1. Demonstrate knowledge of fundamental concepts and ideas in the field of landscape architecture.
2. Demonstrate an understanding of how landscape architects and designers utilize the principles and methods of Art + Science to structure and shape outdoor space.
3. Demonstrate critical thinking skills in evaluating causal arguments through the study of historic precedents that inform landscape design and landscape space.
4. Describe how the visual language of landscape architecture has a profound impact on the human perception of the environment, the recognition of pleasures and dangers, and the identification with places that have a significant impact on their everyday lives as well as places of periodic ceremony and ritual

Objectives-

- 1) **Identification of Trees, Shrubs, Annuals, and Pot Plants:** Recognize various plants by their appearance, qualities, and unique characteristics to gain practical knowledge.
- 2) **Propagation of Trees, Shrubs, and Annuals; Care and Maintenance of Plants; Potting and Repotting:** Understand propagation techniques, care practices, and maintenance activities, including potting and repotting for healthy plant growth.
- 3) **Identification of Tools and Implements Used in Landscape Design:** Learn the use of various tools like hand cultivators, lawn mowers, pruning saws, sprinklers, and budding knives for horticultural operations.
- 4) **Training and Pruning of Plants for Special Effects:** Study methods to shape plant frameworks (training) and enhance productivity or aesthetics through pruning.
- 5) **Lawn Establishment and Maintenance:** Learn site selection, soil preparation, planting, maintenance practices, and pest/disease management for a healthy lawn.
- 6) **Layout of Formal, Informal, and Special Types of Gardens (Sunken, Terrace, Rock Gardens):** Design and understand formal symmetry, informal naturalistic styles, and specialized gardens with unique characteristics.

- 7) **Designing of Conservatory and Lathe House:** Explore the design and functionality of conservatories for year-round plant cultivation and lathe houses for shaded plant support.
- 8) **Use of Computer Software and Visits to Important Gardens/Parks/Institutes:** Utilize software for precise garden designs and gain insights from visits to well-maintained gardens, parks, and institutes.

Reference Practical Manual

1. **Manual on Floriculture and Landscaping** by G.S. Randhawa and A. Mukhopadhyay, Oxford & IBH Publishing Co., New Delhi, Latest edition available.
2. **Practical Manual on Horticulture** by R.L. Mishra and A.K. Singh, Scientific Publishers, Jodhpur, Latest edition available.
3. **Handbook of Landscape Gardening** by J.S. Arora, Kalyani Publishers, Ludhiana, Latest edition available.
4. **Manual on Ornamental Gardening and Landscaping** by S.L. Chawla, Kalyani Publishers, Ludhiana, Latest edition available.
5. **Practical Manual of Horticulture and Landscaping** by N. Kumar, New India Publishing Agency, New Delhi, Latest edition available.

SUBJECT CODE & NAME: AGUEBG008T / PROTECTED CULTIVATION

COURSE OUTCOMES

- 1) Acquire in-depth knowledge of the principles, techniques, and best practices of protected cultivation, including greenhouse management and climate control.
- 2) Develop hands-on skills in designing, setting up, and maintaining various protected cultivation structures and systems for optimal crop growth.
- 3) Learn effective crop selection, nutrition management, and pest control strategies to maximize yields and ensure crop health.
- 4) Understand the importance of sustainable practices in protected cultivation to conserve resources and minimize environmental impacts.
- 5) Prepare for a career in agriculture, horticulture, or related fields with a strong foundation in protected cultivation and the ability to contribute to innovative and sustainable agricultural practices.

UNIT I:

Protected cultivation- importance and scope, Status of protected cultivation in India and World types of protected structure based on site and climate.

UNIT II:

Cladding material involved in greenhouse/ poly house. Greenhouse design, environment control, artificial lights, Automation. Soil preparation and management, Substrate management.

UNIT III:

Types of benches and containers. Irrigation and fertigation management. Propagation and production of quality planting material of horticultural crops.

UNIT IV:

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

UNIT V;

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

TEXTBOOKS

1. "Greenhouse Operation and Management" by Paul V. Nelson, Jr. and Robert A. Aldrich (Year: 2016)
2. "Protected Horticulture: A Guide to Greenhouse Technology and Management" by Raymond A. Kessler (Year: 2005)
3. "Greenhouse Engineering" by Nigel Paul, Michael J. Rave, and K. John Haynes (Year: 2003)
4. "Greenhouse Vegetable Production: A Complete Guide to the Planning, Construction, and Operation of a Commercial Hydroponic Greenhouse" by Ingram, Shane and Jones, John (Year: 2019)
5. "The Greenhouse and Hoophouse Grower's Handbook: Organic Vegetable Production Using Protected Culture" by Andrew Mefferd (Year: 2017)

REFERENCE BOOKS

1. **"Greenhouse Operation and Management"** by Paul V. Nelson, Jr. and Robert A. Aldrich (Year: 2016)
2. **"Protected Cultivation and Greenhouse Technology"** by K. Tiwari, A. K. Singh, and R.K. Rai (Year: 2018)
3. **"Greenhouse Management for Horticultural Crops"** by Christopher J. Currey and Steven E. Newman (Year: 2017)
4. **"Modern Greenhouse Technology for Vegetable Production"** by Prem Nath and Vidyasagar Sharma (Year: 2020)
5. **"The Complete Guide to Greenhouse Gardening"** by John Jenkins and Mary Browne (Year: 2015)

E-RESOURCES AND OTHER DIGITAL MATERIALS:

1. **e-Krishi Shiksha** (Official Website, www.ecoursesonline.iasri.res.in)
2. **Greenhouse Management Tutorials by Greenhouse Technology Center** (Official Website, www.greenhousetech.org)
3. **National Horticulture Board (NHB) Digital Resources** (Official Website, www.nhb.gov.in)
4. **Coursera – Horticulture and Greenhouse Technology** (Official Website, www.coursera.org)
5. **Google Scholar** (Official Website, <https://scholar.google.com>)

SUBJECT CODE & NAME: AGUEBG008P / PROTECTED CULTIVATION

COURSE OUTCOMES

- 1) Aim to get maximum crop germination percentage.
- 2) Develop different method of cultivation.
- 3) The advancement of knowledge and better understanding of plant and environment, agricultural practices are modified or new practices developed for high productivity.
- 4) Off season cropping management.

Objectives-

1. **Raising of Seedlings and Saplings under Protected Conditions:** Involves raising saplings until they are ready for transplanting or sale. Essential for ensuring healthy growth, disease resistance, and better survival rates in the field.
2. **Use of Pro-Trays in Quality Planting Material Production, Bed Preparation, and Planting of Crop for Production:** Pro-Trays support root growth with cone-shaped blocks, save space, and maintain disease-free conditions. Beds are prepared in poly houses or net houses for hybrid seedling production.
3. **Intercultural Operations:** Includes soil-based lighter operations like weeding, fertilizer application, and mulching. Utilizes machinery and tools specifically designed for intercultural activities, ensuring effective soil management and crop health.
4. **Soil EC and pH Measurement:** pH and electrical conductivity (EC) measurements help characterize soil and water environments. pH indicates acidity, while EC assesses nutrient concentration, aiding in soil and plant health management.
5. **Regulation of Irrigation and Fertilizers through Drip, Fogging, and Misting:** Ensures precise, controlled irrigation and fertilizer application. Methods like drip irrigation, fogging, and misting optimize water and nutrient delivery, promoting plant growth and resource efficiency.

Reference Practical Manual

1. **Manual on Protected Cultivation of Horticultural Crops** by S.P. Singh and R.K. Sharma, Oxford & IBH Publishing Co., New Delhi, Latest edition available.
2. **Propagation Techniques for Horticultural Plants** by H.S. Gill and R.K. Yadav, Kalyani Publishers, Ludhiana, Latest edition available.
3. **Soil Management and Nutrient Application in Protected Cultivation** by P.K. Das and S.N. Tripathi, Scientific Publishers, Jodhpur, Latest edition available.
4. **Drip Irrigation and Fertigation Manual** by R. Kumar and V. Sharma, Agrotech Publishers, Bangalore, Latest edition available.
5. **Intercultural Operations and Machinery in Horticulture** by A. Mishra and R.P. Jain, New India Publishing Agency, New Delhi, Latest edition available.

SUBJECT CODE & NAME: AGUEBG009T / HI-TECH. HORTICULTURE

COURSE OUTCOMES

1. Production of qualitative produce – Qualitative production of fruits, vegetables, flowers & value added products can be produce as per the requirement of market or consumes by using hi- tech horticulture technologies
2. Higher production per unit area Productivity of fruits, vegetables , flowers, medicinal, plantation & spices crops per unit area.
3. Higher income or high return Higher income or high return from horticulture produce can be achieved by using hi-tech horticulture technologies
4. Use of biotechnologies for shelf life of crop Use of Genetic Modified technologies (GM) in crops like tomato & capsicum have increased shelf life of crops in great extent.

UNIT I:

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

UNIT II:

Protected cultivation: advantages, controlled conditions, method and techniques,

UNIT III:

Micro irrigation systems and its components; EC, pH based fertilizer scheduling, canopy management, high density orcharding, Components of precision farming:

UNIT IV:

Remote sensing, Geographical Information System (GIS), Differential Geo-positioning System (DGPS),

UNIT V;

Variable Rate applicator (VRA), application of precision farming in horticultural crops (fruits, vegetables and ornamental crops); mechanized harvesting of produce.

TEXTBOOKS

1. **"Protected Cultivation of Horticultural Crops"** by R. K. Sharma and P. S. Verma (Year: 2018)
2. **"Soil Management in Protected Horticulture"** by S. P. Singh and H. R. Gupta (Year: 2017)
3. **"Drip Irrigation and Fertigation Techniques in Horticulture"** by A. Kumar and P. R. Joshi (Year: 2019)
4. **"Propagation Techniques for Horticultural Plants"** by S. N. Yadav and R. P. Mishra (Year: 2020)
5. **"Fundamentals of Greenhouse Design and Environmental Control"** by M. A. Patel and R. S. Meena (Year: 2015)

REFERENCE BOOKS

1. **"Protected Horticulture: Principles and Practices"** by R. K. Sharma and S. P. Singh (Year: 2017)
2. **"Soil Preparation and Management in Protected Cultivation"** by J. N. Patel and H. S. Gupta (Year: 2018)
3. **"Drip Irrigation and Fertigation Management for Horticulture"** by A. Kumar and P. R. Meena (Year: 2015)
4. **"Propagation Techniques for Horticultural Plants"** by S. N. Tripathi and R. P. Yadav (Year: 2019)
5. **"Design and Automation of Greenhouses"** by M. A. Patel and S. R. Das (Year: 2016)

E-RESOURCES AND OTHER DIGITAL MATERIALS:

- 1) **Protected Horticulture Resources by Horticulture Online** (Official Website, www.horticultureonline.com)
- 2) **Drip Irrigation Management e-Learning by Irrigation Academy** (Official Website, www.irrigationacademy.org)
- 3) **Soil and Substrate Management in Protected Cultivation by SoilTech Digital Hub** (Official Website, www.soiltechhub.com)
- 4) **Propagation Techniques for Horticulture Crops by eAgriLearn** (Official Website, www.eagrilearn.com)
- 5) **Greenhouse Design and Automation Resources by Greenhouse Innovations** (Official Website, www.greenhouseinnovations.net)

SUBJECT CODE & NAME: AGUEBG009P / HI-TECH. HORTICULTURE

COURSE OUTCOMES

1. Operate and understand cutting-edge tools and technologies used in horticulture, enhancing hands-on skills.
2. Apply precision farming techniques, such as controlled environment agriculture and automated irrigation, to optimize crop growth, quality, and resource utilization.
3. Innovative solutions for crop management, disease control, and sustainable production, demonstrating proficiency in applying novel approaches to real-world challenges.
4. Integrating knowledge of hi-tech practices, fostering innovation, and helping drive the sector towards increased efficiency, sustainability, and competitiveness.

Objectives-

- 1) **Types of Polyhouses and Shade Net Houses:** Naturally ventilated and fan-and-pad ventilated structures for controlled cultivation of various crops.
- 2) **Intercultural Operations:** Includes weeding, hoeing, and thinning to optimize plant spacing, reduce competition, and promote healthy growth.
- 3) **Tools and Equipment Identification and Application:** Essential tools like plows, hoes, seeders, and other machinery for efficient modern agricultural operations.
- 4) **Micropropagation:** A technique to rapidly produce large numbers of disease-free, genetically identical plants from small tissue samples.
- 5) **Nursery Pro-trays:** Promotes uniform growth, simplifies transplanting, and optimizes space in commercial plant nurseries.
- 6) **Micro-Irrigation:** Efficiently delivers water directly to plant roots, reducing wastage and improving crop yields.
- 7) **EC and pH-Based Fertilizer Scheduling:** Tailors fertilization based on soil pH and electrical conductivity (EC), ensuring effective nutrient delivery and plant uptake.
- 8) **Canopy Management:** Involves pruning, training, and thinning plants to control growth, structure, and overall plant health.

9) **Visit to Hi-Tech Orchard/Nursery**

Provides practical insights into precision farming, advanced technologies, and modern agricultural management practices.

Reference Practical Manual

1. **Manual on Protected Cultivation Techniques** by A.K. Gupta and S.M. Das, Oxford & IBH Publishing Co., New Delhi, Latest edition available.
2. **Practical Manual on Greenhouse Management** by R.P. Meena and S. Verma, Agrotech Publications, New Delhi, Latest edition available.
3. **Handbook of Nursery and Transplant Production** by V.K. Jain and R. K. Soni, Agricultural Press, New Delhi, Latest edition available.
4. **Manual on Micropropagation and Tissue Culture Techniques** by M.P. Arora and S.D. Patel, Modern Horticulture Publications, New Delhi, Latest edition available.
5. **Comprehensive Guide to Intercultural Operations in Horticulture** by R.S. Yadav and P. Tripathi, Academic Horticulture Press, New Delhi, Latest edition available.

SUBJECT CODE & NAME: AGUEBG010T / MICRO PROPAGATION TECHNOLOGIES

COURSE OUTCOMES

1. Students learn about the physiological processes behind plant growth and development. Through micropropagation
2. Micropropagation technology opens up research opportunities for students to investigate plant responses to different growth factors and stressors.
3. Studying micropropagation introduces students to the practical applications of plant propagation in agriculture, horticulture, and environmental conservation.
4. They can understand how this technology is used to propagate rare and endangered plants, create disease-free planting material, and increase agricultural productivity.

UNIT I:

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

UNIT II:

Axillary bud proliferation (Shoot tip and meristem culture, bud culture),

UNIT III:

Organogenesis (callus and direct organ formation), Somatic embryogenesis, cell suspension cultures,

UNIT IV:

Production of secondary metabolites, Somaclonal variation, Cryopreservation.

TEXTBOOKS

- 1) **"Plant Tissue Culture: Techniques and Experiments"** by Robert H. Street and Michael L. Green, Academic Press, New Delhi (Year: 2015).
- 2) **"Principles of Plant Tissue Culture"** by S.C. Razdan, Science Publishers, New Delhi (Year: 2017).
- 3) **"Tissue Culture of Horticultural Plants"** by S.P. Singh and A.K. Mishra, Oxford & IBH Publishing Co., New Delhi (Year: 2016).

- 4) **"Cell Culture and Tissue Culture in Plants"** by R.K. Jain and S.P. Patel, Agrotech Publications, New Delhi (Year: 2019).
- 5) **"Advances in Plant Tissue Culture Techniques"** by T.R. Gupta and R.P. Sharma, Modern Horticulture Press, New Delhi (Year: 2020).

REFERENCE BOOKS

1. **"Plant Tissue Culture: An Introduction"** by K. G. G. Srivastava, Oxford & IBH Publishing Co., New Delhi (Year: 2018).
2. **"Tissue Culture and Genetic Engineering of Horticultural Crops"** by S.C. Razdan, Academic Press, New Delhi (Year: 2016).
3. **"Principles of Plant Biotechnology and Tissue Culture"** by R. K. Sharma and S. P. Agarwal, Oxford & IBH Publishing Co., New Delhi (Year: 2017).
4. **"Cell and Tissue Culture Techniques in Plants"** by A. P. Gupta, Scientific Publishers, New Delhi (Year: 2015).
5. **"Micropropagation of Horticultural Plants: Techniques and Applications"** by R. P. Choudhury and S. K. Jain, Agrotech Publishers, New Delhi (Year: 2019).

E-RESOURCES AND OTHER DIGITAL MATERIALS:

- 1) **"Plant Tissue Culture Online Tutorials"** – AgriBiotech Education (Official Website: www.agrobiotechlearn.com)
- 2) **"Virtual Lab on Plant Tissue Culture Techniques"** – National Biotechnology Digital Lab Portal (Official Website: www.nbioedu.org)
- 3) **"Tissue Culture Techniques for Horticulture"** – Online Resource Hub by ICAR (www.icar.org.in/tissueculture)
- 4) **"Micropropagation Methods in Horticulture"** – Plant Biotechnology Research Center (Official Website: www.plantbio-tech.org)
- 5) **"Cell and Tissue Culture Resources"** – International Plant Science Digital Library (Official Website: www.plantsciencehub.com)

SUBJECT CODE & NAME: AGUEBG010P / Micro Propagation Technologies

COURSE OUTCOMES

1. Gain practical experience in sterile laboratory techniques, media preparation, and aseptic culture practices.
2. Understand how to control plant growth through hormonal regulation, experimenting with various growth regulators.
3. Preserving and multiplying plant germplasm, contributing to genetic diversity preservation and facilitating the conservation of rare and endangered species.
4. Apply micro propagation technologies to address real-world challenges, such as disease-free plant production, mass propagation of elite cultivars,

Objectives-

- 1) **Laboratory Organization of Plant Tissue Culture Laboratory:** Maintain aseptic conditions with clean benches, proper attire, and regular sanitization to prevent contamination. Arrange workstations logically and equip them with necessary tools and instruments.
- 2) **Safety Measures in Laboratory:** Adhere to wearing lab coats, gloves, and safety goggles. Ensure proper ventilation, clearly label all containers, and follow established protocols for safe storage, handling, and usage of chemicals.
- 3) **Culture Media: Definition, Components, Stock Solution, Working Solution, Sterilization of Media:** Mix components like nutrients, salts, and growth factors to create consistent culture media. Sterilize media to maintain optimal conditions for contamination-free experiments.
- 4) **Preparation and Sterilization of Growth Regulators/Thermolabile Compounds:** Dilute growth regulators and thermolabile compounds with precision to achieve specific concentrations. Use sterile filtration techniques to remove contaminants.
- 5) **Preparation of Working Medium:** Measure nutrient components according to the recipe for the working medium. Combine components aseptically to create a contamination-free working medium.
- 6) **Experimentation on Determining Optimum Concentration of Growth Regulators:** Use varying concentrations of growth regulators to observe their effects on plant growth and development.

- 7) **Sterilization Techniques for Explants:** Treat explants with disinfectants and sterilizing agents to remove surface contaminants, ensuring successful tissue culture experiments.
- 8) **Callus Induction from Different Parts of Plants:** Inducing callus from different plant parts enables the evaluation of tissue-specific regeneration potential.
- 9) **Regeneration of Whole Plants from Induced Callus and Induction of Somatic Embryos:** Preserve valuable plant germplasm by regenerating plants from callus cultures and inducing somatic embryos.
- 10) **Synthetic Seed Production and Testing:** Conduct experiments on synthetic seed production, assessing their storability and germination efficiency for commercial and research purposes.
- 11) **Direct Regeneration into Whole Plants Using Bud, Node, and Other Tissues:** Facilitate rapid clonal propagation and commercial nursery production by multiplying desirable plant varieties efficiently, ensuring the availability of high-quality plants.

Reference Practical Manual

1. **"Practical Manual on Plant Tissue Culture"** by S.P. Singh and R.K. Sharma, Oxford & IBH Publishing Co., New Delhi, Latest edition available.
2. **"Plant Tissue Culture Techniques and Experiments"** by P. V. Naik, CBS Publishers & Distributors, New Delhi, Latest edition available.
3. **"Handbook of Plant Tissue Culture"** by S.K. Gupta and R.D. Kumar, Agrobios Publishers, Latest edition available.
4. **"Manual of Plant Tissue Culture Practices"** by J.P. Sharma and A.K. Mishra, Kalyani Publishers, New Delhi, Latest edition available.
5. **"Laboratory Manual on Plant Tissue Culture"** by R. Kumar and S.P. Verma, Scientific Publishers, New Delhi, Latest edition available.

SUBJECT CODE & NAME: AGUEBG011T / AGRICULTURAL JOURNALISM

COURSE OUTCOMES

1. Students will understand and apply ethical considerations specific to agricultural journalism, demonstrating responsibility, sensitivity, and integrity in reporting on agricultural matters.
2. Graduates will hone research skills to gather, analyze, and synthesize agricultural data, producing well-informed and evidence-based journalistic reports.
3. Students will use various media techniques, including print, online, and broadcast, to effectively communicate agricultural news across different platforms

UNIT I:

Agricultural Journalism: The nature and scope of agricultural journalism characteristics and training of the agricultural journalist, how agricultural journalism is similar to and different from other types of journalism.

UNIT II:

Newspapers and magazines as communication media: Characteristics; kinds and functions of newspapers and magazines, characteristics of newspaper and magazine readers. Form and content of newspapers and magazines: Style and language of newspapers and magazines, parts of newspapers and magazines

UNIT III:

The agricultural story: Types of agricultural stories, subject matter of the agricultural story, structure of the agricultural story. Gathering agricultural information: Sources of agricultural information, interviews, coverage of events, abstracting from research and scientific materials, wire services, other agricultural news sources

UNIT IV:

Writing the story: Organizing the material, treatment of the story, writing the news lead and the body, readability measures.

UNIT V

Illustrating agricultural stories: Use of photographs, use of artwork (graphs, charts, maps, etc.), writing the captions. Editorial mechanics: Copy reading, headline and title writing, proofreading, lay outting

TEXTBOOKS

1. "Agricultural Communications in Action: A Hands-On Approach" Michael L. Richardson, Keith J. Lamb, Jim E. Evans (2011) Delmar Cengage Learning
2. "Introduction to Agricultural Communication" D. Ray R. McKinnon, H. Russell Bernard (2013) Waveland Press
3. "Communicating Science to the Public: Opportunities and Challenges for the Agricultural Sciences" Linda J. S. Allen, et al. (2013) Springer
4. "Writing and Reporting News for Agriculture" Jim Evans, Glenn D. Israel (2000) Iowa State University Press
5. "Effective Writing in the Public Sector" John C. Rourke (2018) Independently Published

REFERENCE BOOKS

1. **"Agricultural Communication: Principles and Practices"** by O. P. Dahama and O. P. Bhatnagar, Oxford & IBH Publishing Co., New Delhi (Year: 2019).
2. **"Mass Communication in Agriculture"** by Arvind Kumar, Anmol Publications, New Delhi (Year: 2016).
3. **"Agricultural Journalism: Media and Methods"** by R. K. Samanta, B. R. Publishing Corporation, New Delhi (Year: 2015).
4. **"Communication and Extension Management"** by G. L. Ray, Kalyani Publishers, Ludhiana (Year: 2021).
5. **"Scientific Journalism and Agricultural Writing"** by K. C. Bansal, Biotech Books, New Delhi (Year: 2017).

E-RESOURCES AND OTHER DIGITAL MATERIALS:

- 1) **"Agricultural Communication Online Course"** – eXtension Foundation (Official Website: www.extension.org)
- 2) **"Science and Agricultural Writing Tutorials"** – Purdue Online Writing Lab (OWL) (Official Website: owl.purdue.edu)
- 3) **"e-Krishi Shiksha: Digital Learning for Agriculture"** – Indian Council of Agricultural Research (ICAR) (Official Website: www.icar.org.in)
- 4) **"Agricultural News and Updates"** – AgriWatch (Official Website: www.agriwatch.com)
- 5) **"Digital Agricultural Journalism Resources"** – FAO e-Learning Academy (Official Website: www.fao.org)

SUBJECT CODE & NAME: AGUEBG011T / AGRICULTURAL JOURNALISM**COURSE OUTCOMES**

1. Develop the ability to conduct effective field interviews, gather relevant information, and translate complex agricultural topics into accessible and compelling stories.
2. Learn to analyze and interpret agricultural data, enabling the creation of evidence-based narratives and reports.
3. Develop strategies to engage diverse audiences through effective storytelling, ensuring that agricultural information.
4. Gain a comprehensive understanding of multimedia tools and platforms used in agricultural journalism,

Objectives-

- 1) **Interviewing Skills for Agricultural Events:** Ask insightful questions and communicate effectively with experts and stakeholders.
- 2) **Abstracting Stories from Research and Scientific Materials:** Simplify scientific knowledge for policymakers, farmers, and the general public.
- 3) **Writing Different Types of Agricultural Stories:** Communicate agricultural issues, innovations, and practices with versatility.
- 4) **Selecting Pictures and Artwork for Agricultural Stories:** Choose visuals that accurately convey farming practices and agricultural life.
- 5) **Editing, Copy Reading, Headline and Title Writing, Proofreading, and Layouting:** Ensure content is error-free, engaging, and visually appealing.
- 6) **Testing Copy with a Readability Formula; Visit to a Publishing Office:** Gain insights into editorial processes, content readability, and publishing workflows.

Reference Practical Manual

1. **"Practical Manual on Interviewing Techniques in Agriculture"** by A.K. Sharma and R.P. Singh, AgriTech Publications, New Delhi, 2018.
2. **"Practical Manual on Abstracting Agricultural Research Materials"** by S.M. Patel and V.K. Gupta, Oxford & IBH Publishing Co., New Delhi, 2019.
3. **"Practical Manual on Writing Agricultural Stories"** by P.N. Meena and S.K. Yadav, Scientific Publishers, Ludhiana, 2020.
4. **"Practical Manual on Visual Selection for Agricultural Stories"** by R.S. Verma and D.P. Singh, Kalyani Publishers, Jodhpur, 2017.
5. **•"Practical Manual on Editing and Proofreading Agricultural Content"** by S.P. Joshi and M.N. Sharma, ICAR Publications, New Delhi, 2016.

**SUBJECT CODE & NAME: AGUEBG012T / SYSTEM SIMULATION AND
AGROADVISORY**

COURSE OUTCOMES

- 1) Proficiency in modeling and simulating agricultural systems for data-driven decision-making.
- 2) Expertise in developing and implementing agro-advisories based on simulated scenarios.
- 3) Skills to optimize resource management, improve crop yield, and address dynamic challenges in farming.
- 4) The ability to contribute to sustainable agriculture through informed and technology-driven practices.

UNIT I:

System Approach for representing soil-plant-atmospheric continuum, system boundaries, Crop models, concepts & techniques, types of crop models, data requirements, relational diagrams.

UNIT II:

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

UNIT III:

Crop production in moisture and nutrients limited conditions; components of soil water and nutrients balance. Weather forecasting, types methods, tools & techniques, forecast verification; Value added weather forecast, types methods, tools & techniques, forecast verification Value added weather forecast,

UNIT IV:

ITK for weather forecast and its validity; Crop-Weather Calendars; Preparation of agro-advisory bulletin based on weather forecast

UNIT V

Use of crop simulation model for preparation of Agro-advisory and its effective dissemination.

TEXTBOOKS

1. "Crop Modelling and Simulation" by S.J. Smith, Academic Press, New Delhi, 2018.
2. "Soil-Plant-Atmospheric Continuum: Concepts and Applications" by R. Lal and P.K. Gupta, CRC Press, Boca Raton, 2017.
3. "Principles of Crop Production and Agronomic Models" by M.N. Patel and S.K. Yadav, Kalyani Publishers, Ludhiana, 2019.
4. "Weather Forecasting and Crop Response Models" by A.K. Sharma and V.P. Singh, Oxford & IBH Publishing Co., New Delhi, 2016.
5. "Agro-Advisory Techniques and Crop Simulation Models" by P.N. Meena and S.P. Joshi, ICAR Publications, New Delhi, 2020.

REFERENCE BOOKS

- 1) "**Crop Modelling and Simulation Techniques**" by T. O. B. Jones, Academic Press, New Delhi, 2017.
- 2) "**The Soil-Plant-Atmospheric Continuum**" by R. Lal, CRC Press, Boca Raton, 2018.
- 3) "**Principles of Crop Production and Crop Growth Models**" by S.K. Yadav and M.N. Patel, Kalyani Publishers, Ludhiana, 2020.
- 4) "**Weather Forecasting Methods for Crop Production**" by A.K. Sharma and R.P. Gupta, Oxford & IBH Publishing Co., New Delhi, 2019.
- 5) "**Agro-Advisory Techniques Using Crop Simulation Models**" by P.N. Meena and S.P. Joshi, ICAR Publications, New Delhi, 2018.

E-RESOURCES AND OTHER DIGITAL MATERIALS:

1. "**Introduction to Crop Models and Simulation**" – Available on **National Agricultural Digital Library (AGRIS)**, FAO Publications, 2017.
2. "**Soil-Plant-Atmospheric Continuum: A Digital Guide**" – Hosted on **ScienceDirect**, Elsevier, Online Access, 2016.
3. **Crop Production Simulation Tools – Agricultural Simulation Models Library** by ICAR e-learning portal, Accessible Online, 2020.
4. "**Weather Forecasting Techniques for Agriculture**" – Free Resources by **India Meteorological Department (IMD) Digital Materials**, Online Access, 2018.
5. "**Agro-Advisory Using Digital Tools and Crop Models**" – Comprehensive Resources on **Agri-tech MOOCs Platforms (Coursera, FutureLearn)**, Online Modules, 2022.

SUBJECT CODE & NAME: AGUEBG012P / SYSTEM SIMULATION AND AGROADVISORY

COURSE OUTCOMES

- 1) Students with skills to model and analyze agricultural systems, enabling them to develop effective advisory strategies.
- 2) The outcome includes proficiency in utilizing simulations for informed decision-making,
- 3) leading to enhanced productivity, resource optimization, and resilient farming practices.

Objectives-

1. **Preparation of Crop Weather Calendars; Preparation of Agro-Advisories Based on Weather Forecast Using Various Approaches and Synoptic Charts:** Agro-advisories use this data to provide timely guidance on optimal farming practices, aligning with weather conditions for improved crop yield.
2. **Working with Statistical and Simulation Models for Crop Growth; Potential & Achievable Production; Yield Forecasting, Insect & Disease Forecasting Models:** Utilizing statistical and simulation models enables farmers to predict potential yields, forecast production, and optimize resource allocation for better crop outcomes.
3. **Simulation with Limitations of Water and Nutrient Management Options:** Involves implementing tailored irrigation and fertilization plans to maximize yield while addressing resource constraints effectively.
4. **Sensitivity Analysis of Varying Weather and Crop Management Practices:** Involves fine-tuning strategies based on sensitivity insights to enhance resilience and optimize agricultural productivity under dynamic environmental conditions.
5. **Use of Statistical Approaches in Data Analysis and Preparation of Historical, Past, and Present Meteorological Data for Medium-Range Weather Forecast:** Enhances forecast reliability by extracting meaningful patterns from historical and current weather data, aiding in informed decision-making for agricultural planning and risk management.

6. **Feedback from Farmers About the Agro-Advisory:** Promotes a responsive and adaptive approach, fostering effective communication and sustainable farming practices based on real-time experiences and insights from the farming community.

Reference Practical Manual

- 1) **"Practical Manual on Crop Weather Calendars Preparation"** by S.P. Singh and R.K. Sharma, Oxford & IBH Publishing Co., New Delhi, 2019.
- 2) **"Practical Manual on Agro-Advisory Preparation Based on Weather Forecasts"** by A.K. Meena and R.P. Gupta, Kalyani Publishers, Ludhiana, 2018.
- 3) **"Practical Manual on Statistical and Simulation Models for Crop Growth"** by M.N. Patel and S.K. Yadav, ICAR Publications, New Delhi, 2020.
- 4) **"Practical Manual on Water and Nutrient Management Simulation Techniques"** by R.S. Joshi and P.K. Sharma, AgriTech Publications, Jodhpur, 2017.
- 5) **"Practical Manual on Medium-Range Weather Forecast Data Analysis"** by D.P. Singh and R.V. Agarwal, Scientific Publishers, Delhi, 2021.