SYLLABUS

FOR

AGRICULTURAL SCIENCES AND TECHNOLOGY

[B.Sc. (Hons.) Ag.]

(Fifth Semester)

PRAYAGRAJ

FACULTY OF AGRICULTURAL SCIENCES AND TECHNOLOGY

UNITED UNIVERSITY PRAYAGRAJ

Syllabus for B.Sc. (Hons.) Agriculture

Course Title: Principle of Integrated Pest and Disease management **Course Code: AGUCBG501T**

Semester: V

L	T	P	C
1	0	0	1

Objective:

This subject can help to students to know about pest and damage, how to control pest and what are the methods were useful to prevent insect pest &disease. students can learn different types of symptoms were take place in plant parts. they can know about what is IPM and their use.

Course Syllabus (Theory)

Categories of insect pests and diseases, IPM: Introduction, history, importance, concepts, principles and tools of IPM. Economic importance of insect pests, diseases and pest risk analysis. Methods of detection and diagnosis of insect pest and diseases. Calculation and dynamics of economic injury level and importance of Economic threshold level .Ecological management of crop environment. Introduction to conventional pesticides for the insect pests and disease management. Survey surveillance and forecasting of Insect pest and diseases. Development and validation of IPM module. Implementation and impact of IPM (IPM module for Insect pest and disease. Safety issues in pesticide uses. Political, social and legal implication of IPM. Case histories of important IPM programmes.Case histories of important IPM programmes

Syllabus organised in Unit (Theory)

Unit	Content	Hours
1.	**Categories of insect pests and diseases**, IPM: Introduction, history, importance, concepts, principles and tools of IPM.	4
2.	**Economic importance of insect pests,** diseases and pest risk analysis. Methods of detection and diagnosis of insect pest and diseases. Calculation and dynamics of economic injury level and importance of Economic threshold level.	6
3.	**Ecological management of crop environment.** Introduction to conventional pesticides for the insect pests and disease management. Survey surveillance and forecasting of Insect pest and diseases. Development and validation of IPM module	4
4.	**Implementation and impact of IPM** (IPM module for Insect pest and disease. Safety issues in pesticide uses.	4
5.	**Political, social and legal implication of IPM.** Case histories of important IPM programmes. Case histories of important IPM programmes	5

Course Outcomes

- This subjects helps to identify what kind of pests and their symptoms developed on leaves.
- They know how to control pests and what are the herbicides used for different crops.

Recommended Text Books

- Dhaliwal, G.S. and Ramesh Arora 2001. Integrated pest management: Concepts and approaches, Kalyani Publishers, Ludhiana
- Metcalf, R.L. and Luckman, W.H.1982. Introduction to insect pest management Wiley inter science publishing, New York.
- Larry P Pedigo 1991. Entomology and pest management, Prentice Hall of India Pvt. Ltd., New Delhi
- Venugopala Rao, N., Umamaheswari, T., Rajendraprasad, P., Naidu,V.G. and Savithri,P.2004.Integrated Insect Pest Management, Agrobios (India) Limited, Jodhpur.
- Chaube, H.S. and Ramji Singh. 2001. Introductory Plant Pathology. International Book Distribution Co., Lucknow. 136.
- Mehrotra, R.S. 1980. Plant Pathology. Tata McGraw-Hill Publishing Co. Ltd. New Delhi
- Singh, R.S. 2002. Introduction to Principles of Plant Pathology. Oxford & IBH Publishing Co.Pvt. Ltd.,New Delhi.
- Vidyasekharan,P. 1993. Principles of Plant Pathology. CBS Publishers and Distributors, New Delhi

Recommended Reference Books

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

Course Title: Principles of Integrated Pest and Disease Management Lab **Course Code: AGUCBG501P**

Semester: V

L	T	P	C
0	0	1	1

Objective:

- The course will consist of lecture (both theory and practical)in field.
- Highlight the mainly practical oriented topics.
- Evaluation will be done both theory and farm visiting experiments.
- Aim of study to identification and control of emerging pest.

Course Syllabus (Practical)

Methods of diagnosis and detection of various insect pests, and plant diseases, Methods of insect pests and plant disease measurement, Assessment of crop yield losses, calculations based on economics of IPM, Identification of biocontrol agents, different predators and natural enemies. Mass multiplication of Trichoderma, Pseudomonas, Trichogramma, NPV etc. Identification and nature of damage of important insect pests and diseases and their management. Crop (agro-ecosystem) dynamics of a selected insect pest and diseases. Plan & assess preventive strategies (IPM module) and decision making. crop monitoring attacked by insect, pest and diseases. Awareness campaign at farmers fields.

Syllabus organised in Unit (Practical)

Topics	Description with Practical Applications	Hours
Diagnosis method: Methods of diagnosis and detection of various insect pests,	Various methods for diagnosing and detecting insect pests include visual inspections, pheromone traps, sticky traps, and DNA-based techniques, enabling accurate identification and effective pest management strategies	**2**
Identification: Identification of biocontrol agents	Various diagnostic methods for insect pests include visual inspections, pheromone traps, sticky traps, and DNA-based techniques.	**2**
Multification: Massmultiplication of Trichoderma, Pseudomonas, Trichogramma, NPV etc.	Mass multiplication involves large-scale production of beneficial organisms like Trichoderma, Pseudomonas, Trichogramma, and NPV, to be used as biocontrol agents in agricultural systems.	**2**
Nature of damage: Identification and nature of damage of important insect pests and diseases and their management	Identifying the nature of damage caused by important insect pests and diseases helps in implementing appropriate management strategies, such as biological control, cultural practices.	**2**

Awareness: Awareness campaign at farmers fields.	Conducting awareness campaigns at farmers' fields helps educate them about modern agricultural practices, sustainable techniques, and pest management strategies.	**2**
Crop monitoring: crop monitoring attacked by insect, pest and diseases.	Crop monitoring involves regular inspections of crops to detect signs of insect pest and disease infestations, allowing for timely intervention and implementation of pest control measures to minimize crop damage and ensure higher yields	**2**

Course Outcomes

1. Student should be able to detect the insect pest & plant diseases along with its level of incidence.
2. Student should know the integrated pest & disease management with respect to forecasting & use of bio-control agents.

Syllabus for B.Sc. (Hons.) Agriculture

Course Title: Pests of Crops and Stored Grains and their Management Course Code: AGUCBG502T

Semester: V

L	T	P	C
2	0	0	2

Objective:

The objective of this course is to provide students with a comprehensive understanding of various pests that infest crops and stored grains and equip them with effective management strategies to minimize economic losses and ensure food safety. The course aims to cover a wide range of pests, including insects, rodents, and fungi, that are known to be significant threats to both pre-harvest crops and post-harvest grain storage

Course Syllabus (Theory)

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

Syllabus organized in Unit (Theory)

Unit	Content	Hours
1	**Introduction:** General account on nature and type of damage by different arthropods pests.	2
2	**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	4
3	**Nature and damage:** nature of damage and control practice other important arthropod pests of various field crop, vegetable crop, fruit crop, plantation crops, ornamental crops, spices and condiments.	4
4	**Factor of losses:** Factors affecting losses of stored grain and role of physical, biological, mechanical and chemical factors in deterioration of grain.	3
5	**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.	6

Course Outcomes:

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

- The course will provide insights into effective pest management strategies for crops during the growing season and for stored grains during post-harvest storage.
- Students will understand the economic impact of pests on crop yields and post-harvest losses.

Recommended Text Books

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

Course Title: Pests of Crops and Stored Grains and their Management Lab **Code: AGUCBG502P**

Semester: V

L	T	P	C
0	0	2	1

Objective:

The main objective to provide Practical knowledge related to different pest and their damage in field as well as lab, doses to control their populations and quality controls.

Course Syllabus (Practical)

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

Syllabus organised in Unit (Practical)

Topics	Description with Practical Applications	Hours
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.	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**
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.	**2**
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.	Farmers can apply the right amount of insecticide for effective pest control while minimizing environmental impact and avoiding overuse Enables proper preservation of stored grains, preventing infestations and reducing post-harvest losses. Helps safeguard stored commodities from rodent damage, maintaining their quality and market value.	**2**

Determination of moisture content of grain. Methods of grain sampling under storage condition.	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.	**2**
Visit to Indian Storage Management and Research Institute, Hapur and Quality Laboratory, Department of Food., Delhi. Visit to nearest FCI godowns.	Students gain insights into modern storage practices, quality assessment methods,enhancing their ability to implement efficient storage strategies and maintain food quality. Student learn about pest control, inventory management, and gain valuable experience in handling large-scale storage operations in the context of food security and distribution.	**2**

Course Outcomes

- To avoid Post harvest losses of food grains the proper care of storage facilities,
- continuous monitoring and use of proper prophylactic and curative measures are essential. Use of new systems of grain storage including silo storage

Course Title: Diseases of Field and Horticultural Crops and their Management -I **Course Code: AGUCBG503T**

Semester: V

L	T	P	C
4	0	0	2

Objective:

To familiarize the students about the causal organism, symptomatology, etiology and epidemiology of the important diseases of field and horticulture crops for devising efficient management strategies against them

Course Syllabus (Theory)

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; 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; 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.

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

Syllabus organised in Unit (Theory)

Unit	Content	Hours
1	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.	4
2	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.	4
3	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.	6
4	Horticultural Crops: Guava: wilt and anthracnose; Banana: Panama wilt, bacterial wilt, Sigatoka and bunchy top; Papaya: foot rot, leaf curl and mosaic.	4
5	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;	12

	Colocasia: Phytophthora blight; Coconut: wilt and bud rot; Tea: blister blight; Coffee: rust.	

Course Outcomes

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

Recommended Text Books

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

Course Title: Diseases of Field and Horticultural Crops and their Management-I Lab **Code: AGUCBG503P**

Semester: V

L	T	P	C
0	0	2	1

Objective:

- Basic identification of diseases of field crops.
- Basic identification of diseases of horticultural crops.
- Knowledge of collection and preservation of diseased specimens.

Course Syllabus (Practical)

Identification and histopathological studies of selected diseases of field and horticultural crops covered in theory. Field visit for the diagnosis offield problems. Collection and preservation of plant diseased specimens for Herbarium; Note: Students should submit 50 pressed and well-mounted specimens.

Syllabus organised in Unit (Practical)

Topics	Description with Practical Applications	Hours
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.	**2**
Identification and collection of disease crops.	Collection and making Herbarium (available horticultural and field crops).	**2**

Course Outcomes:

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

Syllabus for B.Sc. (Hons.) Agriculture

Course Title: Crop Improvement – I (Kharif) **Course Code: AGUCBG504T**

Semester: V

L	T	P	C
1	0	0	1

Objective:

The objective of this course is to provide students with a comprehensive understanding of the principles and techniques involved in improving the genetic traits and productivity of Kharif crops. Kharif crops are those sown in the rainy season and harvested in the autumn, making this course essential for agricultural practices in regions with a monsoonal climate. The course typically focuses on major Kharif crops like rice, maize, sorghum, millets, soybeans, and cotton.

Course Syllabus (Theory)

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, Pegionpea, Brinjal, Tobacco and underutilized crops; study of genetics of qualitative and quantitative characters. Important concepts of breeding self-pollinated, cross pollinated and vegetatively propagated crops (kharif). 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. Plant genetic resources, their utilization and conservation. Ideotype concept and climate resilient crop varieties for future

Syllabus organised in Unit (Theory)

Unit	Content	Hours
1	**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, Pegionpea, Brinjal, Tobacco and underutilized crops;	**4**
2	**Concept of breedng:** study of genetics of qualitative and quantitative characters. Important concepts of breeding self-pollinated, cross pollinated and vegetatively propagated crops (kharif). Major breeding objectives	**4**
3	**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..	**4**
4	**Concept:** .Plant genetic resources, their utilization and conservation. Ideotype concept and climate resilient crop varieties for future.	**3**

Course Outcomes

- Students will develop a solid understanding of the fundamental principles and concepts involved in crop improvement, particularly for Kharif crops.
- 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.
- 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.
- Students will learn how to integrate crop improvement techniques with agronomic practices to achieve optimal crop productivity and sustainability

Recommended Text Books

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

Course Title: Crop Improvement – I (Kharif) Lab **Course Code: AGUCBG504P**

Semester: V

L	T	P	C
1	0	0	1

Objective:

The production technology of Kharif crops likes Rice, Maize, Pigeonpea, Urdbean, Mungbean, , Sesame, etc. aims to optimize agricultural practices and maximize yield during the Kharif (monsoon) season. The objectives include efficient water management, timely sowing, appropriate crop selection, nutrient management, pest and disease control, and adopting sustainable practices to enhance agricultural productivity and food security.

Course Syllabus (Practical)

Floral biology, Emasculation and hybridization techniques in different crop species; viz., Rice,Maize, Pigeonpea, Urdbean, Mungbean, , Sesame, Cowpea,Brinjal and Tobacco. Maintenance breeding of different kharif crops. Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods. Estimation of heterosis, inbreeding depression and heritability; Layout of field experiments; Study of quality characters, donor parents for different characters. Visit to AICRP plots of different field crops

Syllabus organised in Unit (Practical)

Topics	Description with Practical Applications	Hours
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.	**2**
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	**2**
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	**2**

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.	**2**
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.	**2**
Study of quality characters, donor parents 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.	**2**
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.	**2**

Course Outcomes

- 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.
- Students will learn to identify common Kharif crop pests and diseases, crop yield and quality.
- 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.
- students will develop practical skills in implementing various crop management techniques and gain real-world experience in Kharif crop production.

Course Title: Entrepreneurship Development and Business Communication **Course Code: AGUCBG505T**

Semester: V

L	T	P	C
2	0	0	2

Objective:

The Specific objectives of this course are to make students able to;

- To get acquainted with small scale industries and agricultural industries.
- To develop the innovativeness among students regarding enterprises.
- To get acquainted with communication involved in organisations.

Course Syllabus (Theory)

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

Syllabus organised in Unit (Theory)

Unit	Content	Hours
1	Concept of Entrepreneur, Entrepreneurship Development, Characteristics of entrepreneurs;	4
2	SWOT Analysis & achievement motivation, Government policy and programs and institutions for entrepreneurship development, Impact of economic reforms on Agribusiness/ Agrienterprises	4
3	Entrepreneurial Development Process; Business Leadership Skills; Developing organizational skill (controlling, supervising, problem solving, monitoring & evaluation),	4
4	Developing Managerial skills, Business Leadership Skills (Communication, direction and motivation Skills), Problem solving skill, Supply chain management and Total quality management	4
5	Project Planning Formulation and report preparation; Financing of enterprise, Opportunities for agri entrepreneurship and rural enterprise	4

Course Outcomes

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

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

Recommended Text 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)

Course Title: Entrepreneurship Development and Business Communication Lab **Course Code: AGUCBG505P**

Semester: V

L	T	P	C
0	0	2	1

Objective:

- To enhance effective communication skills in various business contexts.
- To enable seamless information exchange within and outside the organization.
- To improve decision-making processes through clear and concise communication.
- To build strong professional relationships and ensure the overall success of the business

Course Syllabus (Practical)

Assessing entrepreneurial traits, problem solving skills, managerial skills and achievement motivation, exercise in creativity, time audit through planning, monitoring and supervision, identification and selection of business idea, preparation of business plan and proposal writing, visit to entrepreneurship development institute and entrepreneurs

Syllabus organised in Unit (Practical)

Topics	Description with Practical Applications	Hours
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,	**2**
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.	**2**
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.	**2**

Course Outcomes

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

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

Syllabus for B.Sc. (Hons.) Agriculture

Course Title: Geoinformatics and Nano-technology for Precision Farming **Course Code: AGUCBG505T**

Semester: V **L T P C**

2 0 0 1

Objective:

To acquire knowledge about the significance and concepts of precision agriculture. Geoinformatics and its application in precision farming. Nanotechnology and its role in precision farming.

Course Syllabus (Theory)

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

Syllabus organised in Unit (Theory)

Unit	Content	Hours
1	Precision agriculture: concepts and techniques; their issues and concerns for Indian agriculture; Geoinformatics- definition, concepts, tool and techniques; their use in Precision Agriculture.	**4**
2	Crop discrimination and Yield monitoring, soil mapping; fertilizer recommendation using geospatial technologies; Spatial data and their management in GIS; Geodesy and its basic principles;	**4**
3	Remote sensing concepts and application in agriculture; Image processing and interpretation; Global positioning system (GPS), components and its functions;	**4**
4	System Simulation- Concepts and principles, Introduction to crop Simulation Models and their uses for optimization of Agricultural Inputs; STCR approach for precision agriculture;	**4**
5	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.	**4**

Course Outcomes

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

Recommended Text Books

- Geoinformatics and Nanotechnology for Precision Farming by SR Reddy.
- Nanotechnology and Precision Farming by Tarun Kumar Upadhyay and Sushil Kumar Sharma.
- Geo-Informatics by A.M. Chandra.
- Heege Hermann J. (2013). Precision in crop farming. Springer.
- Sahu D D and Solanki R M (2018). Remote sensing techniques in agriculture. Agrobios
- Basudeb Bhatta (2011). Remote sensing and GIS. Oxford University Press.
- Vyas P R (2015) Remote sensing and geographical information system. Rawat Publications.
- George Joseph (2015) Fundamentals of remote sensing, Oxford Universities Press.

Course Title: Geoinformatics and Nano-technology for Precision Farming Lab **Course Code: AGUCBG506P**

Semester: V

L	T	P	C
0	0	2	1

Objective:

To equip students with several GIS software, data handling and application of nanoparticles in agriculture.

Course Syllabus (Practical)

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

Syllabus organised in Unit (Practical)

Topics	Description with Practical Applications	Hours
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.	**2**
Visual and digital interpretation of remote sensing images.	To study the principles of remote sensing image interpretation.	**2**
Supervised and unsupervised classification and acreage estimation.	To know details about image classification. To study procedure for acreage estimation.	**2**
Multispectral remote sensing for soil mapping.	to know the different spectral bands. To learn the different methods of multispectral remote sensing for soil mapping.	**2**
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.	**2**
Fertilizers recommendations based of VRT and STCR techniques.	To know the variable rate technology. To know detail procedure of VRT technique for fertilizers recommendation.	**2**
Crop stress (biotic/abiotic) monitoring using geospatial technology.	To study the calculation of crop stress by geospatial technique.	**2**
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.	**2**

Projects formulation and execution related to precision farming.	To know the research institutes related with precision farming.	**2**

Course Outcomes

- Describe the basic concepts of remote sensing and geoinformatics
- Learn about tools and techniques of geoinformatics used in precision farming
- Learn about tools and techniques of nanotechnology in relation to agriculture
- Learn about tools and techniques of image interpretation

Syllabus for B.Sc. (Hons.) Agriculture

Course Title: Principles of Food Science and Nutrition **Course Code: AGUCBG507T**

Semester: V

L	T	P	C
2	0	0	2

Objective:

Explore the fundamental principles of food science, including food composition, processing, and preservation methods.

Examine the role of nutrition in maintaining health and preventing diet-related diseases.

Equip students with the knowledge to promote sound dietary choices and sustainable food practices for individuals and communities.

Course Syllabus (Theory)

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

Syllabus organised in Unit (Theory)

Unit	Content	Hours
1.	**Introduction:** Concepts of Food Science, definitions, measurements, density, phase change, pH, osmosis, surface tension, colloidal systems etc	8
2.	**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.	10
3.	**Food microbiology**: Food microbiology (bacteria, yeast, moulds, spoilage of fresh & processed foods, Production of fermented foods); Principles and methods of food processing and preservation (use of heat, low temperature, chemicals, radiation, drying etc.).	8
4.	**Food and nutrition** : Food and nutrition, Malnutrition (over and under nutrition), nutritional disorders; Energy metabolism (carbohydrate, fat, proteins); Balanced/modified diets, Menu planning, New trends in food science and nutrition	8

Course Outcomes

- Student will be able to understand basic aspects of food and nutrition.
- Study the basic principles involving various food preservation methods.

- Student will be able to gain knowledge about the role of nutrition behind health and avoiding diseases
- Student will be able to understand both dynamic and practical aspects of food science
- Study the basic understanding of food chemistry, and food microbiology.

Recommended text books

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

Recommended refrence Books:

1. Sumati R. Mudambi, Shalini M.Rao and M.V. Rajagopal. 2006. Food Science, 2nd Ed. New Age International(P) Limited, New Delhi.
2. Martin Eastwood. 2003. Principles of Human Nutrition. Blackwell Science Ltd., Oxford.
3. Norman N.Potter. 1998. Food Science, 5th Ed. Springer Science+ Business Media, New York.

Syllabus for B.Sc. (Hons.) Agriculture

Course Title: Values and Professional Ethic **Course Code: AGUCBG508T**

Semester: V

L	T	P	C
1	0	0	1

Objective:

- The Specific objectives of this course are to make students able;
- Cultivate ethical awareness and moral reasoning among students.
- Encourage responsible decision-making based on ethical principles.
- Foster compassionate and socially responsible behavior in individuals

Course Syllabus (Theory)

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

Syllabus organised in Unit (Theory)

Unit	Content	Hours
1	**Values and Ethics**-An Introduction. Goal and Mission of Life	4
2	**Principles and** Philosophy. Self Exploration. Self Awareness. Self Satisfaction	4
3	**Motivation.** Sensitivity. Success. Selfless Service. Case Study of Ethical Lives	4
4	**Positive Spirit. Body, Mind and** Soul. Attachment and Detachment. Spirituality Quotient. Examination	4

Course Outcomes

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

Recommended Text 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)

Syllabus for B.Sc. (Hons.) Agriculture

Course Title: Weed Management **Course Code: AGUBG5101T**

Semester: V

L	T	P	C
2	0	0	1

Objective:

Main objective of this course is to:

- Provide Students with a comprehensive understanding of weed biology and ecology.
- Equip them with diverse strategies, including chemical and non-chemical methods, for effective weed control.
- Foster sustainable practices to minimize weed impacts on agriculture, ecosystems, and the environment.
- Empower participants to develop tailored weed management plans for different settings.

Course Syllabus (Theory)

Introduction to weeds, characteristics of weeds their harmful and beneficial effects on ecosystem. Classification, reproduction and dissemination of weeds. Herbicide classification, concept of adjuvant, surfactant, herbicide formulation and their use. Introduction to mode of action of herbicides and selectivity. Allelopathy and its application for weed management. Bio-herbicides and their application in agriculture. Concept of herbicide mixture and utility in agriculture. Herbicide compatibility with agro-chemicals and their application. Integration of herbicides with non chemical methods of weed management. Herbicide Resistance and its management

Syllabus organised in Unit (Theory)

Unit	Content	Hours
1	Introduction to weeds, characteristics of weeds their harmful and beneficial effects on ecosystem	4
2	Classification, reproduction and dissemination of weeds.	4
3	Herbicide classification, concept of adjuvant, surfactant, herbicide formulation and their use. Introduction to mode of action of herbicides and selectivity.	4
4	Allelopathy and its application for weed management. Bio-herbicides and their application in agriculture. Concept of herbicide mixture and utility in agriculture	4
5	Herbicide compatibility with agro-chemicals and their application. Integration of herbicides with non chemical methods of weed management. Herbicide Resistance and its management	4

Course Outcomes

- Understand weed biology, ecology, and identification.
- Implement Integrated Weed Management strategies effectively.
- Apply sustainable practices to minimize environmental impacts.
- Develop comprehensive weed management plans for diverse settings.
-

Recommended Text Books

- "Integrated Weed and Soil Management" by Jitendra Kumar and Devendra Kumar Choudhary (Year: 2017) - Publisher: New India Publishing Agency.
- "Weed Management in Horticultural Crops" by A. Sankaranarayanan and P. Jayakumar (Year: 2014) - Publisher: New India Publishing Agency.
- "Herbicides: Chemistry, Degradation, and Mode of Action" by Franck E. Dayan, Stephen O. Duke, and John E. Franz (Year: 2020) - Publisher: CRC Press.
- "Weeds of North America" by Richard Dickinson and France Royer (Year: 2013) - Publisher: University of Chicago Press.
- "Weed Ecology in Natural and Agricultural Systems" by L. J. Musselman and R. R. James (Year: 2006) - Publisher: CABI.
- "The Biology of Weeds and Invasive Plants" by R. C. H. Shepherd (Year: 2009) - Publisher: Wiley-Blackwell.

Course Title: Weed Management Practical **Course Code: AGUBG5101P**

Semester: V

L	T	P	C
0	0	2	1

Objective:

- Develop hands-on skills in identifying and classifying different weed species.
- Gain proficiency in implementing various weed control methods, including mechanical, cultural, and chemical approaches.
- Learn to design and execute integrated weed management plans for specific agricultural or ecological settings.
- Acquire knowledge of sustainable practices and ethical considerations in weed management to minimize environmental impacts.

Course Syllabus (Practical)

Techniques of weed preservation. Weed identification and their losses study. Biology of important weeds. Study of herbicide formulations and mixture of herbicide. Herbicide and agrochemicals study. Shift of weed flora study in long term experiments. Study of methods of herbicide application, spraying equipments. Calculations of herbicide doses and weed control efficiency and weed index.

Syllabus organized in Unit (Practical)

Topics	Description with Practical Applications	Hours
Techniques of weed preservation. Weed identification and their losses study. Biology of important weeds	Students will learn about proper methods for collecting, drying, and preserving weed Students will develop skills to identify common weed species. Understanding the life cycles, reproductive strategies, and growth habits of key weed species.	**2**
Study of herbicide formulations and mixture of herbicide. Herbicide and agrochemicals study	Students will explore different herbicide formulations and learn about the benefits and limitations. gain insights into various agrochemicals, their modes of action, and proper application methods and apply their knowledge to select and apply appropriate herbicide formulations, taking into account target weed species	**2**
Shift of weed flora study in long term experiments	Understanding the shifts in weed species and their dynamics, Long-term experiments help in formulating comprehensive weed management plans for sustainable agriculture.	**2**

Study of methods of herbicide application, spraying equipments. Calculations of herbicide doses and weed control efficiency and weed index.	Application and spraying equipment enables participants to apply herbicides effectively, maximizing weed control while minimizing drift and environmental impacts. Calculations of herbicide doses and weed control efficiency, along with the weed index,	**2**

Course Outcomes

- Hands-on Weed Identification: Participants can identify and classify common weed species, aiding targeted and effective weed control strategies.
- 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.
- Herbicide Application Proficiency: Participants gain skills in proper herbicide application techniques, ensuring precise and safe use while minimizing environmental impact.
- 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.

Syllabus for B.Sc. (Hons.) Agriculture

Course Title: Agrochemicals **Course Code: AGUBG5102 T**

Semester: V

L	T	P	C
2	0	0	1

Objective:

Main objective of this course is to:

- Provide comprehensive knowledge of various agricultural chemicals, including pesticides, herbicides, fungicides, and fertilizers.
- Educate students on safe and responsible agrochemical use to minimize environmental impacts and protect human health.
- Familiarize students with Integrated Pest Management (IPM) principles, promoting sustainable and effective crop protection.
- Enhance understanding of agrochemicals' role in increasing crop productivity and ensuring food security in modern agriculture.

Course Syllabus (Theory)

An introduction to agrochemicals, their type and role in agriculture, effect on environment, soil, human and animal health, merits and demerits of their uses in agriculture, management of agrochemicals for sustainable agriculture. Herbicides-Major classes, properties and important herbicides. Fate of herbicides. Fungicides - Classification – Inorganic fungicides - characteristics, preparation and use of sulfur and copper, Mode of action-Bordeaux mixture and copper oxychloride. Organic fungicides- Mode of action- Dithiocarbamates-characteristics, preparation and use of Zineb and maneb.Systemic fungicides- Benomyl, carboxin, oxycarboxin, Metalaxyl, Carbendazim, characteristics and use. Introduction and classification of insecticides: inorganic and organic insecticides Organochlorine, Organophosphates, Carbamates, Synthetic pyrethroids Neonicotinoids, 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. 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 potassiumchloride, potassium sulphate and potassium nitrate. Mixed and complex fertilizers: Sources and compatibility– preparation of major, secondary and micronutrient mixtures. Complex fertilizers: Manufacturing of ammonium phosphates, nitrophosphates and NPK complexes. Fertilizer control order. Fertilizer logistics and marketing. Plant bio-pesticides for ecological agriculture, Bio-insect repellent

Syllabus organised in Unit (Theory)

Unit	Content	Hours
1	**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.	**3**
2	**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.	**3**
3	**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.	**4**
4	**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 potassiumchloride, potassium sulphate and potassium nitrate. Mixed and complex fertilizers	**3**
5	**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	**3**

Course Outcomes

- Comprehensive Knowledge: Students will gain a thorough understanding of various agrochemicals, their types, modes of action, formulations, and applications in agriculture.
- Safe and Responsible Use: Students will learn to apply agrochemicals responsibly, following safety guidelines and environmental regulations to minimize risks and adverse effects.
- 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.
- 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**.**

Recommended Text Books

- "Introduction to Agrochemicals: A Practical Approach" by Peter Collin (Year: 2003) - Publisher: Wiley-Blackwell.

- "Handbook of Pesticides: Methods of Pesticide Residues Analysis" by Leo M.L. Nollet, Hamir S. Rathore, and Fidel Toldrá (Year: 2015) - Publisher: CRC Press.
- "Pesticide Chemistry: Crop Protection, Public Health, Environmental Safety" edited by Hideo Ohkawa, Hisashi Miyagawa, and Philip W. Lee (Year: 2007) - Publisher: Wiley-VCH.
- "Handbook of Fertilizers" edited by Shri Niwas Singh (Year: 2016) - Publisher: Oxford Book Company.

Course Title: Agrochemicals (Practical) **Course Code: AGUBG5102P**

Semester: V

L	T	P	C
0	0	2	1

Objective:

Introduction of analytical instruments and their principles

- To develop Pesticide Residue Testing Laboratory
- Development of new Lead molecules with Agricultural Importance.
- Rearing of Bio-control agents for controlling insets pests

Course Syllabus (Practical)

Sampling of fertilizers and pesticides. Pesticides application technology to study about various pesticides appliances. Quick tests for identification of common fertilizers. Identification of anion and cation in fertilizer. Calculation of doses of insecticides to be used. To study and identify various formulations of insecticide available kin market. Estimation of nitrogen in Urea. Estimation water soluble P2 O5 and citrate soluble P2 O5 in single super phosphate. Estimation of potassium in Muraite of Potash/ Sulphate of Potash by flame photometer. Determination of copper content in copper oxychloride. Determination of sulphur content in sulphur fungicide. Determination of thiram. Determination of ziram content.

Syllabus organized in Unit (Practical)

Topics	Description with Practical Applications	Hours
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 to study about various pesticides appliances.Quick tests for identification of common fertilizers.	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. The application of pesticide is not merely the operation of sprayer or duster.	**2**
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.	**2**

To study and identify various formulations of insecticide available kin market.	A pesticide formulation is a mixture of chemicals which effectively controls a pest. Formulating a pesticide involves processing it to improve its storage, handling, safety, application, or effectiveness.	**2**
Estimation of nitrogen in Urea.	Commonly used methods for urea determination are based on enzymatic and chemical assays	**2**
Estimation water soluble P2 O5 and citrate soluble P2 O5 in single super phosphate.	Single superphosphate is grey coloured, dry, granular or powdered phosphatic fertilizer. It is sold in gunny bags with polythene lining inside or plastic bags. When super phosphate is applied in moist soil or in dry soil after rain or irrigation, phosphate part (H2PO4) is dissolved in the soil water.	**2**
Estimation of potassium in Muraite of Potash/ Sulphate of Potash by flame photometer.	This estimation of K is extremely useful for samples containing high concentration of K like MOP. As the method is gravimetric one the accuracy of the method is high.	**2**
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, the gas phase being brought to a maximum water content of 10 g/m<3> before being introduced into the aqueous system	**2**
Determination of sulphur content in sulphur fungicide.	Sulphur is determined by Iodate titration or IR detection	**2**
Determination of thiram.	Different methods available to detect thiram pesticide which include, spectrophotometry), voltammetry high performance liquid chromatography mass spectrometry and gas chromatography	**2**

Course Outcomes

- Imparts knowledge on agrochemicals *viz*., fertilizers and pesticides
- Introduction and classification of insecticides
- Introduction and classification of fungicides
- Fertilizers, manufacturing processes and their importance
- Knowledge on choice of agrochemicals and their impact on environment

Syllabus for B.Sc. (Hons.) Agriculture

Course Title: Landscaping **Course Code: AGUBG5103T**

Semester: V

L	T	P	C
2	0	0	1

Objective:

Main objective of this course is to:

- Develop students' understanding of landscape design principles, spatial planning, and aesthetics.
- Enhance students' horticultural knowledge to select and care for plants in landscape projects.
- Equip students with practical skills in landscape construction, installation, and maintenance techniques.
- Foster creativity and environmental awareness to design sustainable and visually appealing landscapes.

Course Syllabus (Theory)

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

Syllabus organised in Unit (Theory)

Unit	Content	Hours
1	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	4
2	Trees: selection, propagation, planting schemes, canopy management, shrubs and herbaceous perennials: selection, propagation, planting schemes, architecture.	4
3	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	4

4	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.	**4**
5	Bonsai: principles and management, lawn: establishment and maintenance. CAD application.	**3**

Course Outcomes

- Students will demonstrate a comprehensive understanding of landscape design principles, spatial organization, and aesthetics, enabling them to create visually appealing landscapes.
- 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.
- Students will develop hands-on skills in landscape construction, installation, and maintenance, preparing them for real-world projects.
- Students will be equipped to design landscapes that promote environmental sustainability, conserve resources, and enhance biodiversity, contributing to ecologically responsible landscape practices.

Recommended Text Books

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.
6. "Landscape Architecture: A Manual of Environmental Planning and Design" by Barry Starke (Year: 2006) - Publisher: McGraw-Hill Education.

Course Title: Landscaping (Practical) **Course Code: AGUBG5103P**

Semester: V

L	T	P	C
0	0	2	1

Objective:

Introduction of analytical instruments and their principles
To develop Pesticide Residue Testing Laboratory
Development of new Lead molecules with Agricultural Importance.
Rearing of Bio-control agents for controlling insets pests

Course Syllabus (Practical)

Identification of trees, shrubs, annuals, pot plants; Propagation of trees, shrubs and annuals, care and maintenance of plants, potting and repotting, identification of tools and implements used in landscape design, training and pruning of plants for special effects, lawn establishment and maintenance, layout of formal gardens, informal gardens, special type of gardens (sunken garden, terrace garden, rock garden) and designing of conservatory and lathe house. Use of computer software, visit to important gardens/ parks/ institutes.

Syllabus organized in Unit (Practical)

Topics	Description with Practical Applications	Hours
Identification of trees, shrubs, annuals, pot plants	Here students have to identify different looks, quality and get vision knowledge.	**2**
Propagation of trees, shrubs and annuals, care and maintenance of plants, potting and repotting,	Care and maintenance practices, including potting and repotting, ensure healthy growth, longevity, and aesthetic appeal of plants in gardens, indoor spaces, and greenhouses.	**2**
Identification of tools and implements used in landscape design,	A Gardener needs different kind of tools and equipment for carrying out various horticultural operations. However, with the advancement of science and technology, the use of metals like copper, steel and iron has led to the development of various kinds of garden tool and equipment like hand cultivator, tractor, lawn mower, harrow, spade, secateur, garden fork, sprinkler, rake, pruning saw, spray pump, grass shear, budding-cum-grafting knife, etc.	**2**
Training and pruning of plants for special effects	Training determines the general character and even details of plant out line its branching and frame work. Pruning determines the capacity of plant to produce fruit	**2**
Lawn establishment and maintenance	The lawn improves the attractiveness of the garden and also acts as cushion in playgrounds. The primary provision is to	**2**

	maintain the lawn properly with good care by selecting site, land preparation, intercultural operations, preventing/managing diseases & pests and problems associated with lawns.	
Layout of formal gardens, informal gardens, special type of gardens (sunken garden, terrace garden, rock garden)	Symmetrical layouts, geometric shapes, and well-defined boundaries, often used for showcasing grandeur and elegance in historical estates. Informal gardens have a more relaxed, naturalistic design with curved paths and a mix of plantings, providing a tranquil and casual atmosphere	**2**
Designing of conservatory and lathe house	Conservatory: Year-round plant cultivation, indoor-outdoor living space. Lathe House: Shade provision, support for climbing plants, enhancing garden aesthetics.	**2**
Use of computer software and visit to important gardens/ parks/ institutes.	Computer software: Enables precise garden design, plant selection, and landscaping visualization for efficient and accurate planning. Visits to gardens/parks/institutes: Provide inspiration, knowledge, and hands-on experience to implement best practices and innovative ideas in garden design and management.	**2**

Course Outcomes

- Demonstrate knowledge of fundamental concepts and ideas in the field of landscape architecture.
- Demonstrate an understanding of how landscape architects and designers utilize the principles and methods of Art + Science to structure and shape outdoor space.
- Demonstrate critical thinking skills in evaluating causal arguments through the study of historic precedents that inform landscape design and landscape space.
- 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

Syllabus for B.Sc. (Hons.) Agriculture

Course Title: Protected cultivation **Course Code: AGUBG5104T**

Semester: V

L	T	P	C
2	0	0	1

Objective:

Main objective of this course is to:

- Introduce students to the principles and practices of cultivating plants in controlled environments like greenhouses and polyhouses.
- Teach modern techniques and technologies for optimizing crop production, pest management, and climate control.
- Provide hands-on experience and knowledge on selecting suitable crops, managing irrigation, and implementing sustainable cultivation methods.
- Equip learners with the skills to address challenges and capitalize on the benefits of protected cultivation for enhanced productivity and economic viability in agriculture and horticulture.

Course Syllabus (Theory)

Protected cultivation- importance and scope, Status of protected cultivation in India and World types of protected structure based on site and climate. Cladding material involved in greenhouse/ poly house. Greenhouse design, environment control, artificial lights, Automation. Soil preparation and management, Substrate management. Types of benches and containers. Irrigation and fertigation management. Propagation and production of quality planting material of horticultural crops. Greenhouse cultivation of important horticultural crops – rose, carnation, chrysanthemum, gerbera, orchid, anthurium, lilium, tulip, tomato, bell pepper, cucumber, strawberry, pot plants, etc. Cultivation of economically important medicinal and aromatic plants. Off-season production of flowers and vegetables. Insect pest and disease management.

Syllabus organised in Unit (Theory)

Unit	Content	Hours
1	Protected cultivation- importance and scope, Status of protected cultivation in India and World types of protected structure based on site and climate.	4
2	Cladding material involved in greenhouse/ poly house. Greenhouse design, environment control, artificial lights, Automation. Soil preparation and management, Substrate management.	4
3	Types of benches and containers. Irrigation and fertigation management. Propagation and production of quality planting material of horticultural crops.	4

4	Greenhouse cultivation of important horticultural crops – rose, carnation, chrysanthemum, gerbera, orchid, anthurium, lilium, tulip, tomato, bell pepper, cucumber, strawberry, pot plants, etc.	**4**
5	Cultivation of economically important medicinal and aromatic plants. Off-season production of flowers and vegetables. Insect pest and disease management.	**3**

Course Outcomes

- Acquire in-depth knowledge of the principles, techniques, and best practices of protected cultivation, including greenhouse management and climate control.
- Develop hands-on skills in designing, setting up, and maintaining various protected cultivation structures and systems for optimal crop growth.
- Learn effective crop selection, nutrition management, and pest control strategies to maximize yields and ensure crop health.
- Understand the importance of sustainable practices in protected cultivation to conserve resources and minimize environmental impacts.
- 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.

Recommended Text Books

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)

Course Title: Protected cultivation (Practical) **Course Code: AGUBG5104P**

Semester: V

L	T	P	C
0	0	2	1

Objective:

Main objective of this course is to:

- Make students acquainted concepts and applications of precision farming and protected cultivation.
- The practical aspects of this course include study of different types of greenhouses, designs for active summer and winter cooling, estimation of drying rate of agricultural products inside greenhouse.
- Testing of soil and water suitability for crops.
- Fertigation requirements for greenhouse crops.
- Study of various growing media and economic analysis.

Course Syllabus (Practical)

Raising of seedlings and saplings under protected conditions, use of protrays in quality planting material production, Bed preparation and planting of crop for production, Inter cultural operations, Soil EC and pH measurement, Regulation of irrigation and fertilizers through drip, fogging ad misting

Syllabus organized in Unit (Practical)

Topics	Description with Practical Applications	Hours
Raising of seedlings and saplings under protected conditions	It is an area, in which new saplings are raised and nourished until they are ready for sale or transplanting at a permanent place in a field. Raising of seedlings in a nursery is important for various reasons.	**2**
Use of pro trays in quality planting material production, Bed preparation and planting of crop for production.	Pro-Trays should be used for the production of good variety seedlings and to save place. The blocks of plastic tray is in cone shape which helps in the proper growth and development of the roots. For the preparation of disease and pest free hybrid seeds, seedling should be ready in poly house or net house.	**2**
Inter cultural operations	All the lighter and finer operations carried out on the soil, between sowing had harvesting are termed as intercultural operations. They include weeding, fertilizer application, mulching, etc. The machineries and implements used for this purpose are called as	**2**

	inter cultural equipments	
Soil EC and pH measurement.	It is often useful to characterize an environment, such as a body of water, by measuring its pH and electrical conductivity (EC). pH is a measure of the acidity of the water or soil based on its hydrogen ion concentration and is mathematically defined as the negative logarithm of the hydrogen ion concentration	**2**
Regulation of irrigation and fertilizers through drip, fogging ad misting**.**	To get precise,controlled and tested method for application of irrigation water and fertilizer applications.	**2**

Course Outcomes

- Aim to get maximum crop germination percentage.
- Develop different method of cultivation.
- The advancement of knowledge and better understanding of plant and environment, agricultural practices are modified or new practices developed for high productivity.
- Off season cropping management.

SYLLABUS

FOR

AGRICULTURAL SCIENCES AND TECHNOLOGY

[B.Sc. (Hons.) Ag.]

(Sixth Semester)

PRAYAGRAJ

FACULTY OF AGRICULTURAL SCIENCES AND TECHNOLOGY

Syllabus for B.Sc. (Hons.) Agriculture

Course Title: Rainfed Agriculture and Watershed Management **Course Code: AGUCBG601T**

Semester: VI

L	T	P	C
1	0	0	1

Objective:

- Comprehend rainfed farming intricacies and sustainable practices.
- Learn watershed management for efficient resource utilization.
- Enhance climate resilience and adaptive agricultural techniques.
- Foster holistic skills for rural development and environmental stewardship.

Course Syllabus (Theory)

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

Syllabus organised in Unit (Theory)

Unit	Content	Hours
1	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.	4
2	Soil and water conservation techniques, Drought: types, effect of water deficit on physio-morphological characteristics of the plants, Crop adaptation and mitigation to drought.	4
3	Water harvesting: importance, its techniques, Efficient utilization of water through soil and crop management practices, Management of crops in rainfed areas	4
4	Contingent crop planning for aberrant weather conditions, Concept, objective, principles and components of watershed management, factors affecting watershed management.	4

Course Outcomes

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

Recommended Text Books/Reference Books

- Das M M and Saika M I (2013). Watershed Management. PHI learning.
- Tripathi R P and Singh H P (2008). Soil erosion and conservation. New age international.
- Murthy V V N and Jha M K (2016). Land and water management engineering. Kalyani Publishers, ND.
- Das Ghanshyam (2016). Hydrology and Soil Conservation Engineering Including Watershed Management. PHI learning.
- Jayanthi C and Kalpana R (2016). Dryland agriculture. Kalyani Publishers.

Course Title: Rainfed Agriculture and Watershed Management Lab **Course Code: AGUCBG601P**

Semester: VI

L	T	P	C
0	0	2	1

Objective:

- The course will consist of lecture (both theory and practical) in field.
- Highlight the mainly practical oriented topics.
- Evaluation will be done both theory and farm visiting experiments.
- Aim of study to identification and control of emerging pest.

Course Syllabus (Practical)

Studies on climate classification. Studies on rainfall pattern in rainfed areas of the country and pattern of onset and withdrawal of monsoons. Studies on cropping pattern of different rainfed areas in the country and demarcation of rainfed area on map of India. Interpretation of meteorological data and scheduling of supplemental irrigation on the basis of evapo-transpiration demand of crops. Critical analysis of rainfall and possible drought period in the country, effective rainfall and its calculation. Studies on cultural practices for mitigating moisture stress. Characterization and delineation of model watershed. Field demonstration on soil & moisture conservation measures. Field demonstration on construction of water harvesting structures. Visit to rainfed research station/watershed.

Syllabus organised in Unit (Practical)

Topics	Description with Practical Applications	Hours
Studies on climate classification.	List the name of areas in the given map divided according to Koppen's classification of climate.	**2**
Studies on rainfall pattern 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.	**2**
Studies on cropping pattern of different rainfed areas in the country and demarcation of rainfed area on map of India.	Write about different cropping systems suitable for rainfed area of India.	**2**
Interpretation of meteorological data and scheduling of supplemental irrigation on the basis of evapo-transpiration demand of crops.	Write about the instruments used for different parameters related to weather. Write about irrigation scheduling and supplemental irrigation. Schedule supplemental irrigation on the basis of evapotranspiration.	**2**
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, depict drought period of areas in the region.	**2**

Studies on cultural practices for mitigating moisture stress.	What are the different cultural practices used for mitigating moisture stress	**2**
Characterization and delineation of model watershed.	Steps involved in delineation of watersheds	**2**
Field demonstration on soil & moisture conservation measures.	What are the different methods to conserve soil and moisture	**2**
Field demonstration on construction of water harvesting structures.	Traditional techniques and modern techniques	**2**
Visit to rainfed research station/watershed.	Note down salient points that are observed at research station during visit	**2**

Course Outcomes

- Understand rainfed agriculture and their application in agriculture.
- Learn about watershed management and meteorological observations.
- Learn the skill of assessing drought and crop adaptation and to develop contingent crop planning.
- Have understanding about water harvesting structures and visit various sites.

Syllabus for B.Sc. (Hons.) Agriculture

Course Title: Manures, Fertilizers and Soil Fertility Management **Course Code: AGUCBG602T**

Semester: VI

L	T	P	C
3	0	0	3

Objective:

The Specific objectives of this course are to make students able to;

- To know about sustainable soil fertility management and different methods of evaluation
- To know about different forms of Manures and Fertilizers and their methods of application.
- Understand various Nutrient management concepts and Nutrient use efficiencies of major and micronutrients and enhancement techniques.
- Soil health - Quality indices and their management - Organic farming and Precision Farming - Long term effect of fertilization on soil

Course Syllabus (Theory)

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 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. 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. 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. 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. 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.

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Syllabus organized in Unit (Theory

Unit	Content	Hours
1	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 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.	**4**
2	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.	**4**
3	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.	**4**
4	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. Saline and alkali soils – amendments for reclamation and soil conditioners.	**4**
5	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.	**4**

Course Outcomes:

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

Recommended Text Books/Reference Books

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

- Gupta,A.K. (2007) Methods in Environmental Analysis of Water , Soil and Air. 2nd Edn. Published by Agrobios (India) Jodpur
- Mengel, K.J. and Kirkby, A. 1978. Principles of Plant Nutrition. International Potash Institute, Switzerland 31
- Nyle.C. Brady 1995. The Nature and Properties of Soils. 10th Edn. Printice Hall India pvt. Ltd. New Delhi
- Raymond W Miller and Roy L. Donahue. 1992. Soils and Introduction to Soils and Plant Growth. 6th edn. Printice Hall India pvt. Ltd. New Delhi
- Robert .M. Devlin and Francis H. Witham 1986. Plant Physiology. 4th Edn. CBS Publishers and Distributors New Delhi.
- Singh,S.S.2011.Soil Fertility and Nutrient Management.3rd Edn. Kalyani Publishers. New Delhi
- Tisdale,S.L., Nelson,W.L.,Beaton, J.D. and Havlin,J.L. 1995. Soil Fertility and Fertilisers. 5th Edn. Macmillan publishing company, USA.
- Fundamentals of Soil Science. Published by Indian Society of Soil Science, IARI New Delhi, 2002.

Course Title: Manures, Fertilizers and Soil Fertility Management **Course Code: AGUCBG602P**

Semester: VI

L	T	P	C
0	0	2	1

Objective:

- To know about different forms of Manures and Fertilizers and their methods of application.
- Understand various Nutrient management concepts and Nutrient use efficiencies of major and micronutrients and enhancement techniques.
- Soil health - Quality indices and their management - Organic farming and Precision Farming - Long term effect of fertilization on soil

Course Syllabus (Practical)

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

Syllabus organised in Unit (Practical)

Topics	Description with Practical Applications	Hours
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 K2Cr2O7 solution. The reaction is assisted by the heat generated when two volumes of H2SO4 are mixed with one volume of the dichromate.	**2**
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 NH4 +-N released trapped in boric acid and its concentration determined successively every 5 min for a total of 40 min.	**2**
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	**2**

	colorimeter at 880 nm. The result is reported in parts per million (ppm) phosphorus (P) in the soil.	
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+, Ca2+ and also Mg2+) by a 1M ammonium acetate solution buffered at pH 7.	**2**
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 BaCl2 solution followed by turbidimetric analysis. in the given soil sample. of the soil. SO ions adsorbed in the subsoil and make them free for extraction into water	**2**
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. Soil or plant materials (ash or dry materials in the form of powder) can be directly used for digestion to estimate the total nitrogen content.	**2**
Estimation of P in plants	Most methods for phosphate determination are 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 to quantify orthophosphate extracted from plants	**2**
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. The results are reported as parts per million (ppm) of potassium (K) in the soil.	**2**
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)	

Course Outcomes

- The students have knowledge with basic principle of soil fertility management.
- The students with general concepts and classification of manures and fertilizer.

- The students have knowledge about methods of fertilizer recommendation to crops

Syllabus for B.Sc. (Hons.) Agriculture

Course Title: Post-Harvest Management and Value Addition of Fruits and Vegetables **Course Code: AGUCBG603T**

Semester: VI

L	T	P	C
1	0	0	1

Objective:

- The Specific objectives of this course are to make students able to;
- To study about the role and importance of Post harvest technology in Indian industry.
- To study about the various management technologies on Pre- harvest and Post harvest of fruits and vegetables.
- To study about the conventional and modern packaging and storage methods.
- To study about processed and fermented products of fruit and vegetables.

Course Syllabus (Theory)

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. 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. 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.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. 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.

Syllabus organized in Unit (Theory)

Topic	Content	Hours
1	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.	**4**
2	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.	**4**
3	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.	**4**
4	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.	**4**
5	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.	**4**

Course Outcomes:

- After the completion of this course the student will be able to understand the following points:

- To make the students aware of the new innovative technologies of processing, harvesting, drying and canning.
- Prolong the Post harvest storage life of horticultural commodities and increase income through value addition of the products and to reduce Post harvest losses.
- To understand the various packaging and storage methods for preservation of fruits and vegetables after Post harvest.
- To learn the making various processed and fermented products.

Recommended Text Books/Reference Books

- John, P.J. 2008. A hand book on Post Harvest management of Fruits and Vegetables. Daya Publishing House. Delhi.147.
- Kader, A.A. 2002. Postharvest Technology of Horticultural Crops. UCUCANR Publications. 535p.
- Mitra, S. K. 1997. Postharvest Physiology and Storage of Tropical Fruits. CAB International, UK.
- NIIR Board. 2012. Food Packaging Technology Handbook (2nd Rev. Ed). NIIR Project Consultancy Services. 749 p.
- Panda, H. 2010. Handbook on Spices and Condiments (Cultivation, Processing and Extraction). Asia Pacific Business Press Inc. . 640 P.
- Rajarathnam, S. and Ramteke, R.S.2011. Advances in preservation and processing technologies of fruits and vegetables. New India Publishing Agency, New Delhi
- Ranganna, S. 1986. Handbook of Analysis and Quality Control for Fruit and Vegetable Products. Tata Mc. Graw Hill Publishing Company, New Delhi,1112p.
- Sadasivam, S. and Manickam, A.1996. Biochemical methods. New Age International Pvt.Ltd. Publishers 256p.
- Saraswathy, S., Preeti, J.L., Balasubramanyan, S., Suresh, J., Revathy, N. and Natarajan, S. 2008. Postharvest management of horticultural crops. AGRIBIOS (India).
- Sharma, S.K. 2010. Postharvest management and processing of fruits and vegetables-
- Instant Notes. New India Publishing Agency. New Delhi.390. 70
- Srivastava, R.P. and Sanjeev Kumar.2007. Fruit and vegetable preservation: Principles and Practices. International Book Distributing Company, Lucknow.474.
- Sudheer, K.P. and Indira ,V. 2007. PostHarvest Technology of Horticultural Crops. New India. Publ. Agency.
- Verma, L.R. and Joshi, V.K. 2000. Postharvest technology of fruits and vegetables-General concepts and principles. Vol I & II.

Course Title: Post-Harvest Management and Value Addition of Fruits and Vegetables Lab **Course Code: AGUCBG603P**

Semester: VI

L	T	P	C
0	0	2	1

Objective:

The main objective is to increase production of fruits and vegetables will have significance only when which they reach the consumer in good condition at a reasonable price. The existing post-harvest losses of fruits and vegetables could be considerably reduced by adopting improved packaging

Course Syllabus (Practical)

Guidelines for establishing fruit and vegetable processing unit- FSSAI standards. Preliminary processing of fruits. Determination of total soluble solids, Preparation of fruit beverages (squash/ syrup/ RTS beverage) Cashew apple processing. Preparation of fruit jam. Preparation of guava jelly, Grape Wine Preparation. Preparation of pickle. Tomato processing. Visit to processing units of horticultural crops, familiarization with different processed products from spices and plantation crops

Syllabus organised in Unit (Practical)

Topics	Description with Practical Applications	Hours
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.	**2**
Determination of total soluble solids	Sugar content using a refractometer to determine the TSS in a fruit juice, and quality for production or consumption.	**2**
Preparation of fruit beverages (squash/ syrup/ RTS beverage)	Blend, filter, and pasteurize the fruit puree, adding sugar and preservatives as per recipe.	**2**
Cashew apple processing	Process it through filtration, pasteurization, and blending to produce cashew apple juice,	**2**
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.	**2**
Grape wine preparation	Crush and press grapes to extract juice, ferment with yeast, monitor temperature and sugar levels.	**2**
Preparation of pickle	Clean, chop, and season vegetables with spices and salt, pack tightly in sterilized jars,	**2**

Tomato processing	remove skins and seeds; process into puree or sauce; heat, package, and sterilize, creating versatile tomato products for various culinary applications."	**2**
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	**2**

Course Outcomes

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

Course Title: Principles of Organic Farming **AGUCBG604T**

Semester: VI

L	T	P	C
1	0	0	1

Objective:

- The Specific objectives of this course are to make students able to;
- To seek out the presence of chemical contaminants in conventional vs organically big crops.
- Promote a lot of usage of natural pesticides.
- Management pests, diseases and weeds
- Cultivate the soil in right time in right manner.
- To push sensible soil structure, texture and fertility
- To grief, read summary of organic agriculture.
- To check regarding the benefits and downsides of organic farming.

Course Syllabus (Theory)

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

Syllabus organized in Unit (Theory)

Unit	Content	Hours
1	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.	**4**
2	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 fertilisers – types, methods of application – benefits and limitations.	**4**
3	Nutrient use in organic farming-scope and limitations. Nutrient management in organic farming. Organic ecosystem and their concepts.	**4**

	Choice of crops and varieties in organic farming – crop rotations – need and benefits– multiple cropping.	
4	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.	**4**
5	Inspection – certification - labelling and accreditation procedures for organic products. Processing, - economic consideration and viability. Marketing and export potential of organic products – national economy.	**4**

Course Outcomes

- On successful completion of this course, the students will be able to.
- Develop critical understanding on various aspects of agronomy.
- Explain the nutrition and application of nutrients to plants.
- Explain the cropping methods and crop rotation.
- Realize various weed management practices.
- Explain the different aspects of crop harvesting.

Recommended Text Books

- Arun K. Sharma. 2002. A Hand book of organic farming. Agrobios, India. 627p.
- Palaniappan, S.P and Annadurai, K.1999. Organic farming-Theory and Practice. Scientific publishers, Jodhpur, India. 257p.
- Mukund Joshi and Prabhakarasetty, T.K. 2006. Sustainability through organic farming. Kalyani publishers, New Delhi. 349p.
- Balasubramanian, R., Balakishnan, K and Siva Subramanian, K. 2013. Principles and practices of organic farming. Satish Serial Publishing House. 453p
- Tarafdar, J.C., Tripathi, K.P and Mahesh Kumar, 2009. Organic agriculture. Scientific Publishers, India. 369p.
- Tiwari, V.N., Gupta, D.K., Maloo, S.R and Somani, L.L. 2010. Natural, organic, biological, ecological and biodynamic farming. Agrotech Publishing Academy, Udaipur. 420p.
- Dushyent Gehlot. 2005. Organic farming- standards, accreditation, certification and inspection. Agrobios, India. 357.

Course Title: Principles of Organic Farming Lab **Course Code: AGUCBG604P**

Semester: VI

L	T	P	C
0	0	2	1

Objective:

- To know the individual components of organic farming
- To study the various components present on organic farm. The Major components of organic farming system would include,
- To visit and introduce various components and their utilization of organic farm research stations

Course Syllabus (Practical)

Study of different organic materials. Preparation of enriched Farm Yard Manure. Study of composting methods. Preparation of vermin- compost Study of recycling of farm waste Study of green manuring. Visit to urban waste recycling unit. Study of bio fertilizer

Syllabus organised in Unit (Practical)

Topics	Description with Practical Applications	Hours
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 (soil taken from the field) and a handful of calcium mixed well, and shade dried for 15 days and used.	**2**
Study of composting methods	In this topic practical related to different composting method is done.	**2**
Preparation of vermi- compost	Collection and gathering of soil, earthworms and other sources related to vermicompost	**2**
Study of recycling of farm waste	An effective means of managing agricultural solid wastes is to recycle them to produce useful products.	**2**
Study of green manuring	It improves soil structure, increases water holding capacity and decreases soil loss by erosion.	**2**
Visit to urban waste recycling unit	The collection, transportation, treatment, and disposal of waste generated in urban areas.	**2**
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.	**2**

Course Outcomes

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

Course Title: Farm Management, Production and Resource Economic **Course Code: AGUCBG605T**

Semester: VI

L	T	P	C
1	0	0	1

Objective:

The Specific objectives of this course are to make students able to equip students with the knowledge and skills necessary to effectively manage agricultural and farming enterprises, to provide a comprehensive understanding of various aspects related to agricultural production and resource management. To understand the economic aspects of agricultural resource allocation, including land, labour, capital, and other inputs. Students learn about cost analysis, resource optimization, and decision-making in agriculture. To introduce students to financial management principles specific to farming, including budgeting, financial analysis, and investment decision-making.

Course Syllabus (Theory)

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. 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. 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. 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. 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.

Syllabus organised in Unit (Theory)

Unit	Content	Hours
1	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.	4
2	Principles of farm management: concept of production function and its type, use of production function in decision-making on a farm, factor-product,	4

	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.	
3	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.	**4**
4	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.	**4**
5	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.	**4**

Course Outcomes

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

Recommended Text Books/Reference Books

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

Course Title: Manures, Fertilizers and Soil Fertility Management Lab **Course Code AGUCBG605P**

Semester: VI

L	T	P	C
0	0	2	1

Objective:

Students are able to understand the role of nutrients in plant growth, learn about various organic and inorganic amendments to enhance soil fertility, grasp the principles of balanced nutrient application for sustainable agriculture, and develop skills to recommend appropriate nutrient management practices for efficient and environmentally responsible crop production.

Course Syllabus (Practical)

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

Syllabus organised in Unit (Practical)

Topics	Description with Practical Applications	Hours
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.	**2**
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.	**2**
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	**2**

	pricing strategies.	
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.	**2**

Course Outcomes

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

Course Title: Crop improvement – II (Rabi Crops) **Code: AGUCBG606T**

Semester: VI

L	T	P	C
1	0	0	1

Objective:

- Gain knowledge about center of origin, distribution and wild relatives of various Rabi crops
- Understand genetics of qualitative and quantitative characters and plant genetic resources and their conservation process.
- Understand the major breeding objectives, procedures and innovative approaches for development of hybrids and varieties for different purposes.

Course Syllabus (Practical)

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

Syllabus organised in Unit (Practical)

Unit	Content	Hours
I	**Introduction:** Centres of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fodder crops and cash crops; vegetable and horticultural crops.	4
II	**Plant genetic resources:** Plant genetic resources, its utilization and conservation; study of genetics of qualitative and quantitative characters.	4
III	**Breeding Methods:** Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids arid varieties for yield, adaptability, stability, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional)	4
IV	**Seed Production:** Hybrid seed production technology of rabi crops. Ideotype concept and climate resilient crop varieties for future.	4

Course Outcomes:

- Know about the centre of origin and wild relatives of various Rabi crops
- Understand the plant genetic resources, its conservation process and genetics of qualitative and quantitative characters.
- Compare the new genetic approaches with the conventional approaches.
- Demonstrate the field experiments and apply field techniques for hybrid seed production for

achieving a definite ideotype & climate resilient crop varieties for future

. **Suggested Reading:**

- Crop Breeding and Biotechnology, Hari Har Ram, Kalyani Publication, New Delhi.
- Breeding of Asian Field crops, D.A. Sleper, J.M. Poehlman, Blackwell Publishers.
- Principle and Procedures of Plant Breeding Biotechnological and Conventional Approach G.S.
- Claahal S.S. Gosla, Narosa Publishers House. New Delhi.
- Plant Breeding Principle and Methods, B.D. Singh, Kalyani Publication New Delhi.

Course Title: Crop Improvement – II (Rabi Crops) Lab **Course Code AGUCBG606P**

Semester: VI

L	T	P	C
0	0	2	1

Objective:

The prime aim of this lab is to make-

Students well acquainted with geographical topography of world and India and to increase / stabilize production of crops, forage, fruits, fuel and timber in rainfed areas by introduction of improved soil and moisture conservation measures, better crop and range land management practices.

Course Syllabus (Practical)

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

Syllabus organised in Unit (Practical)

Topics	Description with Practical Applications	Hours
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 of segregation generation may be grouped into 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 specific character of a well-adapted variety for which it is deficient.	**2**
Study of field techniques for seed production and hybrid seeds production in Rabi crops; Estimation	Techniques related to seed production and estimations process should be observed by	**2**

of heterosis, inbreeding depression and heritability	students.	
Study of quality characters, study of donor parents for different characters; Visit to seed production plots; Visit to AICRP plots of different field crops.		**2**

Course Outcomes

- Students understand the value of using wild relatives to generate novel types of *rabi* crop in this course.
- Learner acquires knowledge of gene preservation technique to subsequently utilize to enhance Rabi crops.
- The student learns how to use breeding techniques to enhance Rabi crops.
- 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.

Syllabus for B.Sc. (Hons.) Agriculture

Course Title: Protected Cultivation and Secondary Agriculture **Course Code: AGUCBG607T**

Semester: VI

L	T	P	C
1	0	0	1

Objective:

- Develop a deep comprehension of greenhouse and controlled environment agriculture techniques.
- Value-added agricultural activities beyond primary production, such as processing, packaging, and marketing.
- Acquire practical skills in designing, managing, and operating protected cultivation systems
- Explore innovative and sustainable practices within protected cultivation and secondary agriculture, considering resource efficiency, environmental impact, and economic viability.

Course Syllabus (Theory)

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. Green house equipments, materials of construction for traditional and low cost green houses. Irrigation systems used in greenhouses, typical applications, passive solar green house, hot air green house heating systems, green house drying. Cost estimation and economic analysis. Important Engineering properties such as physical, thermal and aero & hydrodynamic properties of cereals, pulses and oilseed, their application in PHT equipment design and operation. Drying and dehydration; moisture measurement, EMC, drying theory, various drying method, commercial grain dryer (deep bed dryer, flat bed dryer, tray dryer, fluidized bed dryer, recirculatory dryer and solar dryer). Material handling equipment; conveyer and elevators, their principle, working and selection..

Syllabus organised in Unit (Theory)

Unit	Content	Hours
1	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.	**4**
2	Green house equipments, materials of construction for traditional and low cost green houses.	**4**
3	Irrigation systems used in greenhouses, typical applications, passive solar green house, hot air green house heating systems, green house drying.	**4**
4	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	**4**
5	Drying and dehydration; moisture measurement, EMC, drying theory,	**4**

	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.	

Course Outcomes

- Enabling students to produce high-quality crops in controlled environments and mitigate environmental challenges.
- 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.
- Gain the ability to analyze and address challenges in protected cultivation and secondary agriculture,.
- Prepare students for careers in greenhouse farming, controlled environment agriculture,

Recommended Text Books/Reference Books

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

Course Title: Protected Cultivation and Secondary Agriculture Lab **Course Code: AGUCBG608P**

Semester: VI

L	T	P	C
0	0	2	1

Objective:

- Develop hands-on proficiency in setting up and managing greenhouse systems, including temperature and humidity control, irrigation management, and pest control strategies.
- Acquire practical knowledge of crop-specific cultivation practices within protected environments
- Gain practical experience in post-harvest handling, processing, and value addition techniques, including grading, sorting, packaging, and preservation methods.
- Apply practical insights to explore opportunities in agribusiness and entrepreneurship related to protected cultivation and secondary agriculture

Course Syllabus (Practical)

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

Syllabus organised in Unit (Practical)

Topics	Description with Practical Applications	Hours
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.	**2**
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.	**2**
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.	**2**
Determination of engineering properties (shape and size, bulk density and porosity of	Determining engineering properties and moisture content of biomaterials helps engineers design efficient handling systems and storage	**2**

biomaterials). Determination of Moisture content of various grains by moisture meter.	structures, optimizing agricultural processes and reducing wastage	
Field visit to seed processing plant.	A field visit to a seed processing plant provides firsthand insights into seed cleaning, grading, and treatment methods.	**2**

Course Outcomes

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

Syllabus for B.Sc. (Hons.) Agriculture

Course Title: Diseases of Field and Horticultural Crops and their Management-II **Course Code: AGUCBG608T**

Semester: VI

L	T	P	C
3	0	0	3

Objective:

To familiarize the students about the causal organism, symptomatology, etiology and epidemiology of the important diseases of field and horticulture crops for devising efficient management strategies against them.

Course Syllabus (Theory)

Symptoms, etiology, disease cycle and management of following diseases:
Field Crops: Wheat: rusts, loose smut, karnal bunt, powdery mildew, alternaria blight, and ear cockle; Sugarcane: red rot, smut, wilt, grassy shoot, ratoon stunting and Pokkah Boeng; Sunflower: Sclerotinia stem rot and Alternaria blight; Mustard: Alternaria blight, white rust, downy mildew and Sclerotinia stem rot; Gram: wilt, grey mould and Ascochyta blight; Lentil: rust and wilt; Cotton: anthracnose, vascular wilt, and black arm; Pea: downy mildew, powdery mildew and rust. Horticultural Crops: Mango: anthracnose, malformation, bacterial blight and powdery mildew; Citrus: canker and gummosis; Grape vine: downy mildew, Powdery mildew and anthracnose; Apple: scab, powdery mildew, fire blight and crown gall; Peach: leaf curl. Strawberry: leaf spot Potato: early and late blight, black scurf, leaf roll, and mosaic; Cucurbits: downy mildew, powdery mildew, wilt; Onion and garlic: purple blotch, and Stemphylium blight; Chillies: anthracnose and fruit rot, wilt and leaf curl; Turmeric: leaf spot Coriander: stem gall Marigold: Botrytis blight; Rose: dieback, powdery mildew and black leaf spot

Syllabus organised in Unit (Theory)

Unit	Content	Hours
1	Symptoms, etiology, 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	4
2	Symptoms, etiology, 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.	4
3	Symptoms, etiology, disease cycle and management of Mango: anthracnose, malformation, bacterial blight and powdery mildew; Citrus: canker and gummosis; Grape vine: downy mildew, Powdery mildew and anthracnose; Apple: scab, powdery mildew, fire blight and crown gall; Peach: leaf curl. Strawberry: leaf spot Potato: early and late blight, black scurf, leaf roll, and mosaic;	4
4	Symptoms, etiology, disease cycle and management of Cucurbits: downy	4

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

Course Outcomes

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

Recommended Text Books/Reference Books

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

Course Title: Diseases of Field and Horticultural Crops and their Management Lab **Course Code: AGUCBG608P**

Semester: VI

L	T	P	C
0	0	2	1

Objective:

- To get actual practical experience in applying the improved technology for obtaining maximum production
- To study the operations wise labour requirement and cost of each operation.
- To study the input requirement for cultivation of allotted crop.
- To study the constraints encountered for cultivation of crop under given set of field and climatic condition.
- To study benefit cost ratio.
- To develop confidence among the students.
- To develop research attitude in the students

Course Syllabus (Practical)

Identification and histopathological studies of selected diseases of field and horticultural crops covered in theory. Field visit for the diagnosis of field problems. Collection and preservation of plant diseased specimens for herbarium.

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

Syllabus organised in Unit (Practical)

Topics	Description with Practical Applications	Hours
Identification and histopathological studies of selected diseases of field and horticultural crops covered in theory. Field visit 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 on herbarium sheets with accurate labelling. This aids future study, reference, and research on plant diseases.	**2**

Course Outcomes

- Students will be adept at recognizing and understanding diseases in field and horticultural crops.
- The field visit component enhances their practical skills, enabling them to diagnose real-world field issues accurately.

- As a result, students will gain comprehensive knowledge and proficiency in managing crop diseases effectively.
- students will master the collection, proper documentation, and preservation techniques of plant diseased specimens for herbarium use

Course Title: Management of Beneficial Insects **Course Code: AGUCBG609T**

Semester: VI

L	T	P	C
1	0	0	1

Objective:

The management of beneficial insects involves the intentional use of these insects to control pest populations in agriculture and horticulture. This approach is known as biological control or biocontrol. Beneficial insects include predators, parasitoids, and pollinators.

Course Syllabus (Theory)

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. Types of silkworm, 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. 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 pollinator, weed killers and scavengers with their importance.

Syllabus organised in Unit (Theory)

Unit	Content	Hours
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.	**4**
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.	**4**
III	Species of lac insect, morphology, biology, host plant, lac production – seed lac, button lac, shellac, lac- products. Enemies of lac insects.	**4**
IV	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 pollinator, weed killers and scavengers with their importance.	**4**

Course Outcomes

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

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

Recommended Text Books

- A text book of Applied Entomology, Vol. II by K. P. Srivastava and G. S. Dhaliwal, Kalyani Publisher
- Elements of Economic Entomology by B. V. David and V. V. Rammurthy. Namrutha Publications (7th Edition)

Recommended Reference Books

- Principles of Applied Entomology by K. N. Ragumoorthy, M. R. Srinivasan, V. Balasubramani and N. Natarajan Published by A. E. Publication, Coimbatore
- 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.

Syllabus for B.Sc. (Hons.) Agriculture

Course Title: Problematic Soils and their Management **Course Code: AGUCBG610T**

Semester: VI

L	T	P	C
1	0	0	1

Objective:

- Understand the characteristics and types of problematic soils, including saline, sodic, and acidic soils, and their impacts on plant growth.
- Learn practical strategies and techniques for soil reclamation and amelioration, aiming to enhance soil structure, fertility, and water-holding capacity.
- Develop proficiency in diagnosing soil-related issues, recommending appropriate management practices.
- Gain insights into the broader environmental implications of soil degradation and the role of effective management in preserving ecosystems and ensuring food security.

Course Syllabus (Theory)

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

Syllabus organised in Unit (Theory)

Unit	Content	Hours
1	Soil quality and health, Distribution of Waste land and problem soils in India.	4
2	Their categorization based on properties. Reclamation and management of Saline and sodic soils, Acid soils, Acid Sulphate soils, Eroded and Compacted soils, Flooded soils, Polluted soils.	4
3	Irrigation water – quality and standards, utilization of saline water in agriculture.	4
4	Remote sensing and GIS in diagnosis and management of problem soils	4
5	Multipurpose tree species, bio remediation through MPTs of soils, land capability and classification, land suitability classification. Problematic soils under different Agro-ecosystems	4

Course Outcomes

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

Recommended Text Books

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

Syllabus for B.Sc. (Hons.) Agriculture

Course Title: Hi-tech. Horticulture **Course Code: AGUBG6101T**

Semester: VI

L	T	P	C
1	0	0	1

Objective:

To scope of hi-tech horticulture in India, Hi-tech nursery management, Micropropagation of horticultural crop, hi-tech field preparation and planting methods, Mechanized harvesting produce, Remote sensing & geographical information system.

Course Syllabus (Theory)

Introduction, importance & scope of hi-tech horticulture in India, Hi-tech nursery management & mechanization of horticultural crops, Micro-propagation of horticultural crops, hi-tech field preparation and planting methods, Protected cultivation: Advantage & constraints, Environmental control in green house- temperature, light, Co2, relative humidity and ventilation methods & techniques. Micro irrigation systems & its components, EC/pH based irrigation/ fertigation scheduling. Hi-tech canopy management of horticultural crops. High density orcharding in Mango, guava, papaya, citrus, pineapple etc . Remote sensing & geographical information system. Differential geo-positioning system (DGPS). Component of precision farming & application of precision farming in horticultural crops (fruit, vegetables & ornamental crops 2 crops each). Mechanized harvesting produce. Post-harvest management for export

Syllabus organised in Unit (Theory)

Unit	Content	Hours
1	Introduction, importance & scope of hi-tech horticulture in India, Hi-tech nursery management & mechanization of horticultural crops, Micro-propagation of horticultural crops, hi-tech field preparation and planting methods.	4
2	Protected cultivation: Advantage & constraints, Environmental control in green house- temperature, light, Co2, relative humidity and ventilation methods & techniques. Micro irrigation systems & its components, EC/pH based irrigation/ fertigation scheduling.	4
3	Hi-tech canopy management of horticultural crops. High density orcharding in Mango, guava, papaya, citrus, pineapple etc . Remote sensing & geographical information system. Differential geo-positioning system (DGPS).	4

4	Component of precision farming & application of precision farming in horticultural crops (fruit, vegetables & ornamental crops 2 crops each). Mechanized harvesting produce. Post-harvest management for export.	**4**

Course Outcomes

- St 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
- Higher production per unit area Productivity of fruits, vegetables , flowers, medicinal, plantation & spices crops per unit area can be achieves by using hi-tech horticulture technologies.
- Higher income or high return Higher income or high return from horticulture produce can be achieved by using hi-tech horticulture technologies
- 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 extentr

Recommended Text Books

- Hi-tech Horticulture- T.A.More, MPKV,Rahuri Balraj Singh,2005: Protected cultivation of vegetable crops.Kalyani publication
- Patil M.T. & Patil,P.V.,2004 Commercial Protected Floriculture.MPKV,Rahuri
- Commercial floriculture- Prasad & kumar
- Green house operation & Management: Paul V. Nelson
- Singh, R.S.1999. Diseases of vegetable crops. Oxford & IBH Publications, New Delhi
- Chaube, H.S and V.S. Pundhir,2012. Crop Diseases & Their Management. PHI Pvt. Ltd., New Delhi

Course Title: Hi-tech. Horticultural Lab **Course Code: AGUBG6101P**

Semester: VI

L	T	P	C
0	0	2	1

Objective:

- To get actual practical experience in applying the improved technology for obtaining maximum production
- To study the operations wise labour requirement and cost of each operation.
- To study the input requirement for cultivation of allotted crop.
- To study the constraints encountered for cultivation of crop under given set of field and climatic condition.
- To study benefit cost ratio.
- To develop confidence among the students.
- To develop research attitude in the students.

Course Syllabus (Practical)

Types of polyhouses and shade net houses, Intercultural operations, tools and equipments identification and application, Micro propagation, Nursery-protrays, microirrigation, EC, pH based fertilizer scheduling, canopy management, visit to hi-tech orchard/nursery
Note: Students should submit 50 pressed and well-mounted specimens.

Syllabus organised in Unit (Practical)

Topics	Description with Practical Applications	Hours
Types of polyhouses and shade net houses	Naturally ventilated and fan-and-pad ventilated types, utilized for controlled cultivation of various crops.	**2**
Intercultural operations	involve weeding, hoeing, and thinning among crops to optimize spacing, reduce competition, and promote healthier growth.	**2**
Tools and equipments identification and application	Tools and equipment like plows, hoes, and seeders is vital in modern agriculture.	**2**
Micro propagation	Is applied to rapidly produce large numbers of disease-free and genetically identical plants from small plant tissue samples,	**2**
Nursery-protrays	promotes uniform growth, simplifying transplanting, and optimizing space utilization in commercial plant nurseries.	**2**
Micro-irrigation	efficiently deliver water directly to plant roots, reducing water wastage and enhancing crop	**2**

	yields	
EC, pH based fertilizer scheduling	optimizes nutrient delivery in soil, tailoring fertilization to match plant needs, fostering efficient nutrient uptake.	**2**
Canopy management	involves pruning, training, and thinning plants to control growth,	**2**
Visit to hi-tech orchard/nursery	enabling learners to observe and learn about precision farming, innovative technologies, and modern management practices.	**2**

Course Outcomes

- Operate and understand cutting-edge tools and technologies used in horticulture, enhancing hands-on skills.
- Apply precision farming techniques, such as controlled environment agriculture and automated irrigation, to optimize crop growth, quality, and resource utilization.
- Innovative solutions for crop management, disease control, and sustainable production, demonstrating proficiency in applying novel approaches to real-world challenges.
- Integrating knowledge of hi-tech practices, fostering innovation, and helping drive the sector towards increased efficiency, sustainability, and competitiveness.

Syllabus for B.Sc. (Hons.) Agriculture

Course Title: Micro propagation technologies **Course Code: AGUBG6102T**

Semester: VI

L	T	P	C
1	0	0	1

Objective:

- Gain a comprehensive understanding of tissue culture methods, protocols, and principles for rapidly multiplying plants under sterile conditions.
- Learn to design and optimize tissue culture protocols for specific plant species, considering factors like explant selection, medium composition, and growth regulators.
- Explore how micropropagation contributes to disease-free, genetically uniform plants, supporting horticultural and agricultural industries.
- Develop skills to apply micropropagation for rare or endangered species conservation, rapid multiplication of elite cultivars.

Course Syllabus (Theory)

Introduction, History, Advantages and limitations; Types of cultures (seed, embryo, organ, callus, cell), Stages of micropropagation, Axillary bud proliferation (Shoot tip and meristem culture, bud culture), Organogenesis (callus and direct organ formation), Somatic embryogenesis, cell suspension cultures, Production of secondary metabolites, Somaclonal variation, Cryopreservation.

Syllabus organised in Unit (Theory)

Unit	Content	Hours
1	Introduction, History, Advantages and limitations; Types of cultures (seed, embryo, organ, callus, cell), Stages of micropropagation.	**4**
2	Axillary bud proliferation (Shoot tip and meristem culture, bud culture),	**4**
3	Organogenesis (callus and direct organ formation), Somatic embryogenesis, cell suspension cultures,	**4**
4	Production of secondary metabolites, Somaclonal variation, Cryopreservation.	**4**

Course Outcomes

- Students learn about the physiological processes behind plant growth and development. Through micropropagation
- Micropropagation technology opens up research opportunities for students to investigate plant responses to different growth factors and stressors.
- Studying micropropagation introduces students to the practical applications of plant propagation in agriculture, horticulture, and environmental conservation.
- They can understand how this technology is used to propagate rare and endangered plants, create disease-free planting material, and increase agricultural productivity.

Recommended Text Books

- Plants from Test Tubes: An introduction to Micro-propagation (Fourth Edition) – Lydiane Kyte, John Kleyn, Holly Scoggins and Mark Bridgen (Timber Press)
- Introduction top Plant Tissue Culture- M. K. Razdan (Science Publisher)
- Somatic Embryogenesis: Fundamental Aspects and Application – Loyola-Vargas, Victor, OchoaAleja, Neftali (Springer)
- Plant Tissue Culture, Techniques and Experiment – Robert H Smith (AP)
- Plant Tissue Culture- Protocols in Plant Biotechnology - M.C. Gayatri and R. Kavyashree (Narosa Publishing)
- Practical biotechnology and Plant Tissue Culture- Prof. Santosh Nagar, Dr. Madhavi Adhav (S Chand)

Course Title: Micro propagation technologies Lab **Course Code: AGUBG6102P**

Semester: VI

L	T	P	C
0	0	2	1

Objective:

- Laboratory organization of Plant Tissue Culture Laboratory
- Safety Measures in Laboratory
- Sterilization techniques: Common Contaminant in Laboratory, Sterilization of glassware, Working of Laminar air flow cabinet
- Culture Media: Definition, Components of Media, Stock Solution, Working Solution, Sterilization of Media
- Callus induction from different parts of plants
- Regeneration of whole plants from induced callus using different parts of plants.
- Induction of somatic embryos

Course Syllabus (Practical)

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

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

Syllabus organised in Unit (Practical)

Topics	Description with Practical Applications	Hours
Laboratory organization of Plant Tissue Culture Laboratory	Maintain aseptic conditions with clean benches, proper attire, and regular sanitization to prevent contamination. Arrange workstations logically, equip with necessary tools,	**2**
Safety Measures in Laboratory	Adhere to wearing lab coats, gloves, and safety goggles Employ proper ventilation, label all containers, and follow protocols for safe storage, usage of chemical.	**2**
Culture Media: Definition, Components of Media, Stock Solution, Working Solution, Sterilization of Media	mix components like nutrients, salts, and growth factors to create consistent culture media, ensuring optimal conditions for experiments.	**2**
Preparation and sterilization of growth regulators/thermolabile	Dilute growth regulators or thermolabile compounds with precision to achieve specific concentrations.	**2**

compounds	Utilize sterile filtration techniques to remove contaminants.	
Preparation of working medium	Measure specific nutrient components according to the recipe for the working medium. Combine components aseptically to create a contamination-free working medium.	**1**
Experimentation on determining optimum concentration of growth regulators.	Using varying concentrations of growth regulators to observe their effects on plant growth,	**2**
Sterilization techniques for explants	Treat explants with appropriate disinfectants and sterilizing agents to eliminate surface contaminants.	**2**
Callus induction from different parts of plants	Inducing callus from different plant parts enables the assessment of tissue-specific regeneration potential.	**2**
Regeneration of whole plants from induced callus using different parts of plants. Induction of somatic embryos.	Preservation of valuable plant germplasm by regenerating plants from callus,	**1**
Experiments of synthetic seeds production and testing storability and germination efficiency.	Conducting experiments on synthetic seed production and testing their storability and germination efficiency	**2**
Direct regeneration into whole plants using bud, node and other tissues.	Rapid Clonal Propagation and Commercial Nursery Production rapid multiplication of desirable plant varieties for sale, enhancing the availability of quality plants	**2**

Course Outcomes

- Gain practical experience in sterile laboratory techniques, media preparation, and aseptic culture practices.
- Understand how to control plant growth through hormonal regulation, experimenting with various growth regulators.
- Preserving and multiplying plant germplasm, contributing to genetic diversity preservation and facilitating the conservation of rare and endangered species.
- Apply micro propagation technologies to address real-world challenges, such as disease-free plant production, mass propagation of elite cultivars,

Syllabus for B.Sc. (Hons.) Agriculture

Course Title: Agricultural Waste Management **Course Code: AGUCBG6103T**

Semester: VI

L	T	P	C
1	0	0	1

Objective:

To impart knowledge to students on various methods of agricultural waste management for eco-friendly energy and manure production.

Course Syllabus (Theory)

Definition- Solid waste suitable for composting – Methods of composting – vermicomposting. Mineralization process in composting – Biochemistry of composting – Factors involved -Infrastructure required – maturity parameters – value addition – application methods. Definition – potential agro residues and their characteristics for briquetting – fundamental aspects and technologies involved in briquetting – economic analysis of briquetting – setting up of briquetting plant- appliances for biomass briquettes. Screening of suitable lingo cellulosic substrate for biogas production -determination of bio-energy potential of agro-waste by estimating total solids – volatile solids. Calorific value- per cent total carbohydrates, moisture, lignin and cellulosic contents – preparation of feed stocks for anaerobic bio- digestion – types of digesters – factors affecting –nutrient value and utilization of biogas slurry. Ethanol production from lingo cellulosic wastes–Processing of Biomass to Ethanol-pretreatment-fermentation-distillation.

Syllabus organised in Unit (Theory)

Unit	Content	Hours
1	Definition- Solid waste suitable for composting – Methods of composting – vermicomposting	4
2	Mineralization process in composting – Biochemistry of composting – Factors involved -Infrastructure required – maturity parameters – value addition – application methods.	4
3	Definition – potential agro residues and their characteristics for briquetting	4

	– fundamental aspects and technologies involved in briquetting – economic analysis of briquetting – setting up of briquetting plant- appliances for biomass briquettes	
4	Screening of suitable lingo cellulosic substrate for biogas production - determination of bio-energy potential of agro-waste by estimating total solids – volatile solids –	**4**
5	Calorific value- per cent total carbohydrates, moisture, lignin and cellulosic contents – preparation of feed stocks for anaerobic bio- digestion – types of digesters – factors affecting –nutrient value and utilization of biogas slurry	**3**
6	Ethanol production from lingo cellulosic wastes–Processing of Biomass to Ethanol-pretreatment-fermentation-distillation.	**3**

Course Outcomes

At the end of the course student will be able to understand

- Various eco-friendly methods for agricultural waste management.
- Nutritive value and energy production potential of agro wastes.

Recommended text books

- Raymond C Loehr, Agricultural Waste Management- problems, processes and approaches. First edition, Academic press, 1974.
- Diaz, l.F.M. de Bertoldi and W. Bidlingmaier. 2007. Compost science and technology, Elsevier pub., PP.1-380.
- Uta Krogmann, Ina Korne and Luis F. Diaz.2010. Solid waste technology and management (Vol 1 and2). Blackwel Pub Ltd., Wiley Online library.
- Yong Sik Ok, Sophie M. Uchimiya, Scott X. Chang, Nanthi Bolan., Biochar-production characterization and applications. 2015. CRC press
- P.D. Grover and S.K. Mishra, Biomass Briquetting: Technology and Practices. Published by FAO Regional Wood Energy Development Programme in Asia, Bangkok, Thailand, 1996.
- Magdalena Muradin and Zenon Foltynowicz, Potential for Producing Biogas from Agricultural Waste in Rural Plants in Poland. Sustainability, 2014, 6, 5065-5074.
- Biochar production from agricultural wastes via low-temperature microwave carbonization

Syllabus for B.Sc. (Hons.) Agriculture

Course Title: Soil, Plant, Water and Seed Testing **Course Code: AGUBG104T**

Semester: VI

L	T	P	C
1	0	0	1

Objective:

- To develop understanding regarding major techniques for analysis.
- To develop understanding related to correct interpretation of results

Course Syllabus (Theory)

Principle of pH meter, EC meter, spectrophotometer, flame photometer and AAS. Soil analysis: Objectives, sampling of soil, procedure and precautions. Determination of texture, bulk density. Interpretation of analytical data viz., pH, EC, organic carbon, N, P, K, S and micronutrients (Fe, Mn, Zn, Cu, B) and nutrient index. Plant analysis: Sampling stages and plant part to be sampled. Analysis of nutrients, Quantitative rating of plant analysis data and interpretation of results, critical nutrient concentration, critical nutrient ranges. Water analysis: Quality criteria, classification and suitability of irrigation water and water quality index. Seed: Introduction, definition and importance, seed germination, viability, vigor and storage. Use of soil testing kit for major and micronutrient analyzer

Syllabus organised in Unit (Theory)

Unit	Content	Hours
1	**Major techniques:** Principle of pH meter, EC meter, spectrophotometer, flame photometer and AAS. Soil analysis: Objectives, sampling of soil, procedure and precautions	4
2	Determination of texture, bulk density. Interpretation of analytical data viz., pH, EC, organic carbon, N, P, K, S and micronutrients (Fe, Mn, Zn, Cu, B) and nutrient index	4
3	Plant analysis: Sampling stages and plant part to be sampled. Analysis of nutrients, Quantitative rating of plant analysis data and interpretation of results, critical nutrient concentration, critical nutrient ranges	4
4	Water analysis: Quality criteria, classification and suitability of irrigation water and water quality index. Seed: Introduction, definition and importance, seed germination, viability, vigor and storage. Use of soil testing kit for major and micronutrient analyzer	4

Course Outcomes

- Soil testing and plant analyses have proven to be invaluable tools in the diagnosing of nutritional deficiencies and problems related to plant growth.
- Each advance in our basic understanding of plant physiology and soil chemistry, and each advance in instrumentation leads to improvements in methodology and interpretation.

Recommended Text Books

1. Methods of Soil Analysis, Part-2 – A. L. Page, R. H. Miller and R. Keeney, American Society of Agronomy and Soil Science, Society of America Publication, Madison, Wisconsin, USA (1982)
2. Analytical Agricultural Chemistry – S. I. Chopra and J. S. Kanwar, Kalyani Publishers (2014) 5. Seed Technology - R. L. Agarwal, Oxford & IBH Co. Pvt. Ltd., New Delhi (1997)

Recommended Reference Books

1. Soil Chemical Analysis – M. L. Jackson, Prentice Hall of India Pvt. Ltd. New Delhi (1973)
2. Soil and Plant Analysis – C. S. Piper, Scientific Publishers, India (2010)

Course Title: Soil, Plant, Water and Seed Testing Lab **Course Code: AGUBG6104P**

Semester: VI

L	T	P	C
0	0	2	1

Objective:

To develop understanding related to evaluation of fertility, available nutrients status of soil. Determination of acidity, salinity and alkalinity problems and Recommendation of the required amount of fertilizers. Lime or gypsum based on soil test value.

Course Syllabus (Practical)

Practical Standardization of solutions and reagents, collection and preparation of soil samples, estimation of pH, EC, organic carbon, NPKS, micronutrients, CEC and exchangeable sodium in soil. Determination of EC and pH of saturation extract/paste. Estimation of cations and anions. Plant sampling and sample preparation for analysis, digestion of plant material and estimation of N, P, K in plant. Rapid plant tissue test for N, P, and K. Determination of EC, pH, cations (Ca++, Mg++, Na+ , K+) and anions (B, CO3--, HCO3- , Cl-) in irrigation water . Computation of SAR and RSC. Seed quality testing: Germination, viability, moisture and vigor

Syllabus organised in Unit (Practical)

Topics	Description with Practical Applications	Hours
Practical Standardization of solutions and reagents	The solutions with known strength. Calibration of other solutions and reagents depends upon the accurate strength of these solutions. Prepared by using certain substances (known as standard substances) having typical characteristics.	**2**
Collection and preparation of soil samples	Procedure of sample collection and preparation	**2**
Estimation of pH, EC, organic carbon, NPKS, micronutrients, CEC and exchangeable sodium in soil.	Determination by demonstration by EC meter, pH meter	**4**
Determination of EC and pH of saturation extract/paste. Estimation of cations and anions	Preparation of saturation paste and its importance	**2**
Plant sampling and sample preparation for analysis, digestion of plant material and estimation of N, P, K in plant. Rapid plant tissue test for N, P, and K.	Detail understanding of dry ashing and wet digestion methods. Mineral Acids digestion, Open Vessel Acid Digestions, Closed Vessel Digestions, Microwave Digestions, Dry Ashing Techniques	**2**

Rapid plant tissue test for N, P, and K. Determination of EC, pH, cations (Ca++, Mg++, Na+ , K+) and anions (B, CO3--, HCO3- , Cl-) in irrigation water	For **Nitrogen** 1-% diphenylamine in conc. sulphuric , Acid, For **Phosphorous** Ammonium molybdate solution, Stannous chloride powder, For **Potassium** Sodium cobalt nitrate reagent, Ethyl alcohol (95%), For **Calcium Morgan's R** 30 ml of glacial acetic acid and 100 grams of sodium acetate are dissolved in a little of distilled water.	**2**
Computation of SAR and RSC	The **sodium adsorption ratio** (**SAR**) is an irrigation water quality parameter used in the management of sodium-affected soils. It is an indicator of the suitability of water for use in agricultural irrigation, as determined from the concentrations of the main alkaline and earth alkaline cations present in the water. The RSC index is used to find the suitability of the water for irrigation in clay soils which have a high cation exchange capacity.	**2**
Seed quality testing: Germination, viability, moisture and vigor	Seed testing is required to assess the seed quality attributes of the seed lots which have to be offered for sale. It includes seed moisture content, germination and vigour, physical and genetic purity, freedom from seed borne diseases and insect infestation should be understood by students	**4**

Course Outcomes

- Proficiency in hands-on testing methods for soil, plants, water, and seeds.
- Ability to interpret and apply test results for problem-solving in agriculture and environment.
- Effective communication of findings, promoting sustainable practices and ethical awareness