Detailed Course Scheme

Bachelor of Science (Hons.)

Agriculture

Semester-V

(2024- 28)

DOC202410100010

RNB GLOBAL UNIVERSITY

RNB Global City, Ganganagar Road,
Bikaner, Rajasthan 334601

OVERVIEW

RNB Global University follows Semester System along with Choice Based Credit System as per latest guidelines of University Grants Commission (UGC). Accordingly, each academic year is divided into two semesters, **Odd (July-December) and Even (January-June).** Also, the university follows a system of continuous evaluation along with regular updating in course curricula and teaching pedagogy.

The Curriculum for B. Sc Agriculture program for (July-December) Odd Semester 2026 along with examination pattern is as follows:

Course Scheme

Semester –V

S. No.	Course Code	Course Category	Course Name	L	T	P	Credits
1.	BSAC45300	AEC-14	Agricultural Marketing and Trade	2	0	0	2
2.	BSAC45301	AEC-15	Agricultural Marketing and Trade Lab	0	0	2	1
3.	BSAC57300	DSCMT-1a	Introduction to Agro-meteorology	1	0	0	1
4.	BSAC57301	DSCMT-1b	Introduction to Agro-meteorology Lab	0	0	2	1
5.	BSAC51152	DSCBI-1a	Fundamentals of Crop Physiology	2	0	0	2
6.	BSAC51153	DSCBI-1b	Fundamentals of Crop Physiology Lab	0	0	2	1
7.	BSAC44302	DSCEN-2a	Pest management in crops and stored grains	2	0	0	2
8.	BSAC44303	DSCEN-2b	Pest management in crops and stored grains Lab	0	0	2	1
9.	BSAC47304	DSCPP-2a	Diseases of Field and Horticultural Crops and their Management	2	0	0	2
10.	BSAC47305	DSCPP-2b	Diseases of Field and Horticultural Crops and their Management Lab	0	0	2	1
11.	BSAC42300	DSCPB-3a	Crop Improvement (kharif crops) – I	1	0	0	1
12.	BSAC42301	DSCPB-3b	Crop Improvement (kharif crops) – I Lab	0	0	2	1
13.	BSAE41003	DSCAG-7a	Weed Management	1	0	0	1
14.	BSAE41004	DSCAG-7b	Weed Management Lab	0	0	2	1
15.	BSAC48300	DSCHO-4a	Ornamental Crops, MAPs and Landscaping	1	0	0	1
16.	BSAC48301	DSCHO-4b	Ornamental Crops, MAPs and Landscaping	0	0	2	1
17.	BSAE41005	AEC-16	Farming based livelihood systems	2	0	0	2
18.	BSAE41006	AEC-17	Farming based livelihood systems Lab	0	0	2	1
19.	IAPC99347	IAPC-1	Summer Internship and Report	-	-	-	4
20.	WHNN99000		Workshop & Seminars / Human Value & Social Service / NSS	-	-	-	1
			Total	**14**		**18**	**28**

The students will register for online courses of 10 credit hours (as per UGC guidelines for online courses) as a partial requirement for the comprising one or more courses at the approved portals during the third and fourth years with prior approval from the Head of the institution.

EVALUATION SCHEME - THEORY

The evaluation of the theory paper of B.Sc. Agriculture program would be based on Internal and External Assessments. Internal Assessment would consist of 50% of the marks (50 marks) and external assessment (in form of End Term Exam) would consist of remaining 50% marks (50 marks). Detailed scheme of Internal and External Assessments as follows:

Internal Assessment

The distribution of Internal Assessment Marks is as follows:

Type	Details	Marks
Mid Term	Two Mid-term Sessional of 15 marks each (15+15)	30
Marks obtained in various Tests, Assignments, Presentations, Quiz, Tutorials, etc.	Average of marks obtained	15
Academic and course involvement		5
TOTAL	**50**	

External Assessment

Type	Marks
Theory	50

EVALUATION SCHEME - PRACTICAL

The evaluation of the practical paper of B.Sc. Agriculture program would be based on Internal and External Assessments. Internal Assessment would consist of 50% of the marks (50 marks) and external assessment (in form of End Term Exam) would consist of remaining 50% marks (50 marks). Detailed scheme of Internal and External Assessment is as follows:

Internal Assessment

Type	Details	Marks
Marks obtained in various manuals, practical file, participation, any model prepared, output of practical	Average of marks obtained	45
Academic and course involvement		5
TOTAL	**50**	

External Assessment

Type	Marks
Practical	50

1. Vision

Vision of School of Agriculture is to be established as advanced studies and research and skill-based centre for students and scholars.

2. Mission

Mission of School of Agriculture is to cultivate a scholarly mindset and analytical abilities in students, as well as train them in agricultural sphere, to reach the profession's daunting needs by providing dynamic knowledge in the field of agriculture.

3. Program Educational Objectives (PEOs)

After successful completion of the program, the graduates will be

AGPEO 1: Able to apply concepts of basic and applied sciences to Agriculture

AGPEO 2: Able to design and develop interdisciplinary and innovative systems.

AGPEO 3: Able to inculcate effective communication skills, team work, ethics, leadership in preparation for a successful career in agriculture and R&D organizations.

4. Program Outcomes (POs)

Students graduating with the B.Sc. (Hons.) Agriculture degree should be able to:

PO1. Agriculture knowledge: Apply the knowledge of basic and applied sciences to agriculture, agriculture fundamentals and agriculture specialization to the solution of complex agriculture problems. Apply the knowledge of regenerative agriculture with a conservation and rehabilitation approach to food and farming systems.

PO2. Problem analysis: Identify, formulate, review research literature, and analyze complex agriculture problems reaching substantiated conclusions using first principles of basic and applied sciences. Understand rapid appraisal of agricultural innovation systems, a diagnostic tool that can guide the analysis of complex agricultural problems and innovation capacity of the agricultural system towards futuristic agriculture.

PO3. Design/development of solutions: Design solutions for complex agriculture problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, social, and environmental considerations.

PO4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern agriculture and IT tools including prediction and modelling to complex agriculture activities with an understanding of the limitations. Learning use of GIS, IoT, Automation, Intelligent Systems in Farming & Agriculture development & trading.

PO6. The agriculture graduate and society: Apply reasoning informed by the contextual knowledge to assess social, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional agriculture practices. Recognize, analyze, and evaluate the critical human and social factors impacting agriculture. Understand the social dimensions of agriculture and its connections with food and environmental systems.

PO7. Environment and sustainability: Understand the impact of the professional agriculture solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.

PO8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the agriculture practice.

PO9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. Communication: Communicate effectively on complex agriculture activities with the agriculture community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. Project management and finance: Demonstrate knowledge and understanding of the agriculture and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments. Able to design, launch and run a new business, to create job and not to seek for job. Also capable with an effective mix of knowledge, skills, and personal attitudes to be employed initially and function successfully in the required roles.

PO12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

5. Program Specific Outcomes (PSOs)

At the end of the program, the student will be able to:

PSO 1. Clearly understand the concepts and applications in the field of agriculture. Apply the knowledge of crop cultivation, crop improvement, soil and crop management for sustainable organic agricultural production and development.

PSO 2. Associate the learning from the courses related to agriculture to arrive at solutions to real world problems. Analyze and identifying complex agricultural problems and formulating ethical solutions using the principles of agricultural science, and business.

PSO 3. Have the capability to comprehend the technological advancements in the usage of modern design tools to analyze and design subsystems/processes for a variety of applications. Develop innovative processes, products, and technologies to meet the challenges in agriculture and farming practices

PSO 4. Possess the skills to communicate in both oral and written forms, the work already done and the future plans with necessary road maps, demonstrating the practice of professional ethics and the concerns for social and environmental wellbeing.

6. Course Outcomes (COs)

Course	Course outcomes: - After completion of these courses students should be able to
BSAC45300-Agricultural Marketing and Trade	**CO1:** Identify and define the fundamental concepts of agricultural marketing, including market structures, segmentation, and the marketing mix relevant to agricultural products. **CO2:** Describe the factors affecting demand, supply, and producer's surplus for agricultural commodities, and explain the significance of marketable and marketed surplus in agricultural markets. **CO3:** Apply pricing and promotion strategies by comparing cost-based and competition-based pricing, and evaluate the effectiveness of advertising, personal selling, and other promotional methods in agricultural marketing. **CO4:** Analyze the marketing processes and functions, including storage, transport, grading, and branding, as well as the roles of different marketing channels and agencies in agricultural commodity distribution. **CO5:** Evaluate the impact of government institutions like FCI, APMC, and WTO agreements on agricultural markets, and assess the relevance of these policies in the context of current agricultural trade and pricing.
BSAC45301-Agricultural Marketing and Trade Lab	**CO1:** Define the basic concepts of agricultural marketing, including market structure, market segmentation, and the components of the marketing mix for agricultural commodities. **CO2:** Describe the factors influencing demand, supply, and producer's surplus in the agricultural sector, and identify the key elements affecting marketable surplus. **CO3:** Explain different pricing and promotional strategies, such as cost-based and competition-based pricing, and discuss the merits and demerits of advertising, personal selling, and other market promotion techniques in agricultural marketing. **CO4:** Analyze the roles and efficiencies of various agricultural marketing channels and market functionaries, and examine factors contributing to marketing costs, margins, and price spreads of farm commodities. **CO5:** Evaluate the impact of government policies, including the roles of APMC, WTO, and public institutions like FCI and CACP, on agricultural marketing and assess their relevance to the present-day agricultural market structure.

BSAC57300-Introduction to Agro-meteorology	**CO1:** Comprehend the fundamentals and scope of agricultural meteorology, including the composition, structure, and characteristics of the Earth's atmosphere **CO2:** Explain atmospheric weather variables such as pressure, wind, temperature, and solar radiation. **CO3:** Apply knowledge of atmospheric moisture concepts, precipitation processes **CO4:** Identify and assess the mechanisms of monsoon patterns and their critical role in Indian agriculture, as well as extreme weather hazards such as drought, floods, cyclones, and heat waves, and their effects on agricultural activities. **CO5:** Understand climate change, global warming, and climatic variability, along with their implications for agriculture. Develop the ability to utilize different types of weather forecasting and modify crop microclimates for sustainable agricultural planning.
BSAC57301-Introduction to Agro-meteorology Lab	**CO1:** Develop expertise in setting up an agro-meteorological observatory, selecting appropriate sites, exposing instruments, and accurately recording various weather parameters critical for agricultural applications. **CO2:** Measure and analyze solar radiation components (total, shortwave, longwave) using Planck's intensity law, estimate radiation intensity with the BSS, and compute albedo and sunshine duration to understand energy distribution and its effects on crop growth. **CO3:** Acquire skills in measuring air and soil temperatures, vapor pressure, relative humidity, and dew point. Conduct trend and variation analysis of temperature data and compute soil heat flux to support crop-weather relationship studies. **CO4:** Measure and interpret atmospheric pressure, wind speed, and direction, including windrose preparation. Record and analyze precipitation data, open pan evaporation, and evapotranspiration; calculate Potential Evapotranspiration (PET) and Actual Evapotranspiration (AET) for effective crop water management. **CO5:** Utilize synoptic charts, weather reports, and forecasting techniques. Develop a crop weather calendar based on forecast data to support agricultural decision-making and enhance weather-resilient crop planning.

BSAC51152-Fundamentals of Crop Physiology	**CO1:** Understand the principles of plant and crop physiology, including water relations, nutrient transport, and the physiological roles of essential elements, to explain their significance in crop growth and development.*)* **CO2:** Apply knowledge of physiological processes such as diffusion, osmosis, water absorption, and water loss (transpiration, guttation) to evaluate water use efficiency and plant hydration strategies. **CO3:** Analyze the structure and function of the photosynthetic apparatus, including pigment systems, light reactions, and carbon fixation pathways (C3, C4, CAM), to examine their roles in plant productivity and adaptation. **CO4:** Evaluate the impact of plant hormones and growth regulators (PGRs) on plant processes such as growth, development, senescence, and abscission, and recommend agricultural practices for crop management. **CO5:** Create experimental setups using techniques like hydroponics, sand culture, and aeroponics to demonstrate the role of environmental factors, such as light, temperature, and photoperiod, on plant growth and physiological responses.
BSAC51153-Fundamentals of Crop Physiology Lab	**CO1:** Understand the structural and functional characteristics of stomata, water relations in plants (imbibition, osmosis, plasmolysis, water potential), and nutrient requirements **CO2:** Apply practical techniques such as tissue testing, hydroponics, and identification of nutrient deficiency and toxicity **CO3:** Analyze physiological processes like photosynthesis, respiration, and transpiration by estimating pigments and rates to evaluate plant performance under various conditions. **CO4:** Evaluate the effects of plant growth regulators (PGRs) and hormonal control on senescence, abscission, and growth **CO5:** Compare the anatomical differences between C3 and C4 plants and demonstrate their adaptive strategies through hands-on analysis to illustrate variations in photosynthetic pathways.
BSAC44302-Pests Management in Crops and Stored Grain	**CO1:** Explain the identification, taxonomy, host range, biology and bionomics, nature of the damage. **CO2:** Apply the ecological approach to insect pest management. **CO3:** Explainthetechniquetooperatevariouspesticideappliancesasaknap-sack sprayer, foot sprayer, aerosol, fumigators, etc, for pesticide application. **CO4:** Build crop-wise IPM modules for sustainable agriculture and Storage structure and methods of grain storage to minimize the risk of food security. **CO5:** Importance of Storage structure and methods of grains to rage.

BSAC44303-Pests Management in Crops and Stored Grain Lab	**CO1:** Identification of major insect pests of crops and their damage symptoms. **CO2:** Methods of monitoring & Management strategies of insect pests of different crops. **CO3:** Study on structural entomology and household pests. **CO4:** Spraying techniques for selected field and horticultural crops. **CO5:** Vertebrate pest management, Mass multiplication
BSAC47304-Diseases of Field and Horticultural Crops and their Management	**CO1:** Find common pathogens of different diseases in the crops. **CO2:** Interpret the knowledge about etiology and diagnosis the symptoms of diseases in field and horticultural crops. **CO3:** Identify different culture, techniques, biology of pathogens in the laboratory. **CO4:** Apply Eco-friendly and economically suitable management practices. **CO5:** Solve the problem of diseases affecting the farmer's field.
BSAC47305-Diseases of Field and Horticultural Crops and their Management Lab	**CO1:** Recall the symptoms, causes, and histopathological characteristics of major diseases affecting field and horticultural crops. **CO2:** Explain the relationships between pathogens and their host plants by identifying key symptoms of diseases. **CO3:** Apply integrated disease management strategies using fungicides, antibiotics, and bio-pesticides for effective control of diseases in field and horticultural crops. **CO4:** Analyze field samples and classify plant diseases by their symptoms and causal agents during field visits, and suggest appropriate diagnostic and management measures. **CO5:** Develop a herbarium of collected diseased plant specimens and design innovative disease management approaches combining conventional and biotechnological tools.
BSAC42300-Crop Improvement-I (Kharif Crops)	**CO1:** Recall the evolutionary history of important field crops along with their centre of origin, its wild species and wild relatives that can be utilized in crop improvement. **CO2:** Identify Genetic basis and methods of breeding in cross pollinated crops and modes of selection. **CO3:** Build the understanding of germplasm conservation, utilization, and genetics of qualitative. **CO4:** Elaborate breeding procedures, methods and breeding objectives in different crop which is important for the development of improved varieties. **CO5:** Recall the evolutionary history of important field crops.

BSAC42301-Crop Improvement-I (Kharif Crops) Lab	**CO1:** Define important agronomic experiments of Kharif crops at experimental farms. **CO2:** Explain morphological characteristics of kharif crops. **CO3:** Experiment with study of yield contributing characters of kharif season crops, **CO4:** Analyse sowing methods kharif crops, identifications of weed in kharif season. Recommend visit to research stations of related crops. **CO5:** Evaluate quality characters in Kharif crops, such as yield, stress tolerance, and nutritional quality, and identify donor parents for breeding different desirable traits.
BSAE41003-Weed Management	**CO1:** Analyze the characteristics, classification, and harmful effects of weeds on ecosystems. **CO2:** Demonstrate various weed management techniques including physical, cultural, chemical, and biological methods. **CO3:** Understand and manage herbicide resistance, weed shifts, and precision weed management technologies. **CO4:** Evaluate the role of herbicides, their properties, and application in weed control. **CO5:** Apply integrated weed management strategies to different cropping systems.
BSAE41004-Weed Management Lab	**CO1:** Identify and classify weeds in different agricultural and natural ecosystems. **CO2:** Understand the biology and life cycles of major weeds and their ecological impact. **CO3:** Apply various herbicide formulations, mixtures, and methods of application for effective weed control. **CO4:** Calibrate herbicide application equipment and calculate correct doses for precise weed management. **CO5:** Manage problem weeds and parasitic species using integrated weed management strategies.

BSAC48300-Ornamental Crops, MAPs and Landscaping	**CO1:** Understand and articulate the economic and ecological importance of medicinal, aromatic, and ornamental plants, identifying their applications in health, industry, and landscape aesthetics. **CO2:** Apply production techniques specific to medicinal plants (e.g., ashwagandha, costus, isabgol, geranium) and aromatic plants (e.g., lemongrass, citronella, vetiver), demonstrating skills in planting, cultivation, and post-harvest management. **CO3:** Demonstrate knowledge of propagation, maintenance, and harvesting techniques for various cut and loose flowers such as roses, gerberas, orchids, marigolds, and jasmine, ensuring quality and productivity in open-field conditions. **CO4:** Apply fundamental landscaping principles to design and maintain aesthetically pleasing and ecologically sound landscapes, effectively incorporating trees, shrubs, climbers, and herbaceous borders into cohesive outdoor spaces. **CO5:** Able to assess, recommend, and perform basic processing and value-addition techniques for ornamental and medicinal plant produce, enhancing product quality and exploring potential commercial applications
BSAC48301-Ornamental Crops, MAPs and Landscaping Lab	**CO1:** Identify various medicinal, aromatic, and ornamental plants, including trees, shrubs, climbers, seasonal flowers, and houseplants, based on key morphological characteristics and uses. **CO2:** Demonstrate propagation techniques for medicinal, aromatic, and ornamental plants, including methods such as terminal cuttings, herbaceous cuttings, and division, with specific skills in handling plants like Anthurium, orchids, bougainvillea, gerbera, and gladiolus. **CO3:** Prepare nursery beds and sow seasonal flower seeds, ensuring optimal conditions for germination and growth in nursery management practices. **CO4:** Implement techniques for establishing and maintaining lawns, including bed preparation, planting, and upkeep, along with the use of flower preservatives to extend the vase life of cut flowers. **CO5:** Perform training and pruning on ornamental plants, establish hedges and edges, and develop plans for garden layouts that incorporate aesthetic principles and practical considerations in landscape design.

BSAE41005-Farming based livelihood systems	**CO1:** Analyze the status of agriculture and livelihood systems in India by identifying key indicators to evaluate rural and urban livelihood patterns. **CO2:** Explain the components, approaches, and frameworks of agricultural livelihood systems, and differentiate between traditional and modern farming systems. **CO3:** Evaluate the feasibility of integrating various farming components (e.g., livestock, aquaculture, and agroforestry) within specific agro-climatic zones to promote sustainable livelihoods. **CO4:** Design and propose innovative farming-based livelihood models and enterprises, incorporating insights from NABARD, ICAR, and case studies, to address contemporary challenges like climate change and digitalization. **CO5:** Assess the impact of government schemes, programs, and public-private collaborations in promoting farming-based livelihood opportunities and their role in advancing a circular and green economy.
BSAE41006-Farming based livelihood systems Lab	**CO1:** Identify and classify diverse farming systems and agricultural-based livelihood enterprises prevalent in various agro-climatic zones. **CO2:** Analyze the components, production, and profitability of crop-based, livestock-based, and integrated farming-based livelihood models. **CO3:** Evaluate the functional aspects of agri-based enterprises, focusing on their integration of production, processing, and distribution sectors within value chain models. **CO4:** Develop project proposals for farming-based livelihood systems, incorporating cost and profit analysis for sustainable enterprise management. **CO5:** Investigate case studies of start-ups in the agricultural sector to understand innovation, risk management, and success factors in modern agri-enterprises.

WHNN99000-Workshop & Seminars / Human Value & Social Service / NSS	**CO1:** Relate to the concept of cognitive development and Big Five personality characteristics. Explain the basic fundamentals of Emotional Intelligence. **CO2:** Develop ability to practice new problem-solving skills in a group and use these skills in personal life. Build coping strategies and adapt balanced self- determined behaviour. **CO3:** Find about the working and mechanism of human nature. Classify and explain group behavior at organizational level and individual level. **CO4:** Organize and plan organizational change and stress management practices. Discover various human values and their importance in real world. **CO5:** Create leadership skills to be effective leader and evaluate the hierarchy of human values.

7. CO PO Mapping

BSAC45300	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		3	2	3		2	3	3	2	3	2	
CO2	2	2	3	2		2		2	3	3	3	3
CO3	3	2		2	3	2	3	2			2	3
CO4	3	3	2	2	2		2		3	2	3	2
CO5	2	3				3	3	2	3	2	3	2

BSAC45301	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2		3	2			2	2	2	3
CO2	2		2		3	3	2		2	2	2	3
CO3	3	3	3	3	3		3	2	2	3	3	2
CO4	2	3	3	3		2	2	3	3	2		2
CO5		3	3	3	3	2	2	2	2	2	2	2

BSAC57300	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	3	3	2	2	3	3	2	2		3
CO2	3	3		2	3			2	2	2		2
CO3	3	3	2	2		3	3	2		2	3	
CO4	3	2			2		2	2			3	2
CO5	2	2	3	2	2	2	3	3	3	2		3

BSAC57301	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3		2		2	2	2	3	2
CO2	3	2	3	2	2			3	3		3	
CO3	2	3	2	3			2	3	3	2		2
CO4	3	2			3	2	3			2	2	3
CO5	2		3	3	3	2		3	3	2	3	3

BSAC51152	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3		2	3		2	3	2	2
CO2	2			2	2		3	3	3		3	
CO3	3	3	2				2	2	3	2		2
CO4	3	2	2	3		2				3	2	2
CO5	2		3	3	3	3		3	3	3	3	3

BSAC51153	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	3	3	3		2	2	2		3	2
CO2		2		3		3	2	2	3	3	2	2
CO3	3	3	3		3	3	3			3	3	
CO4	2		2	2	2	3	3	2		3	3	2
CO5	3	3	3	3		3		2	3		3	

BSAC44302	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2	3		3	3		2	3	3	3
CO2	3		3		2	2	3	2	2	2		2
CO3	2	3	3	3		2	3	3			3	3
CO4	2	2	2	3	3		3		2		3	3
CO5	2	2		3	3	2	3		2		3	3

BSAC44303	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	3	3			2	2		3	2
CO2	3		3		2	2	3	3		2	3	2
CO3	3	3	3	3		3	3	3			3	3
CO4	2	2		3	3	2	3		2		3	3
CO5	3	3		3		3	3		2	3		3

BSAC47304	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	2	3	2	3	3	2	2	2	3
CO2	3	3	2	3	3		3	2	3	2		3
CO3	3	3	2	2	3	2	3	3	3		2	3
CO4	2	2	2	3		3	2		3	2	2	3
CO5	3	2	3	3		3		2	2	3	3	2

BSAC47305	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3		3	3	3	2	3	2		2
CO2	2	3		3	2	3		3	2	3	3	2
CO3	3	3	3	2	3	2	3	2	3		2	3
CO4	3	3	2	3			3	3	2	3	3	3
CO5	2	2	3	2	3	2	3	2	3	2		3

BSAC42300	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2		3	2		2	2	3	3	
CO2	2	3	3	2		3	2		2	2	2	2
CO3	3	2		3	2	2	3		2		3	3
CO4	3	2	2	2	3		2	3	3		2	3
CO5	3	3	3	3		2	3	3	3	3		2

BSAC42301	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		3	2	2	2	3	2	2	3		2	3
CO2	3				3		3	3	2		3	2
CO3	2	2	2	3	3	2		2		3	2	
CO4	3	2		3		2	2	2	2	3		2
CO5	2	2	3	2	2		2		3		2	3

BSAE41003	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	3	2	2	2	3		2
CO2	3	3	3			3	3	2	2	3	3	2
CO3		3	3	3	2	3	3	3	2	2		3
CO4	3	3	3	3	3	2		2	3	2	2	3
CO5	3	3	3	3	2		3	2		3	3	3

BSAE41004	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	3		2	2	2	3	3		3	2
CO2	2	2	3	3		2	3	2	3	2	3	2
CO3	3	3	2	2	3		3	3	3	3	2	3
CO4	2		3	2	3	3	2		3	2	2	3
CO5	3	3	3	3	2	3	3	2		3	3	3

BSAC48300	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3		2	3		2	3	2		3
CO2	3	2	2	2	2	2		2	2	2	2	2
CO3	3		3	3	2	2	2			3	2	
CO4	3	3	2	2	2			2	2		2	2
CO5		2	2	3	2	3	2	3	2	2	3	3

BSAC48301	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2		2	3	3	2	2	3			3	2
CO2	3	3		3	2			2	3	3		2
CO3	2		2			3	2	3		3	2	
CO4	3	3	2	3	2	3	3	3		3		3
CO5	2	3			2	3	3		3		2	3

BSAE41005	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	3		3	3			3	3	2	2
CO2			2	3	2	2	3	2		3		2
CO3	3	3		3	2			3	3	3		2
CO4	3	3	3	2	2	2	2	3		3	2	2
CO5	2	3		3		3	3	3	2		2	2

BSAE41006	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3		3	2			3	3	2	2
CO2			2	3	2	2	3	2		3		2
CO3	3	3		3	2			3	3	3		2
CO4	3	3	3	2	2	2	2	2		3	2	2
CO5	2	3		3		3	3	3	2		2	2

WHNN99000	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3		3	2			3	3	2	2
CO2			2	3	2	2	3	2		3		2
CO3	3	3		2	2			3	3	3		2
CO4	2	3	3	2	2	2	2	2		3	2	2
CO5	2	3		3		3	3	3	2		2	2

8. Curriculum

Course Name: Agricultural Marketing and Trade

Course Code: BSAC45300

Course Outline

Unit I: Agricultural Marketing: Concepts and definitions of market, marketing, agricultural marketing, market structure, marketing mix and market segmentation, classification and characteristics of agricultural markets; Demand, supply and producer's surplus of agri commodities: nature and determinants of demand and supply of farm products, producer's surplus–meaning and its types, marketable and marketed surplus, factors affecting marketable surplus of agri-commodities; Pricing and promotion strategies: pricing considerations and approaches– cost based and competition based pricing; market promotion – advertising, personal selling, sales promotion and publicity – meaning, merits and demerits;

Unit II: Marketing process and functions: Marketing process concentration, dispersion and equalization; exchange functions – buying and selling; physical functions – storage, transport and processing; facilitating functions – packaging, branding, grading, quality control and labelling (Agmark); Market functionaries and marketing channels: Types and importance of agencies involved in agricultural marketing; meaning and definition of marketing channel; number of channel levels; marketing channels for different farm products; Integration, efficiency, costs and price spread: Meaning, definition and types of market integration; marketing efficiency; marketing costs, margins and price spread; factors affecting cost of marketing; reasons for higher marketing costs of farm commodities; ways of reducing marketing costs; Role of Govt. in agricultural marketing: Public sector institutions- CWC, SWC, FCI, CACP and DMI – their objectives and functions; cooperative marketing in India;

Unit III: Risk in marketing: Types of risk in marketing; speculation and hedging; an overview of futures trading; Agricultural prices and policy: Meaning and functions of price; administered prices; need for innovations in agricultural price policy; Trade: Concept of International Trade and its need, theories of absolute and comparative advantage. Present status and prospects of international trade in agri-commodities; WTO; Agreement on Agriculture (AoA) and its implications on Indian agriculture; IPR; Role of government in agricultural marketing; Role of APMC and its relevance in the present-day context.

Suggested readings

1. Acharya, S.S. and Agarwal, N.L. 2006. Agricultural Marketing in India, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Chinna, S.S. 2005. Agricultural Economics and Indian Agriculture. Kalyani Pub, N Delhi.

3. Dominic Salvatore, Micro Economic Theory
4. Kohls Richard, L. and Uhl Josheph, N. 2002. Marketing of Agricultural Products, Prentice-Hall of India Private Ltd., New Delhi.
5. Kotler and Armstrong, 2005. Principles of Marketing, Pearson Prentice-Hall.
6. Lekhi, R. K. and Joginder Singh. 2006. Agricultural Economics. Kalyani Publishers, Delhi.
7. Memoria, C.B., Joshi, R.L. and Mulla, N.I. 2003. Principles and Practice of Marketing in India, Kitab Mahal, New Delhi.
8. Pandey Mukesh and Tewari, Deepali. 2004. Rural and Agricultural Marketing, International Book Distributing Co. Ltd, New Delhi.
9. Sharma, R. 2005. Export Management, Laxmi Narain Agarwal, Agra.

Course Name: Agricultural Marketing and Trade Lab

Course Code: BSAC45301

Course Outline

Plotting and study of demand and supply curves and calculation of elasticities; Study of relationship between market arrivals and prices of some selected commodities; Computation of marketable and marketed surplus of important commodities; Study of price behaviour over time for some selected commodities; Construction of index numbers; Visit to a local market to study various marketing functions performed by different agencies, identification of marketing channels for selected commodity, collection of data regarding marketing costs, margins andprice spread and presentation of report in the class; Visit to market institutions –NAFED, SWC, CWC, cooperative marketing society, etc. to study their organization and functioning. Application of principles of comparative advantage of international trade.

Course Name: Introduction to Agro-meteorology

Course Code: BSAC57300

Course Outline

Unit I: Meaning and scope of agricultural meteorology; Earth atmosphere: its composition, extent and structure; Atmospheric weather variables; Atmospheric pressure, its variation with height; Wind, types of wind, daily and seasonal variation of wind speed, cyclone, anticyclone, land breeze and sea breeze; Nature and properties of solar radiation, solar constant, depletion of solar radiation, short wave, longwave and thermal radiation, net radiation, albedo;

Unit II: Atmospheric temperature, temperature inversion, lapse rate, daily and seasonal variations of temperature, vertical profile of temperature, Application of Thermal time concept and Crop/Pest weather calendar; Energy balance of earth; Atmospheric humidity, concept of saturation, vapour pressure, process of condensation,

formation of dew, fog, mist, frost, cloud; Precipitation, process of precipitation, types of precipitation such as rain, snow, sleet, and hail, cloud formation and classification; Artificial rainmaking. Monsoon- mechanism and importance in Indian agriculture;

Unit III: Weather hazards - drought, floods, frost, tropical cyclones and extreme weather conditions such as heat-wave and cold-wave; Agriculture and weather relations; Modifications of crop microclimate, climatic normal for crop and livestock production. Weather forecasting- types of weather forecast and their uses. Climate change, climatic variability, global warming, causes of climate change and its impact on regional and national agriculture.

Suggested Readings

1. Agricultural Meteorology by G.S.L.H.V. Prasado Rao
2. Fundamentals of Agro-meteorology and Climate Change by G. S. Mahi and P. K. Kingra
3. Introduction to Agro-meteorology and Climate Change by Alok Kumar Patra
4. Introduction to Agro-meteorology by H. S. Mavi
5. Text Book of Agricultural Meteorology by M. C.Varshneya and P.B. Pillai

Course Name: Introduction to Agro-meteorology Lab

Course Code: BSAC57301

Course Outline

Unit I: Visit of Agro-meteorological Observatory, site selection of observatory, exposure of instruments and weather data recording, Measurement of total, shortwave and long wave radiation, and its estimation using Planck's intensity law, Measurement of albedo and sunshine duration, computation of Radiation Intensity using BSS; Measurement of maximum and minimum air temperatures, its tabulation, trend and variation analysis, Measurement of soil temperature and computation of soil heat flux, Determination of vapor pressure and relative humidity, Determination of dew point temperature,

Unit II: Measurement of atmospheric pressure and analysis of atmospheric conditions, Measurement of wind speed and wind direction, preparation of windrose, Measurement, tabulation and analysis of rain, Measurement of open pan evaporation and evapo-transpiration, Computation of PET and AET, Use of synoptic charts, weather reports, weather forecasting-types and methods, crop weather calendar.

Course Name: Fundamentals of Crop Physiology

Course Code: BSAC51152

Course Outline

Unit I: Definitions of plant physiology and crop physiology; Importance of crop physiology; Relationship of crop physiology with other branches of crop science; Diffusion and osmosis; Physiological roles of water to crop plants; Definition of water potential and components of water potential; Water absorption by plants: Concept of active and passive absorption; Water loss by plants: Types of water loss: transpiration, stomatal physiology and guttation; Water use efficiency; Essential and beneficial elements; Passive and active transport of mineral element; Functions of essential elements; Criteria of essentiality of nutrients; Correction measures for nutrient deficiency symptoms; Foliar nutrition and root feeding – significance; Aeroponics Imbibition;

Unit II: Field capacity, permanent wilting point and available soil moisture; Apoplast, symplast and transmembrane, Ascent of sap – theories and mechanism; Soil-plant-atmospheric continuum. Significance of transpiration. Stomatal opening and closing mechanisms. Definition of Cavitation and embolism. Antitranspirants - types and examples. Hydroponics and sand culture. Overview of plant cell - organelle and their functions. Brief outline of: Photosynthetic apparatus, pigmentsystem, quantum requirement and quantum yield; Structure of chloroplast, Examples of different photosynthetic pigments (chlorophyll, carotenoids, phycobilins etc.), Difference between chlorophyll a and chlorophyll b, Structure of chlorophyll a and chlorophyll b, Short discussion on quantum requirement and quantum yield, Red drop and Emerson enhancement effect, Pigment system I and II.

Unit III: Introduction to light reaction of photosynthesis, Light absorption by photosynthetic pigments and transfer of energy. Source of O2 during photosynthesis: Hill reaction; Brief introduction to cyclic and non-cyclic photo-phosphorylation: production of assimilatory powers; Introduction to C3, C4 and CAM pathways: Calvin Cycle, Hatch and Slack Cycle, CAM Cycle; Significance of these pathways (concept of photorespiration, absence of photorespiration in C4 plant: Productivity of C4 plant, CAM: an adaptive mechanism); Factors affecting photosynthesis (light, temperature, CO2, O2 etc.). Outline of the process of respiration: Definition and importance, Glycolysis, Kreb Cycle and ETC, Factors affecting respiration (O2, temperature, CO2 etc.). Terminologies / Definitions: Growth, Development and Differentiation. Measurement of plant growth (fresh weight, dry weight, linear dimension, area etc.). Introduction to CGR, RGR, NAR etc. Photoperiodism: Photoperiodic Classification of plants: Short Day Plant, Long Day Plant, Day Neutral plant etc. Introduction to Photoperiodic induction site of photo-inductive perception, Role of Phytochrome Introduction to Vernalization (What is vernalization, devernalization etc.),

Unit IV: Meaning, classification (seasonal, sequential etc), relation with abscission. Physiological and biochemical changes during senescence, Abscission and its significance, Concept of stay green, Hormonal regulation of senescence. Terminologies / Definitions: Plant hormone, Plant growth regulators (PGR), Plant growth inhibitor. Recognized classes of PGR (Auxins, Gibberellins, Cytokinins, Ethylene and Abscisic acid) and their major physiological roles, Agricultural uses of PGRs (IBA, NAA, 2, 4 –D, GAs, Kinetin etc).

Suggested readings

1. Devlin's Exercises in Plant Physiology by Robert Devlin, Francis H. Witham and David F. Blaydes
2. Fundamentals of Plant Physiology by Lincoln Taiz, Eduardo Zeiger, Ian Max Mølle and Angus Murphy
3. Plant Physiology by Robert M. Devlin and Francis H. Witham
4. Plant Physiology by Lincoln Taiz and Eduardo Zeiger
5. Plant physiology by Frank B. Salisbury and Cleon W. Ross

Course Name: Fundamentals of Crop Physiology Lab

Course Code: BSAC51153

Course Outline

Study on structure and distribution of stomata; Demonstration of imbibition, osmosis, plasmolysis, estimation of water potential, relative water content; Tissue test for mineral nutrients, identification of nutrient deficiency and toxicity symptoms in plant; Identification of nutrients by hydroponics; Estimation of photosynthetic pigments, rate of photosynthesis, respiration and transpiration; Plant growth analysis; Study on senescence and abscission, hormonal regulation of senescence; Demonstration of the effects of different PGRs on plants, Leaf anatomy of C3 and C4 plants.

Course Name: Pest management in crops and stored grains

Course Code: BSAC44302

Course Outline

Unit I: General description on nature and type of damage by different arthropod pests; Scientific name, order, family, host range, distribution, biology and bionomics; Nature of damage and management of major insect pests of various field crops, vegetable crops, fruit crops, plantation crops, ornamental crops, spices and condiments. Structural entomology and important household pests, their nature of damage and management. Factors affecting loss of stored grains. Insect pests, mites, rodents, birds and microorganisms associated with stored grains and their management.

Unit II: Storage structures and methods of grain storage and fundamental principles of stored grains management. Management of non insect pest of mites, snails and slugs, Concept of IPM, Practices, scope and limitations of IPM. Classification of insecticides, toxicity of insecticides and formulations of insecticides, Biorational pesticides including insect repellents, antifeedants, Use of drones and AI in pest management,

Suggested readings

1. A Textbook of Insect Pest and Disease Management, 2021. Somnath Sen, and Mohd. Sameer,S. Kataria & Sons publish.
2. Agricultural Pests of India and South east Asia, A.S. Athwal, Kalyani Publishers.
3. A Textbook of Applied Entomology, K.P. Srivastava and G. S. Dhaliwal, Kalyani Publish.
4. Essentials of Pest Management: Key Information on Pest Identification and its Management, 2022. Prakash Rambhat Thalya and Ravi Chandra
5. Integrated pest Management Concept and Approaches- G.S. Dhaliwal and Ramesh Arora
6. Pest Management: Methods, Applications and Challenges, Tarique Hassan Askary, Agriculture, Agriculture Issues and policies, Books, Nova, Pest Control, Science and Technology,2022

Course Name: Pest management in crops and stored grains Lab

Course Code: BSAC44303

Course Outline

Field visit, identification of major insect pests and their damage symptoms. Collection and preservation of major insect pests; collection of damage samples, their identification and herbarium preparation. Methods of monitoring of pest incidence in situ. Management strategies of insect pests of different crops. Study on structural entomology and household pests. Storage structures and methods of grain storage. Spraying techniques for selected field and horticultural crops. Vertebrate pest management, Mass multiplication of NPV and entomopathogenic nematodes.

Course Name: Diseases of Field and Horticultural Crops and their Management

Course Code: BSAC47304

Course Outline

Unit I: Symptoms, etiology, disease cycle, epidemiology and management of major diseases of the following field and horticultural crops: Field crops- Rice (blast, brown spot, sheath blight, false smut, bacterial leaf blight, bacterial leaf streak, tungro, khaira); Wheat (rusts, loose smut, Karnal bunt); Maize (banded leaf and sheath blight, southern and northern blight, downy mildew); Sorghum (smuts, grain mold, anthracnose); Bajra (downy mildew, ergot) and Finger millet (blast, leaf spot); Groundnut (early and late leaf spots, rust, wilt); Soybean (rhizoctonia blight, bacterial spot, seed and seedling rot, mosaic); Grams (Ascochyta blight, wilt, grey mold); Pea (downy mildew, powdery mildew, rust); Black gram and Green gram (web blight, Cercospora leaf spot, anthracnose, yellow mosaic); Sugarcane (red rot, smut, grassy shoot, ratoon stunting, PokahBoeng); Mustard (Alternaria blight, white rust, downy mildew, sclerotinia stem rot) and Sunflower (sclerotinia stem rot, Alternaria blight); Cotton (anthracnose, vascular wilts, black arm).

Unit II: Horticultural crops: Citrus (canker, gummosis) and Guava (wilt, anthracnose); Banana (sigatoka, Panama wilt, bacterial wilt, bunchy top); Papaya (foot rot, leaf curl, mosaic) and Pomegranate (bacterial blight); Apple (scab, powdery mildew, fire blight, crown gall) and Peach (leaf curl); Grapevine (downy mildew, powdery mildew, anthracnose) and Strawberry (leaf spot); Coconut (bud rot, Ganoderma wilt), Tea (blister blight) and Coffee (rust); Mango (anthracnose, malformation, bacterial blight, powdery mildew);

Unit III: Potato (early and late blight, black scurf, leaf roll, mosaic) and Tomato (damping off, wilt, early and late blight, leaf curl, mosaic); Brinjal (25homopsis blight and fruit rot, sclerotinia blight) and Chilli (anthracnose and fruit rot, wilt, leaf curl); Cucurbits (powdery and downy mildew, wilts) and Cruciferous vegetables (Alternaria leaf spot, black rot, cauliflower mosaic); Beans (anthracnose, bacterial blight) and Okra (yellow vein mosaic); Ginger (soft rot), Turmeric (leaf Spot) and Coriander (stem gall); Rose (dieback, powdery mildew, black leaf spot) and Marigold (botrytis blight, leaf spots).

Suggested readings

1. Integrated Plant Disease Management By R.C. Sharma
2. Plant Diseases By R.S. Singh
3. Plant Disease Management: Principles and Practices By Hriday Chaube
4. Plant Pathology By G.N. Agrios

Course Name: Diseases of Field and Horticultural Crops and their Management Lab

Course Code: BSAC47305

Course Outline

To study the symptoms of different diseases of field and horticultural crops: Blast and brown spot of rice, sheath blight and bacterial leaf blight of rice, downy mildew and powdery of cucurbits, rhizoctonia and Cercospora leaf spot of green gram / black gram, Alternaria blight and downy mildew of mustard, early blight of late blight of potato and tomato, Phomopsis blight of brinjal, powdery mildew and rust of pea, stem gall of coriander, anthracnose and fruit rot of chilli, taphrina leaf spot of turmeric, red rot of sugarcane, acquaintance with fungicides, antibiotics and biopesticides and their use in management of diseases of horticultural crops. 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.

Course Name: Crop Improvement (kharif crops) – I

Course Code: BSAC42300

Course Outline

Centres of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fibres; fodders and cash crops; vegetable and other horticultural crops of kharif season; Plant genetic resources, its utilization and conservation, study of genetics of qualitative and quantitative characters; Important concepts of breeding self-pollinated, cross-pollinated and vegetatively propagated crops. 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); Hybrid seed production technology in maize, rice, sorghum, pearl millet and pigeopea etc. Ideotype concept, climate resilient crop varieties for future.

Suggested Readings

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

Course Name: Crop Improvement (kharif crops) – I Lab

Course Code: BSAC42301

Course Outline

Botany of crops, Floral biology, emasculation and hybridization techniques in different crop species, viz. rice, jute, maize, sorghum, pearl millet, ragi, pigeopea, urdbean, mungbean, soybean, groundnut, sesame, castor, cotton, cowpea, tabacco, brinjal, okra and cucurbitaceous crops. Maintenance breeding of different kharif crops. 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 seed production in kharif crops; Estimation of heterosis, inbreeding depression and heritability; Layout of field experiments; Study of quality characters, donor parents for different characters; Visit to seed production plots; Visit to AICRP breeding plots of different crops.

Course Name: Weed Management

Course Code: BSAE41003

Course Outline

Unit I: Introduction to weeds, characteristics of weeds, their harmful and beneficial effects on ecosystem. Classification, reproduction and dissemination of weeds, crop-weed completion, factors of competition, factors affecting growth and development. Studies on weed seed bank, weed shifts. Concepts of weed management: physical, cultural, chemical and biological; principles and methods, integrated weed management. Implements for weed control, robotic weed control, weed management in organic/ natural farming.

Unit II: Herbicide classification and properties of important herbicides, concept of adjuvants, surfactants, herbicide formulation and their use, Nano herbicides, precision weed management; Mode of action of herbicides and selectivity phenomenon. Concept of herbicide mixture and utility in agriculture, Herbicide compatibility with agro-chemicals and their application, Herbicide resistance and its management. Weed management in different field and horticultural crops; aquatic weed management, weed management in cropping systems.

Suggested Readings

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

4. Naidu, V.S.G.R. Handbook of Weed Identification. Directorate of Weed Research, Jabalpur.
5. Rajagopal, A., Aravindan, R. and Shanmugavelu, K.G. 2015. Weed management of Horticultural Crops. Agrobios (India), Jodhpur.
6. Ramamoorthy, K. and Subbian, P. Predominant Weed flora in hill –ecosystems. Agrobios (India), Jodhpur.
7. Rao, V.S. 2000. Principles of Weed Science. Oxford & IBH Publishing Co., New Delhi.
8. Subramanian, S., Mohammed Ali, A. and Jayakumar, R. 1991. All About Weed Control. Kalyani Publishers, Ludhiana.
9. Tadulingam, C. and Venkatnarayana, D. 1955. A Handbook of Some South Indian Weeds. Government Press, Madras.
10. Thakur, C. 1977. Weed Science. Metropolitan Book Co. Pvt. Ltd., New Delhi.

Course Name: Weed Management Lab

Course Code: BSAE41004

Course Outline

Techniques of weed preservation, weed identification and losses caused by weeds. Biology of important weeds. Study weeds in different situations, Study of herbicide formulations and mixture of herbicide. Study methods of herbicide application, Herbicide application equipment- their parts, use, maintenance and calibration. Weed control implements, Calculation of herbicide doses and requirement, weed control efficiency and weed index, Phytotoxicity of herbicides, Weed management in fallow lands, Management of problem and parasitic weeds.

Course Name: Ornamental Crops, MAPs and Landscaping

Course Code: BSAC48300

Course Outline

Production technology of ashwagandha, costus, isabgol and geranium; Production technology of mint, aloe and ocimum, Coleus, Glory lily, Periwinkle etc.; Production technology of plants like lemongrass, citronella, vetiver and palmarosa etc., Importance and scope of ornamental crops; Importance and scope of medicinal and aromatic plants and landscaping; Principles of landscaping; Landscape uses of trees, shrubs and climbers, Production technology of important cut flowers like rose, gerbera and orchids; Production technology of gladiolus, tuberose and lilium; Production technology of chrysanthemum and carnation; Package of practices for loose flowers like marigold and jasmine under open conditions; Brief concept of Home landscaping, Carpet bedding, Topiary, Bonsai, Lawn, flower arrangement, Herbaceous Border, Hedge, Edge etc.; Processing and value addition imp ornamental crops; Processing and value addition of MAPs produce.

Suggested readings

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

Course Name: Ornamental Crops, MAPs and Landscaping Lab

Course Code: BSAC48301

Course Outline

Identification MAPs and Ornamental plants (trees, shrubs, climbers, seasonal flower and house plants). Propagation of MAP, Bed preparation and planting of MAP; Nursery bed preparation and sowing of seasonal flower seeds; Propagation of ornamental plants by terminal/herbaceous cuttings; Propagation of Anthurium and orchids; Propagation of bougainvillea; Planting of gerbera suckers; Gladiolus corms; Establishment and maintenance of lawn; Preparation of flower preservatives and their use in extending the vase life of cut flowers; Training and pruning of ornamental plants and raising of hedge and edge; Planning and layout of garden.

Course Name: Farming based livelihood systems

Course Code: BSAE41005

Course Outline

Unit I: Status of agriculture in India and different states, Income of farmers and rural people inIndia, Livelihood-Definition, concept and livelihood pattern in urban and rural areas, Differentindicators to study livelihood systems. Agricultural livelihood systems (ALS): Meaning, approach,approaches and framework, Definition of farming systems and farming based livelihood systemsPrevalent Farming systems in India contributing to livelihood.

Unit II: Types of traditional and modernfarming systems. Components of farming system/ farming-based livelihood systems- Crops andcropping systems, Livestock (Dairy, Piggery, Goatry, Poultry, Duckry etc.), Horticultural crops,Agro--forestry systems, Aqua culture Duck/Poultry cum Fish, Dairy cum Fish, Piggery cum Fishetc., Small-, medium- and large- enterprises including value chains and secondary enterprises aslivelihood components for farmers, Factors affecting integration of various enterprises of farmingfor livelihood. Feasibility of different farming systems for different agro-climatic zones,

Unit III: Commercialfarming-based livelihood models by NABARD, ICAR and other organizations across the country,Case studies on different livelihood enterprises associated with the farming. Risk and success factorsin farming-based livelihood systems, Schemes and programs by Central and State Government,Public and Private organizations involved in promotion of farming-based livelihood opportunities.Role of farming-based livelihood enterprises in 21st Century in view of circular economy, greeneconomy, climate change, digitalization and changing life style.

Suggested Readings

1. Ashley, C. and Carney, D. 1999. Sustainable Livelihoods: Lessons from Early Experience;Department for International Development: London, UK; Volume 7. [Google Scholar]
2. Agarwal, A. and Narain, S. 1989. Towards Green Villages: A strategy for Environmentally,Sound and Participatory Rural Development, Center for Science and Environment, New Delhi,India
3. Carloni, A. 2001. Global Farming Systems Study: Challenges and Priorities to 2030 – RegionalAnalysis: Sub-Saharan Africa, Consultation Document, FAO, Rome, Italy
4. Dixon, J. and A. Gulliver with D. Gibbon. 2001. Farming Systems and Poverty: ImprovingFarmers' Livelihoods in a Changing World. FAO & World Bank, Rome, Italy & Washington,DC, USA
5. Evenson, R.E. 2000. Agricultural Productivity and Production in Developing Countries'. InFAO, The State of Food and Agriculture, FAO, Rome, Italy
6. Livelihood Improvement of Underprivileged Farming Community: Some Experiences fromVaishali, Samastipur, Darbhanga and Munger Districts of Bihar by B. P. Bhatt, Abhay Kumar,P.K. Thakur, AmitavaDeyUjjwal Kumar, Sanjeev Kumar, B.K. Jha, Lokendra Kumar, K. N.Pathak, A. Hassan, S. K. Singh, K. K. Singh and K. M. Singh ICAR Research Complex forEastern Region ICAR Parisar, P.O. Bihar Veterinary College, Patna - 800 014, Bihar
7. Panwar et al. 2020. Integrated Farming System models for Agricultural Diversification,Enhanced Income and employment, Indian Council of Agricultural Research, New Delhi.
8. Reddy, S.R. 2016. Farming System and Sustainable Agriculture, Kalyani Publishers, New Delhi.
9. Singh, J.P., et al. 2015. Region Specific Integrated Farming System Models, ICAR-IndianInstitute of Farming Systems Research, Modipuram.
10. Walia, S. S. and Walia, U. S. 2020. Farming System and Sustainable Agriculture, Scientific Publishers, Jodhpur, Rajasthan.

Course Name: Farming based livelihood systems Lab

Course Code: BSAE41006

Course Outline

Survey of farming systems and agricultural based livelihood enterprises, Study of components of important farming based livelihood models/ systems in different agro-climatic zones, Study of production and profitability of crop based, livestock based, processing based and integrated farming based livelihood models, Field visit of innovative farming system models. Visit of Agri-based enterprises and their functional

aspects for integration of production, processing and distribution sectors and Study of agri-enterprises involved in industry and service sectors (Value Chain Models),Learning about concept of project formulation on farming-based livelihood systems along with cost and profit analysis, Case study of Start-Ups in agri-sectors.

9. Lesson Plan

BSAC45300 - Agricultural Marketing and Trade

Unit	Particulars	Class No.	Pedagogy of Class
Unit-I	Agricultural Marketing: Concepts and definitions of market,	C-1	Lecture
Unit-I	Marketing, agricultural marketing, market structure,	C-2	Lecture
Unit-I	Marketing mix and market segmentation, classification, and characteristics of agricultural markets	C-3	Lecture
Unit-I	Demand, supply, and producer's surplus of agri	C-4	Lecture
Unit-I	Class Assignment	C-5	Class Assignment
Unit-I	Commodities: nature and determinants of demand and supply of farm products, producer's surplus – meaning and its types, marketable and marketed surplus, factors affecting marketable surplus of agri-commodities;	C-6	Lecture
Unit-I	Commodities: nature and determinants of demand and supply of farm products, producer's surplus – meaning and its types, marketable and marketed surplus, factors affecting marketable surplus of agri-commodities;	C-7	Lecture
Unit-I	Pricing and promotion strategies: pricing considerations and approaches – cost-based and competition-based pricing;	C-8	Lecture
Unit-I	Class Assignment	C-9	Class Assignment
Unit-I	market promotion – advertising, personal selling, sales promotion, and publicity – meaning, merits and demerits	C-10	Lecture
Unit-II	Marketing process and functions: Marketing process concentration, dispersion and equalization; exchange functions – buying and selling;	C-11	Lecture
Unit-II	Home Assignment		Home Assignment
Unit-II	physical functions – storage, transport and processing; facilitating functions – packaging, branding, grading, quality control and labelling (Agmark);	C-12	Lecture
Unit-II	Market functionaries and marketing channels: Types and importance of agencies involved in agricultural marketing; meaning and definition of marketing channel; number of channel levels	C-13	Lecture

Unit-II	Class Assignment	C-14	Class Assignment
Unit-II	Market functionaries and marketing channels: Types and importance of agencies involved in agricultural marketing; meaning and definition of marketing channel; number of channel levels	C-15	Lecture
Unit-II	marketing channels for different farm products;	C-16	Lecture
Unit-II	Clarification Class	C-17	Clarification Class
Unit-II	Integration, efficiency, costs and price spread: Meaning, definition and types of market integration	C-18	Lecture
Unit-II	marketing efficiency; marketing costs, margins and price spread; factors affecting cost of marketing; reasons for higher marketing costs of farm commodities; ways of reducing marketing costs	C-19	Lecture
Unit-II	Home Assignment		Home Assignment
Unit-II	Role of Govt. in agricultural marketing: Public sector institutions- CWC, SWC, FCI, CACP and DMI – their objectives and functions; cooperative marketing in India	C-20	Lecture
Unit-II	Quiz	C-21	Quiz
Unit-III	Risk in marketing: Types of risk in marketing; speculation and hedging; an overview of futures trading	C-22	Lecture
Unit-III	Agricultural prices and policy: Meaning and functions of price; administered prices; need for innovations in agricultural price policy; Trade:	C-23	Lecture
Unit-III	Presentation	C-24	Presentation
Unit-III	Concept of International Trade and its need, theories of absolute and comparative advantage.	C-25	Lecture
Unit-III	Present status and prospects of international trade in agri-commodities;	C-26	Lecture
Unit-III	Quiz		Quiz
Unit-III	WTO; Agreement on Agriculture (AoA) and its implications on Indian agriculture;	C-27	Lecture
Unit-III	Presentation	C-28	Presentation
Unit-III	IPR; Role of government in agricultural marketing; Role of APMC and its relevance in the present-day context.	C-29	Lecture
Unit-III	Clarification class	C-30	Clarification class

BSAC45301 - Agricultural Marketing and Trade Lab

Unit	Particulars	Class No.	Pedagogy of Class
Unit-I	Plotting and study of demand and supply curves and calculation of elasticities	P-1,2	Practical
Unit-I	Study of relationship between market arrivals and prices of some selected commodities	P-3,4	Practical
Unit-I	Computation of marketable and marketed surplus of important commodities	P-5,6	Practical
Unit-I	Visit to a local market to study various marketing functions performed by different agencies	P-7,8	Practical
Unit-I	Identification of marketing channels for selected commodity, collection of data regarding	P-9,10	Practical
Unit-I	Marketing costs, margins and price spread and presentation of report in the class	P-11,12	Practical
Unit-I	Visit to market institutions –NAFED, SWC, CWC, cooperative marketing society	P-13,14	Practical
Unit-I	Study their organization and functioning. Application of principles of comparative	P-15	Practical

BSAC57300 - Introduction to Agro-meteorology

Unit	Particulars	Class No.	Pedagogy of Class
Unit-I	Meaning and scope of agricultural meteorology; Earth atmosphere: its composition, extent and structure	C-1	Lecture
Unit-I	Atmospheric weather variables; Atmospheric pressure, its variation with height	C-2	Lecture
Unit-I	Wind, types of wind, daily and seasonal variation of wind speed, cyclone, anticyclone, land breeze and sea breeze	C-3	Lecture
Unit-I	Class Assignment	C-4	Class Assignment
Unit-I	Nature and properties of solar radiation, solar constant, depletion of solar radiation, short wave, long wave and thermal radiation, net radiation, albedo;	C-5	Lecture
Unit-II	Atmospheric temperature, temperature inversion, lapse rate, daily and seasonal variations of temperature, vertical profile of temperature	C-6	Lecture
Unit-II	Home Assignment		Home Assignment
Unit-II	Application of Thermal time concept and Crop/Pest weather calendar; Energy balance of earth; Atmospheric humidity, concept of saturation, vapour pressure, process of condensation, formation of dew, fog, mist, frost, cloud	C-7	Lecture
Unit-II	Clarification Class	C-8	Clarification Class
Unit-II	Precipitation, process of precipitation, types of precipitation such as rain, snow, sleet, and hail, cloud formation and classification; Artificial rainmaking. Monsoon- mechanism and importance in Indian agriculture;	C-9	Lecture
Unit-II	Quiz	C-10	Quiz
Unit-III	Weather hazards - drought, floods, frost, tropical cyclones and extreme weather conditions such as heat-wave and cold-wave	C-11	Lecture
Unit-III	Presentation	C-12	Presentation
Unit-III	Agriculture and weather relations; Modifications of crop microclimate, climatic normal for crop and livestock production.	C-13	Lecture
Unit-III	Home Assignment		Home Assignment
Unit-III	Weather forecasting- types of weather forecast and their uses. Climate change, climatic variability, global warming, causes of climate change and its impact on regional and national agriculture	C-14	Lecture
Unit-III	Presentation	C-15	Presentation

BSAC57301 - Introduction to Agro-meteorology Lab

Unit	Particulars	Class No.	Pedagogy of Class
Unit-I	Visit of Agro-meteorological Observatory	P-1	Practical
Unit-I	Site selection of observatory	P-2	Practical
Unit-I	Exposure of instruments and weather data recording	P-3	Practical
Unit-I	Measurement of total, shortwave and long wave radiation, and its estimation using Planck's intensity law	P-4	Practical
Unit-I	Measurement of albedo and sunshine duration	P-5	Practical
Unit-I	Computation of Radiation Intensity using BSS;	P-6	Practical
Unit-I	Measurement of maximum and minimum air temperatures, its tabulation, trend and variation analysis	P-7	Practical
Unit-I	Measurement of soil temperature and computation of soil heat flux	P-8	Practical
Unit-I	Determination of vapor pressure and relative humidity	P-9	Practical
Unit-I	Determination of dew point temperature	P-10	Practical
Unit-II	Measurement of atmospheric pressure and analysis of atmospheric conditions	P-11	Practical
Unit-II	Measurement of wind speed and wind direction, preparation of windrose	P-12	Practical
Unit-II	Measurement, tabulation and analysis of rain,	P-13	Practical
Unit-II	Measurement of open pan evaporation and evapo-transpiration	P-14	Practical
Unit-II	Computation of PET and AET, Use of synoptic charts, weather reports, weather forecasting-types and methods, crop weather calendar	P-15	Practical

BSAC51152 - Fundamentals of Crop Physiology

Unit	Particulars	Class No.	Pedagogy of Class
Unit-I	Definitions of plant physiology and crop physiology; Importance of crop physiology;	C-1	Lecture
Unit-I	Relationship of crop physiology with other branches of crop science; Diffusion and osmosis; Physiological roles of water to crop plants; Definition of water potential and components of water potential;	C-2	Lecture
Unit-I	Class Assignment	C-3	Class Assignment
Unit-I	Water absorption by plants: Concept of active and passive absorption;	C-4	Lecture
Unit-I	Water loss by plants: Types of water loss: transpiration, stomatal physiology and guttation; Water use efficiency;	C-5	Lecture
Unit-I	Home Assignment		Home Assignment
Unit-I	Essential and beneficial elements; Passive and active transport of mineral element; Functions of essential elements; Criteria of essentiality of nutrients;	C-6	Lecture
Unit-I	Correction measures for nutrient deficiency symptoms; Foliar nutrition and root feeding – significance; Aeroponics Imbibition;	C-7	Lecture
Unit-I	Clarification class	C-8	Clarification class
Unit-II	Field capacity, permanent wilting point and available soil moisture; Apoplast, symplast and transmembrane, Ascent of sap – theories and mechanism;	C-9	Lecture
Unit-II	Quiz	C-10	Quiz
Unit-II	Soil-plant-atmospheric continuum. Significance of transpiration. Stomatal opening and closing mechanisms. Definition of Cavitation and embolism.	C-11	Lecture
Unit-II	Class Assignment	C-12	Class Assignment
Unit-II	Antitranspirants - types and examples. Hydroponics and sand culture.	C-13	Lecture
Unit-II	Overview of plant cell - organelle and their functions. Brief outline of: Photosynthetic apparatus, pigment system, quantum requirement and quantum yield;	C-14	Lecture
Unit-II	Home Assignment		Home Assignment
Unit-II	Structure of chloroplast, Examples of different	C-15	Lecture

	photosynthetic pigments (chlorophyll, carotenoids, phycobilins etc.), Difference between chlorophyll a and chlorophyll b, Structure of chlorophyll a and chlorophyll b, Short discussion on quantum requirement and quantum yield, Red drop and Emerson enhancement effect, Pigment system I and II.		
Unit-III	Introduction to light reaction of photosynthesis, Light absorption by photosynthetic pigments and transfer of energy.	C-16	Lecture
Unit-III	Presentation	C-17	Presentation
Unit-III	Source of O2 during photosynthesis: Hill reaction; Brief introduction to cyclic and non-cyclic photo-phosphorylation: production of assimilatory powers;	C-18	Lecture
Unit-III	Introduction to C3, C4 and CAM pathways: Calvin Cycle, Hatch and Slack Cycle, CAM Cycle; Significance of these pathways (concept of photorespiration, absence of photorespiration in C4 plant: Productivity of C4 plant, CAM: an adaptive mechanism);	C-19	Lecture
Unit-III	Clarification class	C-20	Clarification class
Unit-III	Factors affecting photosynthesis (light, temperature, CO2, O2 etc.). Outline of the process of respiration: Definition and importance,	C-21	Lecture
Unit-III	Class Assignment	C-22	Class Assignment
Unit-III	Glycolysis, Kreb Cycle and ETC, Factors affecting respiration (O2, temperature, CO2 etc.). Terminologies / Definitions: Growth, Development and Differentiation.	C-23	Lecture
Unit-III	Quiz	C-24	Quiz
Unit-III	Measurement of plant growth (fresh weight, dry weight, linear dimension, area etc.). Introduction to CGR, RGR, NAR etc.Photoperiodism: Photoperiodic Classification of plants: Short Day Plant, Long Day Plant, Day Neutral plant etc.	C-25	Lecture
Unit-III	Presentation	C-26	Presentation
Unit-III	Introduction to Photoperiodic induction site of photo-inductive perception, Role of Phytochrome Introduction to Vernalization (What is vernalization, devernalization etc.),	C-27	Lecture
Unit-IV	Meaning, classification (seasonal, sequential etc), relation with abscission, Physiological and biochemical changes during senescence, Abscission and its significance, and Concept of stay green, Hormonal regulation of senescence. Terminologies / Definitions: Plant hormone, Plant	C-28	Lecture

	growth regulators (PGR), Plant growth inhibitor.		
Unit-IV	Presentation	C-29	Presentation
Unit-IV	Recognized classes of PGR (Auxins, Gibberellins, Cytokinins, Ethylene and Abscisic acid) and their major physiological roles, Agricultural uses of PGRs (IBA, NAA, 2, 4 –D, GAs, Kinetin etc).	C-30	Lecture

BSAC51153 - Fundamentals of Crop Physiology Lab

Unit	Particulars	Class No.	Pedagogy of Class
Unit-I	Study on structure and distribution of stomata;	P-1	Practical
Unit-I	Demonstration of imbibition, osmosis, plasmolysis,	P-2	Practical
Unit-I	estimation of water potential, relative water content;	P-3	Practical
Unit-I	Tissue test for mineral nutrients,	P-4	Practical
Unit-I	identification of nutrient deficiency and toxicity symptoms in plant;	P-5	Practical
Unit-I	Identification of nutrients by hydroponics;	P-6	Practical
Unit-I	Estimation of photosynthetic pigments, rate of photosynthesis, respiration and transpiration;	P-7	Practical
Unit-I	Estimation of photosynthetic pigments, rate of photosynthesis, respiration and transpiration;	P-8	Practical
Unit-I	Plant growth analysis;	P-9	Practical
Unit-I	Study on senescence and abscission, hormonal regulation of senescence;	P-10	Practical
Unit-I	Study on senescence and abscission, hormonal regulation of senescence;	P-11	Practical
Unit-I	Demonstration of the effects of different PGRs on plants,	P-12	Practical
Unit-I	Demonstration of the effects of different PGRs on plants,	P-13	Practical
Unit-I	Leaf anatomy of C3 and C4 plants.	P-14	Practical
Unit-I	Leaf anatomy of C3 and C4 plants.	P-15	Practical

BSAC44302 – Pests Management in Crops and Stored Grain

Unit	Particulars	Class No.	Pedagogy of Class
Unit-I	General account on nature and type of damage by different arthropods pests	C-1	Lecture
Unit-I	Scientific name, order, family, host range, distribution, biology and bionomics;	C-2	Lecture
Unit-I	Nature of damage and management of major insect pests of various field crops	C-3	Lecture
Unit-I	Class Assignment	C-4	Class Assignment
Unit-I	Scientific name, order, family, host range, distribution, biology and bionomics; Nature of damage and management of major insect pests of various vegetable crop	C-5	Lecture
Unit-I	Scientific name, order, family, host range, distribution, biology and bionomics; Nature of damage and management of major insect pests of various vegetable crop	C-6	Lecture
Unit-I	Home Assignment	C-7	Home Assignment
Unit-I	Scientific name, order, family, host range, distribution, biology and bionomics; Nature of damage and management of major insect pests of various fruit crops	C-8	Lecture
Unit-I	Quiz	C-9	Quiz
Unit-I	Scientific name, order, family, host range, distribution, biology and bionomics; Nature of damage and management of major insect pests of various plantation crops	C-10	Lecture
Unit-I	Presentation	C-11	Presentation
Unit-I	Scientific name, order, family, host range, distribution, biology and bionomics; Nature of damage and management of major insect pests of various ornamental crops	C-12	Lecture
Unit-I	Class Assignment	C-13	Class Assignment
Unit-I	Scientific name, order, family, host range, distribution, biology and bionomics; Nature of damage and management of major insect pests of various spices & condiments crops	C-14	Lecture
Unit-I	Structural entomology and important household pests, their nature of damage and management.	C-15	Lecture
Unit-I	Clarification class	C-16	Clarification Class

Unit-I	Factors affecting losses of stored grain	C-17	Lecture
Unit-II	Storage structures and methods of grain storage and fundamental principles of stored grains management.	C-18	Lecture
Unit-II	Presentation	C-19	Presentation
Unit-II	Insect pests, mites, rodents, birds and microorganisms associated with stored grains and their management.	C-20,21	Lecture
Unit-II	Quiz I/ Field visit	C-22	Quiz I/ Field visit
Unit-II	Management of non-insect pest of mites, snails and slugs	C-23	Lecture
Unit-II	Concept of IPM, Practices, scope and limitations of IPM	C-24	Lecture
Unit-II	Class Assignment	C-25	Class Assignment
Unit-II	Classification of insecticides, toxicity of insecticides and formulations of insecticides	C-26	Lecture
Unit-II	Classification of insecticides, toxicity of insecticides and formulations of insecticides	C-27	Lecture
Unit-II	Clarification class	C-28	Clarification Class
Unit-II	Biorational pesticides including insect repellents, antifeedants,	C-29	Lecture
Unit-II	Use of drones and AI in pest management	C-30	Lecture
Unit-II	Home Assignment		Home Assignment

BSAC44303 – Pests Management in Crops and Stored Grain Lab

Unit	Particulars	Class No.	Pedagogy of Class
Unit-I	Identification of different types of damage	P-1	Practical
Unit-I	Collection of damage samples, their identification and herbarium preparation of Field crops	P-2,3	Practical
Unit-I	Collection of damage samples, their identification and herbarium preparation of Vegetable crops	P-4	Practical
Unit-I	Collection of damage samples, their identification and herbarium preparation of Fruit crops	P-5,6	Practical
Unit-I	Collection of damage samples, their identification and herbarium preparation of Plantation crops	P-7	Practical
Unit-I	Collection of damage samples, their identification and herbarium preparation of spices &condiments	P-8	Practical
Unit-I	Methods of monitoring of pest incidence in situ.	P-9	Practical
Unit-I	Management strategies of insect pests of different crops.	P-10	Practical
Unit-I	Study on structural entomology and household pests.	P-11	Practical
Unit-I	Storage structures and methods of grain storage.	P-12	Practical
Unit-I	Spraying techniques for selected field and horticultural crops.	P-13	Practical
Unit-I	Vertebrate pest management, Mass multiplication of NPV and entomopathogenic nematodes.	P-14	Practical
Unit-I	Visit nearest FCI godowns.	P-15	Practical

BSAC47304 - Diseases of Field and Horticultural Crops and their Management

Unit	Particulars	Class No.	Pedagogy of Class
Unit-I	Symptoms, etiology, disease cycle, epidemiology and management of major diseases of Rice (blast, brown spot, sheath blight, false smut, bacterial leaf blight, bacterial leaf streak, tungro, khaira)	C-1	Lecture
Unit-I	Symptoms, etiology, disease cycle, epidemiology and management of major diseases of Wheat (rusts, loose smut, Karnal bunt)	C-2	Lecture
Unit-I	Symptoms, etiology, disease cycle, epidemiology and management of major diseases of Maize (banded leaf and sheath blight, southern and northern blight, downy mildew)	C-3	Lecture
Unit-I	Class Assignment	C-4	Class Assignment
Unit-I	Symptoms, etiology, disease cycle, epidemiology and management of major diseases of Sorghum (smuts, grain mold, anthracnose)	C-5	Lecture
Unit-I	Symptoms, etiology, disease cycle, epidemiology and management of major diseases of Bajra (downy mildew, ergot) and Finger millet (blast, leaf spot)	C-6	Lecture
Unit-I	Home Assignment		Home Assignment
Unit-I	Symptoms, etiology, disease cycle, epidemiology and management of major diseases of Groundnut (early and late leaf spots, rust, wilt) and Soybean (rhizoctonia blight, bacterial spot, seed and seedling rot, mosaic)	C-7	Lecture
Unit-I	Class Assignment	C-8	Class Assignment
Unit-I	Symptoms, etiology, disease cycle, epidemiology and management of major diseases of Grams (Ascochyta blight, wilt, grey mold) and Pea (downy mildew, powdery mildew, rust)	C-9	Lecture
Unit-I	Presentation	C-10	Presentation
Unit-I	Symptoms, etiology, disease cycle, epidemiology and management of major diseases of Black gram and Green gram (web blight, Cercospora leaf spot, anthracnose, yellow mosaic)	C-11	Lecture
Unit-I	Symptoms, etiology, disease cycle, epidemiology and management of major diseases of Sugarcane	C-12	Lecture

	(red rot, smut, grassy shoot, ratoon stunting, PokahBoeng)		
Unit-I	Quiz	C-13	Quiz
Unit-I	Symptoms, etiology, disease cycle, epidemiology and management of major diseases of Mustard (Alternaria blight, white rust, downy mildew, sclerotinia stem rot) and Sunflower (sclerotinia stem rot, Alternaria blight)	C-14	Lecture
Unit-I	Presentation	C-15	Presentation
Unit-I	Symptoms, etiology, disease cycle, epidemiology and management of major diseases of Cotton (anthracnose, vascular wilts, black arm)	C-16	Lecture
Unit-II	Symptoms, etiology, disease cycle, epidemiology and management of major diseases of Citrus (canker, gummosis) and Guava (wilt, anthracnose)	C-17	Lecture
Unit-II	Home Assignment		Home Assignment
Unit-II	Symptoms, etiology, disease cycle, epidemiology and management of major diseases of Banana (sigatoka, Panama wilt, bacterial wilt, bunchy top), Papaya (foot rot, leaf curl, mosaic) and Pomegranate (bacterial blight)	C-18	Lecture
Unit-II	Clarification Class	C-19	Clarification Class
Unit-II	Symptoms, etiology, disease cycle, epidemiology and management of major diseases of Apple (scab, powdery mildew, fire blight, crown gall) and Peach (leaf curl)	C-20	Lecture
Unit-II	Quiz	C-21	Quiz
Unit-II	Symptoms, etiology, disease cycle, epidemiology and management of major diseases of Grapevine (downy mildew, powdery mildew, anthracnose) and Strawberry (leaf spot)	C-22	Lecture
Unit-II	Symptoms, etiology, disease cycle, epidemiology and management of major diseases of Coconut (bud rot, Ganoderma wilt), Tea (blister blight) and Coffee (rust)	C-23	Lecture
Unit-II	Class Assignment	C-24	Class Assignment
Unit-II	Symptoms, etiology, disease cycle, epidemiology and management of major diseases of Mango (anthracnose, malformation, bacterial blight,	C-25	Lecture

	powdery mildew)		
Unit-III	Symptoms, etiology, disease cycle, epidemiology and management of major diseases of Potato (early and late blight, black scurf, leaf roll, mosaic) and Tomato (damping off, wilt, early and late blight, leaf curl, mosaic)	C-26	Lecture
Unit-III	Presentation	C-27	Presentation
Unit-III	Symptoms, etiology, disease cycle, epidemiology and management of major diseases of Brinjal (homopsis blight and fruit rot, sclerotinia blight) and Chilli (anthracnose and fruit rot, wilt, leaf curl)	C-28	Lecture
Unit-III	Symptoms, etiology, disease cycle, epidemiology and management of major diseases of Cucurbits (powdery and downy mildew, wilts) and Cruciferous vegetables (Alternaria leaf spot, black rot, cauliflower mosaic)	C-29	Lecture
Unit-III	Symptoms, etiology, disease cycle, epidemiology and management of major diseases of Beans (anthracnose, bacterial blight) and Okra (yellow vein mosaic); Ginger (soft rot), Turmeric (leaf Spot) and Coriander (stem gall); Rose (dieback, powdery mildew, black leaf spot) and Marigold (botrytis blight, leaf spots).	C-30	Lecture

BSAC47305 - Diseases of Field and Horticultural Crops and their Management Lab

Unit	Particulars	Class No.	Pedagogy of Class
Unit-I	To study the symptoms of Blast and brown spot of rice	P-1	Practical
Unit-I	To study the symptoms of sheath blight and bacterial leaf blight of rice	P-2	Practical
Unit-I	To study the symptoms of downy mildew and powdery of cucurbits	P-3	Practical
Unit-I	To study the symptoms of rhizoctonia and Cercospora leaf spot of green gram / black gram	P-4	Practical
Unit-I	To study the symptoms of Alternaria blight and downy mildew of mustard	P-5	Practical
Unit-I	To study the symptoms of early blight of late blight of potato and tomato	P-6	Practical
Unit-I	To study the symptoms of Phomopsis blight of brinjal, powdery mildew and rust of pea	P-7	Practical
Unit-I	To study the symptoms of stem gall of coriander, anthracnose and fruit rot of chilli	P-8	Practical
Unit-I	To study the symptoms of taphrina leaf spot of turmeric, red rot of sugarcane	P-9	Practical
Unit-I	Acquaintance with fungicides, antibiotics and bio-pesticides and their use in management of diseases of horticultural crops	P-10,11	Practical
Unit-I	Identification and histopathological studies of selected diseases of field and horticultural crops covered in theory.	P-12	Practical
Unit-I	Field visit for the diagnosis of field problems	P-13	Practical
Unit-I	Collection and preservation of plant diseased specimens for herbarium.	P-14,15	Practical

BSAC42300 - Crop Improvement-I (Kharif Crops)

Unit	Particulars	Class No.	Pedagogy of Class
Unit-I	Centers of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fibers; fodders and cash crops; vegetable and horticultural crops	C1	Lecture
Unit-I	Plant genetic resources, its utilization and conservation, study of genetics of qualitative and quantitative characters	C2	Lecture
Unit-I	Class Assignment	C3	Class Assignment
Unit-I	Important concepts of breeding self-pollinated, cross pollinated and vegetatively propagated crops	C4	Lecture
Unit-I	Clarification Class	C5	Clarification Class
Unit-I	Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield	C6	Lecture
Unit-I	Presentation	C7	Presentation
Unit-I	adaptability, stability, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional)	C8	Lecture
Unit-I	Home Assignment		Home Assignments
Unit-I	Hybrid seed production technology in Maize	C9	Lecture
Unit-I	Presentation	C10	Presentation
Unit-I	Hybrid seed production technology in Rice,	C11	Lecture
Unit-I	Hybrid seed production technology in Sorghum	C12	Lecture
Unit-I	Home Assignment		Home Assignments
Unit-I	Hybrid seed production technology in Pearl millet and Pigeonpea, etc.	C13	Lecture
Unit-I	Ideotype concept and climate resilient crop varieties for future	C14	Lecture
Unit-I	Quiz	C15	Quiz

BSAC42301 - Crop Improvement-I (Kharif Crops) Lab

Unit	Particulars	Class No.	Pedagogy of Class
Unit-I	Introduction to Floral Biology	P-1	Practical
Unit-I	Emasculation Techniques	P-2	Practical
Unit-I	Practical hybridization methods in Pearl millet, Ragi, Pigeonpea, and Urdbean	P-3	Practical
Unit-I	Practical hybridization methods in Mungbean, Soybean, Groundnut, and Sesame	P-4	Practical
Unit-I	Practical hybridization methods in Castor, Cotton, Cowpea, Tobacco	P-5	Practical
Unit-I	Practical hybridization methods in Brinjal, Okra, and Cucurbitaceous crops	P-6	Practical
Unit-I	Strategies and methods for maintaining genetic purity in various Kharif crops	P-7	Practical
Unit-I	Germplasm Handling	P-8	Practical
Unit-I	Field techniques for seed production in Kharif crops	P-9	Practical
Unit-I	Methods for producing hybrid seeds in selected Kharif crops	P-10	Practical
Unit-I	Practical exercises on estimating heterosis, inbreeding depression, and heritability	P-11	Practical
Unit-I	Field Experiment Layout	P-12	Practical
Unit-I	Evaluation of quality characters and identification of donor parents for different traits in Kharif crops	P-13	Practical
Unit-I	Seed Production Plot Visit	P-14	Practical
Unit-I	All India Coordinated Research Project (AICRP) Plot Visit	P-15	Practical

BSAE41003 - Weed Management

Unit	Particulars	Class No.	Pedagogy of Class
Unit-I	Introduction to Weeds	C1	Lecture
Unit-I	Classification of Weeds	C2	Lecture
Unit-I	Class Assignment	C3	Class Room Assignment
Unit-I	Reproduction and Dissemination of Weeds	C4	Lecture
Unit-I	Crop-Weed Competition and Growth Factors	C5	Lecture
Unit-I	Home Assignment		Home Assignment
Unit-I	Studies on Weed Seed Bank and Weed Shifts	C6	Lecture
Unit-I	Concepts of Weed Management	C7	Lecture
	Quiz	C8	Quiz
Unit-I	Integrated Weed Management	C9	Lecture
Unit-II	Home Assignment		Home Assignment
Unit-II	Herbicide Classification and Properties, Nano Herbicides and Precision Weed Management	C10	Lecture
Unit-II	Presentation	C11	Presentation
Unit-II	Herbicide Resistance and Its Management, Weed Management in Cropping Systems	C12	Lecture
Unit-II	Clarification Class	C13	Clarification Class
Unit-II	Weed Management in Horticultural and Aquatic Crops	C14	Lecture
Unit-II	Presentation	C15	Presentation

BSAE41004 - Weed Management Lab

Unit	Particulars	Class No.	Pedagogy of Class
Unit-I	Techniques of Weed Preservation	P-1	Practical
Unit-I	Weed Identification and Losses Caused by Weeds	P-2	Practical
Unit-I	Biology of Important Weeds	P-3	Practical
Unit-I	Study Weeds in Different Situations	P-4	Practical
Unit-I	Study of Herbicide Formulations	P-5	Practical
Unit-I	Study of Herbicide Mixtures	P-6	Practical
Unit-I	Methods of Herbicide Application	P-7	Practical
Unit-I	Herbicide Application Equipment	P-8	Practical
Unit-I	Equipment Calibration	P-9	Practical
Unit-I	Weed Control Implements	P-10	Practical
Unit-I	Calculation of Herbicide Doses and Requirements	P-11	Practical
Unit-I	Weed Control Efficiency and Weed Index	P-12	Practical
Unit-I	Phytotoxicity of Herbicides	P-13	Practical
Unit-I	Weed Management in Fallow Lands	P-14	Practical
Unit-I	Management of Problem and Parasitic Weeds	P-15	Practical

BSAC48300 - Ornamental Crops, MAPs and Landscaping

Unit	Particulars	Class No.	Pedagogy of Class
Unit-I	Production technology of ashwagandha, costus isabgol and geranium.	C-1	Lecture
Unit-I	Production technology of mint, aloe, ocimum, Coleus, Glory, lily, Periwinkle etc.	C-2	Lecture
Unit-I	Production technology of plants like lemongrass, citronella, vetiver and palmarosa etc.	C-3	Lecture
Unit-I	Class Assignment	C-4	Class Assignment
Unit-I	Importance and scope of ornamental crops; Importance and scope of medicinal and aromatic plants and landscaping. Principles of landscaping; Landscape uses of trees, shrubs and climbers.	C-5	Lecture
Unit-I	Home Assignment		Home Assignment
Unit-I	Production technology of important cut flowers like rose, gerbera and orchids.	C-6	Lecture
Unit-I	Presentation	C-7	Presentation
Unit-I	Production technology of gladiolus, tuberose and lilium.	C-8	Lecture
Unit-I	Clarification Class	C-9	Clarification Class
Unit-I	Production technology of chrysanthemum and carnation.	C-10	Lecture
Unit-I	Home Assignment		Home Assignment
Unit-I	Package of practices for loose flowers like marigold and jasmine under open conditions.	C-11	Lecture
Unit-I	Brief concept of Home landscaping, Carpet bedding, Topiary, Bonsai, Lawn, flower arrangement, Herbaceous Border, Hedge, Edge etc.	C-12	Lecture
Unit-I	Quiz	C-13	Quiz
Unit-I	Processing and value addition imp ornamental crops; Processing and value addition of MAPs produce.	C-14	Lecture
Unit-I	Presentation	C-15	Presentation

BSAC48301 - Ornamental Crops, MAPs and Landscaping -Lab

Unit	Particulars	Class No.	Pedagogy of Class
Unit-I	Identification MAPs and Ornamental plants (trees, shrubs, climbers, seasonal flower and house plants).	P-1,2	Practical
Unit-I	Propagation of MAP, Bed preparation and planting of MAP.	P-3,4	Practical
Unit-I	Nursery bed preparation and sowing of seasonal flower seeds.	P-5	Practical
Unit-I	Propagation of ornamental plants by terminal/herbaceous cuttings.	P-6	Practical
Unit-I	Propagation of anthurium, orchids and bougainvillea	P-7	Practical
Unit-I	Planting of gerbera suckers.	P-8	Practical
Unit-I	Planting of gladiolus corms.	P-9	
Unit-I	Establishment and maintenance of lawn.	P-10	Practical
Unit-I	Preparation of flower preservatives and their use in extending the vase life of cut flowers.	P-11,12	Practical
Unit-I	Training and pruning of ornamental plants and raising of hedge and edge.	P-13,14	Practical
Unit-I	Planning and layout of garden.	P-15	Practical

BSAE41005 - Farming based livelihood systems

Unit	Particulars	Class No.	Pedagogy of Class
Unit-I	Status of agriculture in India and different states,	C-1	Lecture
Unit-I	Income of farmers and rural people in India, Livelihood-Definition, concept and livelihood pattern in urban and rural areas,	C-2	Lecture
Unit-I	Different indicators to study livelihood systems.	C-3	Lecture
Unit-I	Agricultural livelihood systems (ALS): Meaning, approach, approaches and framework, Definition of farming systems	C-4	Lecture
Unit-I	Class Assignment	C-5	Class Assignment
Unit-I	Farming based livelihood systems Prevalent Farming systems in India contributing to livelihood.	C-6	Lecture
Unit-II	Types of traditional and modern farming systems.	C-7	Lecture
Unit-II	Home Assignment		Home Assignment
Unit-II	Components of farming system/ farming-based livelihood systems- Crops and cropping systems,	C-8	Lecture
Unit-II	Livestock (Dairy, Piggery, Goatry, Poultry, Duckry etc.),	C-9	Lecture
Unit-II	Clarification class	C-10	Clarification class
Unit-II	Horticultural crops, Agro-forestry systems, Aqua culture Duck/Poultry cum Fish	C-11	Lecture
Unit-II	Quiz	C-12	Quiz
Unit-II	Dairy cum Fish, Piggery cum Fishetc., Small-, medium- and large- enterprises including value chains	C-13	Lecture
Unit-II	Home Assignment		Home Assignment
Unit-II	Secondary enterprises as livelihood components for farmers,	C-14	Lecture
Unit-II	Presentation	C-15	Presentation
Unit-II	Factors affecting integration of various enterprises of farming for livelihood.	C-16	Lecture
Unit-II	Feasibility of different farming systems for different agro-climatic zones,	C-17	Lecture
Unit-II	Class Assignment	C-18	Class Assignment
Unit-II	Commercial farming-based livelihood models by NABARD,	C-19	Lecture
Unit-II	Class room assignment	C-20	Class room assignment

Unit-II	ICAR and other organizations across the country, Case studies on different livelihood enterprises associated with the farming.	C-21	Lecture
Unit-II	Quiz	C-22	Quiz
Unit-II	Risk and success factors in farming-based livelihood systems, Schemes and programs by Central and State Government,	C-23	Lecture
Unit-II	Clarification Class	C-24	Clarification Class
Unit-II	Public and Private organizations involved in promotion of farming-based livelihood opportunities.	C-25	Lecture
Unit-II	Presentation	C-26	Presentation
Unit-II	Role of farming-based livelihood enterprises in 21st Century in view of circular economy,	C-27	Lecture
Unit-II	Quiz	C-28	Quiz
Unit-II	Green economy, climate change, digitalization and changing life style.	C-29	Lecture
Unit-II	Clarification class	C-30	Clarification class

BSAE41006 - Farming based livelihood systems Lab

Unit	Particulars	Class No.	Pedagogy of Class
Unit-I	Survey of farming systems and agricultural based livelihood enterprises,	P-1	Practical
Unit-I	Survey of farming systems and agricultural based livelihood enterprises,	P-2	Practical
Unit-I	Study of components of important farming based livelihood models/ systems in different agro-climatic zones,	P-3	Practical
Unit-I	Study of components of important farming based livelihood models/ systems in different agro-climatic zones,	P-4	Practical
Unit-I	Study of production and profitability of crop based, livestock based, processing based and integrated farming based livelihood models,	P-5	Practical
Unit-I	Study of production and profitability of crop based, livestock based, processing based and integrated farming based livelihood models,	P-6	Practical
Unit-I	Field visit of innovative farming system models.	P-7	Practical
Unit-I	Visit of Agri-based enterprises and their functional aspects for integration of production, processing and distribution sectors and	P-8	Practical
Unit-I	Study of agri-enterprises involved in industry and service sectors (Value Chain Models),	P-9	Practical
Unit-I	Study of agri-enterprises involved in industry and service sectors (Value Chain Models),	P-10	Practical
Unit-I	Learning about concept of project formulation on farming-based livelihood systems along with cost and profit analysis,	P-11	Practical
Unit-I	Learning about concept of project formulation on farming-based livelihood systems along with cost and profit analysis,	P-12	Practical
Unit-I	Learning about concept of project formulation on farming-based livelihood systems along with cost and profit analysis,	P-13	Practical
Unit-I	Case study of Start-Ups in agri-sectors	P-14	Practical
Unit-I	Case study of Start-Ups in agri-sectors	P-15	Practical

Note: This is a tentative lesson plan. The same may change from faculty to faculty as per the teaching pedagogy adopted by the faculty.

The students will register for online courses of 10 credit hours (as per UGC guidelines for online courses) as a partial requirement for the comprising one or more courses at the approved portals during the third and fourth years with prior approval from the Head of the institution.

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