

SCHEME

The structure of the course will comprise eleven-papers in Semester.

SEMESTER-VI			
S.NO.	SUBJECT TITLE	SUBJECT CODE	CREDITS
1.	Rainfed Agriculture & Watershed Management	BAGRI20S601	2(1+1)
2.	Protected Cultivation and Secondary Agriculture	BAGRI20S602	2(1+1)
3.	Diseases of Field and Horticultural Crops and their Management-II	BAGRI20S603	3(2+1)
4.	Post-harvest Management and Value Addition of Fruits and Vegetables	BAGRI20S604	2(1+1)
5.	Management of Beneficial Insects	BAGRI20S605	2(1+1)
6.	Crop Improvement-II (Rabi crops)	BAGRI20S606	2(1+1)
7.	Practical Crop Production –II (Rabi crops)	BAGRI20S607	2(0+2)
8.	Principles of Organic Farming	BAGRI20S608	2(1+1)
9.	Farm Management, Production & Resource Economics	BAGRI20S609	2(1+1)
10.	Principles of Food Science and Nutrition	BAGRI20S610	2(2+0)
11.	Bio pesticides & Bio fertilizers (Elective Course)	BAGRI20S611	3(2+1)
TOTAL			21(11+10)

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Class			B.Sc. (Hons.) Agriculture		
Year/Semester			3 rd Year, VI Semester		
Department			Agriculture		
Paper Name			Rainfed Agriculture and Watershed Management		
Subject code			BAGRI20S601		
L	T	P	Credit Total	2 (1+1)	
1	0	1			
<p>Course Objectives: The course is aimed at</p> <ol style="list-style-type: none"> 1. Explaining the problems faced in rainfed agricultural systems. 2. Imparting knowledge on drought management strategies. 3. Describing watershed management techniques. <p>Expected Course Outcome: At the end of the course the student should be able to</p> <ol style="list-style-type: none"> 1. Build knowledge on solving problems related to rainfed agriculture. 2. Identify several drought management strategies. 3. Plan crop and water management approaches to mitigate drought. 4. Perceive the necessity and difficulties of watershed management. 5. Recommend practices to be followed in rainfed farming systems. 					
Unit	Syllabus				Periods
UNIT 1	Rainfed agriculture: Introduction, types, History of rainfed agriculture and watershed in India; Problems and prospects of rainfed agriculture in India.				3
UNIT 2	Soil and climatic conditions prevalent in rainfed areas; Soil and water conservation techniques, Drought: types, effect of water deficit on physio-morphological characteristics of the plants.				3
UNIT 3	Crop adaptation and mitigation to drought; Water harvesting: importance, its techniques.				3
UNIT 4	Efficient utilization of water through soil and crop management practices, Management of crops in rainfed areas.				3
UNIT 5	Contingent crop planning for aberrant weather conditions, Concept, objective, principles and components of watershed management, factors affecting watershed management.				3

Practical (30 Periods)

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

Text Books


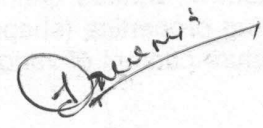

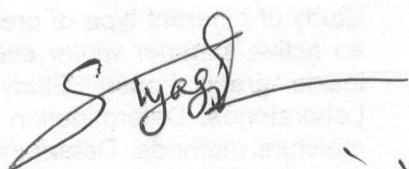
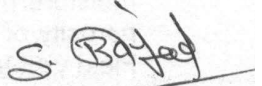
1. Subbareddy, G., Reddy, Y.V.R, Vittal, K.P.R, Thyagaraj, C.R., Ramakrishna, Y.S. and Somani, L.L. 2016. Dryland Agriculture. 2nd Edition, Agrotech Publishing Academy, India.

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- Oswal. M.C. 2017. Watershed Management (for Dryland Agriculture). Associated Publishing Company. India.

Reference Books

- Humberto Blanco-Canqui and Rattan Lal. 2008. Principles of Soil Conservation and Management. Atlantic Pub. & Distr. (P) Ltd., New Delhi, India.
- Singh, S.S. 2016. Crop management under rainfed and irrigated condition. Kalyani Publishers, India.

Class			B.Sc. (Hons.) Agriculture	
Year/Semester			3 rd Year, VI Semester	
Department			Agriculture	
Paper Name			Protected Cultivation and Secondary Agriculture	
Subject code			BAGRI20S602	
L	T	P	Credit Total	2(1+1)
1	0	1		

Course Objectives: The course is aimed to

1. Explain the basics of protected cultivation and its significance in crop cultivation.
2. Demonstrate about different types of greenhouse, its design and cost estimation.
3. Discuss about various drying methods and dryers for post-harvest processing of crops.

Expected Course Outcome: At the end of the course the student should be able to

1. Summarize the scope and importance of greenhouse technology in improving crop production.
2. Compare various types of greenhouses, its advantages and cost benefits.
3. Elaborate on post-harvest processing techniques of various crops.
4. Interpret and compare different drying methods and dryer types applicable for various crops.

Unit	Syllabus	Periods
UNIT 1	Green house technology: Introduction, Types of Green Houses; Plant response to Green house environment, Planning and design of greenhouses,	2
UNIT 2	Design criteria of green house for cooling and heating purposes. Green house equipments, materials of construction for traditional and low cost green houses.	2
UNIT 3	Irrigation systems used in greenhouses, typical applications, passive solar green house, hot air green house heating systems, green house drying. Cost estimation and economic analysis.	3
UNIT 4	Important Engineering properties such as physical, thermal and aero & hydrodynamic properties of cereals, pulses and oilseed, their application in PHT equipment design and operation.	4
UNIT 5	Drying and dehydration; moisture measurement, EMC, drying theory, various drying method, commercial grain dryer (deep bed dryer, flat bed dryer, tray dryer, fluidized bed dryer, recirculatory dryer and solar dryer). Material handling equipment; conveyer and elevators, their principle, working and selection.	4

Practical (30 Periods)

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

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Text Books

1. Singh, B., Singh, B. Sabir, N and M. Hasan. 2014. Advances in Protected Cultivation, New India Publishing Agency, India.
2. Amalendu Chakraverty and R. Paul Singh. 2016. Post-harvest technology and food process engineering. CRC press, USA.

Reference Books

1. Singh, D. K. and K.V. Peter. 2014. Protected Cultivation of Horticultural crops. New India Publishing Agency, India.
2. David W. Reed. 1996. A Grower's Guide to Water, media and nutrition for green house crops. Ball publishing, USA.

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Class			B.Sc. (Hons.) Agriculture	
Year/Semester			3 rd Year, VI Semester	
Department			Agriculture	
Paper Name			Diseases of Field and Horticultural Crops and their Management-II	
Subject code			BAGRI20S603	
L	T	P	Credit Total	3(2+1)
2	0	1		

Course Objectives: The course is aimed at

1. Imparting knowledge on major agricultural and horticultural diseases.
2. Describing the disease causing organism and its mode of spread.
3. Providing information on management of diseased crops.

Expected Course Outcome: At the end of the course the student should be able to

1. Identify and manage major diseases of cereals and pulses.
2. Manage diseases of cash crops and oilseeds.
3. Understand the management practices of major diseases affecting vegetables.
4. Recognize disease symptoms of spices and flower crops and plan control measures.
5. Comprehend the disease management practices of fruit crops.
6. Recommend management practices for major diseases of agricultural and horticultural crops.

Unit	Syllabus	Periods
UNIT 1	Symptoms, etiology, disease cycle and management of following diseases: Horticultural Crops: Mango: anthracnose, malformation, bacterial blight and powdery mildew; Citrus: canker and gummosis; Symptoms, etiology, disease cycle and management of following diseases: Horticultural Crops: Grape vine: downy mildew, Powdery mildew and anthracnose; Apple: scab, powdery mildew, fire blight and crown gall; Peach: leaf curl.	8
UNIT 2	Symptoms, etiology, disease cycle and management of following diseases: Horticultural Crops: Strawberry: leaf spot Potato: early and late blight, black scurf, leaf roll, and mosaic;	4
UNIT 3	Symptoms, etiology, disease cycle and management of following diseases: Horticultural Crops: Cucurbits: downy mildew, powdery mildew, wilt; Onion and garlic: purple blotch, and Stem phylium blight; Chillies: anthracnose and fruit rot, wilt and leaf curl; Turmeric: leaf spot Coriander: stem gall Marigold: Botrytis blight; Rose: dieback, powdery mildew and black leaf spot.	5
UNIT 4	Symptoms, etiology, disease cycle and management of following diseases: Field Crops: Wheat: rusts, loose smut, karnal bunt, powdery mildew, alternaria blight, and ear cockle; Sugarcane: red rot, smut, wilt, grassy shoot, ratoon stunting and Pokkah Boeng;	5
UNIT 5	Symptoms, etiology, disease cycle and management of following diseases: Field Crops: Sunflower: Sclerotinia stem rot and Alternaria blight; Mustard: Alternaria blight, white rust, downy mildew and Sclerotinia stem rot; Gram: wilt, grey mould and Ascochyta blight; Lentil: rust and wilt; Cotton: anthracnose, vascular wilt, and black arm; Pea: downy mildew, powdery mildew and rust.	8

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Practical (30 Periods)

Identification and histo pathological 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.

Text Books

1. Singh, R.S. 2017. Introduction to Principles of Plant Pathology. 5th Edition, MedTech Publishers, India.
2. Mehrotra, R.S. and A. Aggarwal. 2017. Plant Pathology. 3rd Edition, Tata McGraw Hill Publishing Co Ltd., India.

Reference Books

1. Bhattacharya, U.K. 2017. Plant Pathology at a Glance. 1st Edition, Kalyani Publishers, India.
2. Aneja, K.R. 2015. An Introduction to Mycology. 2nd Edition, New Age International Pvt. Ltd., Chennai, India.

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Class			B.Sc. (Hons.) Agriculture	
Year/Semester			3 rd Year, VI Semester	
Department			Agriculture	
Paper Name			Post-harvest Management and Value Addition of Fruits and Vegetables	
Subject code			BAGRI20S604	
L	T	P	Credit Total	2(1+1)
1	0	1		
<p>Course Objectives: The course is aimed at</p> <ol style="list-style-type: none"> 1. Describing the role of post-harvest technology in extending shelf life of agricultural produces. 2. Improving the knowledge and need on value addition in agro-processing. 3. Developing hands on training on processing of different fruits and vegetable products. <p>Expected Course Outcome: At the end of the course the student should be able to</p> <ol style="list-style-type: none"> 1. Discuss on the importance of post-harvest management of crops. 2. Analyze effective methods of storage of the harvested produce. 3. Define processing and value addition of harvested crop produces. 4. Formulate and describe packaging of value added products from fruits and vegetables. 5. Develop entrepreneur skills and discover ideas to process fruits and vegetables. 				
Unit	Syllabus			Periods
UNIT 1	Importance of post-harvest processing of fruits and vegetables, extent and possible causes of post harvest losses; Pre-harvest factors affecting postharvest quality, maturity, ripening and changes occurring during ripening; Respiration and factors affecting respiration rate.			5
UNIT 2	Harvesting and field handling; Storage (ZECC, cold storage, CA, MA, and hypobaric); Value addition concept; Principles and methods of preservation.			3
UNIT 3	Intermediate moisture food- Jam, jelly, marmalade, preserve, candy – Concepts and Standards; Fermented and non-fermented beverages.			2
UNIT 4	Tomato products- Concepts and Standards; Drying/ Dehydration of fruits and vegetables – Concept and methods, osmotic drying.			3
UNIT 5	Canning - Concepts and Standards, packaging of products.			2

Practical (30 Periods)

Applications of different types of packaging, containers for shelf life extension. Effect of temperature on shelf life and quality of produce. Demonstration of chilling and freezing injury in vegetables and fruits. Extraction and preservation of pulps and juices. Preparation of jam, jelly, RTS, nectar, squash, osmotically dried products, fruit bar and candy and tomato products, canned products. Quality evaluation of products - physico-chemical and sensory. Visit to processing unit/ industry.

Text Books

1. Hosahalli S. Ramaswamy. 2014. Post-harvest Technologies of Fruits and Vegetables. DESTceh Pubilcaitons Inc., USA.
2. Srivastava, RP and Kumar, Sanjeev. 2017. Fruits and Vegetable Preservation Principles and Practices. 3rd Edition. CBS Publishers & Distributors, India.

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Reference Books

1. Jagadish Chandra Jana., Tanmay Kumar Koley., Arghya Mani., Chandan Karak., Dipak Kumar Murmu. 2018. Advances in post harvest management, processing and value addition of horticultural crops-Part 2: Vegetables, spices and plantation crops. India.
2. Nirmal Sinha., Jivan Sidhu Jozsef Barta, James Wu. and M. Pilar Cano. 2012. Handbook of Fruits and Fruit Processing. 2nd Edition, John Wiley & Sons, Ltd. Publication, USA.

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Class			B.Sc. (Hons.) Agriculture	
Year/Semester			3 rd Year, VI Semester	
Department			Agriculture	
Paper Name			Management of Beneficial Insects	
Subject code			BAGRI20S605	
L	T	P	Credit Total	2(1+1)
1	0	1		
<p>Course Objectives: The course is aimed at</p> <ol style="list-style-type: none"> 1. Instructing on production techniques involved in beekeeping and silkworm rearing. 2. Describing lac products and production techniques. 3. Imparting knowledge on biological control of insect pests using natural enemies. <p>Expected Course Outcome: At the end of the course the student should be able to</p> <ol style="list-style-type: none"> 1. Acquire knowledge on honeybee species and apiary management. 2. Understand mulberry cultivation and silkworm rearing techniques. 3. Comprehend lac culture and their products. 4. Acquire knowledge on biological control of insect pests. 5. Recommend package of practices for rearing honeybee, silkworm and lac. 				
Unit		Syllabus		Periods
UNIT 1		Importance of beneficial Insects, Beekeeping and pollinators, bee biology, commercial methods of rearing, equipment used, seasonal management, bee enemies and disease.		3
UNIT 2		Bee pasturage, bee foraging and communication. Insect pests and diseases of honey bee. Role of pollinators in cross pollinated plants.		3
UNIT 3		Types of silkworm, voltinism and biology of silkworm. Mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves. Rearing, mounting and harvesting of cocoons. Pest and diseases of silkworm, management, rearing appliances of mulberry silkworm and methods of disinfection.		4
UNIT 4		Species of lac insect, morphology, biology, host plant, lac production – seed lac, button lac, shellac, lac- products.		2
UNIT 5		Identification of major parasitoids and predators commonly being used in biological control. Insect orders bearing predators and parasitoids used in pest control and their mass multiplication techniques. Important species of pollinator, weed killers and scavengers with their importance.		3

Practical (30 Periods)

Honey bee species, castes of bees. Beekeeping appliances and seasonal management, bee enemies and disease. Bee pasturage, bee foraging and communication. Types of silkworm, voltinism and biology of silkworm. Mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves. Species of lac insect, host plant identification. Identification of other important pollinators, weed killers and scavengers. Visit to research and training institutions devoted to beekeeping, sericulture, lac culture and natural enemies. Identification and techniques for mass multiplication of natural enemies.

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Text Books

1. Srivastava, K.P. and G.S. Dhaliwal. 2013. A text book of applied entomology, Volume 2. Kalyani Publishers, India.
2. Ragumorthy, K.N., M.R. Srinivasan, V. Balasubramanian and N. Natarajan. 2016. Principles of Applied Entomology, Ae Publications. India.

Reference Books

1. David V. Alford. 2019. Beneficial Insects. CRC Press, USA.
2. Opender Koul and G.S. Dhaliwal. 2019. Predators and Parasitoids. CRC Press, USA.

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Class			B.Sc. (Hons.) Agriculture		
Year/Semester			3 rd Year, VI Semester		
Department			Agriculture		
Paper Name			Crop Improvement – II (<i>Rabi</i>)		
Subject code			BAGRI20S606		
L	T	P	Credit Total	2(1+1)	
1	0	1			
<p>Course Objectives: The course is aimed at</p> <ol style="list-style-type: none"> 1. Imparting knowledge on the use of genetic resources. 2. Describing concepts of breeding crops based on objectives. 3. Teaching hybrid seed production techniques and introducing to modern breeding concepts. <p>Expected Course Outcome: At the end of the course the student should be able to</p> <ol style="list-style-type: none"> 1. Infer the importance of plant genetic resources and utilize it in crop improvement. 2. Design crop specific breeding methodology. 3. Comprehend breeding methods specific to an objective. 4. Describe hybrid seed production of various rabi crops. 5. Practice hybridization and plant breeding. 					
Unit		Syllabus			Periods
UNIT 1	Plant genetic resources, its utilization and conservation. Study of genetics of qualitative and quantitative characters.			2	
UNIT 2	Floral biology, emasculation, pollination, centers of origin, distribution of species, wild relatives in different cereals and pulses of <i>Rabi</i> season.			3	
UNIT 3	Floral biology, emasculation, pollination, centers of origin, distribution of species, wild relatives in different oilseeds, fodder crops and cash crops, vegetable and horticultural crops of <i>Rabi</i> season.			4	
UNIT 4	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) of different <i>Rabi</i> crops.			4	
UNIT 5	Hybrid seed production technology of <i>rabi</i> crops. Ideotype concept and climate resilient crop varieties for future.			2	

Practical (30 Periods)

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

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Text Books

1. Singh, Chhidda, Singh, Prem and Singh, Rajbir.2003. Modern Techniques of Raising Field Crops, Oxford & IBH Publishing Co., New Delhi.
2. Singh, S.S.1998. Crop Management Under Irrigated and Rainfed Conditions. Kalyani Publishers, New Delhi.
3. Panda, S.C.2012. Modern Concepts and Advance Principles in Crop Production. Agrobios (India), Jodhpur.

Reference Books

1. Singh, S.S.and Singh, Rajesh. 2013. Crop Management Under Irrigated and Rainfed Conditions. Kalyani Publishers, New Delhi.
2. Rathore, P.S. 2000. Techniques and Management of Field Crop Production, Agrobios (India), Jodhpur.

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Class			B.Sc. (Hons.) Agriculture	
Year/Semester			3 rd Year, VI Semester	
Department			Agriculture	
Paper Name			Practical Crop Production –II (Rabi crops)	
Subject code			BAGRI20S607	
L	T	P	Credit Total	1(0+1)
0	0	1		

Course Objectives: The course is aimed at

1. Planning and practicing cultivation of kharif crops.
2. Imparting knowledge on integrated nutrient pest and disease management.
3. Sharing knowledge on marketing of produce and calculating cost benefit ratio.

Expected Course Outcome: At the end of the course the student should be able to

1. Plan and decide on growing a suitable kharif crop.
2. Decide on the best cropping system that can be followed for a kharif season.
3. Recommend package of practices for growing kharif crops.
4. Practice kharif crop production through integrated management.
5. Calculate cost benefit ratio based on cultivation and marketing expenses of a crop.

Practical (30 Periods)

Crop planning, raising field crops in multiple cropping systems: Field preparation, seed, treatment, nursery raising, sowing, nutrient, water and weed management and management of insect-pests diseases of crops, harvesting, threshing, drying winnowing, storage and marketing of produce. The emphasis will be given to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies. Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of 8-10 students.

Text Books

1. Singh, Chhidda, Singh, Prem and Singh, Rajbir.2003. Modern Techniques of Raising Field Crops, Oxford & IBH Publishing Co., New Delhi.
2. Singh, S.S.1998. Crop Management Under Irrigated and Rainfed Conditions. Kalyani Publishers, New Delhi.
3. Panda, S.C.2012. Modern Concepts and Advance Principles in Crop Production. Agrobios (India), Jodhpur.

Reference Books

1. Singh, S.S.and Singh, Rajesh. 2013. Crop Management Under Irrigated and Rainfed Conditions. Kalyani Publishers, New Delhi.
2. Rathore, P.S. 2000. Techniques and Management of Field Crop Production, Agrobios (India), Jodhpur.

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Class			B.Sc. (Hons.) Agriculture	
Year/Semester			3 rd Year, VI Semester	
Department			Agriculture	
Paper Name			Principles of Organic Farming	
Subject code			BAGRI20S608	
L	T	P	Credit Total	2(1+1)
1	0	1		

Course Objectives: The course is aimed at

1. Imparting knowledge on the scope and concepts of organic farming in India.
2. Discussing on indigenous weed, pest, disease and nutrient management for organic farming.
3. Educating students on the certification and marketing of organic farm produces.

Expected Course Outcome: At the end of the course the student should be able to

1. Analyze the scope of organic farming.
2. Recommend varieties suitable for organic farming.
3. Comprehend management practices suitable for organic farming.
4. Understand processing and marketing of organic products.
5. Develop entrepreneur skills and ideas to practice organic farming.

Unit	Syllabus	Periods
UNIT 1	Organic farming, principles and its scope in India; Initiatives taken by Government (central/ state), NGOs and other organizations for promotion of organic agriculture; Organic ecosystem and their concepts	5
UNIT 2	Organic nutrient resources and its fortification; Restrictions to nutrient use in organic farming.	2
UNIT 3	Choice of crops and varieties in organic farming; Fundamentals of insect, pest, disease and weed management under organic mode of production.	3
UNIT 4	Operational structure of NPOP; Certification process and standards of organic farming.	2
UNIT 5	Processing, leveling, economic considerations and viability, marketing and export potential of organic products.	3

Practical (30 Periods)

Visit of organic farms to study the various components and their utilization; Preparation of enrich compost, vermicompost, bio-fertilizers/bio-inoculants and their quality analysis; Indigenous technology knowledge (ITK) for nutrient, insect, pest disease and weed management; Cost of organic production system; Post harvest management; Quality aspect, grading, packaging and handling.

Text Books

1. Sarath Chandran, Unni M.R and Sabu Thomas. 2018. Organic farming. Woodhead Publishing, UK.
2. Reddy, S.R.2017. Principles of organic farming. Kalyani publishers, India.

Reference Books

1. Ranjan Kumar Biswas. 2014. Organic farming in India. New Delhi Publishers, India.

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Class			B.Sc. (Hons.) Agriculture		
Year/Semester			3 rd Year, VI Semester		
Department			Agriculture		
Paper Name			Farm Management, Production & Resource Economics		
Subject code			BAGRI20S609		
L	T	P	Credit Total	2(1+1)	
1	0	1			

Course Objectives: The course is aimed at

1. Discussing the principles of farm management and production economics.
2. Explaining farm business management.
3. Imparting knowledge on risks in agricultural production and management of resources.

Expected Course Outcome: At the end of the course the student should be able to

1. Explain the importance of farm management in agriculture.
2. Comprehend the benefits and cost involved in farm management.
3. Analyze farm business.
4. Devise plans to overcome risks and manage farm resource.
5. Manage a farm.

Unit	Syllabus	Periods
UNIT 1	Meaning and concept of farm management, objectives and relationship with other sciences. Meaning and definition of farms, its types and characteristics, factor determining types and size of farms. Principles of farm management: concept of production function and its type, use of production function in decision-making on a farm, factor-product, factor-factor and product relationship, law of equi-marginal/or principles of opportunity cost and law of comparative advantage.	3
UNIT 2	Meaning and concept of cost, types of costs and their interrelationship, importance of cost in managing farm business and estimation of gross farm income, net farm income, family labour income and farm business income.	2
UNIT 3	Farm business analysis: meaning and concept of farm income and profitability, technical and economic efficiency measures in crop and livestock enterprises. Importance of farm records and accounts in managing a farm, various types of farm records needed to maintain on farm, farm inventory, balance sheet, profit and loss accounts.	3
UNIT 4	Meaning and importance of farm planning and budgeting, partial and complete budgeting, steps in farm planning and budgeting-linear programming, appraisal of farm resources, selection of crops and livestock's enterprises. Concept of risk and uncertainty occurs in agriculture production, nature and sources of risks and its management strategies, Crop/livestock/machinery insurance – weather based crop insurance, features, determinants of compensation.	3
UNIT 5	Concepts of resource economics, differences between NRE and agricultural economics, unique properties of natural resources. Positive and negative externalities in agriculture, Inefficiency and welfare loss, solutions, Important issues in economics and management of common property resources of land, water, pasture and forest resources etc.	4

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Practical (30 Periods)


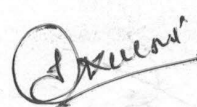
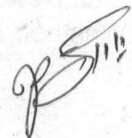
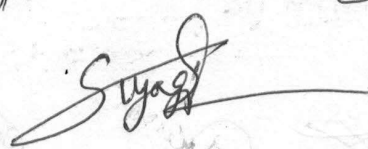

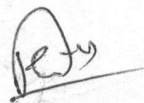
Preparation of farm layout. Determination of cost of fencing of a farm. Computation of depreciation cost of farm assets. Application of equi-marginal returns/opportunity cost principle in allocation of farm resources. Determination of most profitable level of inputs use in a farm production process.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

Text Books

1. Ronald D. Kay, William M. Edwards, and Patricia A Duffy. 2015. Farm Management. 8th edition. McGraw-Hill Education, USA.
2. Raju, V.T and D.V.S. Rao. 2017. Economics of Farm Production and Management. Oxford and IBH Publishing Co. Pvt. Ltd., India.

Reference Books

1. Andrew Barkley and Paul W. Barkley. 2013. Principles of Agricultural Economics. Routledge, Taylor and Francis Group, New York, USA.
2. Amarjit Singh, A.N. Sadhu and Jasbir Singh. 2016. Fundamentals of Agricultural Economics. Himalaya Publishing House, India.
3. Subba Reddy, S and P. Raghu Ram. 2017. Agricultural Finance and Management. Oxford & IBH Publishing Company Private Ltd., New Delhi, India.

Class			B.Sc. (Hons.) Agriculture		
Year/Semester			3 rd Year, VI Semester		
Department			Agriculture		
Paper Name			Principles of Food Science and Nutrition		
Subject code			BAGRI20S610		
L	T	P	Credit Total	2(2+0)	
2	0	0			
<p>Course Objectives: The course is aimed at</p> <ol style="list-style-type: none"> 1. Explaining students on the principles behind food science. 2. Creating awareness on the safety aspects of food and their industrial application. 3. Improving the ability of formulating new need based diet plans. <p>Expected Course Outcome: At the end of the course the student should be able to</p> <ol style="list-style-type: none"> 1. Analyze food biochemically. 2. Comprehend food nutrition, processing, spoilage and preservation. 3. Assess food storage pertaining to safety and hygiene. 4. Analyze stored food based on standards. 5. Comprehend food regulatory laws. 6. Test food scientifically as per standards in a laboratory. 					
Unit		Syllabus			Periods
UNIT 1		Concepts of Food Science (definitions, measurements, density, phase change, pH, osmosis, surface tension, colloidal systems etc.).			2
UNIT 2		Food composition and chemistry (water, carbohydrates, proteins, fats, vitamins, minerals, flavours, colours, miscellaneous bioactives, important reactions).			3
UNIT 3		Food microbiology (bacteria, yeast, moulds, spoilage of fresh & processed foods, Production offer mented foods).			3
UNIT 4		Principles and methods of food processing and preservation (use of heat, low temperature, chemicals, radiation, drying etc.).			3
UNIT 5		Food and nutrition, Malnutrition (over and under nutrition), nutritional disorders; Energy metabolism (carbohydrate, fat, proteins); Balanced/modified diets, Menu planning, New trends in food science and nutrition.			4

Text Books

1. Srilakshmi . 2018. Food science. 7th Edition. New age international publishers, New Delhi.
2. Martin Ray Adams, Maurice O. Moss and Peter McClure. 2016. Food Microbiology. Royal society of chemistry, Cambridge, UK.

Reference Books

1. Avantina Sharma. 2017. Text book of food science and technology. 2nd edition, CBS Publishers & Distributors Pvt. Ltd, New Delhi.
2. William C Frazier, Dennis C Westhoff and N M Vanitha. 2013. McGraw Hill education (India) Pvt. Ltd.

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Class			B.Sc. (Hons.) Agriculture	
Year/Semester			3 rd Year, VI Semester	
Department			Agriculture	
Paper Name			Bio pesticides & Bio fertilizers (Elective Course)	
Subject code			BAGRI20S611	
L	T	P	Credit Total	3(2+1)
2	0	1		
<p>Course Objectives: The course is aimed at</p> <ol style="list-style-type: none"> 1. Imparting knowledge on mass production techniques of biopesticides and biofertilizers. 2. Describing the mode of action of biopesticides and biofertilizers. 3. Demonstrating the practical applications of biopesticides and biofertilizers. <p>Expected Course Outcome: At the end of the course the student should be able to</p> <ol style="list-style-type: none"> 1. Acquire knowledge on scope and importance of biopesticides. 2. Demonstrate mass production and application technology of biopesticides. 3. Comprehend the types of biofertilizers and their characteristics features. 4. Explain the mechanism and mass production of biofertilizers. 5. Demonstrate the different methods of biofertilizer application. 6. Mass produce biopesticides and biofertilizers. 				
Unit		Syllabus		Periods
UNIT 1		History and concept of biopesticides. Importance, scope and potential of biopesticide. Definitions, concepts and classification of biopesticides viz. pathogen, botanical pesticides, and biorationales. Botanicals and their uses.		3
UNIT 2		Biofertilizers - Introduction, status and scope. Structure and characteristic features of bacterial biofertilizers- <i>Azospirillum</i> , <i>Azotobacter</i> , <i>Bacillus</i> , <i>Pseudomonas</i> , <i>Rhizobium</i> and <i>Frankia</i> ; Cynobacterialbiofertilizers- <i>Anabaena</i> , <i>Nostoc</i> , <i>Hapalosiphon</i> and fungal biofertilizers- AM mycorrhiza and ectomycorrhiza.		4
UNIT 3		Mass production technology of bio-pesticides. Virulence, pathogenicity and symptoms of entomo pathogenic pathogens and nematodes. Methods of application of biopesticides. Methods of quality control and Techniques of biopesticides. Impediments and limitation in production and use of biopesticide.		3
UNIT 4		Nitrogen fixation -Free living and symbiotic nitrogen fixation. Mechanism of phosphate solubilization and phosphate mobilization, K solubilization. Production technology: Strain selection, sterilization, growth and fermentation, mass production of carrier based and liquid biofertilizers.		3
UNIT 5		FCO specifications and quality control of biofertilizers. Application technology for seeds, seedlings, tubers, sets etc. Biofertilizers - Storage, shelf life, quality control and marketing. Factors influencing the efficacy of biofertilizers.		2

Practical (30 Periods)

Isolation and purification of important biopesticides: *Trichoderma* *Pseudomonas*, *Bacillus*, *Metarhizium* etc. and its production, Identification of important botanicals, Visit to biopesticide laboratory in nearby area, Field visit to explore naturally infected cadavers, Identification of

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entomopathogenic entities in field condition, Quality control of biopesticides, Isolation and purification of *Azospirillum*, *Azotobacter*, *Rhizobium*, P-solubilizers and cyanobacteria, Mass multiplication and inoculums production of biofertilizers, Isolation of AM fungi -Wet sieving method and sucrose gradient method, Mass production of AM inoculants.

Text Books

1. Sahayaraj, K. 2014. Basic and applied aspects of biopesticides. Springer, India.
2. Giri, B., Prasad, R., Wu, Q.S. and A. Varma. 2019. Biofertilizers for Sustainable Agriculture and Environment. Springer International Publishing, Germany.

Reference Books

1. Ignacimuthu, S, and A. Sen. 2001. Microbials in insect pest management. Science Publishers, India.
2. Panda, H. and D. Hota. 2007. Biofertilizers and organic farming. Gene-Tech Books. India.

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