

SCHEME

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

SEMESTER – V			
S. NO.	SUBJECT TITLE	SUBJECT CODE	CREDITS
1.	Principles of Integrated Pest and Disease Management	BAGRI20S501	3 (2+1)
2.	Manures, Fertilizers and Soil Fertility Management	BAGRI20S502	3 (2+1)
3.	Pests of Crops and Stored Grain and their Management	BAGRI20S503	3 (2+1)
4.	Diseases of Field and Horticultural Crops and their Management -I	BAGRI20S504	3 (2+1)
5.	Crop Improvement-I (Kharif Crops)	BAGRI20S505	2 (1+1)
6.	Entrepreneurship Development and Business Communication	BAGRI20S506	2 (1+1)
7.	Geo-informatics and Nano-technology and Precision Farming	BAGRI20S507	2 (1+1)
8.	Practical Crop Production – I (Kharif crops)	BAGRI20S508	2 (0+2)
9.	Intellectual Property Rights	BAGRI20S509	1 (1+0)
10.	Agrochemicals (Elective Course)	BAGRI20S510	3 (2+1)
TOTAL			21(12+09)

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M. K. Singh
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Class			B.Sc. (Hons.) Agriculture		
Year/Semester			3 rd Year, V Semester		
Department			Agriculture		
Paper Name			Principles of Integrated Pest and Disease Management		
Subject code			BAGRI20S501		
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		Categories of insect pests and diseases, IPM: Introduction, history, importance, concepts, principles and tools of IPM.			4
UNIT 2		Economic importance of insect pests, diseases and pest risk analysis. Methods of detection and diagnosis of insect pest and diseases. Calculation and dynamics of economic injury level and importance of Economic threshold level.			8
UNIT 3		Methods of control: Host plant resistance, cultural, mechanical, physical, legislative, biological and chemical control. Ecological management of crop environment. Introduction to conventional pesticides for the insect pests and disease management.			8
UNIT 4		Survey surveillance and forecasting of Insect pest and diseases. Development and validation of IPM module.			4
UNIT 5		Implementation and impact of IPM (IPM module for Insect pest and disease. Safety issues in pesticide uses. Political, social and legal implication of IPM. Case histories of important IPM programmes.			6

Practical (30 Periods)

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

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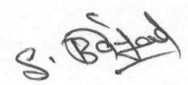

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Text Books

1. Yazdani G.S. and Agarwal M.L. 1979. Elements of Insect Ecology. Naroji publishing house, New Delhi.
2. Atwal, A.S. and Dhaliwal, G.S. 2002. Agricultural Pests of South Asia and Their Management, Kalyani Publishers, New Delhi.

Reference Books

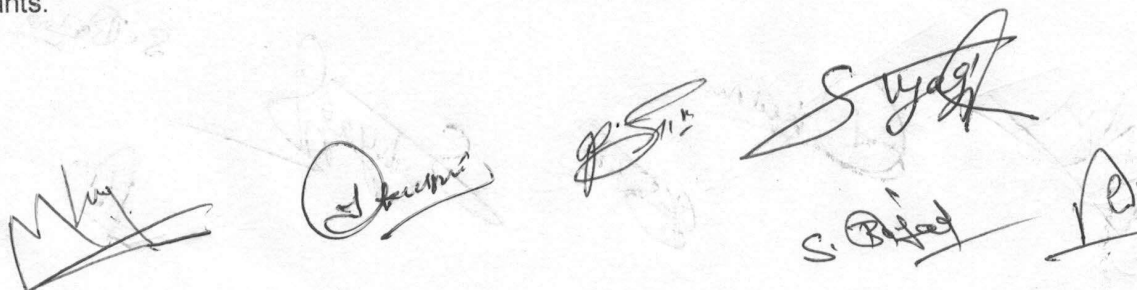
1. Dhaliwal, G.S. and Ramesh Arora 2001. Integrated Pest Management. Concepts and Approaches. Kalyani publishers, New Delhi.
2. Mathur and Upadhyay, 2005. A Text Book of Entomology, Aman Publishing House, Meerut.

Class			B.Sc. (Hons.) Agriculture		
Year/Semester			3 rd Year, V Semester		
Department			Agriculture		
Paper Name			Manures, Fertilizers and Soil Fertility Management		
Subject code			BAGRI20S502		
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 soil manures and fertilizers. 2. Providing a clear understanding on nutrient application and its management. 3. Describing basic concepts of soil fertility, soil chemistry and its response to plants. <p>Expected Course Outcome: At the end of the course the student should be able to</p> <ol style="list-style-type: none"> 1. Comprehend the utility of manures. 2. Interpret the importance of varied forms of plant fertilizers. 3. Interpret deficiency and toxicity symptoms of nutrients in plants. 4. Describe fertility status of soil. 5. Deduce fertilizer application methods based on plant and soil analysis. 6. Estimate plant and soil nutrients and provide recommendations. 					
Unit		Syllabus			Periods
UNIT 1		Introduction and importance of organic manures, properties and methods of preparation of bulky and concentrated manures. Green/leaf manuring. Fertilizer recommendation approaches. Integrated nutrient management.			8
UNIT 2		Chemical fertilizers: classification, composition and properties of major nitrogenous, phosphatic, potassic fertilizers, secondary & micronutrient fertilizers, Complex fertilizers, nano fertilizers Soil amendments, Fertilizer Storage, Fertilizer Control Order.			8
UNIT 3		History of soil fertility and plant nutrition. criteria of essentiality. role, deficiency and toxicity symptoms of essential plant nutrients, Mechanisms of nutrient transport to plants, factors affecting nutrient availability to plants.			6
UNIT 4		Chemistry of soil nitrogen, phosphorus, potassium, calcium, magnesium, sulphur and micronutrients. Soil fertility evaluation, Soil testing. Critical levels of different nutrients in soil.			3
UNIT 5		Forms of nutrients in soil, plant analysis, rapid plant tissue tests. Indicator plants. Methods of fertilizer recommendations to crops. Factor influencing nutrient use efficiency (NUE), methods of application under rainfed and irrigated conditions.			5

Practical (30 Periods)

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



Class			B.Sc. (Hons.) Agriculture		
Year/Semester			3 rd Year, V Semester		
Department			Agriculture		
Paper Name			Pests of Crops and Stored Grains and their Management		
Subject code			BAGRI20S503		
L	T	P	Credit Total	3(2+1)	
2	0	1			

Course Objectives: The course is aimed at

1. Imparting knowledge on pest management in agricultural and horticultural crops.
2. Providing information on optimal insecticides application and fumigation practices.
3. Demonstrating management of insect pests in stored grain ecosystems.

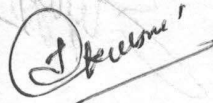
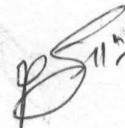
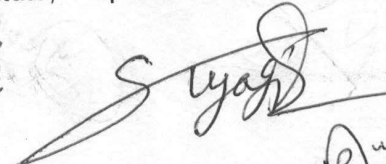
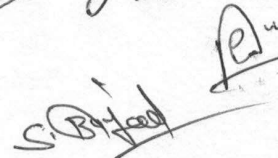
Expected Course Outcome: At the end of the course the student should be able to

1. Identify major pests of field crops and comprehend their management practices.
2. Acquire knowledge on pest management in fruit crops.
3. Explain the methods of pest identification and their management in vegetables.
4. Demonstrate damage symptoms caused by insect pests and their management in plantation, garden, narcotic, spice and condiment crops.
5. Comprehend grain store management.
6. Assess losses created due to insect pests in crops and recommend control measures.

Unit	Syllabus	Periods
UNIT 1	General account on nature and type of damage by different arthropods pests. Scientific name, order, family, host range, distribution, biology and bionomics, nature of damage.	5
UNIT 2	Management of major pests and scientific name, order, family, host range, distribution, nature of damage and control practice other important arthropod pests of various field crop, vegetable crop.	7
UNIT 3	Management of major pests and scientific name, order, family, host range, distribution, nature of damage and control practice other important arthropod pests of various fruit crop, plantation crops, ornamental crops, spices and condiments.	8
UNIT 4	Factors affecting losses of stored grain and role of physical, biological, mechanical and chemical factors in deterioration of grain.	4
UNIT 5	Insect pests, mites, rodents, birds and microorganisms associated with stored grain and their management. Storage structure and methods of grain storage and fundamental principles of grain store management.	6

Practical (30 Periods)

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



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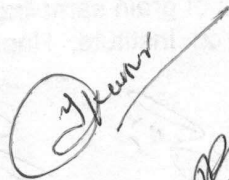

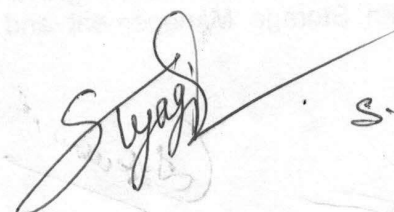
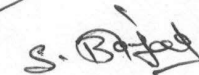
Laboratory, Department of Food., Delhi. Visit to nearest FCI go downs.


Text Books

1. Atwal, A.S. and Dhaliwal, G.S. 2002. Agricultural Pests of South Asia and Their Management, Kalyani Publishers, New Delhi.
2. David, B.V. and Ramamurthy, V.V. 2016. Elements of Economic Entomology, 8th Ed. Popular Book Depot, Chennai.

Reference Books

1. Mathur and Upadhyay, 2005. A Text Book of Entomology, Aman Publishing House, Meerut.
2. Nayar, M.R.G.K. 1986. Insects and Mites of Crops in India, ICAR, New Delhi.



Class			B.Sc. (Hons.) Agriculture		
Year/Semester			3 rd Year, V Semester		
Department			Agriculture		
Paper Name			Diseases of Field and Horticultural Crops and their Management		
Subject code			BAGRI20S504		
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 millets.
2. Manage diseases of pulses and oilseeds.
3. Understand the management practices of major diseases affecting vegetables.
4. Recognise disease symptoms of fruit crops and plan control measures.
5. Comprehend the disease management practices of plantation crops.
6. Recommend management practices for major diseases of agricultural and horticultural crops.

Unit	Syllabus	Periods
UNIT 1	Horticultural Crops: Guava: wilt, anthracnose; Banana: Panama wilt, bacterial wilt, Sigatoka and bunchy top, Papaya: foot rot, leaf curl and mosaic, Pomegranate: bacterial blight; Cruciferous vegetables: Alternaria leaf spot and black rot; Brinjal: Phomopsis blight and fruit rot and Sclerotinia blight; Tomato: damping off, wilt, early and late blight, buck eye rot and leaf curl and mosaic; Okra: Yellow Vein Mosaic.	10
UNIT 2	Beans: anthracnose and bacterial blight; Ginger: soft rot; Colocasia: Phytophthora blight; Coconut: wilt and bud rot; Tea: blister blight; Coffee: rust.	5
UNIT 3	Symptoms, etiology, disease cycle and management of major diseases of following crops: Field Crops: Rice: blast, brown spot, bacterial blight, sheath blight, false smut, khaira and tungro; Maize: stalk rots, downy mildew, leaf spots; Sorghum: smuts, grain mold and anthracnose, Bajra :downy mildew and ergot; Groundnut: early and late leaf spots, wilt.	7
UNIT 4	Soybean: Rhizoctonia blight, bacterial spot, seed and seedling rot and mosaic; Pigeonpea: Phytophthora blight, wilt and sterility mosaic.	3
UNIT 5	Finger millet: Blast and leaf spot; black & greengram: Cercospora leaf spot and anthracnose, web blight and yellow mosaic; Castor: Phytophthora blight; Tobacco: black shank, black root rot and mosaic.	5

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

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Text Books

1. Gupta V K and Paul, Y S 2008. 11nd ed. Diseases of field crops. Kalyani Publishing Co. ND.
2. Mehrotra R S and Aggarwal A. 2012. 12th ed. Plant Pathology, Tata McGraw-Hill Publishing Co Ltd. ND.

Reference Books

1. Cook, A. A. 1981. Diseases of tropical and sub-tropical field fiber and oil plants. Mac Millan Publishing Co. New York.
2. Mishra A , Bohra A and Mishra , A. 2005. Plant Pathology. Agrobios. Jodhpur (India).

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S. Bajaj

Class			B.Sc. (Hons.) Agriculture		
Year/Semester			3 rd Year, V Semester		
Department			Agriculture		
Paper Name			Crop Improvement-I (Kharif Crops)		
Subject code			BAGRI20S505		
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 Kharif crops. 5. Practice hybridisation 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	Important concepts of breeding self pollinated, cross pollinated and vegetatively propagated crops. Floral biology, emasculation, pollination, centers of origin, distribution of species, wild relatives of different cereals and pulses of <i>kharif</i> season.				5
UNIT 3	Floral biology, emasculation, pollination, centers of origin, distribution of species, wild relatives of different oilseeds, fibres, fodders and cash crops, vegetable and horticultural crops of <i>kharif</i> season.				3
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>kharif</i> crops.				3
UNIT 5	Hybrid seed production technology in rice, maize, sorghum, pearl millet and pigeon pea. Ideotype concept and climate resilient crop varieties for future.				2

Practical (30 Periods)

Floral biology, emasculation and hybridization techniques in different crop species viz., Rice, Jute, Maize, Sorghum, Pearl millet, Ragi, Pigeonpea, Urdbean, Mungbean, Soybean, Groundnut, Sesame, Caster, Cotton, Cowpea, Tobacco, 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 seeds 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 plots of different field crops.

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Text Books

1. Chopra, V.L. 2000. *Breeding of Field Crops* (Edt.). Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Chaddha. K.L. and Rajendra Gupta. 1995. Vol. II Medicinal and Aromatic Plant. Malhotra Publishing House, New Delhi.

Reference Books

1. Ram. H.H. 2005. *Vegetable Breeding — Principles and Practices*. Kalyani Publishers. New Delhi.







Class			B.Sc. (Hons.) Agriculture		
Year/Semester			3 rd Year, V Semester		
Department			Agriculture		
Paper Name			Entrepreneurship Development and Business Communication		
Subject code			BAGRI20S506		
L	T	P	Credit Total	2(1+1)	
1	0	1			

Course Objectives: The course is aimed at

1. Explaining entrepreneurship development.
2. Imparting managerial and project planning skills.
3. Describing IPR and plant variety protection in India.

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

1. Acquire knowledge on entrepreneurship development.
2. Develop organizational, managerial, problem-solving and project planning skills.
3. Analyze the types of intellectual property and legislations covering IPR in India.
4. Acquire knowledge on protection of plant varieties and biological diversity.
5. Comprehend agri-business projects, property and diversity protections.

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

Practical (30 Periods)

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

Text Books

1. Harold Koontz & Heinz Weihrich. 2004. *Essentials of Management: An International Perspective*, 2nd Ed. Tata Mc-Graw Hill Publishing Pvt Ltd.
2. Chole, R. R. Kapse, P. S. and Deshmukh, P. R. 2012. *Entrepreneurship Development and Communication Skills* scientific Publisher (India), Jodhpur.

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Reference Books

1. Bhaskaran, S. 2014. Entrepreneurship Development and Management. Aman Publishing House, Meerut.
2. Natrajan, K. and Ganeshan, K.P. 2012. Principles of Management. Himalaya Publishing House, New Delhi.

Class			B.Sc. (Hons.) Agriculture		
Year/Semester			3 rd Year, V Semester		
Department			Agriculture		
Paper Name			Geo-informatics and Nano-technology and Precision Farming		
Subject code			BAGRI20S507		
L	T	P	Credit Total	2(1+1)	
1	0	1			
Course Objectives: The course is aimed at <ol style="list-style-type: none"> 1. Introducing techniques involved in precision agricultural farming. 2. Explaining the role of geographic information system, global positioning system and remote sensing in precision farming. 3. Imparting knowledge on the use of nanotechnology in improving farm productivity. 					
Expected Course Outcome: At the end of the course the student should be able to <ol style="list-style-type: none"> 1. Define the role of remote sensing in precision agriculture. 2. Demonstrate the knowledge gained on geographical information system. 3. Comprehend simulation models on precision agriculture. 4. Explain the role of nanotechnology in improving agriculture. 5. Apply geoinformatics and nanotechnology in precision farming projects. 					
Unit		Syllabus			Periods
UNIT 1		Precision agriculture: concepts and techniques; their issues and concerns for Indian agriculture, Geo-informatics- definition, concepts, tool and techniques; their use in Precision Agriculture.			5
UNIT 2		Crop discrimination and Yield monitoring, soil mapping; fertilizer recommendation using geospatial technologies; Spatial data and their management in GIS.			3
UNIT 3		Remote sensing concepts and application in agriculture; Image processing and interpretation; Global positioning system (GPS), components and its functions.			2
UNIT 4		Introduction to crop Simulation Models and their uses for optimization of Agricultural Inputs; STCR approach for precision agriculture.			2
UNIT 5		Nanotechnology, definition, concepts and techniques, brief introduction about nano-scale effects, nano-particles, nano-pesticides, nano-fertilizers, nano-sensors, Use of nanotechnology in seed, water, fertilizer, plant protection for scaling-up farm productivity.			3

Practical (30 Periods)

Introduction to GIS software, spatial data creation and editing. Introduction to image processing software. Visual and digital interpretation of remote sensing images. Generation of spectral profiles of different objects. Supervised and unsupervised classification and acreage estimation. Multispectral remote sensing for soil mapping. Creation of thematic layers of soil fertility based on GIS. Creation of productivity and management zones. Fertilizers recommendations based of VRT and STCR techniques. Crop stress (biotic/abiotic) monitoring using geospatial technology. Use of GPS for agricultural survey. Formulation, characterization and applications of nano-particles in agriculture. Projects formulation and execution related to precision farming.

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Text Books

1. Krishna, K.K. 2013. Precision Farming: Soil Fertility and Productivity Aspects. Apple Academic Press.
2. Srivastava, G.S. 2014. An Introduction to Geoinformatics. McGrew Hill Education (India) Pvt. Ltd. , New Delhi.

Reference Books

3. Gupta, R.K. and Subhash Chander. 2008. Principles of Geoinformatics. Jain Brothers, New Delhi.
4. Choudhary, S. 2011. Applied Nanotechnology in Agriculture. Arise Publishers & Distributors.

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Class			B.Sc. (Hons.) Agriculture		
Year/Semester			3 rd Year, V Semester		
Department			Agriculture		
Paper Name			Practical Crop Production-I (Kharif Crops)		
Subject code			BAGRI20S508		
L	T	P	Credit Total	2(0+2)	
0	0	2			
<p>Course Objectives: The course is aimed at</p> <ol style="list-style-type: none"> 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. <p>Expected Course Outcome: At the end of the course the student should be able to</p> <ol style="list-style-type: none"> 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 (60 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. Panda, S.C.2012. Modern Concepts and Advance Principles in Crop Production. Agrobios (India), Jodhpur
3. Singh, S.S.and Singh, Rajesh. 2013. Crop Management Under Irrigated and Rainfed Conditions. Kalyani Publishers, New Delhi.

References books

1. Singh, S.S.and Singh, Rajesh. 2015. Principles and Practices of Agronomy (5th Re-set), Kalyani Publishers, New Delhi, Kalyani Publishers, Ludhiana.
2. ICAR. 2010. Handbook of Agriculture (6th edition), Indian Council of Agricultural Research, New Delhi
3. Reddy, S.R. 2012. Agronomy of Field Crops. Kalyani Publishers, Ludhiana.

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Class			B.Sc. (Hons.) Agriculture		
Year/Semester			3 rd Year, V Semester		
Department			Agriculture		
Paper Name			Intellectual Property Rights		
Subject code			BAGRI20S509		
L	T	P	Credit Total	1(1+0)	
1	0	0			
<p>Course Objectives: The course is aimed at</p> <ol style="list-style-type: none"> 1. Explaining entrepreneurship development. 2. Imparting managerial and project planning skills. 3. Describing IPR and plant variety protection in India. <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 entrepreneurship development. 2. Develop organizational, managerial, problem-solving and project planning skills. 3. Analyze the types of intellectual property and legislations covering IPR in India. 4. Acquire knowledge on protection of plant varieties and biological diversity. 5. Comprehend agri-business projects, property and diversity protections. 					
Unit	Syllabus				Periods
UNIT 1	Introduction and meaning of intellectual property, brief introduction to GATT, WTO, TRIPs and WIPO, Treaties for IPR protection: Madrid protocol, Berne Convention, Budapest treaty, etc.				3
UNIT 2	Types of Intellectual Property and legislations covering IPR in India:- Patents, Copyrights, Trademark, Industrial design, Geographical indications, Integrated circuits, Trade secrets.				3
UNIT 3	Patents Act 1970 and Patent system in India, patentability, process and product patent, filing of patent, patent specification, patent claims, Patent opposition and revocation, infringement, Compulsory licensing, Patent Cooperation Treaty, Patent search and patent database.				3
UNIT 4	Origin and history including a brief introduction to UPOV for protection of plant varieties, Protection of plant varieties under UPOV and PPV&FR Act of India, Plant breeders rights, Registration of plant varieties under PPV&FR Act 2001, breeders, researcher and farmers rights.				3
UNIT 5	Traditional knowledge-meaning and rights of TK holders. Convention on Biological Diversity, International treaty on plant genetic resources for food and agriculture (ITPGRFA). Indian Biological Diversity Act, 2002 and its salient features, access and benefit sharing.				3

Text Books

1. Ministry of Agriculture, Government of India. 2004. State of Indian Farmer. Vol. V. Technology Generation and IPR Issues. Academic Foundation.

Reference Books

1. Erbisch FH & Maredia K. 1998. Intellectual Property Rights in Agricultural Biotechnology. CABI.
2. Ganguli P. 2001. Intellectual Property Rights: Unleashing Knowledge Economy. McGraw-Hill. Intellectual Property Rights: Key to New Wealth Generation. 2001. NRDC & Aesthetic Technologies.

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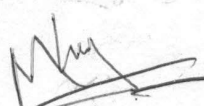
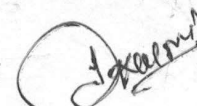
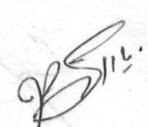
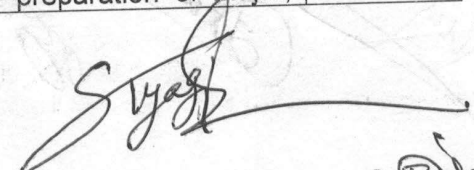

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Class			B.Sc. (Hons.) Agriculture	
Year/Semester			3 rd Year, V Semester	
Department			Agriculture	
Paper Name			Agrochemicals (Elective Course)	
Subject code			BAGRI20S510	
L	T	P	Credit Total	3(2+1)
2	0	1		
<p>Course Objectives: The course is aimed at</p> <ol style="list-style-type: none"> 1. Understanding the role of agrochemicals in agriculture and its effect on environment. 2. Imparting knowledge on herbicides, fungicides, insecticides, fertilizers and its applications. 3. Emphasising the use of right dose of agrochemicals for sustainable agriculture. <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 agrochemicals for sustainable agriculture. 2. Acquire knowledge on herbicides and fungicides. 3. Classify and know the role of insecticides. 4. Analyze fertilizers application related to crop growth. 5. Acquire knowledge on mixed and complex fertilizers. 6. Recommend dosage of agrochemicals for farms. 				
Unit	Syllabus			Periods
UNIT 1	An introduction to agrochemicals, their type and role in agriculture, effect on environment, soil, human and animal health, merits and demerits of their uses in agriculture, management of agrochemicals for sustainable agriculture.			6
UNIT 2	Herbicides-Major classes, properties and important herbicides. Fate of herbicides. Fertilizers and their importance. Nitrogenous fertilizers: Feed stocks and Manufacturing of ammonium sulphate, ammonium nitrate, ammonium chloride, urea. Slow release N-fertilizers.			6
UNIT 3	Fungicides- Classification – Inorganic fungicides - characteristics, preparation and use of sulfur and copper, Mode of action-Bordeaux mixture and copper oxychloride. Organic fungicides- Mode of action-Dithiocarbamates-characteristics, preparation and use of Zineb and maneb. Systemic fungicides- Benomyl, carboxin, oxycarboxin, Metalaxyl, Carbendazim, characteristics and use.			6
UNIT 4	Introduction and classification of insecticides: inorganic and organic insecticides Organo chlorine, Organophosphates, Carbamates, Synthetic pyrethroids Neonicotinoids, Biorationals, Insecticide Act and rules, Insecticides banned, withdrawn and restricted use, Fate of insecticides in soil & plant. IGRs Biopesticides, Reduced risk insecticides, Botanicals, plant and animal systemic insecticides their characteristics and uses. Plant bio-pesticides for ecological agriculture, Bio-insect repellent.			6
UNIT 5	Phosphatic fertilizers: feedstock and manufacturing of single superphosphate. Preparation of bone meal and basic slag. Potassic fertilizers: Natural sources of potash, manufacturing of potassium chloride, potassium sulphate and potassium nitrate. Mixed and complex fertilizers: Sources and compatibility-preparation of major,			6

secondary and micronutrient mixtures. Complex fertilizers: Manufacturing of ammonium phosphates, nitrophosphates and NPK complexes. Fertilizer control order. Fertilizer logistics and marketing.

Practical (30 Periods)

Sampling of fertilizers and pesticides, Pesticides application technology to study about various pesticides appliances, Quick tests for identification of common fertilizers, Identification of anion and cation in fertilizer, calculation of doses of insecticides to be used, To study and identify various formulations of insecticide available kin market, Estimation of nitrogen in Urea, Estimation of water soluble P₂O₅ and citrate soluble P₂O₅ in single super phosphate, Estimation of potassium in Muraite of Potash/Sulphate of Potash by flame photometer, Determination of copper content in copper oxychloride, Determination of sulphur content in sulphur fungicide, Determination of thiram, Determination of ziram content.

Text Books

1. Ranjan Kumar Basak. 2016. Fertilizers: A Text Book. Kalyani publishers, India.
2. Amitava Rakshit, Priyankar Raha and Nirmal De. 2015. Manures fertilizers and pesticides- Theory and applications. CBS Publishers and Distributors Pvt. Ltd., India.

Reference Books

1. Parameshwar Hegde, H. 2009. Textbook of Agro-Chemistry. Discovery Publishing Pvt. Ltd., India.
2. Yawalkar, K.S., J.P. Agarwal and S. Bokde. 2012. Manures and fertilizers. 12th edition, Jain publishing, India.
3. Himadri Panda. 2018. The Complete Technology Book on Herbicides, Fungicides, Nematicides, Weedicides and other Agro Chemicals with Formulations. EIRI, India.

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