INVERTIS UNIVERSITY BAREILLY

Established by Govt. of U.P. u/s 2F of UGC Act, 1956 vide U.P. Act 22 of 2010.

Evaluation Scheme & Syllabus

Of

Bachelor of (Hons.) Agriculture
(III Year)

(w.e.f. Academic Session 2018-19)

DepartmentofAgriculture

INVERTIS UNIVERSITY - INVERTIS VILLAGE

Bareilly-LucknowNH-24,Bareilly

Examination Scheme (Fifth Semester)

V Semester (Credit hours distribution)			
S.No	**Course Code**	**Course Title**	**Credit Hours**
1.	BAG501	Principles of Integrated Pest and Disease Management	3(2+1)
2.	BAG502	Manures, Fertilizers and Soil Fertility Management	3(2+1)
3.	BAG503	Diseases of Field and Horticultural Crops and theirManagement -I	3(2+1)
4.	BAG504	Pests of Crops and Stored Grain and their Management	3 (2+1)
5.	BAG505	Entrepreneurship Development and BusinessCommunication	2 (1+1)
6.	BAG506	Crop Improvement-I *(Kharif Crops)*	2 (1+1)
7.	BAG507	Geoinformatics and Nano-technology and PrecisionFarming	2(1+1)
8.	BAG508	Intellectual Property Rights	1(1+0)
9.	BAG591	Practical Crop Production – I (*Kharif* crops)	2(0+2)
10.		Elective Course*	3 credits
TOTAL			**21(12+9)+3**

21(12+9)+3:21 lectures per week, (12+9) :indicate 12 Lecture and nine practical and 3: credit hours of elective course

Evaluation Scheme									
Course code	**Course title**	**C**	**L**	**P**	**PM**	**UT**	**ESM**	**T**	**FM**
BAG501	Principles of Integrated Pest and Disease Management	3	2	1	20	30	50	100	300
BAG502	Manures, Fertilizers and Soil Fertility Management	3	2	1	20	30	50	100	300
BAG503	Diseases of Field and Horticultural Crops and their Management -I	3	2	1	20	30	50	100	300
BAG504	Pests of Crops and Stored Grain and their Management	3	2	1	20	30	50	100	300
BAG505	Entrepreneurship Development and Business Communication	2	1	1	20	30	50	100	200
BAG506	Crop Improvement-I *(Kharif Crops)*	2	1	1	20	30	50	100	200
BAG507	Geoinformatics and Nano-technology and Precision Farming	2	1	1	20	30	50	100	200
BAG508	Intellectual Property Rights	1	1	0	0	50	50	100	100
BAG591	Practical Crop Production – I (*Kharif* crops)	2	0	2	100	0	0	100	200
	Elective Course*	3			20	30	50	100	300
Total									2400

C-Credit, L-Lecture, P-Practical, , UT-Unit test, ESM: End semester marks, FM-Final marks (TXC), Elective Course*: To be selected from the list

BAG 501: PRINCIPLES OF INTEGRATED PEST AND DISEASE MANAGEMENT	
Teaching Scheme	**Examination Scheme**
Lectures and Practical: 3 hr./ week (2+1)	Unit Test: 30Marks
Tutorials: Nil	Practical marks: 20Marks
Credits: 3	End Semester Exam:50Marks

Course Objectives:

1. To know about Integrated Pest Management and their history, importance and principles.
2. To know different methods of detection and diagnosis of insect pest and disease.
3. To describe different tools of IPM to control pest and disease.
4.To give knowledge of conventional pesticide for the insect pest and disease management.
5. To explain the importance of Survey surveillance and forecasting of insect pest and disease.
6. To give an overview of some case histories of important IPM programmes.

Syllabus

Theory

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

Practical

Methods of diagnosis and detection of various insect pests, and plant diseases, Methods of insect pests and plant disease measurement.Assessment of crop yield losses, calculations based on economics of IPM, Identification of biocontrol agents, different predators and natural enemies. Mass multiplication of *Trichoderma, Pseudomona*s, *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.

Text and Reference books:

1.David and Ramamurthy.2016. Elements of Economic Entomology.Brillion Publishing; 8th Edition edition (2016).
2. A.S. Atwal & G.S. Dhaliwal, 2002. Agricultural Pests of South Asia and their Management. Kalyani Publishers (2015)
3. G.S. Dhaliwal & Ramesh Arora . Integrated Pest Management. Kalyani Publisher.

Course Outcomes:

After completing the course, students will be able to:
1. Understand Economic importance of insect pest,disease and pest risk analysis.
2. Understand different tools of IPM like cultural and mechanical practices etc. to manage insect pest and diseases.
3. Understand Political , Social and Legal implication of about Integrated Pest Management.
4. Understand maximum ideas regarding the control measures and management of diseases and pest.
5. Understand detail account of pesticide and their uses in the crops.
6. Understand why judicial use of chemical control is necessary.
7. Understand the importance of Survey, Surveillance and Forecasting of Insect Pest and Disease.

BAG502: MANURES, FERTILIZERS AND SOIL FERTILITY MANAGEMENT	
Teaching Scheme	**Examination Scheme**
Lectures and Practical: 3 hr./ week (2+1)	Unit Test: 30Marks
Tutorials: Nil	Practical marks: 20Marks
Credits: 3	End Semester Exam:50Marks

Course Objectives:

1. To study organic manures and their types.
2. To study fertilizer their classification and types.
3. To study essential plant nutrients their deficiency and toxicity symptoms in plants and soil.
4.To estimate different types of nutrients and their quantity in soil.

Syllabus

Theory

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.

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.

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. Chemistry of soil nitrogen, phosphorus, potassium, calcium, magnesium, sulphur and micronutrients. Soil fertility evaluation, Soil testing. Critical levels of different nutrients in soil. 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.

Practical

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

Text and reference books:

1.Biswas, T.D. and Mukherjee, S.K. (2006) Text book of soil science.Tata McGraw Hill publishing Co. Ltd, New Delhi.
2. Das, D.K. (2002) Introductory Soil Science, Kalyani publisher, New Delhi
3. Rai, M.M. (2002) Principal of Soil Science, Mac Millan India Ltd, New Delhi
4. Mehra R.K. (2004) Text book of Soil Science, ICAR New Delhi
5. ISSS (2002) Fundamental of Soil Science Div. of Soil Science, IARI, New Delhi
6. Yawalkar, K.S. and Agarwal. J.P. (1992). Manure and fertilizers. Agriculture- Horticulture Publishing House, Nagpur

Course Outcomes:

After completing the course, students will be able to:
1.To impart knowledge of fertilizers and manures as sources of plant nutrients and apprise about the integrated approach of plant nutrition and sustainability of soil fertility.
2.Know the requirements of manures and fertilizers for various crops and their proper time of application.
3.Know how the soil fertility and productivity can be maintained for better crop production.

BAG 503: DISEASES OF FIELD AND HORTICULTURAL CROPS AND THEIR MANAGEMENT -I	
Teaching Scheme	**Examination Scheme**
Lectures and Practical: 3 hr./ week (2+1)	Unit Test: 30Marks
Tutorials: Nil	Practical marks: 20Marks
Credits: 3	End Semester Exam:50Marks

Course Objectives:

1.To know about different symptoms, etiology and disease cycle of major disease of importantcrops.

2.To explain the different methods to manage the disease of some major Field crops and Horticultural crops

3.To know the different plant pathogen causes disease.

4.To describe the methods of management of plant disease.

Syllabus

Theory

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

Soybean: Rhizoctonia blight, bacterial spot, seed and seedling rot and mosaic; Pigeonpea: Phytophthora blight, wilt and sterility mosaic; Finger millet: Blast and leaf spot; black & green gram: Cercospora leaf spot and anthracnose, web blight and yellow mosaic; Castor: Phytophthora blight;Tobacco: black shank, black root rot and mosaic. Horticultural Crops: Guava: wilt and anthracnose; Banana: Panama wilt, bacterial wilt, Sigatoka and bunchy top;Papaya: foot rot, leaf curl and mosaic, Pomegranate: bacterial blight; Cruciferous vegetables: Alternaria leaf spot andblack 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; Beans: anthracnose and bacterial blight; Ginger: soft rot; Colocasia: Phytophthora blight; Coconut: wilt and bud rot; Tea: blister blight; Coffee: rust

Practical

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

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

Text and Reference books:

1.H. S. Chaube, V. S. Pundhir.2005.Crop diseases and their management. PHI Learning Pvt. Ltd.

2.R.S.Singh. Plant disease. Medtech; 10 edition.2017

Course Outcomes:

After completing the course, students will be able to:
1.Understand economic importance of plant disease
2.Identify symptoms of major diseases in crops
3.Understand the mechanism of disease development

BAG 504: PESTS OF CROPS AND STORED GRAIN AND THEIR MANAGEMENT	
Teaching Scheme	**Examination Scheme**
Lectures and Practical: 3 hr./ week (2+1)	Unit Test: 30Marks
Tutorials: Nil	Practical marks: 20Marks
Credits: 3	End Semester Exam:50Marks

Course Objectives:

1. To know about nature and type of damage by different arthropods pest.
2. To know about detailed information, biology and bionomics, nature of damage, and management of major pests.
3. To know about pest of stored grains.
4. To explain about role of different factor in deterioration of stored grain.
5. To know about different storage structure and methods of grain storage.

Syllabus

Theory

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

P**ractical**

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 / godown. Identification of rodents and rodent control operations in godowns. Identification of birds and bird control operations in godowns. Determination of moisture content of grain. Methods of grain sampling under storage condition. Visit to Indian Storage Management and Research Institute, Hapur and Quality Laboratory, Department of Food. Visit to nearest FCI godowns.

Text and Reference books:

1.Atwal, A.S. and Dhaliwal, G.S. 2002. Agricultural Pests of South Asia and Their Management, Kalyani Publishers, New Delhi.

2. David and Ramamurthy.2016. Elements of Economic Entomology.Brillion Publishing; 8th Edition edition (2016).

Course Outcomes:

After completing the course, students will be able to:

1. Understand nature of damage of different arthropods pest
2. Understand an insect management programme for stored grains.
3. Understand risk of chemical residue on the grains.
4. Understand the right procedures and methods for prevent grain damage.
5. Identify many insect pests, rodents, birds and microorganisms of stored grains.

BAG505: ENTREPRENEURSHIP DEVELOPMENT AND BUSINESS COMMUNICATION	
Teaching Scheme	**Examination Scheme**
Lectures and Practical: 2 hr./ week (1+1)	Unit Test: 30Marks
Tutorials: Nil	Practical marks: 20Marks
Credits: 2	End Semester Exam:50Marks

Course Objectives:

1. To studyentrepreneurship and its importance in socio economic development of the nation.
2. To study the key resources required to develop an existing business such as ideas and finance, launch a new venture, or initiate a business enterprise.
3. To study project formulation and report preparation.

Syllabus

Theory

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

Practical

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

Text and Reference 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.

3. Bhaskaran, S. 2014. Entrepreneurship Development and Management. Aman Publishing House, Meerut. 4. Mancuso, J. 1974. The Entrepreneurs Handbook (Vol. 192(, Artech House, Inc., USA.

5. Karthikeyan,C. et al. 2008.. A Text Book of Agricultural Extension Management. Atlantic Publishers, New Delhi.

6. Natrajan,K. and Ganeshan, K.P. 2012.Principles of Management. Himalaya Publishing House, New Delhi.

Course Outcomes:

After completing the course, students will be able to:
1. Identify the elements of success of entrepreneurial ventures
2.Understand the effectiveness of different entrepreneurial strategies
3. Can Interpret their own business plan
4.Will be able to analyze the business environment in order to identify business opportunities.

BAG506: CROP IMPROVEMENT-I *(KHARIF* CROPS)	
Teaching Scheme	**Examination Scheme**
Lectures and Practical: 2 hr./ week (1+1)	Unit Test: 30Marks
Tutorials: Nil	Practical marks: 20Marks
Credits: 2	End Semester Exam:50Marks

Course Objectives:

1. To study origin and distribution of crop species.
2. To study the plant genetic resources and its utilization in improvement of crop plants.
3. To study about breeding objectives of different crops.
4. To study hybrid seed production technology of *Kharif* crops.

Syllabus

Theory

Centers of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fibres; fodders and cash crops; vegetable and horticultural crops; 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 Pigeon pea, etc. Ideotype concept and climate resilient crop varieties for future.

Practical

Floral biology, emasculation and hybridization techniques in different crop species; viz. Rice, Jute, Maize, Sorghum, Pearl millet, Ragi, Pigeonpea, Urdbean, Mungbean, Soybean, Groundnut, Seasame, 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.

Text and Reference 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.

3. Mandal, A. K., P.K. Ganguli and S.P. Banerjee. 1991. Advances in Plant Breeding. Vol. I and II. CBS Publishers and Distributors, New Delhi.

4. Manjit S. Kang 2004. Crop Improvement: Challenges in the Twenty-First Century (Edt). International Book Distributing Co. Lucknow.

5. Poehlman, J.M. 1987. Breeding of Field Crops. AVI Publishing Co. INC, East Port, Conneacticut, USA. 6. Ram, H.H. and H.G. Singh. 1994. Crop Breeding and Genetics. Kalyani Publishers, New Delhi.

Course Outcomes:

After completing the course, students will be able to:
1. Understand the importance of wild relative to produce new varieties of *kharif* crop.
2. Understand gene preservation method for further use to improve kharif crops.
3. Understand dentification of resistance gene relate to kharif crop with high yieldpotential against Pest and pathogen and utilization genes.
4. Learnslearn to apply breeding method to improve *kharif* crops.

BAG507: GEOINFORMATICS AND NANO-TECHNOLOGY AND PRECISION FARMING	
Teaching Scheme	**Examination Scheme**
Lectures and Practical: 2 hr./ week (1+1)	Unit Test: 30Marks
Tutorials: Nil	Practical marks: 20Marks
Credits: 2	End Semester Exam:50Marks

Course Objectives:

1. To study the precision farming which may be helpful to increase production of crop.
2. To study about GPS and GIS system.
3. To study nanotechnology in seed, water, fertilizer, plant protection for scaling-up farm productivity.

Syllabus

Theory

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

Practical

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 nanoparticles in agriculture. Projects formulation and execution related to precision farming.

Test and Reference 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
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
5. Sekhon, B.S. 2014. Nanotechnology in agri-food production: an overview. Nanotechnology, Science and Applications 7:31-532.

Course Outcomes:

After completing the course, students will be able to:
1. More effective use of inputs results in greater crop yield and/or quality, without polluting the environment.
2. Creating awareness amongst farmers about consequences of applying imbalanced doses of farm inputs like irrigation, fertilizers, insecticides and pesticides.
3. Precision agriculture can address both economic and environmental issues that surrounded production agriculture today.

BAG508: INTELLECTUAL PROPERTY RIGHTS	
Teaching Scheme	**Examination Scheme**
Lectures and Practical: 1 hr./ week (1+0)	Unit test:50 Marks
Tutorials: Nil	End Semester Exam:50 Marks
Credits: 1	

Course Objectives:

1. To study the concept of IPR.
2. The main objective of the IPR is to make the students aware of their rights for the protection of their invention done in their project work.
3. To study how to get registration in our country and foreign countries of their invention, designs and thesis or theory written by the students during their project work and for this they must have knowledge of patents, copy right, trademarks, designs and information Technology Act.

Syllabus

Theory

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

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.

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

Text and Reference books:

1.Intellectual Property Rights and the Law, Dr. G.B. Reddy, Gogia Law Agency.
2. Law relating to Intellectual Property, Dr. B.L.Wadehra, Universal Law Publishing Co.
3. IPR P. Narayanan
4. Law of Intellectual Property, Dr.S.R. Myneni, Asian Law House

Course Outcomes:

After completing the course, students will be able to:
1.Develops procedural knowledge to Legal System and solving the problem relating to intellectual property rights.
2. Skill to pursue the professional programs in Company Secretary ship, Law, Business, Agriculture, International Affairs, Public Administration and Other fields.
3.They get awareness of acquiring the patent and copyright for their innovative works.
4.They also get the knowledge of plagiarism in their innovations which can be questioned legally.

BAG591: PRACTICAL CROP PRODUCTION – I (*KHARIF* CROPS)	
Teaching Scheme Lectures and Practical: 2 hr./ week (0+2) Tutorials: Nil Credits: 2	**Examination Scheme** Practical: 100 Marks

Course Objectives:

1. To study management and production of field crops at commercial level.
2. To study computation of benefit cost ratio.
3. To study different marketing channels.
4. To study storage and marketing of their produce.

Syllabus

Practical

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 and Reference books:

1. Yawalkar, K.S., Agarwal, J.P. and Bokde, S. 2008. Manures and Fertilizers (10th edition), Agri-Horticultural Publishing House, Nagpur.
2. Balasubramaniyan, P. and Palaniappan, S.P. 2016. Principles and Practices of AgronomyAgrobios (India), Jodhpur.
3. Reddy, S. R., 2016. Principles of Agronomy (5th edition), Kalyani Publishers, Ludhiana.
4. Singh, S.S. and Singh, Rajesh. 2015. Principles and Practices of Agronomy (5th Re-set), Kalyani Publishers, New Delhi, Kalyani Publishers, Ludhiana.

Course Outcomes:

After completing the course, students will be able to:
1. Profitable based farming system can we adopted with the help of course content
2. Helps to adopt diversified farming system according to available farming situation.
3. In the course study students will be acquainted with the knowledge of profitable crop production technology.
4.Earning while learning

Examination Scheme (Sixth Semester)

VI Semester (Credit hours distribution)			
S.No	**Course Code**	**Course Title**	**Credit Hours**
1.	BAG601	Rainfed Agriculture & Watershed Management	2 (1+1)
2.	BAG602	Protected Cultivation and Secondary Agriculture	2(1+1)
3.	BAG603	Diseases of Field and Horticultural Crops and their Management-II	3 (2+1)
4.	BAG604	Post-harvest Management and Value Addition of Fruits and Vegetables	2 (1+1)
5.	BAG605	Management of Beneficial Insects	2 (1+1)
6.	BAG606	Crop Improvement-II *(Rabi crops)*	2(1+1)
7.	BAG607	Principles of Organic Farming	2(1+1)
8.	BAG608	Farm Management, Production & Resource Economics	2(1+1)
9.	BAG609	Principles of Food Science and Nutrition	2(2+0)
10.		Elective Course*	3 credits
11.	BAG691	Practical Crop Production –II (*Rabi* crops)	2(0+2)
TOTAL			**21(11+10)+3**
21(11+10)+3:21 lectures per week, (11+10) :indicate 11 Lecture and 10 practical+3-elective course			

Evaluation Scheme									
Course code	**Course title**	**C**	**L**	**P**	**PM**	**UT**	**ESM**	**T**	**FM**
BAG 601	Rainfed Agriculture & Watershed Management	2	1	1	20	30	50	100	200
BAG 602	Protected Cultivation and Secondary Agriculture	2	1	1	20	30	50	100	200
BAG 603	Diseases of Field and Horticultural Crops and their Management-II	3	2	1	20	30	50	100	300
BAG 604	Post-harvest Management and Value Addition of Fruits and Vegetables	2	1	1	20	30	50	100	200
BAG 605	Management of Beneficial Insects	2	1	1	20	30	50	100	200
BAG 606	Crop Improvement-II *(Rabi crops)*	2	1	1	20	30	50	100	200
BAG 607	Principles of Organic Farming	2	1	1	20	30	50	100	200
BAG 608	Farm Management, Production & Resource Economics	2	1	1	20	30	50	100	200
BAG 609	Principles of Food Science and Nutrition	2	2	0	0	50	50	100	200
BAG691	Practical Crop Production –II (*Rabi* crops)	2	0	2	100	0	0	100	200
	Elective Course*	3			20	30	50	100	300
Total									2400
C-Credit, L-Lecture, P-Practical, , UT-Unit test, ESM: End semester marks, FM-Final marks (TXC), Elective Course*: To be selected from the list									

BAG601:RAINFED AGRICULTURE & WATERSHED MANAGEMENT	
Teaching Scheme	**Examination Scheme**
Lectures and Practical: 2 hr./ week (1+1)	Unit Test: 30Marks
Tutorials: Nil	Practical marks: 20Marks
Credits: 2	End Semester Exam:50Marks

Course Objectives:

1. To give complete knowledge and information about the subject
2. To give an overview of different types of rainfed systems of country
3. Basic knowledge of rain fed agriculture and water shed management practices.

Syllabus

Theory

Rainfed agriculture: Introduction, types, History of rainfed agriculture and watershed in India; Problems and prospects of rainfed agriculture in India ; Soil and climatic conditions prevalent in rainfed areas; Soil and water conservation techniques, Drought: types, effect of water deficit on physio-morphological characteristics of the plants, Crop adaptation and mitigation to drought; Water harvesting: importance, its techniques, Efficient utilization of water through soil and crop management practices, Management of crops in rainfed areas, Contingent crop planning for aberrant weather conditions, Concept, objective, principles and components of watershed management, factors affecting watershed management.

Practical

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

Text and Reference books:

1.Jayanthi, C. and Kalpana, R. 2016. Dryland Agriculture, Kalyani Publishers, Ludhiana. 2. Reddy, S.R. and Reddy, G. Prabhakara. 2015. Dryland Agriculture, Kalyani Publishers, Ludhiana.

3. Murthy, J. V. S. 1994. Watershed Management, Wiley Eastern Limited. New Age International Limited, New Delhi.

4. Dhruva Narayan, V.V. Singh, P.P., Bhardwaj, S.P., U. Sharma, Sikha, A.K., Vital, K.P.R. and Das, S.K. 1987. Watershed Management for Drought Mitigation, ICAR, New Delhi.

5. Singh, R.P., Sharma, S., Padmnabhan, N.V. , Das, S.K. and Mishra, P.K. 1990.A Field Manual on Watershed Management, ICAR (CRIDA), Hyderabad.

6. Singh, P.K. 2000. Watershed Management (Design & Practices), e-media Publication, Udaipur, India.

Course Outcomes:

After completing the course, students will be able to:
1. Conservation of soil by adopting latest soil conservation techniques will help in obtaining higher production of Rain-fed crops
2. Student can able to understand about rainfed agriculture and its introduction, problem and prospects in India
3. Student can able to understand objective, principles and componentof watershed management.

BAG 602: PROTECTED CULTIVATION AND SECONDARY AGRICULTURE	
Teaching Scheme Lectures and Practical: 2 hr./ week (1+1) Tutorials: Nil Credits: 2	**Examination Scheme** Unit Test: 30Marks Practical marks: 20Marks End Semester Exam:50Marks

Course Objectives:

1. To give complete knowledge and information about the subject
2. To give an overview of different types of biomolecules.
3. To explain the structure and function of plant constituents and components.
4. To describe all biological phenomena at molecular level.

Syllabus

Theory

Green house technology: Introduction, Types of Green Houses; Plant response to Greenhouse environment, Planning and design of greenhouses, Design criteria of green house for cooling and heating purposes. Green house equipment's, materials of construction for traditional and low cost green houses. Irrigation systems used in greenhouses, typical applications, passive solar green house, hot air greenhouse heating systems, green house drying. Cost estimation and economic analysis.

Important Engineering properties such as physical, thermal and aero & hydrodynamic properties of cereals, pulses and oilseed, their application in PHT equipment design and operation. Drying and dehydration; moisture measurement, EMC, drying theory, various drying method, commercial grain dryer (deep bed dryer, flat bed dryer, tray dryer, fluidized bed dryer, recirculatory dryer and solar dryer). Material handling equipment; conveyer and elevators, their principle, working and selection.

Practical:

Study of different type of greenhouses 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 greenhouse equipment's. 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.

Text and Reference books:

1. Green House Technology- Application and Practice. Sharma A and V.M.Salokhe. 2006. Agro Tech. publication, Udaipur
2. Principles of Agricultural Engineering, Vol. I. 2012. Michael, A.M. and T. P. Ojha . Jain Brothers, New Delhi.
3. Post Harvest Technology of Cereals, Pulses and Oil Seeds.1999. Chakravarty, A. Oxford and IBH Pub. New Delhi.
4. Agricultural Process Engineering. 1955. Henderson, S.M. and R.L. Perry. John Willy and Sons, New York.
5. Unit operation of Agriculture Processing. 2004. Shay K.M. and Singh, K.K. Vikas Publication House, New Delhi.

Course Outcomes:

After completing the course, students will be able to:

1. Conservation of soil by adopting latest soil conservation techniques will help in obtaining higher production of Rain-fed crops
2. Student can able to understand about rainfed agriculture and its introduction, problem and prospects in India
3. Student can able to understand objective, principles and componentof watershed management.

BAG 603: DISEASES OF FIELD AND HORTICULTURAL CROPS AND THEIR MANAGEMENT-II	
Teaching Scheme Lectures and Practical: 3 hr./ week (2+1) Tutorials: Nil Credits: 3	**Examination Scheme** Unit Test: 30Marks Practical marks: 20Marks End Semester Exam:50Marks

Course Objectives:

1. To give complete knowledge and information about the subject.
2. To give an overview of different types of disease caused in field and horticulture crops.
3. To symptoms and management of different diseases.

Syllabus

Theory

Symptoms, etiology, disease cycle and management of following diseases:

Field Crops:

Wheat: rusts, loose smut, karnal bunt, powdery mildew, alternaria blight, and ear cockle; Sugarcane: red rot, smut, wilt, grassy shoot, ratoon stunting and PokkahBoeng;

Sunflower: Sclerotinia stem rot and Alternaria blight; Mustard: Alternaria blight, white rust, downy mildew and Sclerotinia stem rot; Gram: wilt, grey mould and Ascochyta blight; Lentil: rust and wilt; Cotton: anthracnose, vascular wilt, and black arm; Pea: downy mildew, powdery mildew and rust.

Horticultural Crops:

Mango: anthracnose, malformation, bacterial blight and powdery mildew; Citrus: canker and gummosis; Grape vine: downy mildew, Powdery mildew and anthracnose; Apple: scab, powdery mildew, fire blight and crown gall; Peach: leaf curl.

Strawberry: leaf spot Potato: early and late blight, black scurf, leaf roll, and mosaic; Cucurbits: downy mildew, powdery mildew, wilt; Onion and garlic: purple blotch, and Stemphylium blight; Chillies: anthracnose and fruit rot, wilt and leaf curl; Turmeric: leaf spot Coriander: stem gall Marigold: Botrytis blight; Rose: dieback, powdery mildew and black leaf spot.

Practical

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

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

Text and 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. Gupta V K and Paul, Y S 2008. IInd ed. Diseases of field crops. Kalyani Publishing Co. ND.

3. Mehrotra R S and Aggarwal A. 2012. 12th ed. Plant Pathology, Tata McGraw-Hill Publishing Co Ltd. ND.

4. Mishra A , Bohra A and Mishra , A. 2005. Plant Pathology. Agrobios. Jodhpur (India).

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5. Rangaswamy,G and Mahadevan, A . 2012. 4th ed. Diseases of crop plants in India. Prentice hall of India Pvt Ltd, New Delhi.

6. Singh R S .2007. 8thed. Plant Diseases. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi

7. Gupta ,V. K. 2014. Diseases of Fruit Crops. Kalyani Publishers

8. Chaube H.S. Crop Diseases and Their Management. PHI
9. Singh R S .2007. Plant Diseases.(9th Ed.) Oxford and IBH Publishing Co.Pvt .Ltd .ND
10. Singh , R.P. 2013. Plant Pathology. Kalyani Publishers

Course Outcomes:

After completing the course, students will be able to:
1. Student will know the common pathogens of different diseases.
2. By knowing means of dispersal of these diseases suitable management methods can be applied.
3 Eco-friendly and economically suitable management practices may be adopted.

BAG 604: POST-HARVEST MANAGEMENT AND VALUE ADDITION OF FRUITS AND VEGETABLES	
Teaching Scheme Lectures and Practical: 2 hr./ week (1+1) Tutorials: Nil Credits: 2	**Examination Scheme** Unit Test: 30Marks Practical marks: 20Marks End Semester Exam:50Marks

Course Objectives:

1. To give knowledge of chemical composition of fruits and vegetables, their pre and post harvest changes.
2. To give knowledge about storage of fruits and vegetables and cause of their post harvest losses, its preservation by value addition.
3. Gives knowledge of methods to prevent the post harvest losses.
4. To impart knowledge on technology for food preservation techniques.

Syllabus

Theory

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; Harvesting and field handling; Storage (ZECC, cold storage, CA, MA, and hypobaric); Value addition concept; Principles and methods of preservation; Intermediate moisture food- Jam, jelly, marmalade, preserve, candy – Concepts and Standards; Fermented and non-fermented beverages. Tomato products- Concepts and Standards; Drying/ Dehydration of fruits and vegetables – Concept and methods, osmotic drying. Canning -– Concepts and Standards, packaging of products.

Practical

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 and Reference books:

1.Battacharjee, S. K. and De, L. C Post Harvest Technology of Flowers and Ornamentals Plants (2005) Pointer Publisher

2 Jacob John, P A Handbook on Post Harvest management of Fruits and vegetables (2008) Daya Publishing House, Delhi

3 Manoranjan, K and Sangita, S. Food Preservation & Processing (1996) Kalyani Publishers

4 Mitra, S. K. Post Harvest Physiology and Storage of Tropical and Sub-tropical Fruits (1997) CAB International

5. Morris, T. N. Principles of Fruit Preservation (2006) Biotech Books, Delhi

6 Saraswathy, S. et. al. Post harvest Management of Horticultural Crops (2008) Agribios

7 Srivastava, R. P. & Sanjeev Kumar Fruits and vegetable Preservation – Principles and Practice (2002) International Book Distributing Co., Lucknow

Course Outcomes:

After completing the course, students will be able to:
1. Understand the different causes of post harvest losses.
2. Gives knowledge about storage chain of fruits and vegetables and their field handling.
3. Imparts knowledge of food preservation methods to prevent post harvest losses.
4. Understand the various food standards and quality control for food preservation.

BAG 605: MANAGEMENT OF BENEFICIAL INSECTS	
Teaching Scheme Lectures and Practical: 2 hr./ week (1+1) Tutorials: Nil Credits: 2	**Examination Scheme** Unit Test: 30Marks Practical marks: 20Marks End Semester Exam:50Marks

Course Objectives:

1. To know about importance of beneficial insects e.g. Honeybee, silk worm, Lac insect etc.
2. To know about morphology and physiology of beneficial Insect
3. To explain about Environmental factors affecting insect life cycle and their infestation.
4. To give knowledge of different categories of pest and their recent methods of control.
5. To give detail account of concept, scope, practices and limitation of Integrated Pest Management.

Syllabus

Theory

Importance of beneficial Insects, Beekeeping and pollinators, bee biology, commercial methods of rearing, equipment used, seasonal management, bee enemies and disease. Bee pasturage, bee foraging and communication. Insect pests and diseases of honey bee. Role of pollinators in cross pollinated plants.

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.

Species of lac insect, morphology, biology, host plant, lac production – seed lac, button lac, shellac, lac- products. 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.

Practical

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.

Text and Reference books:

1.DeBach, P. 1974. Biological control by Natural enemies. Cambridge University Press.
2. Dhaliwal GS & Arora R. 2001. Integrated Pest Management: Concepts and approaches. Kalyani Publ., New Delhi.
3. Dhaliwal, GS &Koul O. 2007. Biopesticides and Pest Management. Kalyani Publ., New Delhi.
4. Gautam, R.D. Biological Pest Suppression, WestvillPublising Co., New Delhi.
5. Manfred Mackaur, Laster E.Ehler and Jens Roland. 1990. Critical Issues in Biological

control- Intercept Ltd. Project Directorate of Biological control. 1994. Technology for mass production of Natural enemies. Technical Bulletin -4.

Course Outcomes:

After completing the course, students will be able to:

1. Understand the importance of beneficial insects.
2. Understand about the commercial methods of rearing of Honey bee, Silk worm and Lac insect.
3. Understand about the pest and disease in beekeeping, Sericulture and Lac culture.
4. Recognize major pest and predators used in biological control.
5. Familiar about the important species of pollinators, weeds killers and scavengers.

BAG 606: CROP IMPROVEMENT-II *(RABI CROPS)*	
Teaching Scheme Lectures and Practical: 2 hr./ week (1+1) Tutorials: Nil Credits: 2	**Examination Scheme** Unit Test: 30Marks Practical marks: 20Marks End Semester Exam:50Marks

Course Objectives:

1. To learn basic principles and fundamentals genetics and plant breeding.
2. To learn different approaches of breeding viz., conventional and modern and advance techniques.
3. To study the wild relatives of different crops.
4. To study the hybrid seed production technology of *rabi* crops

Syllabus

Theory

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

Practical

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

3. Mandal, AK., P.K. Ganguli and S.P. Banerjee. 1991. Advances in Plant Breeding Vol. I and II. CBS Publishers and Distributors, New Delhi.

4. Manjit S. Kang 2004. Crop Improvement: Challenges in the Twenty-First Century (Edt). International Book Distributing Co. Lucknow.

5. Poehlman, J.M. 1987. Breeding of Field Crops. AVI Publishing Co.. INC, East Port, Connecticut, USA.

6. Ram, H.H. and H.G. Singh. 1994. Crop Breeding and Genetics. Kalyani Publishers, New Delhi.

Course Outcomes:

After completing the course, students will be able to:
1.Students learn importance of wild relative to produce new varieties of Rabi crop.
2 learns Gene preservation method for further use to improve Rabi crops.
3. Learner learns to apply breeding method to improve Rabi crops

BAG 607: PRINCIPLES OF ORGANIC FARMING	
Teaching Scheme Lectures and Practical: 2 hr./ week (1+1) Tutorials: Nil Credits: 2	**Examination Scheme** Unit Test: 30Marks Practical marks: 20Marks End Semester Exam:50Marks

Course Objectives:

1. To study about the importance of organic farming and its scope in India.
2. To study the initiatives taken by the government for the promotion of organic farming.
3. To study different organic nutrient resource used in organic farming.
4. To study operational structure of NPOP.
5. To study the certification process of organic farming

Syllabus

Theory

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; Organic nutrient resources and its fortification; Restrictions to nutrient use in organic farming; Choice of crops and varieties in organic farming; Fundamentals of insect, pest, disease and weed management under organic mode of production; Operational structure of NPOP; Certification process and standards of organic farming; Processing, leveling, economic considerations and viability, marketing and export potential of organic products.

Practical

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 and Reference books:

1.Dhama, A.K. 2014. Organic Farming for Sustainable Agriculture (2nd edition), Agrobios (India), Jodhpur.

2. Sharma, Arun K. 2013. A Handbook of Organic Farming, Agrobios (India), Jodhpur

3. Palaniappan, S.P. and Anandurai, K.1999. Organic Farming – Theory and Practice. Scientific Pub. Jodhpur

4. Thapa, U and Tripathy, P. 2006. Organic Farming in India, Problems and prospects, Agrtech, Publising Academy, Udaipur.

Course Outcomes:

After completing the course, students will be able to:
1.Understanding the concept of Organic farming.
2.Learning the production techniques for organic crop production
3. Preparation of manures and natural pesticides.
4. Understand the process of organic certification.

BAG 608: FARM MANAGEMENT, PRODUCTION & RESOURCE ECONOMICS	
Teaching Scheme Lectures and Practical: 2 hr./ week (1+1) Tutorials: Nil Credits: 2	**Examination Scheme** Unit Test: 30Marks Practical marks: 20Marks End Semester Exam:50Marks

Course Objectives:

1. To learn farm and its different components
2. To learn the skills of action farm management.
3. To study different types of farm recorded and their importance.
4.To study the farm economics and ways to improve it.

Syllabus

Theory

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

Practical

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

Text and Reference books:

1.Dhondyal, S.P., "Farm Management – An Economic Analysis", Aman Publishing House, Madhu Market, Meerut (U.P.).

2. Bhavani Devi,P. Raghu Ram,S. SubbaReddy,T.V. Neelakanta Sastry, 2009, Agricultural

economics, Oxford and IBH Co. Pvt. Ltd., , New Delhi.
3. Johl, S.S. and T.R. Kapur, 1989, Fundamentals of Farm Business Management, Kalyani Publishers, Ludhiyana.
4. Kerr, John M., et al., 1997, Natural Resource Economics: Theory and Applications in India, Oxford & IBH, New Delhi.
5. Raju, V. T. and D. V. S. Rao, 2002, "Economics of Farm Production and Management", Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.

Course Outcomes:

After completing the course, students will be able to:
1. Upscaling agricultural technologies.
2. Managing farm in commercial mode.
3. Knowledge on agriculture input and industries.
4.Improving farm economics.

BAG 609: PRINCIPLES OF FOOD SCIENCE AND NUTRITION	
Teaching Scheme Lectures and Practical: 2 hr./ week (2+0) Tutorials: Nil Credits: 2	**Examination Scheme** Unit test: 50 Marks End Semester Exam:50 Marks

Course Objectives:

1.To give knowledge of various basic concept of food science, food composition its chemistry.

2.To give knowledge about basic food microbiology involved in food spoilage or production both.

3.Gives knowledge of methods of food processing and preservation,nutrition and nutritional disorders

4.To impart knowledge on energy metabolism, balanced diet menu planning also.

Syllabus

Theory

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

Text and Reference books:

1.Srilakshmi, B. (2010). Text Book of Food Science. New age international (P) limited, publisher, New Delhi

2 Sehgal, S. and Raghuvanshi, R.S. (2007). Text Book of Community Nutrition, ICAR Publication

3 Khaddar V., (1999). Text Book of Food. Storage and Preservation. Kalyani Publishers, New Delhi.

4 Srilakshmi, B. (2010). Text Book of Nutrition Science. New age international (P) limited, publisher, New Delhi

5 Swaminathan. M. (1993). Advanced Textbook on Food and Nutrition. Volume I, Bappco, the Bangalore Press and Publishing Co. Ltd. Bangalore, p. 576.

Course Outcomes

After completing the course, students will be able to:
1. Understand the basics of food science, food composition its chemistry.
2. Gives knowledge about basic food microbiology involved in food spoilage or production both.
4.Imparts knowledge of methods of food processing and preservation ,nutrition and nutritional disorders
4. Understand the energy metabolism, balanced diet menu planning also.

BAG 691: PRACTICAL CROP PRODUCTION –II (*RABI* CROPS)	
Teaching Scheme Lectures and Practical: 2 hr./ week (0+2) Tutorials: Nil Credits: 2	**Examination Scheme** Practical:100 marks

Course Objectives:

1.To learn commercial cultivation of crops

2.To learn hands on tool for handling different inputs and operations.

3.To work in group mode.

Syllabus

Practical

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 and Reference books:

1. Yawalkar, K.S., Agarwal, J.P. and Bokde, S. 2008. Manures and Fertilizers (10th edition), Agri-Horticultural Publishing House, Nagpur.

2. Balasubramaniyan, P. and Palaniappan, S.P.2016. Principles and Practices of Agronomy (2nd edition), Agrobios (India), Jodhpur.

3. Reddy, S. R. 2016. Principles of Agronomy (5th edition), Kalyani Publishers, Ludhiana.

4. Singh, S.S. and Singh, Rajesh. 2015. Principles and Practices of Agronomy (5th Re-set), Kalyani Publishers, New Delhi, Kalyani Publishers, Ludhiana.

Course Outcomes

After completing the course, students will be able to:
1. Earning while learning
2. Skill to tackle crop raising on commercial scale.
3. Knowledge of seed to seed.