Integral University, Lucknow
Integral Institute of Agricultural Science and Technology
Evaluation Scheme of Undergraduate program
B. Sc. (Hons.) Agriculture
w.e.f. Session 2020-21
Semester - V

Course Code	Course	Periods Per h/week/sem			Evaluation Scheme Theory Mid sem			Evaluation Scheme Practical Examination					End sem Theory Exam	Subject total	Credit	Total Credit Points
								Sessional			End sem exam	Sub Total (sessional + exam)				
		L	T	P	CT	TA	Total	CT	TA	Total	Total					
AG320	**Principles of Integrated Pest and Disease Management**	2	0	2	10	10	**20**	5	5	**10**	**20**	**50**	**50**	**100**	2:0:1	3
AG321	**Manures, Fertilizers and Soil Fertility Management**	2	0	2	10	10	**20**	5	5	**10**	**20**	**50**	**50**	**100**	2:0:1	3
AG322	**Pests of Crops and Stored Grain and their Management**	2	0	2	10	10	**20**	5	5	**10**	**20**	**50**	**50**	**100**	2:0:1	3
AG323	**Diseases of Field and Horticultural Crops and their Management -I**	2	0	2	10	10	**20**	5	5	**10**	**20**	**50**	**50**	**100**	2:0:1	3
AG324	**Crop Improvement-I *(Kharif Crops)***	1	0	2	10	10	**20**	5	5	**10**	**20**	**50**	**50**	**100**	1:0:1	2
BM367	**Entrepreneurship Development and Business Communication**	1	0	2	10	10	**20**	5	5	**10**	**20**	**50**	**50**	**100**	1:0:1	2
AG325	**Geoinformatics and Nano-technology and Precision Farming**	1	0	2	10	10	**20**	5	5	**10**	**20**	**50**	**50**	**100**	1:0:1	2
AG326	**Practical Crop Production – I (*Kharif* crops)**	0	0	4	-	-	-	5	5	**10**	**90**	**10**	-	**100**	0:0:2	2
AG327	**Intellectual Property Rights**	1	0	0	10	10	**20**	-	-	-	-	**20**	**80**	**100**	1:0:1	1
AG328	**Micro propagation Technologies**	1	0	4	10	10	**20**	5	5	**10**	**20**	**50**	**50**	**100**	1:0:2	3*
HT325	**Hi-tech. Horticulture**	2	0	2	10	10	**20**	5	5	**10**	**20**	**50**	**50**	**100**	2:0:1	3*
AG329	**Agricultural Journalism**	2	0	2	10	10	**20**	5	5	**10**	**20**	**50**	**50**	**100**	2:0:1	3*
HT331	**Landscaping**	2	0	2	10	10	**20**	5	5	**10**	**20**	**50**	**50**	**100**	2:0:1	3*
	Total															**21+3=24**

Students can opt any one paper from the elective courses.

B. Sc. (Hons.) Agriculture
SEMESTER-V
Syllabus: Principles of Integrated Pest and Disease Management
Course Code: AG320
w.e.f. Session 2020-21

Theory **3 (2+1)**

Unit 1.

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.

Unit 2.

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.

Unit 3.

Ecological management of crop environment. Introduction to conventional pesticides for the insect pests and disease management. Survey surveillance and forecasting of Insect pest and diseases.

Unit 4.

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.

Suggested Readings:

- Handbook of Entomology by T V Prasad 2016. Kindle Edition.
- Dhaliwal GS & Arora R. 1996. *Principles of Insect Pest Management.*National Agriculture
- Technology Information Centre. The Insects: Structure and Function. Chapman, R.F. 1981. Edward Arnold (Publishers) Ltd, London
- General Entomology. Mani, M.S. Oxford and IBH Publishing Co. Pvt Ltd., New Delhi
- Agrios, GN. 2010. *Plant Pathology*. Acad. Press.
- Entomology and pest management. III Edition. Pedigo, L.P. 1999. Prentice Hall, New Jersey, USA.
- Get latest entomology books online through : https://www.questia.com/library/science-and-technology/life-sciences-and-agriculture/entomology

COURSE: Principles of Integrated Pest and Disease Management
COURSE CODE: AG320

COURSE OBJECTIVES:

- Basics knowledge of Pest Management
- Knowledge of tools of Integrated Pest Management
- Basics of different methods of management
- Ecological management of crop environment
- Survey surveillance and forecasting of Insect pest and diseases
- IPM study –Implementation and impact of IPM (IPM module for Insect pest and disease

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Knowledge about the concept and tools of Integrated Pest Management
CO2	Methods of control: Host plant resistance
CO3	Knowledge of conventional pesticides for the insect pests and disease management
CO4	Development and validation of IPM module
CO5	Knowledge of biology and characteristics of insect pests of different orders

CO-PO-PSO Mapping

PO	PO												PSO		
CO	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	1	3	2	3	1	2	2	3	**3**	**3**	**3**
CO2	2	2	2	2	1	3	2	3	1	2	2	3	**3**	**3**	**1**
CO3	2	2	3	1	1	3	2	2	1	2	2	2	**3**	**3**	**1**
CO4	2	2	3	1	1	3	2	2	1	1	2	3	**3**	**3**	**1**
CO5	2	2	2	1	1	3	2	2	2	2	2	3	**2**	**2**	**2**

B. Sc. (Hons.) Agriculture
SEMESTER-V
Syllabus: Manures, Fertilizers and Soil Fertility Management
Course Code: AG321
w.e.f. Session 2020-21

Theory **3 (2+1)**

Unit 1.

Introduction and importance of organic manures, properties and methods of preparation of bulky and concentrated manures. Green/leaf manuring. Fertilizer recommendation approaches.

Unit 2.

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.

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. Chemistry of soil nitrogen, phosphorus, potassium, calcium, magnesium, sulphur and micronutrients.

Unit 4.

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.

Suggested Readings:

- *Nature and properties of soils*. Brady Nyle C and Ray R Well, 2014. Pearson Education Inc., New Delhi
- Indian Society of Soil Science. 1998. *Fundamentals of Soil Science*. IARI, New Delhi
- Hillel D. 1982. *Introduction to Soil Physics*. Academic Press, London
- Das DK. 2011. *Introductory Soil Science.* Third Revised Edition, Kalyani Publishers.
- Open Access Books - Soil Science | InTechOpen https://www.intechopen.com/books/subject/soil-science/books/all/1/list

COURSE: Manures, Fertilizers and Soil Fertility Management
COURSE CODE: AG321

COURSE OBJECTIVES:

- To learn about the importance of organic manures
- To provide knowledge of integrated nutrient management and role of plant nutrients
- To know the various methods of soil testing and learn about nutrient use efficiency
- To learn the recommended dose of various fertilizers in various crop
- Survey surveillance and forecasting of Insect pest and diseases
- IPM study –Implementation and impact of IPM (IPM module for Insect pest and disease

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Introduction and importance of organic manures
CO2	To learn about green leaf manuring, know about the recommended fertilizer approaches
CO3	To learn about the soil fertility and soil testing
CO4	To learn about the different factor influencing nutrient use efficiency
CO5	To learn about the methods of application under rainfed and irrigated conditions

CO-PO-PSO mapping

PO	PO												PSO		
CO	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	1	3	2	3	1	2	2	3	3	3	3
CO2	2	2	2	2	1	3	2	3	1	2	2	3	3	2	1
CO3	2	2	3	1	1	3	2	2	1	2	2	2	3	3	2
CO4	2	2	3	1	1	3	2	2	1	1	2	3	3	3	1
CO5	2	2	2	1	1	3	2	2	2	2	2	3	3	3	2

B. Sc. (Hons.) Agriculture
SEMESTER-V
Syllabus: Pests of Crops and Stored Grain and their Management
Course Code: AG322
w.e.f. Session 2020-21

Theory **3 (2+1)**

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, 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 crops.

Unit 2.

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 fruit crop, plantation crops, ornamental crops, spices and condiments.

Unit 3.

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.

Unit 4.

Storage structure and methods of grain storage and fundamental principles of grain store management.

Practical

Identification of different types of damage. Identification and study of life cycle and seasonal history of various insect pests attacking crops and their produce: (a) Field Crops; (b) Vegetable Crops; (c) Fruit Crops; (d) Plantation, gardens, Narcotics, spices & condiments. Identification of insect pests and Mites associated with stored grain. Determination of insect infestation by different methods. Assessment of losses due to insects. Calculations on the doses of insecticides application technique. Fumigation of grain store / 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., Delhi. Visit to nearest FCI godowns.

Suggested Readings:

- Agricultural Pests of South Asia and Their Management. Atwal, A.S. and Dhaliwal, G.S. Kalyani Publishers, New Delhi.
- Biology of Insects. Saxena, S.C. 1992. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi
- An introduction to Entomology, Srivastava, P.D. and R.P.Singh. 1997. Concept publishing Company, New Delhi.
- Introduction to General and Applied Entomology. Awasthi, V.B. Scientific Publishers, Jodhpur.
- Get latest entomology books online through : https://www.questia.com/library/science-and-technology/life-sciences-and-agriculture/entomology

COURSE: Crop Pests and Stored Grain Pests and Their Management
COURSE CODE: AG322

COURSE OBJECTIVES:

- Knowledge and concept of different pests of crops
- Basics of damage caused by insect pests to different crops (Field crops, Fruits and vegetables ornamental plants and Medicinal Crop)
- Knowledge of management practices including physical, cultural, mechanical biological and chemical measures
- Study of deterioration of grains
- Study of storage and methods of grain storage

COURSE OUTCOMES (CO):
After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Know about the concept of major and minor pests of the major agricultural crops
CO2	Management of different pests using a set of techniques
CO3	Mode of damage caused by insects of different crops
CO4	Integrated pest Management and its application on different crops
CO5	Familiar with biology and life cycle of insect pests and its application in their control

CO-PO-PSO mapping

PO	PO												PSO		
CO	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	1	3	2	3	1	1	2	1	3	2	2
CO2	2	3	2	2	2	3	2	3	2	2	1	2	2	3	2
CO3	3	2	3	3	2	3	2	3	2	2	1	2	3	2	3
CO4	2	2	3	2	2	3	2	3	1	1	1	3	2	2	3
CO5	2	2	2	3	2	3	2	2	2	1	1	2	2	2	2

B. Sc. (Hons.) Agriculture
SEMESTER-V
Syllabus: Diseases of Field and Horticultural Crops and their Management -I
Course Code: AG323
w.e.f. Session 2020-21

Theory **3 (2+1)**

Unit 1.

Symptoms, etiology, disease cycle and management of major diseases of Field Crops: Rice: blast, brown spot, bacterial blight, sheath blight, false smut, khaira and tungro; Maize: stalk rots, downy mildew, leaf spots

Unit 2.

Symptoms, etiology, disease cycle and management of major diseases of 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

Unit 3.

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 and black rot; Brinjal: Phomopsis blight and fruit rot and Sclerotinia blight; **Unit 4.**

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.

Suggested Readings:

- Fundamentals of Plant Pathology by RS Mehrotra and Ashok Aggarwal, McGraw Hill Education (India) Private Limited, New Delhi
- Agrios, GN. 2010. *Plant Pathology*. Acad. Press.
- Singh RS. 2013. *Introduction to Principles of Plant Pathology.* Oxford and IBH Pub. Co.
- Stakman EC & Harrar JG. 1957. *Principles of Plant Pathology*. Ronald Press, USA.
- *Tarr SAJ*. 1964. *The Principles of Plant Pathology*. McMillan, London.

COURSE: Diseases of Field and Horticultural Crops and their Management -I
COURSE CODE: AG323

COURSE OBJECTIVES:

- Knowledge and concept of different disease of horticultural crops
- Basics of damage caused by microbes in different horticultural crops
- Knowledge of management practices including physical, cultural, mechanical biological and chemical measures
- Study of deterioration of fruits
- Study of storage and methods of fruits, grain storage

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Knowledge and concept of different disease of horticultural crops
CO2	Basics of damage caused by microbes in different horticultural crops
CO3	Knowledge of management practices including physical, cultural, mechanical biological and chemical measures
CO4	Study of deterioration of fruits
CO5	Study of storage and methods of fruits, grain storage

CO-PO-PSO mapping

PO	PO												PSO		
CO	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	1	3	2	3	1	1	2	1	3	3	2
CO2	3	3	2	2	2	3	2	3	2	2	1	2	2	3	2
CO3	3	2	3	3	2	3	2	3	2	2	1	2	3	2	1
CO4	2	2	3	2	2	3	2	3	1	1	1	3	2	2	1
CO5	2	2	2	3	2	3	2	2	2	1	1	2	2	2	1

B. Sc. (Hons.) Agriculture
SEMESTER-V
Syllabus: Crop Improvement-I *(Kharif Crops)*
Course Code: AG324
w.e.f. Session 2020-21

Theory **2 (1+1)**

Unit 1.

Centers of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fibres; fodders and cash crops; vegetable and horticultural crops

Unit 2.

Plant genetic resources, its utilization and conservation, study of genetics of qualitative and quantitative characters

Unit 3.

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).

Unit 4.

Hybrid seed production technology in Maize, Rice, Sorghum, Pearl millet and Pigeonpea, 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, 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.

Suggested Readings:

- Modern Techniques of Raising Field Crops by Chhidda Singh, Prem Singh and Rajbir Singh, Oxford and IBH Publishing Co Pvt Ltd
- Reddy SR. *Principles of Agronomy.* Kalyani Publishers.
- Reddy Yellamanda T and Shankar Reddy G H. New Edn. *Principles of Agronomy*. Kalyani Publishers Ludhiana.
- Gupta O P. *Scientific Weed Management in the Tropics and Sub- Tropics*. Today and Tomorrow's Printers and Publishers. New Delhi.
- Yawalkar K S and Agarwal J P. *Manures and Fertilizers*. Agricultural Horticultural Publishing House, Nagpur.
- Balasubrananiyan P & Palaniappan SP. 2015. *Principles and Practices of Agronomy.* Agrobios

Crop Improvement-I (Kharif Crops)
Course Code: AG324

Course Objectives:

- To study about breeding objectives of different kharif field crops
- To know about different breeding methods applied in field crop
- To get knowledge about hybrid production technology
- To know about different kharif crops botany and their breeding techniques
- To study about different variety developed in kharif crop

Course Outcomes (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	able to learn different breeding objectives of kharif crops
CO2	able to understand basic knowledge about breeding methods in kharif crops
CO3	able to learn hybridization techniques and hybrid concept
CO4	able to learn mechanism of self and cross pollination
CO5	able to learn crop variety development programme

CO-PO-PSO mapping

PO	PO												PSO		
CO	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	1	2	2	3	1	1	2	1	3	3	1
CO2	3	3	3	2	1	2	2	3	2	2	1	2	3	3	1
CO3	3	2	3	3	1	2	2	3	2	2	1	2	3	3	1
CO4	3	2	3	2	1	2	2	3	1	1	1	3	2	2	1
CO5	3	2	2	3	1	2	2	2	2	1	1	2	2	2	1

B. Sc. (Hons.) Agriculture
SEMESTER-V
Syllabus: Entrepreneurship Development and Business Communication
Course Code: BM367
w.e.f. Session 2020-21

Theory **2 (1+1)**

Unit 1.

Concept of Entrepreneur, Entrepreneurship Development, Characteristics of entrepreneurs; SWOT Analysis & achievement motivation

Unit 2.

Government policy and programs and institutions for entrepreneurship development, Impact of economic reforms on Agribusiness/ Agrienterprises, Entrepreneurial Development Process;

Unit 3.

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

Unit 4.

Financing of enterprise, Opportunities for agrientrepreneurship 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.

Suggested Readings:

- Harold Koontz & Heinz Weihrich. 2004. Essentials of Management: An International Perspective, 2nd Ed. Tata Mc-Graw Hill Publishing Pvt Ltd.
- Mukesh Pandey & Deepali Tewari. 2010. The Agribusiness Book. IBDC Publishers.
- Nandan H. 2011. Fundamentals of Entrepreneurship. PHI Learning Pvt Ltd India.
- Philip Kotler, Kavin Lane Keller, Abraham Koshy & Mithileshwar Jha. 2012. Marketing Management: A South Asian Perspective. Pearson Education.
- Poornima Charantimath. 2006. Entrepreneurship Development: Small Business Enterprise.
- Pearson Education.
- Stephans P Robbins & Mary Coulter. 2003. Management. Pearson Education

Entrepreneurship Development and Business Communication
Course Code: BM 367

Course Objectives:

- To study the concept about entrepreneur development
- To know the government policy and programs and institutions
- To get knowledge about government policy and programs and institutions for entrepreneurship
- To learn about business leadership skills and managerial skills
- To learn about the financing of enterprise

Course Outcomes (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	To learn about the concept of entrepreneur and development of SWOT analysis and achievement motivation
CO2	To know about the government policy and programs and institutions
CO3	To learn about the business leadership skills and problem-solving skill
CO4	To know about the supply chain management and total quality management
CO5	To learn about project planning formulation and report preparation

CO-PO-PSO mapping

PO	PO												PSO		
CO	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	1	3	2	3	1	1	2	3	2	2	2
CO2	3	3	3	2	1	3	2	3	2	2	1	3	2	2	3
CO3	3	2	3	3	1	3	2	3	2	2	1	3	**2**	2	3
CO4	3	2	3	2	1	3	2	3	1	1	1	3	2	2	2
CO5	3	2	2	3	1	3	2	2	2	1	1	3	2	2	1

B. Sc. (Hons.) Agriculture
SEMESTER-V
Syllabus: Geoinformatics and Nano-technology and Precision Farming
Course Code: AG325
w.e.f. Session 2020-21

Theory **2 (1+1)**

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. **Unit 2.**

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

Unit 3.

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

Unit 4.

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.

Suggested Readings:

- David E. Reisner. 2009. *Bionanotechnology: Global Prospects*. CRC Press.
- Gabor L. Hornyak, John J. Moore, Tibbals HF., Joydeep Dutta. 2008. *Fundamentals of*
- *Nanotechnology*. CRC Press.
- Jesus M. de la Fuente, V. Grazu. 2012. *Nanobiotechnology: Inorganic nanoparticles Vs Organic*
- *nanoparticles*. Elsevier.
- Yubing Xie. 2012. *The Nanobiotechnology Handbook*. CRC Press.

COURSE: Geoinformatics and Nano-technology and Precision Farming
COURSE CODE: AG325

COURSE OBJECTIVES:

- To introduce the basic concepts of geoinformatics and nanotechnology
- To create awareness about various applications of geoinformatics and nanotechnology for precision agriculture
- To teach basic handling of various geoinfomatic tools

- Introduction to crop Simulation models
- Introduction of Precision agriculture

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Understands the basics of geoinformatics and nanotechnology
CO2	Understands the applications of geoinformatics and nanotechnology in agriculture
CO3	Familiarize students to handle various geoinformatic tools and softwares
CO4	Study of introduction to crop Simulation models
CO5	Study of Precision agriculture and concept and techniques

CO-PO-PSO mapping

PO	PO												PSO		
CO	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	3	3	3	3	2	3	3	3	3	3	2
CO2	3	3	2	3	2	3	3	3	2	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	2	3	3	3	2	2	3
CO4	2	2	3	3	2	3	3	3	2	2	2	3	3	2	2
CO5	2	3	2	3	3	3	3	2	2	3	3	3	3	2	1

B. Sc. (Hons.) Agriculture
SEMESTER-V
Syllabus: Practical Crop Production – I (*Kharif* crops)
Course Code: AG326
w.e.f. Session 2020-21

2 (0+2)

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.

Suggested Readings:

- Acquaah G. 2005. *Principles of Crop Production: Theory, Techniques and Technology.* Prenice Hall.
- Modern Techniques of Raising Field Crops by Chhidda Singh, Prem Singh and Rajbir Singh, Oxford and IBH Publishing Co Pvt Ltd
- Reddy SR. 2011. *Principles of Agronomy.* Kalyani Publishers.
- Chandrasekaran B, Annadural K & Samasundaram E. 2010. *A Text Book of Agronomy.* New Age International (P) Limited Publishers.

COURSE: :**Practical Crop Production – I (Kharif crops)**
COURSE CODE: AG326
COURSE OBJECTIVES:

- To know about crop planning
- To know about field crops
- To know about nutrient water management
- TO know about the insect disease management

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	To know about crop planning, multiple cropping systems, field preparation and seed treatment
CO2	To know about field crops
CO3	To know about threshing, drying, winnowing, storage and marketing
CO4	TO know about the insect disease management
CO5	To learn about seed production, mechanization, resource conservation and integrated nutrient

CO-PO-PSO mapping

PO	PO												PSO		
CO	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	3	3	3	3	2	3	3	3	3	3	1
CO2	3	3	2	3	2	3	3	3	2	3	3	3	3	3	1
CO3	3	3	3	3	3	3	3	3	2	3	3	3	2	2	1
CO4	2	2	3	3	2	3	3	3	2	2	2	3	3	3	1
CO5	2	3	2	3	3	3	3	2	2	3	3	3	3	2	1

B. Sc. (Hons.) Agriculture
SEMESTER-V
Syllabus: Intellectual Property Rights
Course Code: AG327
w.e.f. Session 2020-21

Theory **1 (1+0)**

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. Types of Intellectual Property and legislations covering IPR in India:-Patents, Copyrights, Trademark, Industrial design, Geographical indications, Integrated circuits, Trade secrets.

Unit 2.

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.

Unit 3.

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.

Unit 4.

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.

Suggested Readings:

- Intellectual Property Rights by Neeraj Pandey, Khushdeep Dharni, PHI Learning Pvt. Ltd., 2014
- Intellectual Property Rights In India, by V K Ahuja Lexis Nexis Publishers
- Handbook of Intellectual Property Rights : Concepts and Laws, by Dr. B. Ramaswamy, paper Back

Name of Course/subject- Intellectual Property Rights

Course Code: AG327

Course Objective

1. To make students aware about the concept of Intellectual Property.
2. To make students aware about the different tools for protecting the Intellectual Property.
3. To make students aware about the global and Indian laws regarding Intellectual Property.
4. To make students aware about application of Intellectual Property laws for protection of plant variety.
5. To make students aware about the different treaties, conventions and Acts about protecting plants genetic resources on global and India level.

Course Outcome:

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Students will aware about the concept of Intellectual Property.
CO2	Students will aware about the different tools for protecting the Intellectual Property.
CO3	Students will aware about the global and Indian laws regarding Intellectual Property.
CO4	Students will aware about application of Intellectual Property laws for protection of plant variety.
CO5	Students will aware about the different treaties, conventions and Acts about protecting plants genetic resources on global and India level.

CO-PO-PSO mapping

PO	PO												PSO		
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	1	1	3	1	1	3	1	2	3	2	1	2	2	3
CO2	2	1	1	3	1	1	3	1	2	3	2	1	3	3	3
CO3	2	1	1	3	1	1	3	1	2	3	2	1	3	2	3
CO4	2	1	1	3	1	1	3	1	2	3	2	1	2	3	3
CO5	2	1	1	3	1	3	1	1	2	3	2	1	3	2	3

B.Sc. (Hons.) Agriculture
Semester V
Syllabus: Micro propagation Technologies
Course Code: AG328
w.e.f. Session 2020-21

Theory **3 (1+2)**

Unit 1.

Introduction, History, Advantages and limitations; Types of cultures (seed, embryo, organ, callus, cell).

Unit 2.

Stages of micropropagation, Axillary bud proliferation (Shoot tip and meristem culture, bud culture).

Unit 3.

Organogenesis (callus and direct organ formation), Somatic embryogenesis, cell suspension cultures, Production of secondary metabolites, Somaclonal variation, Cryopreservation.

Practical

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

Suggested Readings:

- Plant Tissue Culture: Theory and Practice by S.S. Bhojwani, M.K. Razdan
- Introduction to Plant Biotechnology by H. S. Chawla
- Practical Book of Biotechnology & Plant Tissue Culture by Madhavi Adhav and Santosh Nagar
- Plant Tissue Culture: Protocols in Plant Biotechnology by M. C. Gayatri and R. Kavyashree

COURSE OBJECTIVES:

- Knowledge and concept of different types of cultures
- Basics Stages of micropropagation,
- Knowledge of Axillary bud proliferation
- Study of Organogenesis, Somatic embryogenesis, cell suspension cultures,
- Study based on Production of secondary metabolites, Somaclonal variation, Cryopreservation.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Knowledge and concept of different types of cultures
CO2	Basics Stages of micropropagation,
CO3	Knowledge of Axillary bud proliferation
CO4	Study of Organogenesis, Somatic embryogenesis, cell suspension cultures,
CO5	Study based on Production of secondary metabolites, Somaclonal variation, Cryopreservation.

CO-PO -PSO MAPPING:

PO	PO												PSO		
CO	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	3	2	3	1	1	2	2	3	2	1
CO2	3	3	2	2	2	3	2	3	2	2	1	3	3	3	1
CO3	3	2	3	3	2	3	2	3	2	2	1	2	3	2	1
CO4	2	2	3	2	2	3	2	3	2	1	1	3	2	3	1
CO5	2	2	2	3	2	3	2	2	2	1	1	2	3	2	1

B.Sc. (Hons.) Agriculture
Semester V
Syllabus: Hi-tech. Horticulture
Course Code: HT325
w.e.f. Session 2020-21

Theory **3 (2+1)**

Unit 1.

Introduction & importance; Nursery management and mechanization; micro propagation of horticultural crops; Modern field preparation and planting methods

Unit 2.

Protected cultivation: advantages, controlled conditions, method and techniques, Micro irrigation systems and its components; EC, pH based fertilizer scheduling, canopy management, high density orcharding

Unit 3.

Components of precision farming: Remote sensing, Geographical Information System (GIS), Differential Geo-positioning System (DGPS), Variable Rate applicator (VRA)

Unit 4.

Application of precision farming in horticultural crops (fruits, vegetables and ornamental crops); mechanized harvesting of produce

Practical

Types of polyhouses and shade net houses, Intercultural operations, tools and equipments identification and application, Micro propagation, Nursery-protrays, micro-irrigation, EC, pH based fertilizer scheduling, canopy management, visit to hi-tech orchard/nursery.

Suggested Readings:

- Singh, D.K., 2007. *Modern Vegetable varieties and production*. IBN publishers, Technology International Book Distributing Co, Lucknow.
- P.L. Taroj, B.B. Vashishtha, D.G.Dhandar. 2004. *Advances in Arid Horticulture*. Internal Book Distributing Co., Lucknow.
- T. Pradeep Kumar, B. Suma, Jyothi Bhaskar and K.N.Sathesan. 2008. *Management of Horticultural Crops*. New India Publishing Agency
- K.L.Chadha, 1993. *Advances in Horticulture*. Malhotra publishing house. New Delhi
- M.S.Dhaliwal, 2008. *Handbook of Vegetable Crops*. Kalyani Publishers. Ludhiana
- Uma Shankar,2008. *Vegetable Pest Management Guide for Farmers*. International Book Distribution Co. Publication. Lucknow.

COURSE: Hi-tech Horticulture
COURSE CODE: HT325

COURSE OBJECTIVES:

- Knowledge and concept nursery management and mechanization
- Basics Stages of micropropagation,
- Knowledge of Axillary bud proliferation
- To know about components of precision farming
- To learn about the mechanized harvesting of produce

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Knowledge and concept of different types nursery management and mechanization
CO2	To learn about basics stages of micropropagation,
CO3	To learn about remote sensing and components of precision farming
CO4	Study of EC, pH based fertilizer scheduling
CO5	To learn about canopy management, application of precision farming

CO-PO -PSO MAPPING:

PO	PO												PSO		
CO	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	3	2	3	1	1	2	2	3	2	1
CO2	3	3	2	2	2	3	2	3	2	2	1	3	3	3	1
CO3	3	2	3	3	2	3	2	3	2	2	1	2	3	3	1
CO4	2	2	3	2	2	3	2	3	2	1	1	3	3	3	1
CO5	2	2	2	3	2	3	2	2	2	1	1	2	3	2	1

B.Sc. (Hons.) Agriculture
Semester V
Syllabus: Agricultural Journalism
Course Code: AG329
w.e.f. Session 2020-21

Theory **3 (2+1)**

Unit 1.

Agricultural Journalism: The nature and scope of agricultural journalism characteristics and training of the agricultural journalist, how agricultural journalism is similar to and different from other types of journalism.

Unit 2.

Newspapers and magazines as communication media: Characteristics; kinds and functions of newspapers and magazines, characteristics of newspaper and magazine readers. Form and content of newspapers and magazines: Style and language of newspapers and magazines, parts of newspapers and magazines.

Unit 3.

The agricultural story: Types of agricultural stories, subject matter of the agricultural story, structure of the agricultural story. Gathering agricultural information: Sources of agricultural information, interviews, coverage of events, abstracting from research and scientific materials, wire services, other agricultural news sources.

Unit 4.

Writing the story: Organizing the material, treatment of the story, writing the news lead and the body, readability measures. Illustrating agricultural stories: Use of photographs, use of artwork (graphs, charts, maps, etc.), writing the captions. Editorial mechanics: Copy reading, headline and title writing, proofreading, lay outing.

Practical

Practice in interviewing. Covering agricultural events. Abstracting stories from research and scientific materials and from wire services. Writing different types of agricultural stories. Selecting pictures and artwork for the agricultural story. Practice in editing, copy reading, headline and title writing, proofreading, layouting. Testing copy with a readability formula. Visit to a publishing office.

Suggested Readings:

- Arvind Kumar (1999). The Electronic Media. Anmol Publications, New Delhi.
- Bhatt, S.C. (1993) Broadcast Journalism. Basic Principles Har Anand Publications, Delhi
- Bhatnagar, R. (2001). Print Media and Broadcast Journalism. Indian Publisher Distributors, Delhi
- Katyal, V.P (2007). Fundamentals of Media Ethics. Cyber Tech Publishers, New Delhi.

COURSE: Agricultural Journalism
COURSE CODE: AG 329

COURSE OBJECTIVES:

- Knowledge and concept of agricultural journalism
- Characteristics and kinds and functions of newspapers
- To learn about types of agricultural stories, subject matter of the agricultural story
- To know about illustration of agricultural stories
- To learn about the editorial mechanics, copy reading, headline and title writing

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	To learn about agricultural journalism
CO2	To learn about newspapers and magazines as communication media
CO3	To learn about agricultural stories
CO4	To know about the writing the story, organization material
CO5	To learn about use of art work , writing captions, proof reading

CO-PO-PSO mapping

PO	PO												PSO		
CO	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	3	2	3	1	1	2	2	3	2	3
CO2	3	3	2	2	2	3	2	3	2	2	1	3	3	3	3
CO3	3	2	3	3	2	3	2	3	2	2	1	2	3	3	3
CO4	2	2	3	2	2	3	2	3	2	1	1	3	3	3	3
CO5	2	2	2	3	2	3	2	2	2	1	1	2	3	2	3

B.Sc. (Hons.) Agriculture

Syllabus: Landscaping
Course Code: HT331
w.e.f. Session 2020-21

Theory **3 (2+1)**

Unit 1.

Importance and scope of landscaping. Principles of landscaping, garden styles and types, terrace gardening, vertical gardening, garden components, adornments, lawn making, rockery, water garden, walk-paths, bridges, other constructed features etc. gardens for special purposes.

Unit 2.

Trees: selection, propagation, planting schemes, canopy management, shrubs and herbaceous perennials: selection, propagation, planting schemes, architecture. Climber and creepers: importance, selection, propagation, planting, Annuals: selection, propagation, planting scheme,

Unit 3.

Other garden plants: palms, ferns, grasses and cacti succulents. Pot plants: selection, arrangement, management. Bio-aesthetic planning: definition, need, planning; landscaping of urban and rural areas, Peri-urban landscaping,

Unit 4.

Landscaping of schools, public places like bus station, railway station, townships, river banks, hospitals, play grounds, airports, industries, institutions. Bonsai: principles and management, lawn: establishment and maintenance. CAD application.

Practical

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

Suggested Readings:

- A.K. Tiwari and R. Kumar. 2012. *Fundamentals of ornamental horticulture and landscape*
- *gardening*. New India.
- H.S.Grewal and Parminder Singh. 2014. *Landscape designing and ornamental plants*
- R.K. Roy. *Fundamentals of Garden designing*.2013.New India publishing agency, Pitampura, New Delhi.
- Rajesh Srivastava. 2014. *Fundamentals of Garden designing*. Agrotech press, Jaipur, New Delhi.
- L.C. De. *Nursery and landscaping*.2013. Pointer publishers, Jaipur India.
- Bose, T.K. Malti, R.G. Dhua, R.S. & Das, P. 2004. Nayaprakash, Calcutta. Floriculture and Landscaping
- Arora, J.S. 2006. Kalyani publishers, Ludhiana. Introductory Ornamental Horticulture. Kalyani publishers, Ludhiana.

COURSE: Landscaping
COURSE CODE: HT331

COURSE OBJECTIVES:

- Knowledge and concept of landscaping
- To know about principles of landscaping, garden styles and types
- To learn about trees selection, propagation, planting schemes, canopy management
- To know about other garden plants
- To learn about the landscaping of schools and public places

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	To know the importance and scope of landscaping
CO2	To learn about trees selection, propagation, planting schemes, canopy management
CO3	To know about other garden plants
CO4	Knowledge and concept of peri urban landscaping
CO5	To learn about bio-aesthetic planning and landscaping of schools

CO-PO-PSO mapping

PO	PO												PSO		
CO	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	3	2	3	1	1	2	2	3	2	1
CO2	3	3	2	2	2	3	2	3	2	2	1	3	3	3	1
CO3	3	2	3	3	2	3	2	3	2	2	1	2	3	2	1
CO4	2	2	3	2	2	3	2	3	2	1	1	3	3	2	1
CO5	2	2	2	3	2	3	2	2	2	1	1	2	3	2	1

Integral University, Lucknow
Integral Institute of Agricultural Science and Technology
Evaluation Scheme of Undergraduate program
w.e.f. Session 2020-21

B. Sc. (Hons.) Agriculture

Semester - VI

Course Code	Course Title	Periods Per h/week/sem			Evaluation Scheme Theory Mid sem			Evaluation Scheme Practical Examination					End sem Theory Exam	Subject total	Credit	Total Credit Points	Attributes						
								Sessional			End sem exam	Sub Total (sessional + exam)												
		L	T	P	CT	TA	Total	CT	TA	Total	Total						Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics
AG335	Rainfed Agriculture & Watershed Management	1	0	2	10	10	**20**	5	5	**10**	**20**	**50**	**50**	**100**	1:0:1	**2**	√		√		√		
AG336	Farming System & Sustainable Agriculture	1	0	0	10	10	**20**	-	-	-	-	**20**	**80**	**100**	1:0:0	**1**	√	√	√		√		
HT327	Protected Cultivation and Secondary Agriculture	1	0	2	10	10	**20**	5	5	**10**	**20**	**50**	**50**	**100**	1:0:1	**2**	√		√		√		
AG339	Diseases of Field and Horticultural Crops and their Management-II	2	0	2	10	10	**20**	5	5	**10**	**20**	**50**	**50**	**100**	2:0:1	**3**	√		√		√		
HT328	Post-harvest Management and Value Addition of Fruits and Vegetables	1	0	2	10	10	**20**	5	5	**10**	**20**	**50**	**50**	**100**	1:0:1	**2**	√	√	√		√		
AG340	Management of Beneficial Insects	1	0	2	10	10	**20**	5	5	**10**	**20**	**50**	**50**	**100**	1:0:1	**2**	√	√	√		√		√
AG341	Crop Improvement-II *(Rabi crops)*	1	0	2	10	10	**20**	5	5	**10**	**20**	**50**	**50**	**100**	1:0:1	**2**	√		√		√		

AG342	**Practical Crop Production –II (*Rabi* crops)**	0	0	4	10	10	**20**	5	5	**10**	**20**	**50**	**50**	**100**	0:0:2	**2**	√		√		√		
AG343	**Principles of Organic Farming**	1	0	2	10	10	**20**	5	5	**10**	**20**	**50**	**50**	**100**	1:0:1	**2**	√	√	√		√	√	√
AG344	**Farm Management, Production & Resource Economics**	1	0	2	10	10	**20**	5	5	**10**	**20**	**50**	**50**	**100**	1:0:1	**2**	√	√	√				
AG345	**Principles of Food Science and Nutrition**	2	0	0	10	10	**20**	-	-	-	-	**20**	**80**	**100**	2:0:0	**2**	√		√				
AG348	**Food Safety and Standards**	2	0	2	10	10	**20**	5	5	**10**	**20**	**50**	**50**	**100**	2:0:1	**3***	√	√	√		√		
AG349	**Biopesticides and Biofertilizers**	2	0	2	10	10	**20**	5	5	**10**	**20**	**50**	**50**	**100**	2:0:1	**3***	√	√	√		√		
HT330	**Protected Cultivation**	2	0	2	10	10	**20**	5	5	**10**	**20**	**50**	**50**	**100**	2:0:1	**3***	√		√		√		
AG351	**System Simulation and Agro-advisory**	2	0	2	10	10	**20**	5	5	**10**	**20**	**50**	**50**	**100**	2:0:1	**3***	√	√	√		√		
	Total															**22+ 3*= 25**							

Students can opt any one paper from the elective courses

B. Sc. (Hons.) Agriculture
SEMESTER-VI
Syllabus: Rainfed Agriculture & Watershed Management
Paper Code: AG335
w.e.f. Session 2020-21

Theory **2 (1+1)**

Uini-1

Rainfed agriculture: Introduction, types, History of rainfed agriculture and watershed in India; Problems and prospects of rainfed agriculture in India

Uini-II

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

Uini-III

Water harvesting: importance, its techniques, Efficient utilization of water through soil and crop management practices, Management of crops in rainfed areas,

Uini-IV

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.

COURSE OBJECTIVES:

- To attain the basics knowledge about rainfed agriculture in Indian condition
- To gain the knowledge of watershed management in Indian condition
- To imbibe the fundamental knowledge about soil and climatic conditions
- To conceive the knowledge about sustainable agricultural Production under dryland condition
- To acquire the efficient and effective water harvesting system and watershed management

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Understand the various scope of rainfed agriculture and watershed management
CO2	To Familiar with the problems and prospects of rainfed agriculture in India
CO3	Students are able to know concept, objective principles and types of watershed management,
CO4	Learn about the drought types and effect of water deficit on physio-morphological characteristics of the plants
CO5	Able to understand the efficient utilization of water through soil and crop management practices besides contingent crop planning for aberrant weather conditions

CO-PO-PSO mapping

PO	PO												PSO		
CO	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	1	3	2	3	1	2	2	3	3	3	1
CO2	2	2	2	2	1	3	2	3	1	2	2	3	2	2	1
CO3	2	2	3	1	1	3	2	2	1	2	2	2	3	2	1
CO4	2	2	3	1	1	3	2	2	1	1	2	3	3	2	1
CO5	2	2	2	1	1	3	2	2	2	2	2	3	3	3	1

B. Sc. (Hons.) Agriculture
SEMESTER-VI
Syllabus: Farming System & Sustainable Agriculture
Paper Code: AG336
w.e.f. Session 2020-21

Theory **1(1+0)**

Unit I

Farming System-scope, importance, and concept, Types and systems of farming system and factors affecting types of farming, Farming system components and their maintenance, Cropping system and pattern, multiple cropping system, Efficient cropping system and their evaluation

Unit II

Allied enterprises and their importance, Tools for determining production and efficiencies in cropping and farming system; Sustainable agriculture-problems and its impact on agriculture, indicators of sustainability, adaptation and mitigation, conservation agriculture strategies in agriculture, HEIA, LEIA and LEISA and its techniques for sustainability

Unit III

Integrated farming system-historical background, objectives and characteristics, components of IFS and its advantages, Site specific development of IFS model for different agro-climatic zones, resource use efficiency and optimization techniques

Unit IV

Resource cycling and flow of energy in different farming system, farming system and environment, Visit of IFS model in different agro-climatic zones of nearby states University/ institutes and farmers field.

COURSE OBJECTIVES:

- To conceive the basics knowledge about farming system in Indian condition
- To acquire the elemental knowledge about new technologies for sustainable agricultural production
- To imbibe the fundamental knowledge of efficient cropping system and their evaluation
- To attain the knowledge of IFS and site specific development of IFS model for different ACZ
- To gain the rudimentary knowledge about resource cycling and flow of energy in different farming system

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Understand the various scope, importance and concepts and farming system components
CO2	To Familiar the sustainable agriculture-problems and its impact on agriculture
CO3	Students are able to know indicators of sustainability (HEIA, LEIA & LEISA and its technique), adoption and mitigation
CO4	Learn about the integrated farming system- historical background, objectives and salient features
CO5	Able to understand the resource cycling and flow of energy in different farming system and environment

CO-PO-PSO mapping

PO	PO												PSO		
CO	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	1	3	2	3	1	2	2	3	3	3	1
CO2	2	2	2	2	1	3	2	3	1	2	2	3	2	2	2
CO3	2	2	3	1	1	3	2	2	1	2	2	2	3	2	1
CO4	2	2	3	1	1	3	2	2	1	1	2	3	3	2	1
CO5	2	2	2	1	1	3	2	2	2	2	2	3	3	3	2

Syllabus: Protected Cultivation and Secondary Agriculture
Paper Code: HT327
w.e.f. Session 2020-21

Theory **2 (1+1)**

Unit I

Green house technology: Introduction, Plant response to Greenhouse environment, Types of Green Houses; Planning and design of greenhouses

Unit II

Design criteria of green house for cooling and heating purposes, Irrigation systems used in greenhouses, typical applications, passive solar green house, hot air green house heating systems, green house drying,

Unit III

Green house equipment's, materials of construction for traditional and low cost green houses, 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.

Unit IV

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

COURSE OBJECTIVES:

- Basics knowledge of Green House Technology
- Knowledge of designing of Green Houses
- Basics of different functioning of different equipment's used in Green houss
- Knowledge of PHT equipment design and operation
- Working, selection and principles of different drying equipment's

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to understand the

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Basics of greenhouse technology
CO2	Designing criteria of green houses
CO3	Different greenhouse equipment's and economic analysis
CO4	PHT equipment design and operation
CO5	Working, selection and principles of different drying equipment's

CO-PO-PSO mapping

PO	PO												PSO		
CO	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	3	2	-	3	1	1	2	3	3	2	1
CO2	2	2	2	2	3	2	-	3	1	1	2	3	3	2	1
CO3	2	3	1	1	3	2	-	2	1	1	2	2	3	2	1
CO4	3	2	1	1	2	1	-	2	1	1	2	3	3	2	1
CO5	2	3	1	1	2	-	-	2	1	1	2	3	3	2	1

B. Sc. (Hons.) Agriculture

SEMESTER-VI

Syllabus: Diseases of Field and Horticultural Crops and their Management-II

Paper Code: AG339

w.e.f. Session 2020-21

Theory **3 (2+1)**

Unit I

Symptoms, etiology, disease cycle and management of Field Crops: Wheat: rusts, loose smut, karnal bunt, powdery mildew, alternaria blight, and ear cockle; Lentil: rust and wilt; Pea: downy mildew, powdery mildew and rust; Gram: wilt, grey mould and Ascochyta blight;

Unit II

Symptoms, etiology, disease cycle and management of Field Crops: Sunflower: Sclerotinia stem rot and Alternaria blight; Mustard: Alternaria blight, white rust, downy mildew and Sclerotinia stem rot; Cotton: anthracnose, vascular wilt, and black arm; Sugarcane: red rot, smut, wilt, grassy shoot, ratoon stunting and Pokkah Boeng

Unit III

Symptoms, etiology, disease cycle and management of 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

Unit IV

Symptoms, etiology, disease cycle and management of Horticultural Crops: 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.

Course Objective:

- *To study the symptoms of different diseases and identify them in field condition.*
- *To study about the pathogen biology.*
- *To study favorable environmental condition.*
- To demonstrate appropriate management strategies.

Course Outcome (CO):

CO1	*This course will help the students to identify diseases of field and horticultural crops in farmer's field.*
CO2	The student can use the basic knowledge regarding different factors affecting disease development.
CO3	*The student will gain knowledge about the recommendation of management practices in order to minimize the harvesting loss.*

CO-PO-PSO mapping

PO	**PO**												**PSO**		
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	1	2	1	3	3	1	2	1	2	1	2	3	2	1
CO2	1	1	3	3	1	2	1	1	3	3	1	2	3	2	1
CO3	1	2	1	2	1	3	3	2	1	2	1	2	3	2	1

B. Sc. (Hons.) Agriculture
SEMESTER-VI
Syllabus: Post-harvest Management and Value Addition of Fruits and Vegetables
Paper Code: HT328
w.e.f. Session 2020-21

Theory **2 (1+1)**

Unit-I

Importance of post-harvest processing of fruits and vegetables, extent and possible causes of post harvest losses.

Unit-II

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.

Unit-III

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.

Unit-IV

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.

COURSE OBJECTIVES:

- Basics knowledge of post-Harvest management and value addition
- Knowledge of factors affecting post-harvest quality.
- Principles and methods of preservation
- Knowledge of different post-harvest products
- Knowledge of drying, canning and packaging

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Basics of post-harvest management and value addition
CO2	factors affecting post-harvest quality
CO3	Principles and methods of preservation
CO4	Post-harvest products
CO5	Principles of drying, canning and packaging

CO-PO-PSO mapping

PO	PO												PSO		
CO	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	3	2	-	3	1	2	2	3	3	2	1
CO2	3	3	2	3	3	2	-	3	1	2	2	3	3	3	1
CO3	3	3	1	3	3	2	-	3	1	2	2	3	3	3	1
CO4	3	3	1	3	3	-	-	3	1	2	2	3	3	2	1
CO5	3	3	1	3	3	-	-	3	1	2	2	3	3	2	1

B. Sc. (Hons.) Agriculture
SEMESTER-VI
Syllabus: Management of Beneficial Insects
Paper Code: AG340
w.e.f. Session 2020-21

Theory **2 (1+1)**

Unit I

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.

Unit II

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.

Unit III

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.

Unit IV

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.

COURSE OBJECTIVES:

- Basics knowledge of beneficial insects and their economic importance
- Knowledge of tools and practices of Apiculture
- Knowledge of tools and practices of Sericulture
- Knowledge of tools and practices of Lac culture
- Knowledge of different helpful insects including parasitoids and predators and other productive insects

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Basics knowledge of beneficial insects and their economic importance
CO2	Knowledge of tools and practices of Apiculture
CO3	Knowledge of tools and practices of Sericulture
CO4	Knowledge of tools and practices of Lac culture
CO5	Knowledge of different helpful insects including parasitoids and predators and other productive insects

PO	PO												PSO		
CO	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	1	3	2	3	1	2	2	3	3	3	1
CO2	2	2	2	2	1	3	2	3	1	2	2	3	3	3	1
CO3	2	2	3	1	1	3	2	2	1	2	2	2	3	3	1
CO4	2	2	3	1	1	3	2	2	1	1	2	3	3	2	1
CO5	2	2	2	1	1	3	2	2	2	2	2	3	3	2	1

B. Sc. (Hons.) Agriculture
SEMESTER-VI
Syllabus: Crop Improvement-II *(Rabi crops)*
Paper Code: AG341
w.e.f. Session 2020-21

Theory **2 (1+1)**

Unit I
Centers of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fodder crops and cash crops; vegetable and horticultural crops

Unit II
Plant genetic resources, its utilization and conservation; study of genetics of qualitative and quantitative characters

Unit III
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)

Unit IV
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

Course Objectives:

- To study about breeding objectives of different rabi field crops
- To know about different breeding methods applied in field crop
- To get knowledge about hybrid production technology
- To know about different rabi crops botany and their breeding techniques
- To study about different variety developed in rabi crop

Course Outcomes (CO):
After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	able to learn different breeding objectives of rabi crops
CO2	able to understand basic knowledge about breeding methods in rabi crops
CO3	able to learn hybridization techniques and hybrid concept
CO4	able to learn mechanism of self and cross pollination
CO5	able to learn crop ideotype breeding concept

CO-PO-PSO mapping

PO	PO												PSO		
CO	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	1	2	2	3	1	1	2	1	3	3	1
CO2	3	3	3	2	1	2	2	3	2	2	1	2	3	3	1
CO3	3	2	3	3	1	2	2	3	2	2	1	2	3	3	1
CO4	3	2	3	2	1	2	2	3	1	1	1	3	3	2	1
CO5	3	2	2	3	1	2	2	2	2	1	1	2	3	2	1

B. Sc. (Hons.) Agriculture
SEMESTER-VI
Syllabus: Practical Crop Production –II (*Rabi* crops)
Paper Code: AG342
w.e.f. Session 2020-21

Practical **2 (0+2)**

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.

Course Objectives:

- To study about field crops
- To know about multiple cropping system
- To get knowledge weed management of diseases
- To know about seed production, mechanization, resource conservation
- To study about integrated nutrient management

Course Outcomes (CO):
After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	able to learn field crops
CO2	able to understand multiple cropping system
CO3	able to learn weed management of diseases
CO4	able to learn seed production, mechanization, resource conservation
CO5	able to learn integrated nutrient management

CO-PO-PSO mapping

PO	PO												PSO		
CO	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	1	2	2	3	1	1	2	1	3	2	1
CO2	3	3	3	2	1	2	2	3	2	2	1	2	3	2	1
CO3	3	2	3	3	1	2	2	3	2	2	1	2	3	2	1
CO4	3	2	3	2	1	2	2	3	1	1	1	3	3	1	1
CO5	3	2	2	3	1	2	2	2	2	1	1	2	3	2	1

B. Sc. (Hons.) Agriculture

SEMESTER-VI
Syllabus: Principles of Organic Farming
Paper Code: AG343
w.e.f. Session 2020-21

Theory **2 (1+1)**

Unit I

Organic farming, principles and its scope in India; Initiatives taken by Government (central/ state), NGOs and other organizations for promotion of organic agriculture

Unit II

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

Unit III

Fundamentals of insect, pest, disease and weed management under organic mode of production; Operational structure of NPOP

Unit IV

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.

Suggested Readings:

- Principles of Organic Farming by P L Maliwa
- Principles of Organic Farming, by S R Reddy, Kalyami Publications, New Delhi
- Basics of Organic Farming by Bansal M
- Jaivik Kheti (Organic Farming) by Chandra Prakash Shukl, Pointer Publishers

Course Objective:

- *To learn and understood the principles and concept*
- *To gain basic knowledge of Scope and importance*
- *To develop the protocol of INM, IPM and IWM practices*
- *To study the preparation of organic compost and its relevance*
- *To know the application and procedure certification, standard and **marketing***

Course Outcome (CO):

CO1	*This course will help the students to know the principles, concept, scope and importance of organic farming*
CO2	The student can use the basic knowledge regarding INM, IPM and IWM practices
CO3	*The student will gain knowledge about the preparation of organic compost*
CO4	*Students to know the application and procedure certification, standard and marketing of organic product*

CO-PO-PSO mapping

PO	**PO**												**PSO**		
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	1	2	1	3	3	1	2	1	2	2	1	3	2	1
CO2	1	1	3	3	1	2	1	1	3	3	1	1	3	2	2
CO3	1	2	1	2	1	3	3	2	1	1	1	2	3	2	1
CO4	1	2	3	1	2	1	2	2	3	3	1	2	3	2	2

B. Sc. (Hons.) Agriculture
SEMESTER-VI
Syllabus: Farm Management, Production & Resource Economics
Paper Code: AG344
w.e.f. Session 2020-21

Theory **2 (1+1)**

Unit I

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.

Unit II

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.

Unit II

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.

Unit II

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.

Course Outcome:

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Students are aware of basic principles of economics and Meaning, Definition, Natureand Scope of Production Economics.
CO2	Students know Economics Models.
CO3	Students understand Agricultural Production Economics and its practical usage.
CO4	To study about farm records.
CO5	To be familiar with market structures.

CO-PO-PSO mapping

PO	PO												PSO		
CO	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3					2	3	3	3	3	3	3	2	2
CO2	3	3					1	3	2	3	3	2	3	2	1
CO3	3	2					2	3	2	1	3	3	3	2	1
CO4	3	3					1	3	2	2	3	3	3	1	2
CO5	3	3					2	2	2	3	3	3	3	2	3

B. Sc. (Hons.) Agriculture
SEMESTER-VI
Syllabus: Principles of Food Science and Nutrition
Paper Code: AG345
w.e.f. Session 2020-21

Theory **2 (2+0)**

Unit I

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).

Unit II

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.).

Unit III

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.

Course objective:

1. To give knowledge about importance and scope of food science, processing, post-harvest losses, principles and methods of food science and nutrition
2. To provide the knowledge about the physical, chemical and biological properties of food and other food material.
3. To educate the students about different types of food and their composition and chemistry.
4. To aware the students about food microbiology and principles and methods of food processing and preservation.
5. To provide Knowledge regarding food and nutrition, malnutrition, nutritional disorders, energy metabolism, balanced/ modified diets, menu planning and new trends in food science and nutrition.

Course Outcome

After completion of course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Students able to understand the importance and scope of food science, processing, post-harvest losses, principles and methods of food science and nutrition
CO2	Able to know about physical, chemical and biological properties of food and other food material.
CO3	Student able to understand about different types of food and their composition and chemistry.
CO4	Able to know about about food microbiology and principles and methods of food processing and preservation
CO5	Students able to understand the basic Knowledge regarding food and nutrition, malnutrition, nutritional disorders, energy metabolism, balanced/ modified diets, menu planning and new trends in food science and nutrition

CO-PO-PSO mapping

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PO	**PO**												**PSO**		
CO	**POI**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	2	-	-	-	3	-	3	3	2	3	2	1
CO2	3	3	3	2	-	-	-	3	-	2	2	3	3	2	1
CO3	3	3	2	2	-	-	-	3	-	3	2	3	3	2	1
CO4	3	3	3	1	-	-	-	3	-	3	2	3	3	2	2
CO5	3	3	2	3	-	-	-	3	-	3	2	3	3	3	1

B.Sc. (Hons.) Agriculture
Syllabus: Food Safety and Standards
Paper Code: AG348
w.e.f. Session 2020-21

Theory **3(2+1)**

Unit 1.

Food Safety – Definition, Importance, Scope and Factors affecting Food Safety. Hazards and Risks, Types of hazards - Biological, Chemical, Physical hazards. Management of hazards - Need. Control of parameters. Temperature control.

Unit 2.

Food storage. Product design. Hygiene and Sanitation in Food Service Establishments- Introduction. Sources of contamination and their control. Waste Disposal. Pest and Rodent Control. Personnel Hygiene.

Unit 3.

Food Safety Measures. Food Safety Management Tools- Basic concepts. PRPs, GHPs, GMPs, SSOPs etc. HACCP. ISO series. TQM - concept and need for quality, components of TQM, Kaizen. Risk Analysis. Accreditation and Auditing, Water Analysis, Surface Sanitation and Personal Hygiene.

Unit 4.

Food laws and Standards- Indian Food Regulatory Regime, FSSA. Global Scenario CAC. Other laws and standards related to food. Recent concerns- New and Emerging Pathogens. Packaging, Product labeling and nutritional labeling. Genetically modified foods\ transgenics. Organic foods. Newer approaches to food safety. Recent Outbreaks. Indian and International Standards for food products.

Practical

Water quality analysis physico-chemical and microbiological. Preparation of different types of media. Microbiological Examination of different food samples. Assessment of surface sanitation by swab/rinse method. Assessment of personal hygiene. Biochemical tests for identification of bacteria. Scheme for the detection of food borne pathogens. Preparation of plans for Implementation of FSMS - HACCP, ISO: 22000.

COURSE OBJECTIVES:

- Recognize and identify the food contaminants influencing the safety of agricultural products.
- Understand and apply properly the national and international legislation/ regulation.
- Implement food safety management systems for primary production.
- Evaluate food safety management systems and recommend the preventive measures.
- To be able to research a topic, synthesis current information and develop a presentation related to food safety and food quality

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Students will have basic knowledge of the application of food quality and food safety system
CO2	Knowledge of identify the hazard of the food chain to ensure food safety
CO3	Basic knowledge of eexamine the chemical and microbiological quality of food samples
CO4	Basic concept of review of legislative approaches for the management of food safety
CO5	Knowledge of detect the adulteration in food samples

CO-PO-PSO mapping

PO	PO												PSO		
CO	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	2	3	3	2	3	3	3	3	2	2
CO2	3	2	3	2	2	2	3	2	1	2	3	2	3	2	2
CO3	3	2	3	3	3	2	3	2	2	2	3	2	3	2	2
CO4	2	2	2	2	2	2	2	3	2	2	2	2	3	1	2
CO5	2	3	2	2	2	2	2	3	2	2	2	3	3	2	2

B.Sc. (Hons.) Agriculture
Syllabus: Biopesticides & Biofertilizers
Paper Code: AG349
w.e.f. Session 2020-21

Theory **3(2+1)**

Unit 1.

History and concept of biopesticides. Importance, scope and potential of biopesticide. Definitions, concepts and classification of biopesticides viz. pathogen, botanical pesticides, and biorationales.

Unit 2.

Botanicals and their uses. Mass production technology of bio-pesticides. Virulence, pathogenicity and symptoms of entomopathogenic pathogens and nematodes. Methods of application of biopesticides. Methods of quality control and Techniques of biopesticides. Impediments and limitation in production and use of biopesticide.

Unit 3.

Biofertilizers - Introduction, status and scope. Structure and characteristic features of bacterial biofertilizers- Azospirillum, Azotobacter, Bacillus, Pseudomonas, Rhizobium and Frankia; Cynobacterial biofertilizers- Anabaena, Nostoc, Hapalosiphon and fungal biofertilizers- AM mycorrhiza and ectomycorhiza.

Unit 4.

Nitrogen fixation -Free living and symbiotic nitrogen fixation. Mechanism of phosphate solubilization and phosphate mobilization, K solubilization. Production technology: Strain selection, sterilization, growth and fermentation, mass production of carrier based and liquid biofertiizers. FCO specifications and quality control of biofertilizers. Application technology for seeds, seedlings, tubers, sets etc. Biofertilizers -Storage, shelf life, quality control and marketing. Factors influencing the efficacy of biofertilizers.

Practical

Isolation and purification of important biopesticides: *Trichoderma Pseudomonas, Bacillus, Metarhyzium* etc. and its production. Identification of important botanicals. Visit to biopesticide laboratory in nearby area. Field visit to explore naturally infected cadavers. Identification of entomopathogenic entities in field condition. Quality control of biopesticides. Isolation and purification of *Azospirillum , Azotobacter, Rhizobium*, P-solubilizers and cyanobacteria. Mass multiplication and inoculums production of biofertilizers. Isolation of AM fungi -Wet sieving method and sucrose gradient method. Mass production of AM inoculants.

COURSE OBJECTIVES:

- To learn about the importance of Biopesticides
- To provide knowledge of Mass production technology of bio-pesticides
- To learn about the importance of Biofertilizers
- To learn Nitrogen fixation -Free living and symbiotic nitrogen
- To study the Structure and characteristic features of biofertilizers

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	The students will learn the importance of Biopesticides
CO2	The students will gain the knowledge of Mass production technology of bio-pesticides
CO3	The students will learn about the importance of Biofertilizers
CO4	The students will learn the Structure and characteristic features of biofertilizers
CO5	The students will learn Nitrogen fixation -Free living and symbiotic nitrogen

CO-PO-PSO mapping

PO	PO												PSO		
CO	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	1	3	2	3	1	2	2	3	3	2	1
CO2	2	2	2	2	1	3	2	3	1	2	2	3	3	2	1
CO3	2	2	3	1	1	3	2	2	1	2	2	2	3	2	1
CO4	2	2	3	1	1	3	2	2	1	1	2	3	3	1	1
CO5	2	2	2	1	1	3	2	2	2	2	2	3	3	2	1

B.Sc. (Hons.) Agriculture
Syllabus: Protected Cultivation
Paper Code: HT330
w.e.f. Session 2020-21

Theory **3(2+1)**

Unit 1.

Protected cultivation- importance and scope, Status of protected cultivation in India and World types of protected structure based on site and climate. Cladding material involved in greenhouse/ poly house. Greenhouse design, environment control, artificial lights, Automation.

Unit 2.

Soil preparation and management, Substrate management. Types of benches and containers. Irrigation and fertigation management. Propagation and production of quality planting material of horticultural crops.

Unit 3.

Greenhouse cultivation of important horticultural crops – rose, carnation, chrysanthemum, gerbera, orchid, anthurium, lilium, tulip, tomato, bell pepper, cucumber, strawberry, pot plants, etc.

Unit 4.

Cultivation of economically important medicinal and aromatic plants. Off-season production of flowers and vegetables. Insect pest and disease management.

Practical

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

COURSE OBJECTIVES:

1.Development of better understanding regarding recent advances in crop management under protected cultivation.
2.Obtaining sufficiency in fruits, vegetables and flowers under protected cultivation in on and off season.
3.Better designing of infrastructure for protected cultivation in different agro-climatic conditions.
4.Enhancement of total crop duration of horticultural crops than traditional ones.
5.Developing low-cost indigenous protected cultivation technologies for enhancing productivity in horticultural crops.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	To get knowledge about green house technology, types of green houses and construction of green houses
CO2	Course will give the knowledge of green house equipment's, materials of construction for traditional and low-cost green houses
CO3	This course will help the students to learn about Irrigation systems used in greenhouses, shade net house in protected cultivation
CO4	By this course student get the of concepts of cleaning and grading Moisture measurement
CO5	Apply horticultural skills and knowledge to operate various business entities found in the horticultural industry

CO-PO-PSO MAPPING:

PO	PO												PSO		
CO	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	3	3	2	3	2	2	2	3	3	2	1
CO2	2	2	2	2	3	3	1	3	2	2	2	3	3	2	2
CO3	2	2	3	2	3	3	1	2	2	2	2	2	3	2	1
CO4	2	2	3	2	3	3	1	2	2	2	2	3	3	1	1
CO5	2	2	2	2	3	3	2	2	2	2	2	3	3	2	2

B.Sc. (Hons.) Agriculture
Syllabus: System Simulation and Agro-advisory
Course Code: AG351
w.e.f. Session 2020-21

Theory **3 (2+1)**

Unit 1.

System Approach for representing soil-plant-atmospheric continuum, system boundaries, Crop models, concepts & techniques, types of crop models, data requirements, relational diagrams.

Unit 2.

Evaluation of crop responses to weather elements; Elementary crop growth models; calibration, validation, verification and sensitivity analysis. Potential and achievable crop production- concept and modeling techniques for their estimation. Crop production in moisture and nutrients limited conditions; components of soil water and nutrients balance.

Unit 3.

Weather forecasting, types, methods, tools & techniques, forecast verification; Value added weather forecast, ITK for weather forecast and its validity; Crop-Weather Calendars; Preparation of agro-advisory bulletin based on weather forecast. Use of crop simulation model for preparation of Agro-advisory and its effective dissemination.

Practical

Preparation of crop weather calendars. Preparation of agro-advisories based on weather forecast using various approaches and synoptic charts. Working with statistical and simulation models for crop growth. Potential & achievable production; yield forecasting, insect & disease forecasting models. Simulation with limitations of water and nutrient management options. Sensitivity analysis of varying weather and crop management practices. Use of statistical approaches in data analysis and preparation of historical, past and present meteorological data for medium range weather forecast. Feedback from farmers about the agroadvisory.

Suggested Readings:

- Pushpa Singh and Narendra Singh. 2012. Modeling and Simulation. S K Kataria and Sons
- Gurvinder Singh, Rachhpal Singh & Saluja KK. 2003. Fundamentals of Computer Programming and Information Technology. Kalyani Publishers.
- Kumar A 2015. Computer Basics with Office Automation. IK International Publishing House Pvt Ltd.
- Maidasani D. 2016. Learning Computer Fundamentals, MS Office and Internet & Web Technology. 3rd edition, Laxmi Publications.

Course Objectives:

- Students of undergraduate will gain knowledge System Approach for representing soil-plant-atmospheric continuum, system boundaries, and Crop models.
- Proper understanding of Crop-Weather Calendars and forewarning model will be inculcated among the students.
- The knowledge gained in this course will be useful in understanding agro-advisories based on weather forecast.
- Understand the Use of statistical approaches in data analysis and preparation of historical, past and present meteorological data for medium range weather forecast.
- Understand the Preparation of agro-advisory bulletin based on weather forecast.

Course Outcome:

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Undergraduate will gain knowledge System Approach for representing soil-plant-atmospheric continuum, system boundaries, and Crop models.
CO2	Understanding of Crop-Weather Calendars and forewarning model will be inculcated among the students.
CO3	Comprehensive knowledge of Preparation of agro-advisories based on weather forecast using various approaches and Preparation of AAS based on weather forecast using synoptic charts
CO4	Understand the Use of statistical approaches in data analysis and preparation of historical, past and present meteorological data for medium range weather forecast.
CO5	Use of statistical approaches in data analysis and preparation of historical, past and present meteorological data for medium range weather forecast

CO-PO-PSO MAPPING:

PO	PO												PSO		
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CO3	3	2	1	1	2	2	2	3	1	1	1	3	3	2	2
CO4	3	2	2	2	2	3	3	3	2	2	1	3	3	1	1
CO5	3	1	2	1	2	2	3	3	2	2	1	3	3	2	1