Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	**AG321**	**Title of the Course**	**Manures, Fertilizers and Soil Fertility Management**	**L**	**T**	**P**	**C**
Year	**III**	**Semester**	V	**2**		**1**	**3**
Course Objectives	1. To learn about the different types of organic manures 2. To provide knowledge different fertilizers and role of integrated nutrient management 3. To study about nutrients and their chemistry in soil 4. To learn about soil fertility evaluation techniques 5. To study about fertilizer recommendations and nutrient use efficiency						

Course Outcomes	
CO1	To learn about the different types of organic manures
CO2	To provide knowledge different fertilizers and role of integrated nutrient management
CO3	To study about nutrients and their chemistry in soil
CO4	To learn about soil fertility evaluation techniques
CO5	To study about fertilizer recommendations and nutrient use efficiency

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Unit 1**	Introduction and importance of organic manures, properties and methods of preparation of bulky and concentrated manures. Green/leaf manuring.	6	CO 1
2	**Unit 2**	Chemical fertilizers: classification, composition and properties of major nitrogenous, phosphatic, potassic fertilizers, secondary & micronutrient fertilizers, complex fertilizers, nano fertilizers. Soil amendments, Fertilizer Storage, Fertilizer Control Order, Integrated nutrient management.	6	CO 2
3	**Unit 3**	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	6	CO 3
4	**Unit 4**	Soil testing. Critical levels of different nutrients in soil. Forms of nutrients in soil, deficiency symptoms, plant analysis, rapid plant tissue tests. Indicator plants.	5	CO 4
5	**Unit 5**	Methods of fertilizer recommendations to crops. Factor influencing nutrient use efficiency (NUE), methods of application under rainfed and irrigated conditions.	5	CO 5
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.			32	CO 1, 2, 3, 4, 5

Reference Books:

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

Das DK. 2011. *Introductory Soil Science.* Third Revised Edition, Kalyani Publishers

e-Learning Source:

https://www.webpages.uidaho.edu/~bmahler/s44601.pdf

Open Access Books - Soil Science | InTechOpen https://www.intechopen.com/books/subject/soil-science/books/all/1/lis

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	2	2	1	2	1	1	1	3	3	2	1
CO2	3	3	3	1	1	1	2	2	1	1	1	3	3	2	1
CO3	3	2	3	1	2	1	1	2	1	1	1	2	3	2	1
CO4	3	2	2	1	2	1	1	2	1	1	1	2	3	2	2
CO5	3	3	2	1	2	2	1	2	1	2	1	3	3	3	2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	AG322	**Title of the Course**	Pests of Crops and Stored Grain and their Management	**L**	**T**	**P**	**C**
Year	**2020-21**	**Semester**	V	**2**	**0**	**1**	**3**
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	
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 contro

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
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.	8	CO 1
2	**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.	8	CO 2
3	**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.	8	CO 3
4	**Unit 4**	Storage structure and methods of grain storage and fundamental principles of grain store management.	8	CO 4, 5
Practical's				
		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.	32	CO 1, 2, 3, 4, 5

Reference Books:

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. Conceptpublishing Company, New Delhi.

Introduction to General and Applied Entomology. Awasthi, V.B. Scientific Publishers, Jodhpur.

e-Learning Source:

Get latest entomology books online through : https://www.questia.com/library/science and-technology/life-sciences-and-agriculture/entomology

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)													
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	1	3	2	3	1	2	2	3	3	3
CO2	2	2	2	2	1	3	2	3	1	2	2	3	3	3
CO3	2	2	3	1	1	3	2	2	1	2	2	2	3	3
CO4	2	2	3	1	1	3	2	2	1	1	2	3	3	3
CO5	2	2	2	1	1	3	2	2	2	2	2	3	2	2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	AG323	**Title of the Course**	Diseases of Field and Horticultural Crops and their Management -I	**L**	**T**	**P**	**C**
Year	**2020-21**	**Semester**	V	**2**	**0**	**1**	**3**
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	
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

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
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	8	CO 1
2	**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	8	CO 2
3	**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;	7	CO 3
4	**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	7	CO 4, 5
Practicals:				
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.			30	CO 1, 2, 3, 4, 5

Reference Books:

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.

e-Learning Source:

Get latest entomology books online through : https://www.questia.com/library/science and-technology/life-sciences-and-agriculture/entomology

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO CO	PO1	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

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	AG324	**Title of the Course**	Crop Improvement-I (Kharif Crops)	**L**	**T**	**P**	**C**
Year	2020-21	**Semester**	V	**1**	**0**	**1**	**2**
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	
CO1	To study about breeding objectives of different kharif field crops
CO2	To know about different breeding methods applied in field crop
CO3	To get knowledge about hybrid production technology
CO4	To know about different kharif crops botany and their breeding techniques
CO5	To study about different variety developed in kharif crop

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
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	4	CO 1
2	**Unit 2**	Centers of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fibres; fodders and cash crops; vegetable and horticultural crops	4	CO 2
3	**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).	4	CO 3, 4
4	**Unit 4**	Hybrid seed production technology in Maize, Rice, Sorghum, Pearl millet and Pigeonpea, etc. Ideotype concept and climate resilient crop varieties for future.	4	CO 4, 5
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.			**32**	**CO 1, 2, 3, 4, 5**

Reference Books:

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.

e-Learning Source:

http://www.eagri.org/eagri50/AGRO301/index.html

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO CO	PO1	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

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	AG325	**Title of the Course**	Geoinformatics and Nano- technology and Precision Farming	**L**	**T**	**P**	**C**
Year	2020-21	**Semester**	V	**1**	**0**	**1**	2
Course Objectives	To introduce the basic concepts of geo-informatics and nano-technology • 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	
CO1	To introduce the basic concepts of geoinformatics and nanotechnology
CO2	To create awareness about various applications of geoinformatics and nanotechnology for precision agriculture
CO3	To teach basic handling of various geoinfomatic tools
CO4	Introduction to crop Simulation models
CO5	Introduction of Precision agriculture

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
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.	4	CO 1
2	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	4	CO 3
3	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	4	CO 2, 4
4	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.	4	CO 4, 5
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.			**32**	**CO 1, 2, 3, 4, 5**

Reference Books:

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

e-Learning Source:

https://bscagristudy.online/wp-content/uploads/2021/03/AGRO-3612-PRINTED-NOTE.pdf

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO4
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

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	AG327	**Title of the Course**	Intellectual Property Rights	**L**	**T**	**P**	**C**
Year	**III**	**Semester**	V	**1**	**0**	**0**	**1**
Course Objectives	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 Outcomes	
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.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Introduction to intellectual property	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.	4	CO 1
2	Patent system in India	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.	4	CO 2
3	UPOV	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.	4	CO 3, 4, 5
4	Indian Biological Diversity Act	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.	4	CO 4, 5

Reference Books:

- 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

e-Learning Source:

https://www.rvskvv.net/images/INTELLECTUAL-PROPERTY-RIGHTS_20.04.2020.pdf

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO CO	PO1	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

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	AG328	**Title of the Course**	Micro propagation Technologies	**L**	**T**	**P**	**C**
Year	**III**	**Semester**	V	**1**	**0**	**2**	**3**
Course Objectives	1. Knowledge and concept of different types of cultures 2. Basics Stages of micropropagation, 3. Knowledge of Axillary bud proliferation 4. Study of Organogenesis, Somatic embryogenesis, cell suspension cultures, **5.** Study based on Production of secondary metabolites, Somaclonal variation, Cryopreservation.						

Course Outcomes	
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.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Unit 1**	Introduction, History, Advantages and limitations; Types of cultures (seed, embryo, organ, callus, cell).	6	CO 1, 2
2	**Unit 2**	Stages of micropropagation, Axillary bud proliferation (Shoot tip and meristem culture, bud culture).	4	CO 3, 4
3	**Unit 3**	Organogenesis (callus and direct organ formation), Somatic embryogenesis, cell suspension cultures, Production of secondary metabolites, Somaclonal variation, Cryopreservation.	6	CO 4, 5
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.			**60**	**CO 1, 2, 3, 4, 5**

Reference Books:

- 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

e-Learning Source:

https://plantbreeding2010.blogspot.com/p/micro-propagation-technologies.html

https://thebiotechnotes.com/2019/08/11/micropropagation/

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO CO	PO1	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

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	AG329	**Title of the Course**	Agricultural Journalism	**L**	**T**	**P**	**C**
Year	**III**	**Semester**	V	**2**	**0**	**1**	**3**
Course Objectives	1. Knowledge and concept of agricultural journalism 2. Characteristics and kinds and functions of newspapers 3. To learn about types of agricultural stories, subject matter of the agricultural story 4. To know about illustration of agricultural stories **5.** To learn about the editorial mechanics, copy reading, headline and title writing						

Course Outcomes	
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

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
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.	8	CO 1
2	**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.	8	CO 2
3	**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.	8	CO 3, 4
4	**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.	8	CO 5
5				

Reference Books:

- 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.

e-Learning Source:

http://ecoursesonline.iasri.res.in/Courses/Extension%20Methodologies%20for%20Transfer%20of%20ag.%20Tech/Data%20Files/lect14.html

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO CO	PO1	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

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	BM367	**Title of the Course**	Entrepreneurship Development and Business Communication	**L**	**T**	**P**	**C**
Year	**3rd**	**Semester**	V	**1**	**0**	**1**	**2**
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	
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

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Unit 1	Concept of Entrepreneur, Entrepreneurship Development, Characteristics of entrepreneurs; SWOT Analysis & achievement motivation	4	CO 1
2	Unit 2	Government policy and programs and institutions for entrepreneurship development, Impact of economic reforms on Agribusiness/ Agrienterprises, Entrepreneurial Development Process	4	CO 2
3	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	4	CO 3
4	Unit 4	Financing of enterprise, Opportunities for agri-entrepreneurship and rural enterprise	4	CO 4, 5
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.			**32**	**CO 1, 2, 3, 4, 5**

Reference Books:

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.

e-Learning Source:

http://ecoursesonline.iasri.res.in

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO4
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	3	3	1	3	2	3	2	1	1	3	2	2	1

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	HT325	**Title of the Course**	Hi-tech. Horticulture	**L**	**T**	**P**	**C**
Year	**III**	**Semester**	V	**2**	**0**	**1**	**3**
Course Objectives	1. Knowledge and concept nursery management and mechanization 2. Basics Stages of micropropagation, 3. Knowledge of Axillary bud proliferation 4. To know about components of precision farming **5.** To learn about the mechanized harvesting of produce						

Course Outcomes	
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

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Unit 1	Introduction & importance; Nursery management and mechanization; micro propagation of horticultural crops; Modern field preparation and planting methods	8	CO 1
2	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	8	CO 2
3	Unit 3	Components of precision farming: Remote sensing, Geographical Information System (GIS), Differential Geo-positioning System (DGPS), Variable Rate applicator (VRA)	8	CO 3
4	Unit 4	Application of precision farming in horticultural crops (fruits, vegetables and ornamental crops); mechanized harvesting of produce	8	CO 4
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.			30	CO 1, 2, 3,4, 5

Reference Books:

- 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.

e-Learning Source:

https://bscagristudy.online/wp-content/uploads/2021/06/ELE-HORT-368-FULL-PRINTED-NOTES.pdf

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO CO	PO1	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

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	HT331	**Title of the Course**	Landscaping	**L**	**T**	**P**	**C**
Year	**III**	**Semester**	V	**2**	**0**	**1**	**3**
Course Objectives	1. Knowledge and concept of landscaping 2. To know about principles of landscaping, garden styles and types 3. To learn about trees selection, propagation, planting schemes, canopy management 4. To know about other garden plants **5.** To learn about the landscaping of schools and public places						

Course Outcomes	
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

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
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.	8	CO 1
2	**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,	7	CO 2
3	**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,	8	CO 3
4	**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.	7	CO 4, 5
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.			32	CO 1, 2, 3, 4, 5

Reference Books:

- 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.

e-Learning Source:

https://agritech.tnau.ac.in/horticulture/horti_landscaping.html

https://coabnau.in/uploads/1632999998_Hort.5.5LandscapingTheoryNoteFinal-converted.pdf

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO CO	PO1	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

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	AG335	**Title of the Course**	Rainfed Agriculture & Watershed Management	**L**	**T**	**P**	**C**
Year	**III**	**Semester**	VI	**2**	**0**	**1**	**3**
Course Objectives	1. To attain the basics knowledge about rainfed agriculture in Indian condition 2. To gain the knowledge of watershed management in Indian condition 3. To imbibe the fundamental knowledge about soil and climatic conditions 4. To conceive the knowledge about sustainable agricultural Production under dryland condition **5.** To acquire the efficient and effective water harvesting system and watershed management						

Course Outcomes	
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 can 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

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Unit 1**	Rainfed agriculture: Introduction, types, History of rainfed agriculture and watershed in India; Problems and prospects of rainfed agriculture in India	8	CO 1
2	**Unit 2**	Soil and climatic conditions prevalent in rainfed areas; Soil and water conservation techniques, Drought: types, effect of water deficit on physio-morphological characteristics of the plants, Crop adaptation and mitigation to drought	8	CO 2
3	**Unit 3**	Water harvesting: importance, its techniques, Efficient utilization of water through soil and crop management practices, Management of crops in rainfed areas,	7	CO 3
4	**Unit 4**	Contingent crop planning for aberrant weather conditions, Concept, objective, principles and components of watershed management, factors affecting watershed management.	7	CO 4, 5
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.			30	CO 1, 2, 3, 4, 5

Reference Books:

- 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.

e-Learning Source:

https://coabnau.in/uploads/1615893931_Agron6.10_Notes.pdf

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO CO	PO1	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	1	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	3	2	3	2	2
CO4	2	2	3	1	1	3	2	2	1	1	2	3	3	2	2
CO5	2	2	2	1	1	3	2	2	2	2	2	3	3	3	2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	AG336	**Title of the Course**	Farming System & Sustainable Agriculture	**L**	**T**	**P**	**C**
Year	**3rd**	**Semester**	6th	**1**	**0**	**0**	**1**
Course Objectives	1. To conceive the basics knowledge about farming system in Indian condition 2. To acquire the elemental knowledge about new technologies for sustainable agricultural production 3. To imbibe the fundamental knowledge of efficient cropping system and their evaluation 4. To attain the knowledge of IFS and site specific development of IFS model for different ACZ 5. To gain the rudimentary knowledge about resource cycling and flow of energy in different farming system						

Course Outcomes	
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

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**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	3	CO 1
2	**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	3	CO 2
3	**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	3	CO 3
4	**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.	3	CO 4,5

Reference Books:

- William L Donn. 1965. Meteorology. McGraw-Hill Book Co. New York.
- A.K.Dahama. 2007. *Organic farming for sustainable agriculture*. Agrobios (India), Jodhpur

e-Learning Source:

http://jnkvv.org/PDF/0504202013425134200822.pdf

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO CO	PO1	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	1	2	3
CO2	2	2	2	2	1	3	2	3	1	2	2	3	2	3	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	3	3
CO5	2	2	2	1	1	3	2	2	2	2	2	3	2	3	3

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	AG339	**Title of the Course**	Diseases of Field and Horticultural Crops and their Management-II	**L**	**T**	**P**	**C**
Year	**3rd**	**Semester**	6th	**2**	**0**	**1**	**3**
Course Objectives	• 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 Outcomes	
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.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
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;	8	CO 1
2	**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	8	CO 2
3	**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	7	CO 3
4	**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	8	CO 2,3
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.			32	CO 1, 2, 3, 4, 5

Reference Books:

- Joshi LM
- Rangaswami G. 1999. Diseases of Crop Plants in India. 4th Ed.. Prentice Hall of India
- Ricanel C
- Singh RS. 1998. Plant Diseases. 7th Ed. Oxford & IBH

e-Learning Source:

https://www.rvskvv.net/images/Disease2_Hort_Crops_20.04.2020.pdf

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO CO	PO1	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	2	2	2
CO2	1	1	3	3	1	2	1	1	3	3	1	2	3	3	3
CO3	1	2	1	2	1	3	3	2	1	2	1	2	3	3	2

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	AG340	**Title of the Course**	Management of Beneficial Insects	**L**	**T**	**P**	**C**
Year	**3rd**	**Semester**	6th	**1**	**0**	**1**	
Course Objectives	• To gain basics knowledge of beneficial insects and their economic importance • To gain Knowledge of tools and practices of Apiculture • To gain Knowledge of tools and practices of Sericulture • To gain Knowledge of tools and practices of Lac culture • To gain Knowledge of different helpful insects including parasitoids and predators and other productive insects						

Course Outcomes	
CO1	Basics knowledge of beneficial insects and their economic importance
CO2	Students will get Knowledge of tools and practices of Apiculture
CO3	Students will get Knowledge of tools and practices of Sericulture
CO4	Students will get Knowledge of tools and practices of Lac culture
CO5	Students will get Knowledge of different helpful insects including parasitoids and predators and other productive insects

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
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.	4	CO 1
2	**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.	4	CO 2
3	**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.	4	CO 3
4	**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.	4	CO 4,5
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.	**30**	**CO 1, 2, 3, 4, 5**

Reference Books:

- Handbook of Entomology by T V Prasad 2016. Kindle Edition.
- Elements of Economic Entomology 8th Edition (English, Paperback, BV David, VV Ramamurthy

e-Learning Source:

- Get latest entomology books online through:https://www.questia.com/library/science-and-technology/life-sciences-and-agriculture/entomology
- Get the course outlook at http://www.jnkvv.org/PDF/03042020204104342001 20.pdf

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO CO	PO1	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	2
CO2	2	2	2	2	1	3	2	3	1	2	2	3	3	3	3
CO3	2	2	3	1	1	3	2	2	1	2	2	2	2	2	2
CO4	2	2	3	1	1	3	2	2	1	1	2	3	2	3	3
CO5	2	2	2	1	1	3	2	2	2	2	2	3	3	1	3

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	AG341	**Title of the Course**	Crop Improvement-II (Rabi crops)	**L**	**T**	**P**	**C**
Year	**3rd**	**Semester**	6th	**1**	**0**	**1**	
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	
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

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
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	4	CO 1
2	**Unit-II**	Plant genetic resources, its utilization and conservation; study of genetics of qualitative and quantitative characters	3	CO 2
3	**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)	4	CO 3,4
4	**Unit-IV**	Hybrid seed production technology of rabi crops. Ideotype concept and climate resilient crop varieties for future	4	
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	30	CO 1, 2, 3, 4, 5

Reference Books:

- Plant Breeding, Principles and Methods by B D Singh, Kalyani Publication.
- Vegetable Breeding, Principles and Practices by Hari Har Ram, Kalyani Publication.
- Essentials of Plant Breeding, by Phundan Singh, Kalyani Publication.
- Modern Techniques of Raising Field Crops by Chhidda Singh, Prem Singh and Rajbir Singh, Oxford and IBH Publishing Co Pvt Ltd

e-Learning Source:

https://bscagristudy.online/wp-content/uploads/2021/04/GPB-366-PRINTED-LONG-NOTE.pdf

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO CO	PO1	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	2	3	1
CO2	3	3	3	2	1	2	2	3	2	2	1	2	3	3	3
CO3	3	2	3	3	1	2	2	3	2	2	1	2	3	2	2
CO4	3	2	3	2	1	2	2	3	1	1	2	3	2	2	2
CO5	3	2	2	3	1	2	2	2	2	1	1	2	3	1	3

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	AG342	**Title of the Course**	Practical Crop Production –II (Rabi crops)	**L**	**T**	**P**	**C**
Year	**III**	**Semester**	VI	**0**	**0**	**2**	**2**
Course Objectives	• Students will be able to learn the production technology of crops from sowing to harvesting						

Course Outcomes	
CO1	Students will be able to learn field crops
CO2	Students will be Able to understand multiple cropping system
CO3	Students will be Able to learn weed management of diseases
CO4	Students will be Able to learn seed production, mechanization, resource conservation
CO5	Students will be Able to learn integrated nutrient management

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.	**90**	**CO 1, 2, 3, 4, 5**
Reference Books:		
https://drive.google.com/file/d/1YP3LcC1Od4cvGfq2oe_Wr8ImnhWfoOZQ/view?usp=share_link		
e-Learning Source:		
www.oecd.org/tad/sustainable-agriculture/49848768.pdf		
https://ecourses.icar.gov.in https://youtu.be/vz-p_vRqLwM		

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO CO	PO1	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	2	2	2	3	2	2	1	2	3	2	2
CO3	3	2	3	2	2	2	2	3	2	2	1	2	3	2	2
CO4	3	2	3	2	2	2	2	3	1	1	1	3	3	1	1
CO5	3	2	2	3	3	1	2	2	2	1	1	2	3	2	2

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	AG343	**Title of the Course**	Principles of Organic Farming	**L**	**T**	**P**	**C**
Year	**III**	**Semester**	VI	**1**	**1**	**1**	**2**
Course Objectives	• 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						

Course Outcomes	
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

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
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	4	CO 2
2	**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	4	CO 1
3	**Unit-III**	Fundamentals of insect, pest, disease and weed management under organic mode of production; Operational structure of NPOP	4	CO 3
4	**Unit-IV**	Certification process and standards of organic farming; Processing, leveling, economic considerations and viability, marketing and export potential of organic products.	4	CO 2, 4
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.	28	CO 1, 2, 3, 4, 5

Reference Books:

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

e-Learning Source:

http://www.apicol.co.in/images/Bio%20Fertilizer%20Production%20and%20marketing.pdf

https://youtu.be/K3f9oINVAR0-

www.agrimoon.com

www.agriglance.com

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO CO	PO1	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

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	AG344	**Title of the Course**	Farm Management, Production & Resource Economics	**L**	**T**	**P**	**C**
Year	**III**	**Semester**	VI	**1**	**1**	**1**	**2**
Course Objectives	• To determine the conditions which provide for optimum use of resources. • To determine the extent to which the existing use of resources deviates from the optimum use • To analyze the forces which are responsible for existing production pattern and resource use. • To find out means and methods for changing the existing use of resources to the optimum level.						

Course Outcomes	
CO1	Students are aware of basic principles of economics and Meaning, Definition, Nature and 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

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
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.	3	CO 1
2	**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	4	CO 2
3	**Unit-III**	Concepts of resource economics, differences between NRE and agricultural economics, unique properties of natural resources. Positive and negative externalities in agriculture, Inefficiency and welfare loss, solutions, Important issues in economics and management of common property resources of land, water, pasture and forest resources etc.	4	CO 3
4	**Unit-IV**	Concepts of resource economics, differences between NRE and agricultural economics, unique properties of natural resources. Positive and negative externalities in agriculture, Inefficiency and welfare loss, solutions, Important issues in economics and management of common property resources of land, water, pasture and forest resources etc.	4	CO 4, 5
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.			**30**	**CO 1, 2, 3, 4, 5**

Reference Books:

Tandan R.K. and Dhondiyal, S.P. "Principles and Methods of Farm Management"

Johl, S.S. and Kapoor, T.R. "Fundamental of Farm Business Management, KalyaniPublishers,Ludhiana and New Delhi.

Sankhayan, P.L. "Introduction to the Economics of Agricutural Production".

Karam, A.S. and Karan Singh "Economics of Farm Management in India"

e-Learning Source:

Handbook on Crop Insurance, Insurance Regulatory and Development Authority Of India (IRDAI), Hyderabad. Available at: http://www.policyholder.gov.in/Crop_Handbook.aspx

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	1	2	3	3	3	3	3	3	2	2
CO2	3	3	1	2	3	1	1	3	2	3	3	2	3	2	1
CO3	3	2	2	1	2	2	2	3	2	1	3	3	3	2	1
CO4	3	3	2	1	2	1	1	3	2	2	3	3	3	1	2
CO5	3	3	1	2	1	2	2	2	2	3	3	3	3	2	3

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	AG345	**Title of the Course**	Principles of Food Science and Nutrition	**L**	**T**	**P**	**C**
Year	**III**	**Semester**	VI	**2**		**0**	**2**
Course Objectives	To give knowledge about importance and scope of food science, processing, post-harvest losses, principles and methods of food science and nutrition To provide the knowledge about the physical, chemical, and biological properties of food and other food material. To educate the students about different types of food and their composition and chemistry. To aware the students about food microbiology and principles and methods of food processing and preservation. 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 Outcomes	
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

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**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).	9	CO 1, 2
2	**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.).	9	CO 2, 3, 4
3	**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.	9	CO 3, 4, 5

Reference Books:

Swaminathan MS Food Science, Chemistry and Experimental Foods, Bangalore Print &Publishing Company

Manay SN and ShadaksharaswamyM(2008): Foods: facts and principles , 3rd Ed. New Age International (P) Ltd

Sohi D. A Comprehensive Textbook of Nutrition & Therapeutic Diets, New Delhi: Jaypee Brothers Medical Publishers

Hughes O and Bennion, M (1970): Introductory Foods, 5th Ed. Macrnillan& Co., New York

e-Learning Source:

http://lib.rudn.ru/file/Food_Science_Nutrition_Catalogue_ebook.pdf

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	1	1	1	3	2	3	3	2	3	2	1
CO2	3	3	3	2	1	1	1	3	2	2	2	3	3	2	1
CO3	3	3	2	2	1	1	1	3	2	3	2	3	3	2	1
CO4	3	3	3	1	1	1	1	3	2	3	2	2	3	2	2
CO5	3	3	2	3	2	2	2	3	2	3	2	3	3	3	1

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	AG348	**Title of the Course**	Food Safety and Standards	**L**	**T**	**P**	**C**
Year	**III**	**Semester**	VI	**2**		**1**	**3**
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	
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 examine 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

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Unit-I**	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.	8	1, 2
2	**Unit-II**	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.	8	3
3	**Unit-III**	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.	8	2
4	**Unit-IV**	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.	8	4, 5
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.			32	CO 1, 2, 3, 4, 5

Reference Books:

Carol E, Mellin; D. and Barbara A C. (1995). Food safety , food fesearch Institute, University of Wisconsin- Madison. Marcel Dekker Inc. New York

The Food Safety and Standards Act along with Rules & Regulations. Commercial Law Publishers (India) Pvt. Ltd.

Swaminathan M. 2005. Handbook of Foods and Nutrition. Ganesh and Co. Pvt. Ltd

Swaminathan M. 1990. Food Science, Chemistry and Experimental Foods. BAPPC

e-Learning Source:

http://lib.rudn.ru/file/Food_Science_Nutrition_Catalogue_ebook.pdf

https://www.slideshare.net/Myt12/food-technology-preservation

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO CO	PO1	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	1	3	2	3	3	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

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	AG349	**Title of the Course**	Biopesticides and Biofertilizers	**L**	**T**	**P**	**C**
Year	**III**	**Semester**	VI	**2**		**1**	**3**
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	
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

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Unit-I**	History and concept of biopesticides. Importance, scope and potential of biopesticide. Definitions, concepts and classification of biopesticides viz. pathogen, botanical pesticides, and biorationales.	8	1, 2
2	**Unit-II**	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.	8	2, 3
3	**Unit-III**	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.	8	3
4	**Unit-IV**	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.	8	4, 5
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.			32	CO 1, 2, 3, 4, 5

Reference Books:

Singh and Purohit, 2008.Biofertilizer Technology, Agrobios

Shalini Suri, Biofertilizers and Biopesticides, 2011. APH Publishing Corporation

Handbook of Biofertilizers and Biopesticides by Rajaram Choyal

Biopesticides Handbook by Jeo M.L. Nollet and Hamir Singh Rathore

e-Learning Source:

http://www.apicol.co.in/images/Bio%20Fertilizer%20Production%20and%20marketing.pdf

https://youtu.be/2rg9L0ppYWQ

https://youtu.be/qQxbeavbrJQ

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	3	2	3	1	2	2	3	3	3	2
CO2	2	2	2	2	2	3	2	3	1	2	2	3	3	2	2
CO3	2	2	3	1	2	3	2	2	1	2	2	2	3	3	2
CO4	2	2	3	1	2	3	2	2	1	2	2	3	3	3	2
CO5	2	2	2	1	2	3	2	2	2	2	2	3	3	2	2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	AG351	**Title of the Course**	System Simulation and Agro-advisory	**L**	**T**	**P**	**C**
Year	**2020**	**Semester**	VI	**2**		**1**	**3**
Course Objectives	• To gain knowledge of crop model predictions through System Simulation and Agro-advisory						

Course Outcomes	
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

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
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.	9	2
2	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.	9	3
3	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.	10	5
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.			30	CO 1, 2, 3, 4, 5

Reference Books:

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.

e-Learning Source:

https://bscagristudy.online/wp-content/uploads/2021/06/ELE-AGM-361-FULL-PRINTED-NOTES.pdf

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO4
CO1	2	3	2	3	1	3	3	3	2	3	2	3	3	2	2
CO2	3	3	3	1	1	3	3	3	2	3	1	2	3	2	2
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

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	HT327	**Title of the Course**	Protected Cultivation and Secondary Agriculture	**L**	**T**	**P**	**C**
Year	**3rd**	**Semester**	6th	**1**	**0**	**1**	**2**
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	
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

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Unit 1**	Green house technology: Introduction, Plant response to Greenhouse environment, Types of Green Houses; Planning and design of greenhouses	4	1
2	**Unit 2**	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,	3	2
3	**Unit 3**	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.	4	3, 4
4	**Unit 4**	Drying and dehydration; moisture measurement, EMC, drying theory, various drying method, commercial grain dryer (deep bed dryer, flat bed dryer, tray dryer, fluidized bed dryer, recirculatory dryer and solar dryer). Material handling equipment; conveyer and elevators, their principle, working and selection.	4	
Practical				
	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.		30	CO 1, 2, 3, 4, 5

Reference Books:

- Protected cultivation of Horticultural Crops by Dinesh Kumar Singh and K V Peter, NIPA Publishers
- Advances in Protected Cultivation by Bhrama Singh, by NIPA Publishers
- Hydroponics and Protected Cultivation by Lynette Morgan by CABI Publishers
- Balraj Singh. 2006. *Protected cultivation of vegetable crops*. Kalyani Publishers, Ludhiana

e-Learning Source:

https://bscagristudy.online/wp-content/uploads/2021/04/ENGG-364-PRINTED-LONG-NOTE.pdf

https://jru.edu.in/studentcorner/lab-manual/agriculture/protected%20cultivation%20and%20secondary%20agriculture.pdf

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	3	2	1	3	2	1	2	3	2	3	3
CO2	2	2	2	2	3	2	1	3	2	1	2	3	2	3	2
CO3	2	3	1	1	3	2	1	2	2	2	2	2	3	3	2
CO4	3	2	1	1	2	1	1	2	2	2	2	3	2	3	3
CO5	2	3	1	1	2	1	1	2	1	1	2	3	2	3	2

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	HT328	**Title of the Course**	Post-harvest Management and Value Addition of Fruits and Vegetables	**L**	**T**	**P**	**C**
Year	**3rd**	**Semester**	6th	**1**	**0**	**1**	**2**
Course Objectives	• **To have Basics knowledge of post-Harvest management and value addition** • **To have Knowledge of factors affecting post-harvest quality.** • **To have knowledge of Principles and methods of preservation** • **To have Knowledge of different post-harvest products** • **To have Knowledge of drying, canning and packaging**						

Course Outcomes	
CO1	Basics of post-harvest management and value addition
CO2	Students will have knowledge of factors affecting post-harvest quality
CO3	Students will have knowledge of the Principles and methods of preservation
CO4	Students will have knowledge of Post-harvest products
CO5	Students will have knowledge of Principles of drying, canning and packaging

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Unit 1**	Importance of post-harvest processing of fruits and vegetables, extent and possible causes of post harvest losses.	4	1
2	**Unit 2**	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.	4	2, 3
3	**Unit 3**	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.	4	3,4
4	**Unit 4**	Drying/ Dehydration of fruits and vegetables – Concept and methods, osmotic drying. Canning –– Concepts and Standards, packaging of products	3	
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.	30	CO 1, 2, 3, 4, 5

Reference Books:

- Ahmad, M.S. & Siddiqui, M.W. 2015. Post Harvest Quality Assurance of Fruits. Springer International Publishing AG Switzerland
- Nanda, V. & Sharma, S. 2017. Novel Food Processing Technologies. New India Publishing Agency.
- Bhutani RC. 2003. Fruit and Vegetable Preservation. Biotech Books.
- Chadha KL & Pareek OP. (Eds.). 1996 Advances in Horticulture. Vol. IV. Malhotra Publ. House.

e-Learning Source:

https://www.rvskvv.net/images/III-Year-II-Sem_PHM--Value-Addition-of-Fruits-and-Vegetables_24.04.2020.pdf

https://agrimoon.com/post-harvest-management-value-addition-of-fruits-vegetable-pdf/

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	3	2	2	3	2	2	2	3	3	2	3
CO2	3	3	2	3	3	2	2	3	1	2	2	3	1	3	2
CO3	3	3	1	3	3	2	2	3	2	2	2	3	2	2	3
CO4	3	3	1	3	3	2	2	3	1	2	2	3	3	3	3
CO5	3	3	1	3	3	2	2	3	1	2	2	3	3	3	1

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation