



Integral University, Lucknow

Effective from Session: 2026-2027							
Course Code	AG240	Title of the Course	Entrepreneurship Development and Business Communication	L	T	P	C
Year	II	Semester	III	2	0	1	3
Course Objectives	1. To provide student an insight into the concept and scope of entrepreneurship 2. To expose the student to various aspects of establishment and management of a small business unit 3. To enable the student to develop financially viable agribusiness proposal						

Course Outcomes Students will be able to	
CO1	Understand the concept, need, importance and evolution of entrepreneurship and entrepreneurial development.
CO2	Explain the steps involved in establishing and running an enterprise.
CO3	Understand enterprise planning, project formulation and production, material, and personnel management.
CO4	Explain financial, marketing and crisis management in enterprise operations.
CO5	Develop practical exposure to entrepreneurship through industrial visits, entrepreneur interaction and project proposal preparation.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Unit 1	Development of entrepreneurship, motivational factors, social factors, environmental factors, characteristics of entrepreneurs, entrepreneurial attributes/competencies. Concept, need for and importance of entrepreneurial development. Evolution of entrepreneurship, objectives of entrepreneurial activities, types of entrepreneurs, functions of entrepreneurs, importance of entrepreneurial development, and process of entrepreneurship development.	7	CO1
2	Unit 2	Environment scanning and opportunity identification need for scanning: spotting of opportunity, scanning of environment identification of product / service: starting a project; factors influencing sensing the opportunities. Infrastructure and support systems: good policies, schemes for entrepreneurship development; role of financial institutions, and other agencies in entrepreneurship development. Steps involved in functioning of an enterprise. Selection of the product / services, selection of form of ownership; registration, selection of site, capital sources, acquisition of manufacturing know how, packaging and distribution.	7	CO 2
3	Unit 3	Planning of an enterprise, project identification, selection, and formulation of project; project report preparation, Enterprise Management. Production management: product, levels of products, product mix, quality control, cost of production, production controls, Material management. Production management: raw material costing, inventory control. Personal management: manpower planning, labour turn over, wages / salaries.	7	CO 3
4	Unit 4	Financial management /accounting: funds, fixed capital and working capital, costing and pricing, long term planning and short-term planning, book keeping, journal, ledger, subsidiary books, annual financial statement, taxation. Marketing management: market, types, marketing assistance, market strategies. Crisis management: raw material, production, leadership, market, finance, natural etc.	8	CO 4

Practical		
Visit to small scale industries/agro-industries, Interaction with successful entrepreneurs/agricentpreneurs. Visit to financial institutions and support agencies. Preparation of project proposal for funding by different agencies.	30	CO 5

Suggested Readings:
- Charantimath, P.M. 2009, Entrepreneurship Development and Small Business Enterprises. Pearson Publications, New Delhi. - Desai, V. 2015, Entrepreneurship: Development and Management, Himalaya Publishing House. - Gupta, C.B. 2001. Management Theory and Practice. Sultan Chand & Sons. - Indu Grover. 2008. Handbook on Empowerment and Entrepreneurship. Agrotech Public Academy. - Khanka, S.S. 1999. Entrepreneurial Development. S. Chand & Co. - Vasant Desai, 1997. Small Scale Industries and Entrepreneurship. Himalaya Publ. House.



<https://www.manage.gov.in/publications/eBooks/Manual%20on%20Entrepreneurship%20development.pdf?>

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

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session: 2026-2027

Course Code	AG241	Title of the Course	Principles of Genetics	L	2	T	0	P	1	C	3
Year	II	Semester	III								
Course Objectives	To make the students acquainted with both principles and practices in the areas of classical genetics, modern genetics, quantitative genetics and cytogenetics.										

Course Outcomes

Students will be able to

CO1	Explain Mendelian genetics, model organisms, chromosome structure, cell division, and statistical tools in genetics.
CO2	Describe DNA/RNA types, gene interactions, and the relationship between cytology, genetics, and cytogenetics.
CO3	Analyze inheritance patterns, linkage, chromosomal variations, and mutation mechanisms.
CO4	Interpret gene expression, genetic material, and quantitative inheritance.
CO5	Practically apply genetic principles and analytical tools in problem-solving.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Unit 1	Pre and post Mendelian concepts of heredity, Mendelian principles of heredity, Study of model organisms (Drosophila, Arabidopsis, Garden pea, E. coli, and mice), Architecture of chromosomes, chromonemata, chromosome matrix, chromomeres, centromere, secondary constriction and telomere, special types of chromosomes, Chromosomal theory of inheritance- cell cycle and cell division-mitosis and meiosis. Probabilit and Chi-square.	7	CO1
2	Unit 2	Types of DNA and RNA, Dominance relationships, Epistatic interactions with example, Introduction and definition of cytology, genetics and cytogenetics and their interrelation.	7	CO 2
3	Unit 3	Multiple alleles, pleiotropism and pseudoalleles, Sex determination and sex linkage, sex limited and sex influenced traits, Blood group genetics, Linkage and its estimation, crossing over mechanism, chromosome mapping, Structural and numerical variations in chromosomes and their implications, Use of haploids, dihaploids and double haploids in Genetics, Mutation, classification, Methods of inducing mutations, mutagenic agents and induction of mutation.	8	CO 3
4	Unit 4	Qualitative and quantitative traits, Polygenes and continuous variations, multiple factor hypothesis, Cytoplasmic inheritance, Nature, structure and replication of genetic material, Protein synthesis, Transcription and translational mechanism of genetic material, Gene concept: Gene structure, function and regulation.	7	CO 4

Practical

Study of microscope, Study of cell structure, Mitosis and Meiosis cell division, Experiments on monohybrid, dihybrid, trihybrid, test cross and back cross, Experiments on epistatic interactions including test cross and back cross, Practice on mitotic and meiotic cell division, Experiments on probability and chi-square test, Determination of linkage and croo-over analysis (through two point test cross data), Study on sex linked inheritance in Drosophila. Study on models on DNA and RNA structures.	30	CO 5
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Suggested Readings:

- Fundamentals of Genetics: B. D. Singh
- Genetics: M. W. Strickberger.
- Principles of Genetics: Gardner, Simmons and Snustad.
- Principles of Genetics: Sinnott, Dunn and Dobzhansky
- Introduction to Genetic Analysis – Anthony J. F. Griffiths, Susan R. Wessler, Sean B. Carroll, John Doebley

e-Learning Source:

[https://annamalaiuniversity.ac.in/studport/download/agri/gen/resources/GPB%20214%20Principles%20of%20Genetics%20and%20Cytogenetics%20\(2+1\)%20Online%20study%20material.pdf](https://annamalaiuniversity.ac.in/studport/download/agri/gen/resources/GPB%20214%20Principles%20of%20Genetics%20and%20Cytogenetics%20(2+1)%20Online%20study%20material.pdf)
<https://agrimoon.com/wp-content/uploads/Principle-of-Genetics.pdf>



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

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session: 2026-2027							
Course Code	AG242	Title of the Course	Crop Production Technology-I (Kharif crops) including Practical Crop Production	L	T	P	C
Year	II	Semester	III	1	0	2	3
Course Objectives	1. To impart basic and fundamental knowledge on principles and practices of kharif crop production 2. To impart knowledge and skill on scientific crop production and management						

Course Outcomes Students will be able to	
CO1	Understand the origin, geographical distribution and economic importance of major <i>kharif</i> crops.
CO2	Learn the soil and climatic requirements, varieties, cultural practices and yields of major <i>kharif</i> crops.
CO3	Implement precise, scientific and improved cultivation practices (sowing, nutrient management, weed control) for different <i>kharif</i> crops.
CO4	Identify and manage major pests and diseases attacking <i>kharif</i> crops.
CO5	Analyses yield contributing characters and calculate costs of cultivation and net returns.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Unit 1	Origin, geographical distribution, economic importance of Kharif crops	4	CO1
2	Unit 2	Soil and climatic requirements, varieties, cultural practices and yield of Kharif crops.	5	CO2
3	Unit 3	Cereals- rice, maize, sorghum, pearl millet, finger millet and other minor millets, pulses- pigeonpea, mungbean and urdbean	5	CO3
4	Unit 4	Oilseeds groundnut, soybean, sesame, castor; fibre crops- cotton and jute; forage crops- sorghum, cowpea, cluster bean, maize, guinea and napier.	5	CO4

Practical				
Rice nursery preparation, transplanting of rice, sowing of soybean, pigeon pea and mungbean, maize, groundnut and cotton, effect of seed size on germination and seedling vigour of Kharif crops, effect of sowing depth on germination of Kharif crops, identification of weeds in Kharif crops, top dressing and foliar feeding of nutrients, study of yield contributing characters and yield calculation of Kharif crops, study of crop varieties and important agronomic experiments at experiential farm, recording biometric observations, Study of forage experiments, morphological description of Kharif crops, silage and hay making, visit to research centres of related crops.				CO 5

Suggested Readings:	
1. B. Gurarajan, R. Balasubramanian and V. Swaminathan. Recent Strategies on Crop Production. Kalyani Publishers, New Delhi. 2. Chidda Singh.1997. Modern techniques of raising field crops. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi. 3. Rajendra Prasad. Textbook of Field Crops Production - Commercial Crops. Volume II ICAR Publication. 4. S.R. Reddy. 2009. Agronomy of Field Crops. Kalyani Publishers, New Delhi 5. S.S. Singh. 2005. Crop Management. Kalyani Publishers, New Delhi.	

e-Learning Source:	
https://www.scribd.com/document/726814851/Crop-Production-Technology-I-Kharif-crops	
https://agrimoon.com/wp-content/uploads/Crop-Production-Technology-.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	1	3	1	1	1	1	2	1	3	1	2	2	3	2
CO2	3	2	3	2	1	1	1	2	1	3	1	3	3	3	2
CO3	3	1	3	1	1	3	1	3	2	3	2	3	1	2	3
CO4	3	2	3	1	1	1	1	1	1	2	3	3	2	1	1
CO5	3	3	3	1	1	1	1	1	1	3	1	3	3	3	1

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



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Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session: 2026-2027							
Course Code	HT229	Title of the Course	Production Technology of Fruit and Plantation Crops	L	T	P	C
Year	II	Semester	III	1	0	1	2
Course Objectives	1. To educate about the different forms of classification of fruit crops 2. To educate about the origin, area, climate, soil, improved varieties and cultivation practices of fruit and plantation crops 3. To educate about the physiological disorders of fruit crops, palms and plantation crops						

Course Outcomes Students will be able to	
CO1	Understand classification, importance, production status, and agro-climatic requirements of fruit and plantation crops.
CO2	Apply propagation techniques, planting systems, crop regulation practices, and orchard management strategies.
CO3	Acquire knowledge of major fruit crops, their varieties, and production technologies.
CO4	Understand cultivation practices, management, and value addition in plantation and palm crops.
CO5	Develop practical skills in propagation, nursery management, crop production, and pest-disease management.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mappe d CO
1	Unit 1	Production status of fruit and plantation crops: Importance and scope of fruit and plantation crop industry in India; nutritional value of fruit crops; classification of fruit crops; area, production, productivity and export potential of fruit and plantation crops. Crop production techniques in tropical, sub-tropical and temperate fruit crops: Climate and soil requirements, varieties.	5	CO 1
2	Unit 2	propagation and use of rootstocks, planting density and systems of planting: High density and ultra-high density planting, cropping systems, after care – training and pruning; water, nutrient and weed management, fertigation, special horticultural techniques, plant growth regulation, important disorders, maturity indices and harvest, value addition.	5	CO 2
3	Unit 3	Fruit crops: mango, banana, papaya, guava, sapota, citrus, grape, litchi, pineapple, pomegranate, apple, pear, peach, strawberry, nut crops Jackfruit and minor fruits- date, ber, apple, plantation crops-coconut, arecanut, cashew, tea, coffee and rubber.	4	CO 3
4	Unit 4	Crop production techniques in palms and plantation crops: Climate and soil requirements, varieties, propagation, nursery management, planting and planting systems, cropping systems, after care, training and pruning for plantation crops, water, nutrient and weed management, intercropping, multi-tier cropping system, mulching, special horticultural practices, maturity indices, harvest and yield, pests and diseases, processing- value addition Palms: Coconut, Arecanut, Oil palm and Palmyrah, Plantation crops: Tea, Coffee, Cocoa, Cashewnut, Rubber.	5	CO 4

Practical		
Propagation techniques, selection of planting material, varieties, important cultural practices for mango, banana, papaya, guava, sapota, grapes, Citrus (mandarin and acid lime), pomegranate, jackfruit, preparation and application of PGR's for propagation, Micro propagation, protocol for mass multiplication and hardening of fruit crops, Identification and description of varieties, mother palm and seed nut selection, nursery practices, seedling selection, fertilizers application, nutritional disorders, pests and diseases of Coconut, Arecanut and cocoa, Tea and coffee, Rubber and cashew, Visit to commercial orchard and plantation industries	30	CO 5

Suggested Readings:	
1. Banday, F.A. and Sharma, M.K.2010 Advances in temperate fruit production. Kalyani Publishers, Ludhiana	
2. Bose, T.K., S.K. Mitra and D. Sanyal 2001. Fruits: Tropical and Subtropical (2 volumes) Naya Udyog, Calcutta.	
3. Bose, T.K., S.K. Mitra, A.A. Farooqi and M.K. Sadhu (Eds). 1999. Tropical Horticulture Vol.1. Naya Prokash, Calcutta.	
4. Chadha, K.L. 2001. Handbook of Horticulture. ICAR, Delhi	
5. Chadha, T.R. 2001 Textbook of temperate fruits. ICAR, New Delhi	
e-Learning Source:	
https://agritech.tnau.ac.in/horticulture/horti_index.html	



Integral University, Lucknow

<https://agrimoon.com/wp-content/uploads/Production-Technology-of-Fruit-and-Plantation-Crops.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	1	1	1	1	2	1	1	1	1	2	3	2	1
CO2	3	3	2	2	2	1	2	1	1	1	1	2	3	3	1
CO3	3	2	2	1	1	1	2	1	1	1	1	2	3	2	1
CO4	3	3	2	2	2	1	3	1	1	1	1	2	3	3	2
CO5	3	3	3	2	2	1	2	1	2	1	1	3	3	3	2

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

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session: 2026-2027

Course Code	AG243	Title of the Course	Fundamentals of Extension Education	L	1	T	0	P	1	C	2
Year	II	Semester	III								
Course Objectives	To state the importance of extension education in agriculture										
	To familiarize with the different types of agriculture and rural development programs launched by govt. of India										
	To classify the types of extension teaching methods										
	To elaborate the importance and different models of communication										
	To explain the process and stages of adoption along with adopters' categories										

Course Outcomes

Students will be able to

CO1	Gain knowledge regarding the K.V.K, ATMA, SAUs and ATIC.
CO2	Understand the rural constraints and salutations.
CO3	Gain knowledge regarding methods of Demonstrations.
CO4	Apply various extension teaching methods and communication techniques, including demonstrations, for effective transfer of technology.
CO5	Explain and apply different survey and data collection methods used in rural areas.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Unit 1	Education: Meaning, definition and Types; Extension Education: meaning, definition, scope and process; objectives and principles of Extension Education; Extension Programme planning: Meaning, Process, Principles and Steps in Programme Development. Extension systems in India: extension efforts in pre-independence era (Sriniketan, Marthandam, Firka Development Scheme, Gurgaon Experiment, etc.) and post-independence era (Etawah Pilot Project, Nilokheri Experiment, etc.); Reorganised Extension System (T&V system) various extension/ agriculture development programs launched by ICAR/ Govt. of India (IADP, IAAP, HYVP, KVK, IVLP, ORP, ND, NATP, NAIP, etc.).	5	CO 1
2	Unit 2	Social Justice and poverty alleviation programme: ITDA, IRDP/SGSY/NRLM. Women Development Programme: RMK, MSY etc. New trends in agriculture extension: privatization extension, cyber extension/ e-extension, market-led extension, farmer-led extension, expert systems, etc., Attributes of Innovation, DWCRA, Commodity Interest Groups (CIGs), Farmers Producer Group (FPG).	5	CO 2
3	Unit 3	Rural Development: concept, meaning, definition; various rural development programs launched by Govt. of India. Community Development: meaning, definition, concept and principles, Philosophy of C.D. Rural Leadership: concept and definition, types of leaders in rural context; Method of identification of Rural Leader. Extension administration: meaning and concept, principles and functions. Monitoring and evaluation: concept and definition, monitoring and evaluation of extension programs; transfer of technology:	5	CO 3
4	Unit 4	concept and models, capacity building of extension personnel; extension teaching methods: meaning, classification, individual, group and mass contact methods, ICT Applications in TOT (New and Social Media), media mix strategies; communication: meaning and definition; Principles and Functions of Communication, models and barriers to communication. Agriculture journalism; diffusion and adoption of innovation: concept and meaning, process and stages of adoption, adopter categories.	4	CO 4

Practical

To get acquainted with university extension system. Group discussion- exercise; Identification of rural leaders in village situation; preparation and use of AV aids, preparation of extension literature (leaflet, booklet, folder, pamphlet news stories and success stories); Presentation skills exercise; micro teaching exercise; A visit to village to understand the problems being			30	CO 5
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Integral University, Lucknow

encountered by the villagers/ farmers; to study organization and functioning of DRDA/PRI and other development departments at district level; visit to NGO/FO/FPO and learning from their experience in rural development; understanding PRA techniques and their application in village development planning; exposure to mass media: visit to community radio and television studio for understanding the process of programme production; script writing, writing for print and electronic media, developing script for radio and television.

Suggested Readings:

1. Adivi Reddy, A. 2001. Extension Education, Sree Lakshmi press, Bapatla.
2. Dahama, O. P. and Bhatnagar, O.P. 1998. Education and Communication for Development, Oxford and IBH publishing Co. Pvt. Ltd, New Delhi.
3. Jaliha, K. A. and Veerabhadraiah, V. 2007. Fundamentals of Extension Education and Management in Extension, Concept publishing company, New Delhi.
4. MuthaiahManoraharan, P. and Arunachalam, R., Agricultural Extension, Himalaya Publishing House (Mumbai).
5. Sagar Mondal and Ray, G. L., Text Book on Rural Development, Entrepreneurship and Communication Skills, Kalyani Publications.

e-Learning Source:

<https://www.youtube.com/watch?v=y4gRAWsplC4>

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	1	2	2	3	3	2	3	3	3	1	2	3	3	3	3
CO2	2	1	3	3	2	3	2	2	3	3	2	3	1	1	2
CO3	2	3	2	3	2	1	3	3	3	3	2	3	3	3	3
CO4	2	2	3	3	3	3	3	3	2	3	2	1	2	3	3
CO5	2	3	2	2	2	2	3	3	1	2	3	2	2	2	2

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

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session: 2026-2027							
Course Code	AG244		Fundamentals of Nematology	L	T	P	C
Year	II	Semester	III	1	0	1	2
Course Objectives	1. To impart knowledge on history, economic importance of plant parasitic nematodes, morphology, biology, host parasitic relationship of nematodes. 2. To impart knowledge on nematode pests of different crops of national and local importance and their management.						

Course Outcomes Students will be able to	
CO1	Explain and discuss the history, diversity, economic importance, and general characteristics of plant parasitic nematodes in agricultural systems.
CO2	Describe and classify nematodes based on morphology and biological features up to family level, emphasizing economically important groups.
CO3	Analyze and interpret nematode feeding behavior, symptomatology, and their interactions with other plant pathogens (fungi, bacteria, viruses) in disease development.
CO4	Evaluate and recommend appropriate nematode management strategies (cultural, biological, chemical, resistance, and INM) for major crops.
CO5	Apply and demonstrate techniques for sampling, extraction, identification, and management of plant parasitic nematodes under laboratory and field conditions.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mappe d CO
1	Unit 1	Introduction: History of phytonematology, habitat and diversity, economic importance of nematodes. General characteristics of plant parasitic nematodes.	4	CO 1
2	Unit 2	Nematode: definition, general morphology and biology. Classification of nematodes up to family level with emphasis on groups containing economically important genera.	4	CO 2
3	Unit 3	Classification of nematodes on the basis of feeding/ parasitic habit. Symptomatology, role of nematodes in disease development, Interaction between plant parasitic nematodes and disease-causing fungi, bacteria and viruses	5	CO 3
4	Unit 4	Nematode pests of crops: Rice, wheat, vegetables, pulses, oilseed and fiber crops, citrus and banana, tea, coffee and coconut. Different methods of nematode management: Cultural methods, physical; methods, Biological methods, Chemical methods, Plant Quarantine, Plant resistance and INM.	5	CO 4

Practical

Sampling methods, collection of soil and plant samples; Extraction of nematodes from soil and plant tissues following Cobb's sieving and decanting technique, Baermann funnel technique, Picking and counting of plant parasitic nematode. Identification of economically important plant nematodes up to generic level with the help of keys and description: Meloidogyne, Pratylenchus; Heterodera, Tylenchulus, Xiphinema, and Helicotylenchus etc. Study of symptoms caused by important nematode pests of cereals, vegetables, pulses, plantation crops etc. Methods of application of nematicides and organic amendments.	30	CO 5
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Suggested Readings:

1. Economic Nematology-Edited by J.M. Webster
2. Plant Parasitic Nematodes (Vol-1) by Zukerman, Mai, Rohde
3. Plant Parasitic Nematodes of India: Problems and Progress by - Gopal Swarup, D. R. Dasgupta, P. K. Koshy.
4. Text book on Introductory Plant Nematology -R.K. Walia and H.K. Bajaj.

e-Learning Source:

[https://agri-bsc.kkwagh.edu.in/uploads/department_course/ENTO-364_\(Introductory_Nematology\).pdf](https://agri-bsc.kkwagh.edu.in/uploads/department_course/ENTO-364_(Introductory_Nematology).pdf)
<https://www.scribd.com/document/916037726/Nema-3-1-Fundamentals-of-Nematology>

Course Articulation Matrix: (Mapping of COs with POs and PSOs)															
PO-PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3



Integral University, Lucknow

CO															
CO1	3	3	2	2	3	2	3	3	3	1	2	2	3	3	3
CO2	3	1	3	3	2	3	2	2	3	3	2	3	1	1	2
CO3	3	3	2	3	2	3	3	3	3	3	2	3	3	3	3
CO4	3	2	3	3	3	3	3	3	2	3	2	1	2	3	2
CO5	3	3	2	2	2	3	3	3	1	2	3	2	2	2	2

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

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session: 2026-2027							
Course Code	AG245	Title of the Course	Principles and Practices of Natural Farming	L	T	P	C
Year	II	Semester	III	1	0	1	2
Course Objectives	1. To provide comprehensive understanding and knowledge to students about natural farming. 2. To teach students the concept, need and principles of native ecology-based production under natural farming. 3. To impart practical knowledge of natural farming and related agricultural practices in Indian and global environmental and economic perspectives.						

Course Outcomes Students will be able to	
CO1	Understand the concepts, principles, history, and scope of natural farming along with its role in climate change mitigation, soil health, and sustainability.
CO2	Explain the pillars, models, and ecological foundations of natural farming including farm design, ecosystem services, and integrated farming approaches.
CO3	Explain the pillars, models, and ecological foundations of natural farming including farm design, ecosystem services, and integrated farming approaches.
CO4	Analyze government initiatives, case studies, and entrepreneurial opportunities in natural and chemical-free farming systems.
CO5	Demonstrate practical skills in natural farming techniques including on-farm input preparation, seed production, ecosystem evaluation, and farm-level management practices.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mappe d CO
1	Unit 1	Indian Heritage of Ancient Agriculture, History of Natural Farming, Importance of natural farming in view of climate change, soil health, water use carbon sequestration, biodiversity conservation, food security and nutritional security, and sustainable development goals (SDGs), Concept of natural farming; Definition of natural farming; Objective of natural farming, Essential characteristics and Principles of natural farming; Scope and importance of natural farming.	4	CO 1
2	Unit 2	Main Pillars of natural farming; Methods/ types/schools of natural farming. Characteristics and design of a natural farm, Concept of ecological balance, ecological engineering and community responsibility in natural versus other farming systems, Introduction to concept of ecological, water, carbon and nitrogen foot prints, Concept and evaluation of ecosystem services, integration of crops, trees and animals, cropping system approaches,	5	CO 2
3	Unit 3	Biodiversity, indigenous seed production, farm waste recycling, water conservation and renewable energy use approaches on a natural farm, Rearing practices for animals under natural farming, Nutrient management in natural farming and their sources, Insect, pest, disease and weed management under natural farming; Mechanization in natural farming, Processing, labelling, economic considerations and viability, certification and standards in natural farming, marketing and export potential of natural farming produce and products.	5	CO 3
4	Unit 4	Initiatives taken by Government (central/state), NGOs and other organizations for promotion of natural farming and chemical free agriculture, Case studies and success stories in natural farming and chemical free traditional farming, Entrepreneurship opportunities in natural farming.	5	CO 4
Practical				
Visit of natural farm and chemical free traditional farms to study the various components and operations of natural farming principles at the farm; Indigenous technical knowledge (ITK) for seed, tillage, water, nutrient, insect-pest, disease and weed management; On-farm inputs preparation methods and protocols, Studies in green manuring in-situ and green leaf manuring, Studies on different types of botanicals and animal urine and dung based non-aerated and aerated inputs for plant growth, nutrient, insect and pest and disease management; Weed management practices in natural			30	CO 5



Integral University, Lucknow

farming; Techniques of Indigenous seed production- storage and marketing, Partial and complete nutrient and financial budgeting in natural farming; farming; Evaluation of ecosystem services in natural farming (Crop, Field and System).		
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Suggested Readings:

1. Ayachit, S.M. 2002. Kashyapi Krishi Sukti (A Treatise on Agriculture by Kashyapa). Brig Sayeed Road, Secunderabad, Telangana: Asian Agri-History Foundation 4: 205.
2. Boeringa, R. (Eed.). 1980. Alternative Methods of Agriculture. Elsevier, Amsterdam, 199 pp.
Indian Council of Agricultural Research, New Delhi.
3. Ecological Farming -The seven principles of a food system that has people at its heart. May 2015, Greenpeace.
4. Ecological Farming, The Seven principles of a food system that has people at its heart. May 2015, Greenpeace

e-Learning Source:

https://agritech.tnau.ac.in/success_stories/RAWE/pdf/Natural_Farming_ana_1.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	1	1	1	2	3	1	1	1	1	2	3	2	1
2CO2	3	3	2	2	1	2	3	1	1	2	1	2	3	3	2
CO3	3	3	3	2	2	2	3	1	1	1	1	2	3	3	3
CO4	2	2	2	2	1	3	3	2	2	1	1	2	2	2	2
CO5	3	3	3	3	3	2	3	2	2	1	1	3	3	3	3

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

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session: 2026-2027							
Course Code	AG246	Title of the Course	Physical Education, First Aid, Yoga Practices and Meditation	L	T	P	C
Year	II	Semester	III	1	0	1	2
Course Objectives	1. To make the students aware about Physical Education, First Aid and Yoga Practices. 2. To disseminate the knowledge and skill how to perform physical training, perform first aid and increase stamina and general well being through yoga.						

Course Outcomes Students will be able to	
CO1	Understand the concepts, principles, history, and scope of natural farming along with its role in climate change mitigation, soil health, and sustainability.
CO2	Explain the pillars, models, and ecological foundations of natural farming including farm design, ecosystem services, and integrated farming approaches.
CO3	Explain the pillars, models, and ecological foundations of natural farming including farm design, ecosystem services, and integrated farming approaches.
CO4	Analyze government initiatives, case studies, and entrepreneurial opportunities in natural and chemical-free farming systems.
CO5	Demonstrate practical skills in natural farming techniques including on-farm input preparation, seed production, ecosystem evaluation, and farm-level management practices.

Practical	
Physical education; Training and Coaching - Meaning and Concept; Methods of Training; aerobic and aerobic exercises; Calisthenics, weight training, circuit training, interval training, Fartlek training; Effects of Exercise on Muscular, Respiratory, Circulatory and Digestive systems; Balanced Diet and Nutrition: Effects of Diet on Performance; Physiological changes due to ageing and role of regular exercise on ageing process; Personality, its dimensions and types; Role of sports in personality development; Motivation and Achievements in Sports; Learning and Theories of learning; Adolescent Problems and its Management; Posture; Postural Deformities; Exercises for good posture. Yoga; History of Yoga, Types of Yoga, Introduction to Yoga: • Asanas: Definition and Importance, Padmasan, Gaumukhasan, Bhadrasan, Vajrasana, Shashankasan, Pashchimotasan, Ushtrasan, Tadasan, Padhastasan, Ardchandrasan, Bhujangasan, Utanpadasan, Sarvangasan, Parvatasan, Patangasan, Shishupalanasan– left leg right leg, Pavanmuktasan, Halasan, Sarpasan, Ardhdhanurasan, Sawasan • Suryanamskar Pranayama (Definition and Importance) Omkar, Suryabhedan, Chandrabhedan, AnulomVilom, Shitali, Shitkari, Bhastrika, Bhramari • Meditation (Definition and Importance), Yogic Kriyas (Kapalbhati), Tratak, Jalneti and Tribandh • Mudras (Definition and Importance) Gyanmudra, Dhyanmudra, Vayumudra, Akashmudra, Pruthvimudra, Shunyamudra, Suryamudra, Varunmudra, Pranmudra, Apanmudra, Vyanmudra, Uddanmudra • Role of yoga in sports • Teaching of Asanas – demonstration, practice, correction and practice. History of sports and ancient games, Governance of sports in India; Important national sporting events; Awards in Sports; History, latest rules, measurements of playfield, specifications of equipment, skill, technique, style and coaching of major games (Cricket, football, table Tennis, Badminton, Volleyball, Basketball, Kabaddi and Kho-Kho) and Athletics Need and requirement of first aid. First Aid equipment and upkeep. First AID Techniques, First aid related with respiratory system. First aid related with Heart, Blood and Circulation. First aid related with Wounds and Injuries. First aid related with Bones, Joints Muscle related injuries. First aid related with Nervous system and Unconsciousness. First aid related with Gastrointestinal Tract. First aid related with Skin, Burns. First aid related with Poisoning. First aid related with Bites and Stings. First aid related with Sense organs, Handling and transport of injured traumatized persons. Sports injuries and their treatments.	30
Suggested Readings:	
Physical Education, First Aid and Yoga Practices - by Ramakant D. Bansode Publisher : Khel Sahitya Kendra	
Physical Education, First Aid, Yoga Practices & Meditation (Sixth Dean, ICAR). Gyanavi Publishers & Distributors	
e-Learning Source:	
https://muslimcollegeofeducation.in/pdf/YOGA-AND-PHYSICAL-EDUCATION.pdf https://www.slideshare.net/slideshow/2-semester-iv-unit-ii-notes-for-yoga-first-aid-pptx/269527110	



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

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session: 2026-2027

Course Code	AG250	Title of the Course	Agricultural Informatics and Artificial Intelligence (AI)	L	2	T	0	P	1	C	3
Year	II	Semester	IV								
Course Objectives	• To acquaint student with the basics of computer applications in agriculture, multimedia, database management, application of mobile app and decision- making processes, etc. • To provide basic knowledge of computer with applications in Agriculture • To make students familiar with Agricultural-Informatics, its components and applications in agriculture										

Course Outcomes

Students will be able to

CO1	Apply data processing tools such as MS-Office, databases, and basic programming concepts to solve agricultural information needs.
CO2	Understand the fundamental concepts of computers, operating systems, internet technologies, and IT tools relevant to agriculture.
CO3	Analyze the role of crop simulation models, geospatial technology, and decision-support systems in modern farming. Agriculture Expert System, Soil Information Systems for supporting Farm decisions.
CO4	Evaluate Artificial Intelligence (AI), IoT, and Big Data applications for smart and sustainable agricultural practices.
CO5	Understand and explore modern digital technologies in agriculture, including programming basics, geospatial tools, smartphones, ICT-based advisory systems, AR/VR, and national initiatives like IDEA.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mappe d CO
1	Unit I	Introduction to Computers, Anatomy of Computers, Memory Concepts, Units of Memory, Operating System: Definition and types, Applications of MS-Office for creating, Editing and Formatting a document, Data presentation, Tabulation and graph creation, Statistical analysis, Mathematical expressions, Database, concepts and types, creating data base, Uses of DBMS in Agriculture. Internet and World Wide Web (WWW): Concepts and components.	7	CO 1
2	Unit II	Computer programming: General concepts, Introduction general programming concepts. Concepts and standard input/output operations. e-Agriculture, Concepts, design and development, Application of innovative ways to use information and communication technologies (IT) in Agriculture. Computer Models in Agriculture: Statistical, weather analysis and crop simulation models, concepts, inputs-outputs files, limitation, advantages and application of models for understanding plant processes, sensitivity, verification, calibration and validation, IT applications for computation of water and nutrient requirement of crops, Computer-controlled devices (automated systems) for Agri-input management.	8	CO 2
3	Unit III	Smartphone mobile apps in agriculture for farm advice: Market price, post-harvest management etc. Geospatial technology: Concepts, techniques, components and uses for generating valuable agri-information. Decision support systems: Concepts, components and applications in Agriculture. Agriculture Expert System, Soil Information Systems etc., for supporting farm decisions. Preparation of contingent crop planning and crop calendars using IT tools. Digital India and schemes to promote digitalization of agriculture in India.	7	CO 3
4	Unit IV	Introduction to artificial intelligence, background and applications, Turing test. Control strategies, Breadth-first search, Depth-first search, Heuristics search techniques: Best-first search, A* algorithm, IoT and Big Data; Use of AI in agriculture for autonomous crop management, and health, monitoring livestock health, intelligent pesticide application, yield mapping and predictive analysis, automatic weeding and harvesting, sorting of produce, and other food processing applications; Concepts of smart agriculture, use of AI in food and nutrition science etc.	8	CO 4



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Practical	
Study of computer components, accessories, practice of important DoS Commands, Introduction of different operating systems such as Windows, Unix/Linux, creating files and folders, File Management .Use of MS-Word and MS Power-point for creating, editing and presenting a scientific documents, MS-EXCEL-Creating a spreadsheet, Use of statistical tools, Writing expressions, Creating graphs, Analysis of scientific data, MS-ACCESS: Creating Database, preparing queries and reports, Demonstration of Agri- information system, Introduction to World Wide Web (WWW) and its components, Introduction of programming languages such as Visual Basic, Java, Fortran, C, C++, Hands on practice on Crop Simulation Models (CSM), DSSAT/Crop-Info/Crop Syst/ Wofost, Preparation of inputs file for CSM and study of model outputs, computation of water and nutrient requirements of crop using CSM and IT tools, Use of smartphones and other devices in agro-advisory and dissemination of market information, Introduction of Geospatial technology, AR/ VR demonstration, Preparation of contingent crop planning, India Digital Ecosystem of Agriculture (IDEA).	CO 5
Reference Books:	
1. Concepts and Techniques of Programming in C by Dhabal Prasad Sethi and Manoranjan, Wiley India.	
2. Fundamentals of Computer by V. Rajaroman.	
3. Introduction to Information Technology by Pearson.	
4. Introduction to Database Management System by C. J. Date.	
5. Introductory Agri-Informatics by Mahapatra, Subrat K et al, Jain Brothers Publication.	
e-Learning Source:	

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	3	2	1	1	1	1	1	1	3	3	2	2	2	2
CO2	2	3	2	2	2	1	1	2	1	2	3	2	3	1	3
CO3	3	3	2	3	1	1	2	3	1	3	3	1	3	2	3
CO4	3	3	1	3	2	1	2	3	2	3	2	3	2	3	2
CO5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

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

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session: 2026-2027							
Course Code	HT230	Title of the Course	Production Technology of Vegetables and Spices	L	T	P	C
Year	II	Semester	IV	1	0	1	2
Course Objectives	1. To educate about the different forms of classification of vegetables 2. To educate about the origin, area, climate, soil, improved varieties and cultivation practices of vegetables and spices 3. To educate about the physiological disorders of vegetables and spices						

Course Outcomes Students will be able to	
CO1	Explain the nutritional and economic importance of vegetables and spices, including kitchen gardening and initial cultivation requirements.
CO2	Implement production practices for major vegetables, cucurbit, and cole crops, including nutrient management and mitigation of physiological disorders
CO3	Demonstrate technical knowledge of cultivation for bulb, root, tuber, and spice crops, including various perennial and herbal varieties.
CO4	Implement knowledge of cultivation for Leafy vegetables including various perennial and herbal varieties.
CO5	Execute practical field operations such as seed extraction, nursery raising, transplanting, and post-harvest handling for diverse horticultural crops.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Unit I	Importance of vegetables and spices in human nutrition and national economy, kitchen gardening, brief about origin, area, climate, soil, improved varieties and cultivation practices such as time of sowing, transplanting techniques	5	CO 1
2	Unit II	planting distance, fertilizer requirements, irrigation, weed management, harvesting and yield, physiological disorders of important vegetable and spices (tomato, okra, brinjal, chili, capsicum, cucumber, bitter gourd, bottle gourd, sweet potato, cassava and moringa, pumpkin, French bean, peas; cole crops such as cabbage, cauliflower, knol-khol;	5	CO 2
3	Unit III	Bulb crops such as onion, garlic; root crops such as carrot, radish, beetroot; tuber crops such as potato	5	CO 3
	Unit IV	Leafy vegetables such as amaranth, palak, perennial vegetables, spice crops like turmeric, zinger, garlic, coriander, cumin, black pepper, cardamom, fenugreek, fennel, clove, nutmeg, cinnamon, curry leaf, tamarind and herbal spices).	5	CO4

Practical			
Identification of vegetables and spice crops and their seeds. Description of varieties. Propagation methods - rapid multiplication techniques - seed collection and extraction. Nursery raising. Direct seed sowing and transplanting. Study of morphological characters of different vegetables and spices. Fertilizers applications. Harvesting and post-harvest practices, Economics of vegetables and spices cultivation, visit to spice gardens.			30
			CO 5

Suggested Readings:	
1. Olericulture, Fundamentals of Vegetable Production (Vol.1) by K.P. Singh, Anant Bahadur 2. Vegetable crops by J. Kabir, T.K. Bose, M.G. Som 3. Vegetable crops (Production technology, Vol II) by M.S. Fagaria, B.R. Choudhury, R.S. Dhaka	
e-Learning Source:	
http://ecoursesonline.iasri.res.in/ https://spices.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	PSO3
CO1	3	2	1	1	1	2	2	1	1	1	1	2	3	2	2
2CO2	3	2	2	2	2	1	2	1	2	1	2	2	3	3	2



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

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session: 2026-2027							
Course Code	AG252	Title of the Course	Principles of Agricultural Economics and Farm Management	L	T	P	C
Year	II	Semester	IV	2	0	0	2
Course Objectives	1. To aware the students about broad areas covered under agricultural Economics and farm management 2. To impart knowledge on judicious use of resources for optimum production						

Course Outcomes	
The students will	
CO1	Understand fundamental economic concepts, scope, and agricultural economics.
CO2	Analyze demand, utility, elasticity, and consumer behavior.
CO3	Evaluate production, cost, supply, distribution, and national income concepts.
CO4	Interpret population, money, inflation, and economic systems.
CO5	Apply economic principles to agriculture, trade, business, and GST in India.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Unit I	Economics: Meaning, scope and subject matter, definitions, activities, approaches to economic analysis; micro- and macro-economics, positive and normative analysis. Nature of economic theory; rationality assumption, concept of equilibrium, economic laws as generalization of human behavior. Basic concepts: Goods and services, desire, want, demand, utility, cost and price, wealth, capital, income and welfare. Agricultural economics: meaning, definition, characteristics of agriculture, importance and its role in economic development	7	CO 1
2	Unit II	Agricultural planning and development in the country. Demand: meaning, law of demand, demand schedule and demand curve, determinants, utility theory; law of diminishing marginal utility, equi-marginal utility principle. Consumer's equilibrium and derivation of demand curve, concept of consumer surplus. Elasticity of demand: concept and measurement of price elasticity, income elasticity and cross elasticity. Production: process, creation of utility, factors of production, input output relationship.	7	CO 2
3	Unit III	Laws of returns: Law of variable proportions and law of returns to scale. Cost: Cost concepts, short run and long run cost curves. Supply: Stock v/s supply, law of supply, supply schedule, supply curve, determinants of supply, elasticity of supply. Distribution theory: meaning, factor market and pricing of factors of Production. Concepts of rent, wage, interest and profit. National income: Meaning and importance, circular flow, concepts of national income accounting and approaches to measurement, difficulties in measurement.	8	CO 3
4	Unit IV	Population: Importance, Malthusian and Optimum population theories, natural and socio-economic determinants, current policies and programs on population control. Money: Barter system of exchange and its problems, evolution, meaning and functions of money, classification of money, money supply, general price index, inflation and deflation. Economic systems: Concepts of economy and its functions, important features of capitalistic, socialistic and mixed economies, elements of economic planning. Forms of business organizations, international trade and balance of payments. GST and its implication on Indian economy.	7	CO4

Suggested Readings:
1. Johl, S.S. and T.R Kapur. 2009. Fundamentals of Farm Business Management. Kalyani Publishers 2. S. Subha Reddy, P. Raghu Ram, T.V. Neelakanta and I. Bhvani Devi .2004. Agricultural Economics. Oxford & IBH publishing Co. Pvt. Ltd
e-Learning Source:
https://rajneeshrajoria.weebly.com/uploads/4/9/0/6/49069889/principles_of_agricultural_economics.pdf https://agrimoon.com/wp-content/uploads/Principles-of-Agricultural-Economics.pdf



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

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session: 2026-2027							
Course Code	AG253	Title of the Course	Crop Production Technology-II (Rabi Crops) including Practical Crop Production	L	T	P	C
Year	II	Semester	IV	1	0	2	3
Course Objectives	1. To impart basic and fundamental knowledge on principles and practices of rabi crop production. 2. To impart knowledge and skill on scientific crop production and management.						

Course Outcomes The students will	
CO1	Gain knowledge on origin, geographical distribution, soil and climatic requirements of Rabi crops.
CO2	Get hands on training skills on raising of Rabi field crops.
CO3	Understand the varieties, cultural and chemical weed management, fertilizer management and requirements of different Rabi crops.
CO4	Learn the yield estimation, economic importance, soil and climatic requirements of different Rabi crop
CO5	Analyses yield contributing characters and calculate costs of cultivation and net returns.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Unit I	Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Cereals-wheat and barley; Pulses-chickpea, lentil, peas, Rabi redgram and rajmash.	5	CO 1
2	Unit II	Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Oilseed- rapeseed, mustard, sunflower, safflower; and linseed. Sugar crops-sugarcane and sugar beet.	5	CO 2
3	Unit III	Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Medicinal and aromatic crops- mentha, lemon grass and citronella.	5	CO 3
		Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Forage crops – barseem, lucerne and oat; Cash crops-potato, quinoa, tobacco.	5	CO 4

Practical				
Sowing methods of wheat and sugarcane; identification of weeds in <i>rabi</i> season crops; study of morphological characteristics of <i>rabi</i> crops; study of yield contributing characters of <i>rabi</i> season crops; yield and juice quality analysis of sugarcane; study of important agronomic experiments of <i>rabi</i> crops at experimental farms; study of <i>rabi</i> forage experiments; oil extraction of medicinal crops; visit to research stations of related crops.			30	CO 5

Suggested Readings:	
1. B. Gurarajan, R. Balasubramanian and V. Swaminathan. Recent Strategies on Crop Production. Kalyani Publishers, New Delhi. 2. Chidida Singh.1997. Modern techniques of raising field crops. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi. 3. Rajendra Prasad. Textbook of Field Crops Production - Commercial Crops. Volume II ICAR Publication. 4. Rajendra Prasad. Textbook of Field Crops Production - Foodgrain Crops. Volume I ICAR Publication.	

e-Learning Source:	
https://www.scribd.com/document/726814851/Crop-Production-Technology-I-Kharif-crops	
https://agrimoon.com/wp-content/uploads/Crop-Production-Technology-.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	1	3	1	1	1	1	2	1	3	1	2	2	2	3
CO2	3	3	3	2	2	1	1	2	1	3	1	3	3	3	2
CO3	3	1	3	1	1	3	1	3	2	3	2	3	1	2	3
CO4	3	2	3	1	3	1	1	1	1	2	3	3	2	1	1
CO5	3	3	3	1	1	1	1	1	1	3	1	3	3	3	1

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



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Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session: 2026-2027							
Course Code	AE276	Title of the Course	Farm Machinery and Power	L	T	P	C
Year	II	Semester	IV	1	0	1	2
Course Objectives	To enable the students to understand the need of farm power, basic principles and parts of IC engine, different tillage, sowing, intercultural, plant protection equipment, working principles of threshers, harvesting of field and horticultural crops.						

Course Outcomes The students will be able to	
CO1	Understand and the need of farm power and describe basic principles and parts and systems of IC engine.
CO2	Explain and demonstrate the working principles and operation of tractors and their major systems.
CO3	Describe and analyze the construction and working of different tillage and intercultural equipment.
CO4	Explain and compare the construction and working principles of sowing, plant protection, threshing, and harvesting equipment used in field and horticultural crops.
CO5	Apply knowledge of farm power and machinery to operate equipment and estimate power requirements for various farm operations.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Unit I	Status of Farm Power in India; Sources of Farm Power, I.C. engines, working principles of I C engines; comparison of two stroke and four stroke cycle engines, Study of different components of I.C. engine, I.C.	5	CO 1
2	Unit II	engine terminology and solved problems; Familiarization with different systems of I.C. engines: Air cleaning, cooling, lubrication, fuel supply and hydraulic control system of a tractor; Familiarization with Power transmission system : clutch; gear box, differential and final drive of a tractor;	5	CO 2
3	Unit III	Tractor types; Cost analysis of tractor power and attached implement; Criteria for selection of tractor and machine implements. Familiarization with Primary and Secondary Tillage implement; Implement for hill agriculture;	5	CO 3
4	Unit IV	implement for intercultural operations; Familiarization with sowing and planting equipment; calibration of a seed drill and solved examples; Familiarization with Plant Protection equipment; Familiarization with harvesting and threshing equipment.	4	CO 4

Practical		
Study of different components of I.C. engine. To study air cleaning and cooling system of engine; Familiarization with clutch, transmission, differential and final drive of a tractor; Familiarization with lubrication and fuel supply system of engine; Familiarization with brake, steering, hydraulic control system of engine; Learning of tractor driving; Familiarization with operation of power tiller; Implements for hill agriculture; Familiarization with different types of primary and secondary tillage implements: mould plough, disc plough and disc harrow; Familiarization with seed-cum-fertilizer drills their seed metering mechanism and calibration, planters and trans planter; Familiarization with different types of sprayers and dusters; Familiarization with different inter-cultivation equipment; Familiarization with harvesting and threshing machinery; Calculation of power requirement for different implements.		CO 5

Suggested Readings:
1. Jagdiswar Sahay – Elements of Agricultural Engineering
2. Jain, S.C. and C.R. Rai-Farm Tractor and maintenance and repair. Standard Publishers, 1705-B, Naisarak. Delhi- 110006
3. Ojha, T.P. and A.M. Michael, A.M. Principles of Agricultural Engineering. Vol.I. Jain brothers, 16/893, East Park Road, Karol Bagh, New Delhi -110005
4. Surendra Singh- Farm machinery –Principles and applications, ICAR, New Delhi

e-Learning Source:
https://rvsagri.ac.in/modules/academics/timetable/FMP%20211.pdf



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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	1	1	1	1	1	1	1	2	2
CO2	2	1	2	3	1	1	1	1	1	1	1	1	2	1	1
CO3	2	2	3	3	1	1	1	1	1	1	1	1	1	1	1
CO4	2	2	1	3	3	1	1	1	1	1	1	1	2	1	2
CO5	2	3	2	3	1	1	1	1	1	1	1	1	3	2	2

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

Name & Sign of Program Coordinator										Sign & Seal of HoD					
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Integral University, Lucknow

Effective from Session: 2026-2027							
Course Code	AG254	Title of the Course	Water Management	L	T	P	C
Year	II	Semester	IV	1	0	1	2
Course Objectives	1. To study the important properties of soil affecting water availability to crops and water requirement for optimum growth and development 2. To study different methods of irrigation and water management practices of both field and horticultural crops and drainage. 3. To study the soil moisture conservation practices including management of rain water, watershed and command areas.						

Course Outcomes	
The students will be able to	
CO1	Develop an understanding of irrigation resources and their development in India, along with soil-plant-water relationships and their influence on crop growth and productivity.
CO2	Explain soil moisture dynamics and crop water use, including available and unavailable soil moisture, water budgeting, rooting characteristics, and the impact of moisture stress on crops.
CO3	Impart knowledge on methods of soil moisture estimation, evapotranspiration, and crop water requirements, along with irrigation scheduling approaches and the concept of effective rainfall.
CO4	Evaluate different irrigation methods and systems, including surface, sub-surface, sprinkler, and drip irrigation, their design, layout, fertigation practices, and economic use of irrigation water.
CO5	Apply advanced irrigation management strategies, including irrigation efficiency, water use efficiency, conjunctive use of water, irrigation water quality management, crop-specific water management, and emerging technologies such as automation and AI-based irrigation practices.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Unit I	Irrigation: definition and objectives; Importance: Function of water for plant growth, water resources and irrigation development for different crops in India; Soil plant water relationships; Available and unavailable soil moisture, distribution of soil moisture, water budgeting, rooting characteristics, moisture extraction pattern, effect of moisture stress on crop growth.	5	CO 1
2	Unit II	Methods of soil moisture estimation, evapotranspiration and crop water requirement; effective rainfall, different approaches of scheduling of irrigation; Methods of irrigation: surface and sub-surface, pressurized methods, viz., sprinkler and drip irrigation, their suitability, merits and limitations, fertigation, economic use of irrigation water.	5	CO 2
3	Unit III	Layout of different irrigation systems, Irrigation efficiency and water use efficiency, conjunctive use of water, irrigation water quality and its management.	4	CO 3
	Unit IV	Water management of different crops (rice, wheat, maize, groundnut, sugarcane, mango, banana and tomato); quality of irrigation water, irrigation management practices for different soils and crops, drip, sprinkler. Layout of underground pipeline system, Irrigation automation, Artificial Intelligence and climate-based irrigation practices and its management.	5	CO4

Practical		
Determination of bulk density by field method; Determination of soil moisture content by gravimetric method, tensiometer, electrical resistance block and neutron moisture meter; Determination of field capacity by field method; Determination of permanent wilting point; Measurement of irrigation water requirement (Problems); Determination of infiltration rate; Demonstration of furrow method of irrigation; Demonstration of check basin and basin method of irrigation; Visit to farmers' field and cost estimation of drip irrigation system; Demonstration of filter cleaning, fertigation, injection and flushing of laterals; layout for different methods of irrigation, Erection and operation of sprinkler irrigation system; Measurement of emitter discharge rate, wetted diameter and calculation of emitter discharge variability; Visit to irrigation research centre/ station and visit to command area		30
		CO5

Suggested Readings:	
1. Rao, Y.P. and Bhaskar, S.R. Irrigation technology. Theory and practice. Agrotech publishing Academy, Udaipur. 2. Dilipkumar Mujmdar. Irrigation water management: Principles and Practices. Prentice Hall of India Pvt. Ltd.,	



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3. S.V. Patil & Rajakumar, G. R., Water Management in Agriculture and Horticultural Crops. Satish serial publishing House, Delhi.

4. Carr M. K. V. and Elias Fereres. Advances in Irrigation Agronomy. Cambridge U

e-Learning Source:

<http://eagri.org/eagri50/AGRO103/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	1	1	1	1	1	1	3	1	1	1	1	2	3	1
CO2	3	2	2	1	1	1	1	3	1	1	1	1	3	3	1
CO3	3	3	3	1	1	1	1	3	1	1	1	1	3	3	1
CO4	3	3	3	2	1	1	1	3	1	1	1	1	3	3	2
CO5	3	2	2	2	2	1	1	3	1	1	2	2	3	3	2

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

Name & Sign of Program Coordinator

Sign & Seal of HoD



Integral University, Lucknow

Effective from Session: 2026-2027							
Course Code	AG255	Title of the Course	Problematic Soils and their management	L	T	P	C
Year	II	Semester	IV	1	0	1	2
Course Objectives	1. To acquaint the students about various problem soils like degraded soils, acid soils, saline soils, alkali soils, eroded soils, submerged soils, polluted soils. Also to impart knowledge about remote sensing, GIS, Multipurpose tree and Land capability classification 2. To give hands on training about estimation of various soil and water quality parameters associated with problem soils.						

Course Outcomes	
The students will be able to	
CO1	Develop an understanding of soil quality and soil health, including key indicators, assessment methods, and their role in sustainable agricultural productivity.
CO2	Analyze the distribution of wastelands and problem soils in India and classify them based on their physical, chemical, and biological properties.
CO3	Impart knowledge on the reclamation and management of problem soils, including acid, saline, sodic, acid sulphate, eroded, compacted, waterlogged, and polluted soils.
CO4	Evaluate soil contamination and degraded land systems, including pesticide- and heavy metal-contaminated soils, mined soils, and riverine soils, along with appropriate remediation and management strategies.
CO5	Apply modern tools and sustainable approaches, such as remote sensing, GIS, irrigation water quality assessment, multipurpose tree species (MPTs), and land capability and suitability classification for effective soil and land resource management.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Unit I	Soil quality and health, Distribution of Waste land and problem soils in India, Categorization of Problem soils based on properties. Reclamation and management of Acid soils, Saline, Sodic soils, Acid Sulphate soils, Eroded and Compacted soils, polluted soils.	5	CO 1
2	Unit II	Contaminated soils (Pesticide contamination, Heavy metal contamination), Mined soils (Coal mined, Oil mined), Management of Riverine soils, Waterlogged soils, Irrigation water – quality and standards, utilization of saline water in agriculture	5	CO 2
3	Unit III	Use of Remote sensing and GIS in diagnosis and management of problem soils. Irrigation and water quality.	5	CO 3
	Unit IV	Multipurpose tree (MPT) species, bio remediation through MPTs of soils, land capability and classification, land suitability classification.	5	CO 4

Practical		
Determination of pHs and EC of saturation extract of problematic soil. Determination of redox potential in soil, Estimation of water soluble and exchangeable cations in soil and computation of SAR and ESP and characterization of problematic soil. Determination of Gypsum requirement of alkali / sodic soil. Determination of lime requirement of acidic soil. Determination of Quality of irrigation water (pH, EC, Ca, Mg, Na, CO ₃ , HCO ₃ , Cl, SAR and RSC), Determination of nitrate (NO ₃ ⁻) from irrigation water, Determination of dissolved oxygen and free carbon dioxide levels in water samples.		CO 5

Suggested Readings:
1. Agarwal, R.R., Yadav, J.S.P. and Gupta, R.N. (1982). Saline Alkali soils of India, ICAR, AGROBIOS (India).
2. Brady Nyle C and Ray R Well., 2014. Nature and properties of soils. Pearson Education Inc., New D Delhi.
3. Cirsan J. Paul., 1985,. Principles of Remote Sensing. Longman, New York
4. Indian Society of Soil Science., 2002. Fundamentals of Soil Science. IARI, New Delhi.

e-Learning Source:
https://rvsagri.ac.in/modules/academics/timetable/SAC%20202.pdf
https://agritech.tnau.ac.in/pdf/3.pdf



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

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session: 2026-2027							
Course Code	AG256	Title of the Course	Basics of Plant Breeding	L	T	P	C
Year	II	Semester	IV	2	0	1	3
Course Objectives	To acquaint with different techniques ranging from simply selecting plants with desirable characteristics for propagation, to more complex molecular techniques for breeding new varieties, which are higher yielding, resistant to biotic and abiotic stresses for ensuring food security.						

Course Outcomes The students will be able to	
CO1	Understand the historical development, concepts, nature, and role of plant breeding along with genetic principles, modes of reproduction, and plant genetic resources.
CO2	Analyze genetic variation, heritability, and genetic advance, and apply breeding methods in self-pollinated crops including selection and hybridization techniques.
CO3	Analyze genetic variation, heritability, and genetic advance, and apply breeding methods in self-pollinated crops including selection and hybridization techniques.
CO4	Apply practical skills in plant breeding such as hybridization, selection, statistical analysis, and screening for biotic and abiotic stresses.
CO5	Evaluate advanced breeding approaches including mutation breeding, polyploidy, participatory breeding, and understand IPR, variety release, and farmers' rights.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Unit I	Historical development, concept, nature and role of plant breeding, major achievements and future prospects; Genetics in relation to plant breeding, modes of reproduction and apomixes, self incompatibility and male-sterility-genetic consequences, cultivar options, Plant genetic resources, its utilization and conservation Domestication, Acclimatization and Introduction.	7	CO 1
2	Unit II	Centres of origin/ diversity, Components of Genetic variation. Heritability and genetic advance. Pre-breeding and Universal Plant Breeder's equation. Genetic basis and breeding methods in self-pollinated crops mass and pure line selection, hybridization techniques and handling of segregating population	7	CO 2
3	Unit III	Multiline concept, Concepts of population genetics and Hardy-Weinberg Law, Genetic basis and methods of breeding cross-pollinated crops, modes of selection. Population movement schemes- Ear to Row method, Modified Ear to Row, recurrent selection schemes. Heterosis and inbreeding depression, development of inbred lines and hybrids, composite and synthetic varieties. Breeding methods in asexually propagated crops, clonal selection and hybridization.	8	CO 3
4	Unit IV	Wide hybridization and pre-breeding. Polyploidy in relation to plant breeding, mutation breeding- methods and uses. Breeding for important biotic and abiotic stresses. Participatory plant breeding. Variety Release and notification. Intellectual Property Rights, Patenting, Plant Breeders and Farmer's Rights.	7	CO 4

Practical

Plant Breeder's kit, Study of germplasm of various crops, Study of floral structures of selfpollinated and cross-pollinated crops, Emasculation and hybridization techniques in self and cross pollinated crops, Consequences of inbreeding on genetic structure of resulting populations, Study of male sterility system, Handling of segregating populations, Methods of calculating mean, range, variance, standard deviation, heritability, Designs used in plant breeding experiments, analysis of Randomized Block Design, To work out the mode of pollination in a given crop and extent of natural out-crossing, Prediction of performance of double cross hybrids, Maintenance of breeding records and data collection, Screening tests for biotic and abiotic stresses.	30	CO 5
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Suggested Readings:

1. Principles of Plant Breeding (1st & 2nd Edition) by RW Allard.
2. Plant Breeding: Principles & Practices by JR Sharma.
3. Plant Breeding- B.D. Singh.
4. Principles and Procedures of Plant Breeding - Biotechnical and Conventional Approaches by GS Chahal and SS Gosal.
5. Principles of Plant Genetics and Breeding by George Acquaah.



Integral University, Lucknow

e-Learning Source:

<https://davuniversity.org/images/files/study-material/Fundamentals%20of%20Plant%20Breeding%20AGS127.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	1	-	-	1	2	2	-	-	-	1	3	2	1
CO2	3	3	2	2	1	-	1	-	-	-	-	1	3	3	2
CO3	3	3	3	2	1	-	1	-	-	-	-	1	3	3	3
CO4	2	3	3	3	2	-	1	-	2	1	-	1	3	3	3
CO5	2	2	2	1	1	2	3	3	2	2	1	2	2	2	2

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

Name & Sign of Program Coordinator

Sign & Seal of HoD