Integral University, Lucknow

Effective from Session: 2018-19							
Course Code	HT113	**Title of the Course**	Fundamentals of Horticulture	**L**	**T**	**P**	**C**
Year	**I**	**Semester**	I	**1**		**1**	**2**
Course Objectives	1. Students will get basic knowledge about horticulture course and its scope 2. Students can get hands on training practical knowledge 3. Demonstrate the safe use of equipment, chemicals and tools used in the industry. 4. Identify and explain benefits of professional organizations in the horticulture industry. 5. To understand basic problems comes under horticulture production technology						

Course Outcomes	
CO1	Demonstrate an understanding of the composition, fertility and biology of soil and how they relate to good plant growth
CO2	Identify and prescribe sustainable options in horticulture which benefit the environment while maintaining productivity and economic viability
CO3	Apply horticultural skills and knowledge to operate various business entities found in the horticultural industry
CO4	Identify and practice safe use of tools, equipment and supplies used in horticulture careers
CO5	Propagate, grow, and maintain plants in horticulture production systems

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Unit 1**	Horticulture - Its definition and branches, importance and scope; horticultural and botanical classification; climate and soil for horticultural crops	3	CO 1, 2
2	**Unit 2**	Plant propagation-methods and propagating structures; Seed dormancy, Seed germination, principles of orchard establishment; Principles and methods of training and pruning	4	CO 2, 4
3	**Unit 3**	Juvenility and flower bud differentiation; unfruitfulness; pollination, pollinizers and pollinators; fertilization and parthenocarpy, Vegetative parthenocarpy	4	CO 3, 5
4	**Unit 4**	Medicinal and aromatic plants; importance of plant bio-regulators in horticulture. Irrigation – methods, Fertilizer application in horticultural crops	3	CO 4, 5
Practical				
Identification of garden tools. Identification of horticultural crops. Preparation of seed bed/ nursery bed. Practice of sexual and asexual methods of propagation including micro-propagation. Layout and planting of orchard. Training and pruning of fruit trees. Preparation of potting mixture. Fertilizer application in different crops. Visits to commercial nurseries/orchard.			**30**	CO 1, 2, 3, 4, 5

Reference Books:

- Prasad and Kumar, 2014. Principles of Horticulture 2nd Edn. Agrobios (India).
- Neeraj Pratap Singh, 2005. Basic concepts of Fruit Science 1st Edn. IBDC Publishers.
- Gardner/Bardford/Hooker, J.R.. Fundamentals of Fruit Production. Mac Graw Hill Book Co., New York.
- Edmond,J.B, Sen,T.L, Andrews, F.S and Halfacre R.G. New Edition Fundamentals of Horticulture. Tata Mc Graw Hill Publishing Co., New Delhi
- Kumar, N., 1990. Introduction to Horticulture. Rajyalakshmi publications, Nagarcoil, Tamilnadu
- Jitendra Singh, Latest Edition. Basic Horticulture. Kalyani Publishers, Hyderabad.
- Chadha,K.L.(ICAR), Handbook of Horticulture. ICAR, New Delhi
- Kausal Kumar Misra and Rajesh Kumar, 2014. Fundamentals of Horticulture. Biotech Books.

e-Learning Source:

Fundamentals of Horticulture Question Bank download from: https://agrimoon.com/fundamentals-of-horticultur-pdf-book/

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

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

Integral University, Lucknow

Effective from Session: 2018-19							
Course Code	AG115	**Title of the Course**	Fundamentals of Plant Biochemistry and Biotechnology	**L**	**T**	**P**	**C**
Year	**I**	**Semester**	I	**2**		**1**	**3**
Course Objectives	1. To introduce the basic knowledge of plant biotechnology and plant biochemistry 2. To introduce the history of plant tissue culture, preparation of solution, various biochemical test 3. To introduce the recent advances in plant biotechnology 4. To familiar them tissue culture laboratory, basic techniques of biotechnology						

Course Outcomes	
CO1	Students will able to know what are the basic technologies involved in plant biochemistry and biotechnology as well as how these technologies are used for the production of useful products
CO2	Students can figure out the measures to prevent the various stresses of any crop, how to identify resistant sources
CO3	Students will know how to isolate DNA form the leaf and how to identify biochemical given in a sample
CO4	Students will Know the role various role of biomolecules such as carbohydrate, protein, lipid etc in life
CO5	They can use their skills for the identification of resistant sources for various stresses

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Unit 1**	Importance of Biochemistry. Properties of Water, pH and Buffer. Carbohydrate: Importance and classification. Structures of Monosaccharides, Reducing and oxidizing properties of Monosaccharides, Mutarotation; Structure of Disaccharides and Poly saccharides.	7	CO 1
2	**Unit 2**	Lipid: Importance and classification; Structures and properties of fatty acids; storage lipids and membrane lipids. Proteins: Importance of proteins and classification; Structures, titration and zwitterions nature of amino acids; Structural organization of proteins. Enzymes: General properties; Classification; Mechanism of action; Michaelis & Menten and Line Weaver Burk equation & plots; Introduction to allosteric enzymes.	6	CO 2
3	**Unit 3**	Nucleic acids: Importance and classification; Structure of Nucleotides, A, B & Z DNA; RNA: Types and Secondary & Tertiary structure. Metabolism of carbohydrates: Glycolysis, TCA cycle, Glyoxylate cycle, Electron transport chain. Metabolism of lipids: Beta oxidation, Biosynthesis of fatty acids.	6	CO 3
4	**Unit 4**	Concepts and applications of plant biotechnology: Scope, organ culture, embryo culture, cell suspension culture, callus culture, anther culture, pollen culture and ovule culture and their applications; Micro-propagation methods; organogenesis and embryogenesis, Synthetic seeds and their significance; Embryo rescue and its significance; somatic hybridization and cybrids; Somaclonal variation and its use in crop improvement; cryo-preservation;	6	CO 4
5	**Unit 5**	Introduction to recombinant DNA methods: physical (Gene gun method), chemical (PEG mediated) and Agrobacterium mediated gene transfer methods; Transgenics and its importance in crop improvement; PCR techniques and its applications; RFLP, RAPD, SSR; Marker Assisted Breeding in crop improvement; Biotechnology regulations	6	CO 5
Practicals				
Preparation of solution, pH & buffers, Qualitative tests of carbohydrates and amino acids. Quantitative estimation of glucose/ proteins. Titration methods for estimation of amino acids/lipids, Effect of pH, temperature and substrate concentration on enzyme action, Paper chromatography/ TLC demonstration for separation of amino acids/ Monosaccharides. Sterilization techniques. Composition of various tissue culture media and preparation of stock solutions for MS nutrient medium. Callus induction from various explants. Micro-propagation, hardening and acclimatization. Demonstration on isolation of DNA. Demonstration of gel electrophoresis techniques and DNA finger printing.			32	CO 1, 2, 3, 4, 5

Reference Books:

- Rajan Katoch (2018) *Fundamentals Of Plant Biochemistry and Biotechnology*, Kalyani Publishers
- Goodwin, TW & Mercer EI. Latest Ed. *Introduction to Plant Biochemistry. 2nd Ed*. Oxford, New York. Pergaman Press
- Berg JM, Tymoczko JL, & Stryer L. *Biochemistry*. 5th Ed. W.H. Freeman & Co.
- Com EE & Stumpf PK. 2010. *Outlines of Biochemistry*. John Wiley Publications.

e-Learning Source:

Fundamentals of Plant Biochemistry and Biotechnology Question Bank download from https://drive.google.com/file/d/1t4h3AD-pfTJiDsnjmXiozMKMIPgOxsAv/view?pli=1

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

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

Integral University, Lucknow

Effective from Session: 2018-19							
Course Code	AG116	**Title of the Course**	Fundamentals of Soil Science	**L**	**T**	**P**	**C**
Year	**I**	**Semester**	I	**2**		**1**	**3**
Course Objectives	1. To introduce the basic knowledge of plant biotechnology and plant biochemistry 2. To introduce the history of plant tissue culture, preparation of solution, various biochemical test 3. To introduce the recent advances in plant biotechnology 4. To familiar them tissue culture laboratory, basic techniques of biotechnology.						

Course Outcomes	
CO1	To gain basic knowledge of soil fertility and productivity
CO2	To study Importance or Significance of soil macronutrient and micronutrients
CO3	To Assess and develop importance of soil physical and chemical properties
CO4	To study about soil pollution and mitigation process
CO5	To study about soil pollution and mitigation process

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Unit 1**	Soil as a natural body, Pedological and edaphological concepts of soil; Soil genesis: soil forming rocks and minerals; weathering, processes and factors of soil formation	6	CO 1
2	**Unit 2**	Soil Profile, components of soil; Soil physical properties: soil-texture, structure, density and porosity, soil colour, consistence and plasticity; Elementary knowledge of soil taxonomy classification and soils of India	6	CO 2
3	**Unit 3**	Soil water retention, movement and availability; Soil air, composition, gaseous exchange, problem and plant growth, Soil temperature; source, amount and flow of heat in soil; effect on plant growth, Soil reaction-pH, soil acidity and alkalinity, buffering, effect of pH on nutrient availability	6	CO 3
4	**Unit 4**	Soil colloids inorganic and organic; silicate clays: constitution and properties; sources of charge; ion exchange, cation exchange capacity, base saturation; soil organic matter: composition, properties and its influence on soil properties	6	CO 4
5	**Unit 5**	Humic substances - nature and properties; soil organisms: macro and micro organisms, their beneficial and harmful effects; Soil pollution - behaviour of pesticides and inorganic contaminants, prevention and mitigation of soil pollution	5	CO 5
Practicals				
Study of soil profile in field. Study of soil sampling tools, collection of representative soil sample, its processing and storage. Study of soil forming rocks and minerals. Determination of soil density, moisture content and porosity. Determination of soil texture by feel and Bouyoucos Methods. Studies of capillary rise phenomenon of water in soil column and water movement in soil. Determination of soil pH and electrical conductivity. Determination of cation exchange capacity of soil. Study of soil map. Determination of soil colour. Demonstration of heat transfer in soil. Estimation of organic matter content of soil.			30	CO 1, 2, 3, 4, 5

Reference Books:

Indian Society of Soil Science. 1998. *Fundamentals of Soil Science*. IARI, New Delhi

Brady Nyle C and Ray R Well, 2014. Nature and properties of soils. Pearson Education Inc., New Delhi

Hillel D. 1982. Introduction to Soil Physics. Academic Press, London

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

e-Learning Source:

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

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

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

Integral University, Lucknow

Effective from Session: 2018-19							
Course Code	AG117	**Title of the Course**	INTRODUCTION TO FORESTRY	**L**	**T**	**P**	**C**
Year	**I**	**Semester**	II	**1**		**1**	**2**
Course Objectives	**1.** To impart detail theoretical as well as practical knowledge of forestry and various other related allied branches of forestry science. **2.** To provide a basic understanding of emerging problems in the fields of forest by organizing visits to farm forest, industrial plantation, dense forest and open forest, nurseries and orchards. **3.** To bestow knowledge regarding various modern techniques used in tree plantation for sustainable development in India. **4.** To learn the applications of various fields of agriculture like horticulture, vegetable science, forestry, livestock production and others for raising the income of the marginal farmers. **5.** To provide detailed knowledge on the subject to improve the farmer's condition by their contributions regarding basic and modern knowledge about organic farming.						

Course Outcomes	
CO1	Knowledge of role trees in almost all terrestrial ecosystems and provide a range of products and services to rural and urban people
CO2	The benefits that trees provide are best sustained by integrating trees into agriculturally productive landscapes
CO3	To study the sustainable utilization of land through agroforestry.
CO4	Study of economically importance of tree and various purposes for growing of tree
CO5	To study scientific management of trees such as creation, conservation and utilization of their resources

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Unit 1**	Introduction – definitions of basic terms related to forestry, objectives of silviculture, forest classification, salient features of Indian Forest Policies. Forest regeneration, Natural regeneration - natural regeneration from seed and vegetative parts, coppicing, pollarding, root suckers; Artificial regeneration – objectives, choice between natural and artificial regeneration, essential preliminary considerations	3	CO 1
2	**Unit 2**	Crown classification. Tending operations – weeding, cleaning, thinning – mechanical, ordinary, crown and advance thinning. Forest mensuration – objectives, diameter measurement, instruments used in diameter measurement	4	CO 2
3	**Unit 3**	Non instrumental methods of height measurement - shadow and single pole method; Instrumental methods of height measurement geometric and trigonometric principles, instruments used in height measurement; tree stem form, form factor, form quotient, measurement of volume of felled and standing trees, age determination of trees	4	CO 3
4	**Unit 4**	Agroforestry – definitions, importance, criteria of selection of trees in agroforestry, different agroforestry systems prevalent in the country, shifting cultivation, taungya, alley cropping, wind breaks and shelter belts, home gardens. Cultivation practices of two important fast growing tree species of the region	3	CO 4, 5
Practical				
Identification of tree-species. Diameter measurements using calipers and tape, diameter measurements of forked, buttressed, fluted and leaning trees. Height measurement of standing trees by shadow method, single pole method and hypsometer. Volume measurement of logs using various formulae. Nursery lay out, seed sowing, vegetative propagation techniques. Forest plantations and their management. Visits of nearby forest based industries.			28	CO 1, 2, 3, 4, 5

Reference Books:

Beazley, M. Latest Edn. The International Book of Forest. London

Khanna, L.S. Principles and Practice of Silviculture. Khanna Bandhu, New Delhi

Persson, R. World Forest Resources. Periodical Experts, New Delhi

Champion, H, G and Seth, S.K. Forest types of India, a revised survey of forest types of India, GOI Press,New Delhi, 404p

e-Learning Source:

https://icar.org.in/files/mFort.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	1	3	3	1	3	1	2	1	3	3	3	3
CO2	3	2	3	2	3	1	1	3	1	2	3	2	3	2	3
CO3	3	2	3	1	3	2	1	3	3	3	1	3	3	2	3
CO4	3	2	3	2	3	3	1	3	2	2	2	3	3	2	3
CO5	3	1	1	1	3	2	1	3	3	3	3	3	3	2	3

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

Integral University, Lucknow

Effective from Session: 2018-19							
Course Code	AG118	**Title of the Course**	Fundamentals of Agronomy	**L**	**T**	**P**	**C**
Year	**I**	**Semester**	I	**3**		**1**	**2**
Course Objectives	1. To provide a basic understanding of emerging problems in the fields of agriculture by organizing visits to agricultural fields, nurseries and orchards. 2. To bestow knowledge regarding various modern techniques used in farming for sustainable agriculture in India. 3.To provide a basic understanding of the market and post-harvest handling of agricultural produce. 4. To provide detailed knowledge on the subject to improve the farmer's condition by their contributions regarding basic and modern knowledge about organic farming. 5. Learn to follow scientific and economic approach along with agricultural production and effective use of land.						

Course Outcomes	
CO1	Students will exploits the knowledge developed by basic and allied sciences for higher crop production.
CO2	Students will aims at obtaining maximum production at minimum cost
CO3	The advancement of knowledge and better understanding of plant and environment, agricultural practices are modified or new practices developed for high productivity
CO4	To study the application of basic agronomic methodology for healthy environment
CO5	Study for optimum growth, management and improvement of field crop with the objective of increasing food, fiber, oil seed and other agriculture products

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Unit 1**	Agronomy and its scope, seeds and sowing, tillage and tilth, crop density and geometry, Crop nutrition, manures and fertilizers, nutrient use efficiency, water resources, soil-plant-water relationship, crop water requirement, Water use efficiency	12	CO 1
2	**Unit 2**	Irrigation- scheduling criteria and methods, quality of irrigation water, logging. Weeds- importance, classification, crop weed competition, concepts of weed management-principles and methods, Herbicides- classification, selectivity and resistance, allelopathy	10	CO 2
3	**Unit 3**	Growth and development of crops, Difference between growth and Development, factors affecting growth and development, plant ideotypes	10	CO 3, 4
4	**Unit 4**	Crop rotation and its principles, adaptation and distribution of crops, Crop management technologies in problematic areas, harvesting and threshing of crops	10	CO 4, 5
Practical				
Identification of crops, seeds, fertilizers, pesticides and tillage implements, study of agro-climatic zones of India, Identification of weeds in crops, Methods of herbicide and fertilizer application, Study of yield contributing characters and yield estimation, Seed germination and viability test, Numerical exercises on fertilizer requirement, plant population, herbicides and water requirement, Use of tillage implements-reversible plough, one way plough, harrow, leveler, seed drill, Study of soil moisture measuring devices, Measurement of field capacity, bulk density and infiltration rate, Measurement of irrigation water.			32	CO 1, 2, 3, 4, 5

Reference Books:

Reddy Yellamanda T and Shankar Reddy G H. New Edn. Principles of Agronomy. Kalyani Publishers Ludhiana

Gupta O P. Scientific Weed Management in the Tropics and Sub- Tropics. Today and Tomorrow's Printers and Publishers. New Delhi.

Arnon L. Crop Production in Dry Regions. Leonard Hill Publishing Co. London

Yawalkar K S and Agarwal J P. Manures and Fertilizers. Agricultural Horticultural Publishing House, Nagpur

Balasubrananiyan P & Palaniappan SP. 2015. Principles and Practices of Agronomy. Agrobios

e-Learning Source:

https://coabnau.in/uploads/1610422657_Agron.2.2B.Sc.(Agri.).pdf

https://bscagristudy.online/wp-content/uploads/2021/03/AGRO-111-PRINTED-SHORT-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	3	2	2	3	3	3	3	2	2	2	3	3	3	2
CO2	3	2	3	2	3	1	3	3	2	3	2	2	2	2	2
CO3	3	2	3	1	3	2	3	3	2	3	3	3	3	3	2
CO4	3	2	3	2	3	3	3	3	2	2	3	3	3	3	2
CO5	3	2	2	2	3	2	3	3	2	3	2	3	3	3	2

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

Integral University, Lucknow

Effective from Session: 2018-19							
Course Code	BM125	**Title of the Course**	Human Values & Ethics in Agriculture (Non-Gradial)	**L**	**T**	**P**	**C**
Year	**I**	**Semester**	I	**1**		**0**	**1**
Course Objectives	1. To understand value and ethics, goal and mission of life 2. To solve case study of ethical lives 3. To understand basic knowledge of decision making and motivation						

Course Outcomes	
CO1	Understand value and ethics of life
CO2	Acquaint principals and philosophy in life
CO3	Understand importance of motivation
CO4	Understand mission and vision of life
CO5	Understand Case on ethical lives and spirituality

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Unit 1**	Values and Ethics-An Introduction. Goal and Mission of Life. Vision of Life	4	CO 1, 3
2	**Unit 2**	Principles and Philosophy. Self Exploration. Self Awareness. Self Satisfaction. Decision Making. Motivation. Sensitivity. Success. Selfless Service	4	CO 2, 4
3	**Unit 3**	Case Study of Ethical Lives. Positive Spirit. Body, Mind and Soul. Attachment and Detachment. Spirituality Quotient. Examination	3	CO 3, 5

Reference Books:

Gaur RR, Sangal R & Bagaria GP. 2011. A Foundation Course in Human Values and Professional Ethics. Excel Books.

Mathur SS. 2017. Education for Values, Environment and Human Rights. RSA International.

Sharma RA. 2011. Human Values and Education -Axiology, Inculcation and Research. R. Lall Book Depot.

Srivastava S. 2011. Human Values and Professional Ethics. S K Kataria & Sons

Tripathi A.N. 2017. Human Values. New Age International (P) Ltd Publishers

e-Learning Source:

https://buat.edu.in/wp-content/uploads/2022/09/Reading-Manual_ASS-114.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	2	2	3	1	2	3	1	1	1
CO2	3	2	3	3	3	2	2	2	3	1	1	2	1	1	2
CO3	3	2	3	3	3	2	2	2	3	1	1	3	1	2	1
CO4	3	2	3	3	3	2	2	2	3	1	1	2	1	2	1
CO5	3	2	2	1	2	2	2	2	3	1	1	3	1	1	1

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

Integral University, Lucknow

Effective from Session: 2018-19							
Course Code	AG119	**Title of the Course**	Introductory Biology	**L**	**T**	**P**	**C**
Year	**I**	**Semester**	I	**1**		**1**	**2**
Course Objectives	1. Basic concepts of diversity, characteristics, and origin of living world 2. Knowledge of evolution and eugenics 3. Knowledge of flowing plants, seed and seed germination 4. Significance of crop and animals and its classifications 5.Basic concepts of Binomial nomenclature and classification Cell and cell division						

Course Outcomes	
CO1	Origin of living world- Basic concepts of diversity, characteristics
CO2	Evolution and eugenics- Basic concepts and knowledge
CO3	Significance of flowing plants, seed and seed germination
CO4	Basic concepts of Binomial nomenclature
CO5	Basic concepts of classification Cell and cell division

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Unit I**	Introduction to the living world, diversity and characteristics of life, origin of life	5	CO 1, 2
2	**Unit II**	Evolution and Eugenics. Binomial nomenclature and classification Cell and cell division	5	CO 2, 4
3	**Unit III**	Morphology of flowing plants. Seed and seed germination. Plant systematic- viz; Brassicaceae, Fabaceae and Poaceae. Role of animals in agriculture	5	CO 3, 5
Practical				
Morphology of flowering plants – root, stem and leaf and their modifications. Inflorescence, flower and fruits. Cell, tissues & cell division. Internal structure of root, stem and leaf. Study of specimens and slides. Description of plants - Brassicaceae, Fabaceae and Poaceae.			30	CO 1, 2, 3, 4, 5
Reference Books:				
Biology: The Essentials 2017. by Mariëlle Hoefnagels McGraw-Hill Publishers				
Life: An Introduction to Biology by George Gaylord Simpson and William S. Beck, Longman Higher Education Publishers				
Biology: Life on Earth with Physiology by Audesirk/Audesirk/Byers, Pearson Publishers				
e-Learning Source:				
https://www.cliffsnotes.com/study-guides/biology/biology/the-science-of-biology/introduction-to-biology				
https://www.dscc.edu/sites/default/files/bwilliams/Handouts/01%20Introduction%20Lecture%20Notes.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	2	3	2	3	2	2	2	2	3	1	2	2	2	3
CO2	3	1	3	3	3	2	2	3	2	3	2	3	2	2	2
CO3	3	2	3	3	3	1	1	3	2	3	2	3	3	2	2
CO4	3	1	3	3	3	1	2	2	1	1	2	2	2	2	2
CO5	3	2	3	3	3	1	2	3	1	2	2	2	2	2	3

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

Integral University, Lucknow

Effective from Session: 2018-19							
Course Code	AG120	**Title of the Course**	Agricultural Heritage	**L**	**T**	**P**	**C**
Year	**I**	**Semester**	I	**1**		**0**	**1**
Course Objectives	1. Basic knowledge of Agriculture and heritage 2. Status of agriculture and farmers in society, indigenous traditional knowledge of farmers 3. Knowledge to increase the production and productivity of Agriculture 4. Significance of Crop and its classifications 5. Current scenario of Indian agriculture; Indian agricultural concerns and prospects.						

Course Outcomes	
CO1	Agriculture and heritage-basic knowledge and concepts
CO2	Basics and concepts of indigenous traditional knowledge and status of farmers
CO3	Importance of agriculture and agricultural resources available in India
CO4	classifications of crop and its significance to farmers
CO5	Indian agriculture Current scenario and future prospects

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Unit 1**	Introduction of Indian agricultural heritage; Ancient agricultural practices, Relevance of heritage to present day agriculture	4	CO 1
2	**Unit 2**	Past and present status of agriculture and farmers in society; Journey of Indian agriculture and its development from past to modern era; Plant production and protection through indigenous traditional knowledge; Crop voyage in India and world	4	CO 2
3	**Unit 3**	Agriculture scope; Importance of agriculture and agricultural resources available in India; Crop significance and classifications	3	CO 3, 4
4	**Unit 4**	National agriculture setup in India; Current scenario of Indian agriculture; Indian agricultural concerns and future prospects.	3	CO 5

Reference Books:

Reddy Yellamanda T and Shankar Reddy G H. 2017. Principles of Agronomy. Kalyani Publishers Ludhiana.

Gupta O P. Scientific Weed Management in the Tropics and Sub- Tropics. Today and Tomorrows Printers and Publishers. New Delhi

Arnon L.. Crop Production in Dry Regions. Leonard Hill Publishing Co. London

Yawalkar K S and Agarwal J P. New Eds Manures and Fertilizers. Agricultural Horticultural Publishing House, Nagpur

e-Learning Source:

https://coabnau.in/uploads/1587050523_Agriculturalheritage.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	1	3	2	3	2	2	2	3	2	2	3	3	1
CO2	3	1	1	3	2	3	2	3	2	3	2	1	3	3	2
CO3	3	2	1	3	2	3	1	3	2	3	1	1	3	3	2
CO4	3	1	1	3	2	3	2	2	1	1	1	2	2	2	3
CO5	3	2	1	3	1	3	2	3	1	2	2	2	2	2	2

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

Integral University, Lucknow

Effective from Session: 2018-19							
Course Code	MT132	**Title of the Course**	Elementary Mathematics	**L**	**T**	**P**	**C**
Year	**I**	**Semester**	I	**2**		**0**	**2**
Course Objectives	• To have Basic concepts of mathematics, distance formula, section formula (internal and external division) • The students will have basic Knowledge of Equation of co-ordinate axes, Equation of lines parallel to axes • To have Knowledge of Parallel lines, Perpendicular lines, Angle of bisectors between two lines, Area of triangle and quadrilateral • To have General equation of a circle, Equation of circle passing through three given points • To have Basics of Differential Calculus Definition of function, limit and continuity, Simple problems on limit						

Course Outcomes	
CO1	Students will have basic knowledge of distance formula, section formula (internal and external division)
CO2	Knowledge of Parallel lines, Perpendicular lines, Angle of bisectors between two lines, Area of triangle and quadrilateral
CO3	Basics of Circle: Equation of circle whose centre and radius is known, General equation of a circle, Equation of circle passing through three given points
CO4	Differentiation of xn, ex, sin x & cos x from first principle, Derivatives of sum, difference, product and quotient of two functions
CO5	Logarithmic differentiation (Simple problem based on it)

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Unit 1**	Straight lines : Distance formula, section formula (internal and external division), Change of axes (only origin changed), Equation of co-ordinate axes, Equation of lines parallel to axes, Slope-intercept form of equation of line, Slope-point form of equation of line, Two point form of equation of line, Intercept form of equation of line, Normal form of equation of line, General form of equation of line	4	CO 1
2	**Unit 2**	Point of intersection of two st. lines, Angles between two st. lines, Parallel lines, Perpendicular lines, Angle of bisectors between two lines, Area of triangle and quadrilateral. Circle: Equation of circle whose centre and radius is known, General equation of a circle, Equation of circle passing through three given points, Equation of circle whose diameters is line joining two points (x1, y1) & (x2, y2), Tangent and Normal to a given circle at given point (Simple problems), Condition of tangency of a line y = mx + c to the given circle x2 + y2 = a2	4	CO 2
3	**Unit 3**	Differential Calculus Definition of function, limit and continuity, Simple problems on limit, Simple problems on continuity, Differentiation of xn, ex, sin x & cos x from first principle, Derivatives of sum, difference, product and quotient of two functions, Differentiation of functions of functions (Simple problem based on it), Logarithmic differentiation (Simple problem based on it), Differentiation by substitution method and simple problems based on it, Differentiation of Inverse Trigonometric functions. Maxima and Minima of the functions of the form y=f (x) (Simple problems based on it)	3	CO 3
4	**Unit 4**	Integral Calculus : Integration of simple functions, Integration of Product of two functions, Integration by substitution method, Definite Integral (simple problems based on it), Area under simple well-known curves (simple problems based on it). Matrices and Determinants: Definition of Matrices, Addition, Subtraction, Multiplication, Transpose and Inverse up to 3rd order, Properties of determinants up to 3rd order and their evaluation	4	CO 4, 5

Reference Books:

Rastogi SK. 2017 Biomathematics. Krishna Prakashan Media Pvt. Ltd.

Grewal B S. New Edition Higher Engineering Mathematics. Khanna Publishers Delhi.

Narayan Shanti. A Text Book of Vector. S. Chand and Co. Ltd. New Delhi.

e-Learning Source:

https://www.hzu.edu.in/agriculture/Mathematics.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	3	2	2	1	1	1	1	2	1	1	2	2	2	1
CO2	2	2	2	2	1	1	1	1	2	3	1	2	2	2	1
CO3	2	2	2	3	1	1	1	1	2	3	1	2	2	2	1
CO4	2	2	3	3	1	1	1	1	2	3	1	2	2	2	1
CO5	2	2	3	3	1	1	1	1	2	3	1	2	2	2	1

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

Integral University, Lucknow

Effective from Session: 2018-19							
Course Code	LN107	**Title of the Course**	Comprehension & Communication Skills in English	**L**	**T**	**P**	**C**
Year	**I**	**Semester**	II	**1**		**1**	**2**
Course Objectives	• Students will have Knowledge of Professional, cultural and cross-cultural communication • Students will have Basics concept of structural and functional grammar; meaning and process of communication, verbal and nonverbal communication • Students will have Knowledge of reading and comprehension of general and technical articles, precise writing, summarizing, abstracting • To Know the basic concepts of group discussion, organizing seminars and conferences • Time management: Personal organization, prioritizing and balancing; Cosmopolitan culture						

Course Outcomes	
CO1	Knowledge of professional, cultural and cross-cultural communication
CO2	Basic knowledge of structural and functional grammar; meaning and process of communication, verbal and nonverbal communication
CO3	Reading and comprehension of general and technical articles, precise writing, summarizing, abstracting
CO4	Basic concepts of group discussion, organizing seminars and conferences
CO5	Personal organization, prioritizing and balancing; Cosmopolitan culture, Group discussions

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Unit 1**	War Minus Shooting- The sporting Spirit. A Dilemma- A layman looks at science Raymond B. Fosdick. You and Your English – Spoken English and broken English G.B. Shaw.	3	CO 1
2	**Unit 2**	Reading Comprehension, Vocabulary- Antonym, Synonym, Homophones, Homonyms, often confused words. Exercises to Help the students in the enrichment of vocabulary based on TOEFL and other competitive examinations	4	CO 2
3	**Unit 3**	Functional grammar: Articles, Prepositions, Verb, Subject verb Agreement, Transformation, Synthesis, Direct and Indirect Narration. Written Skills: Paragraph writing, Precise writing, Report writing and Proposal writing.	4	CO 3, 4
4	**Unit 4**	The Style: Importance of professional writing. Preparation of Curriculum Vitae and Job applications. Synopsis Writing. Interviews: kinds, Importance and process	3	CO 4, 5
Practical				
Listening Comprehension: Listening to short talks lectures, speeches (scientific, commercial and general in nature). Oral Communication: Phonetics, stress and intonation, Conversation practice. Conversation: rate of speech, clarity of voice, speaking and Listening, politeness &Reading skills: reading dialogues, rapid reading, intensive reading, improving reading skills. Mock Interviews: testing initiative, team spirit, leadership, intellectual ability. Group Discussions.			30	CO 1, 2, 3, 4, 5

Reference Books:

Written and Spoken Communication in English, University Press (India) Pvt. Ltd

Business Communication techniques and methods, by Om P. Juneja and Aarati Mujumdar, Orient BlackSwan Pvt. Ltd

Strengthen your English, M. P. Bhaskaran, D. HorsBurgh, Oxford University Press

A Handbook of Standard English and Indian Usage-Vocabulary and Grammar, J. Sethi, Prentice Hall of India Pvt. Ltd

e-Learning Source:

https://www.rvskvv.net/images/Communication-Skills_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	1	2	1	1	1	1	2	3	3	1	3	3	2	2	1
CO2	1	2	1	1	1	1	2	3	2	2	3	1	3	3	1
CO3	1	2	1	1	1	1	2	3	1	2	3	3	3	2	1
CO4	1	2	1	1	1	1	2	3	2	1	3	3	3	1	1
CO5	1	2	1	1	1	1	2	3	3	1	3	3	2	2	1

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

Integral University, Lucknow

Effective from Session: 2018-19							
Course Code	ED101	**Title of the Course**	Rural Sociology & Educational Psychology	**L**	**T**	**P**	**C**
Year	**I**	**Semester**	I	**2**		**0**	**2**
Course Objectives	• Students will have basics of Sociology and Rural sociology • In depth knowledge of study of Social Groups, Social Stratification, Culture concept • To have knowledge of Functional literacy, non-formal education of rural youth • Basics to eradicate social evils, awareness programmes, consumer awareness • Students will have knowledge of educational psychology: Meaning & its importance in agriculture extension						

Course Outcomes	
CO1	Students will have knowledge of Sociology and Rural sociology
CO2	Knowledge of Functional literacy, non-formal education of rural youth
CO3	Knowledge of Functional literacy, non-formal education of rural youth
CO4	Students will have knowledge of Educational psychology: Meaning & its importance in agriculture extension
CO5	Basic knowledge of Personality, Learning, Motivation, Theories of Motivation

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Unit 1**	Sociology and Rural sociology: Definition and scope, its significance in agriculture extension, Social Ecology, Rural society	5	CO 1, 2
2	**Unit 2**	Social Groups, Social Stratification, Culture concept, Social Institution, Social Change & Development	5	CO 2, 4
3	**Unit 3**	Educational psychology: Meaning & its importance in agriculture extension. Behavior: Cognitive, affective, psychomotor domain, Personality, Learning, Motivation, Theories of Motivation, Intelligence.	5	CO 3, 5

Reference Books:

Mertens, M.D. (2014), Research and evaluation in education and psychology. Sage publication

Mazur, J.E. (2017) Learning and behaviour. Prentice Hall, New Delhi

Klausmier, H.J.. Educational psychology. Harper and Row, New York

Dubious, N.F.. Educational psychology and instructional decisions. Dorsey press

e-Learning Source:

https://agri-bsc.kkwagh.edu.in/uploads/department_course/Rural_Sociology_and_Educational_Psychology.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	2	1	1	3	3	3	3	3	3	3	3	1
CO2	2	3	3	2	1	1	2	3	2	2	3	3	2	2	2
CO3	1	3	3	2	1	1	2	2	2	3	3	3	2	2	1
CO4	1	3	3	2	1	1	3	3	3	3	3	3	2	2	1
CO5	2	1	1	2	1	1	3	3	3	3	3	3	2	2	1

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

Integral University, Lucknow

Effective from Session: 2018-19							
Course Code	AE141	**Title of the Course**	**Soil and Water Conservation Engineering**	**L**	**T**	**P**	**C**
Year	**I**	**Semester**	II	**1**		**1**	**2**
Course Objectives	1. To introduce the concept of soil and water conservation. 2. To learn about the meaning, definition and agents of soil erosion. 3. To study about the soil estimation and soil loss measurement techniques. 4. To familiarize the students about the concept of contouring. 5. To aware the students about the water harvesting and its techniques.						

Course Outcomes	
CO1	Students learned about the meaning, definition and concept of soil and water conservation.
CO2	Learned about the meaning, definition and agents of soil erosion
CO3	Students learned about the soil estimation and soil loss measurement techniques.
CO4	Students knew about the concept of contouring.
CO5	Familiarized about the water harvesting and its techniques

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Unit 1**	Introduction to Soil and Water Conservation, causes of soil erosion. Definition and agentsof soil erosion, water erosion: Forms of water erosion. Gully classification and control measures	5	CO 1, 2
2	**Unit 2**	Soil loss estimation by universal Loss Soil Equation. Soil loss measurement techniques. Principlesof erosion control: Introduction to contouring, strip cropping. Contour bund. Graded bund andbench terracing.	5	CO 3, 4
3	**Unit 3**	Grassed water ways and their design. Water harvesting and its techniques. Winderosion: mechanics of wind erosion, types of soil movement. Principles of wind erosion controland its control measures.	5	CO 4, 5
Practicals				
General status of soil conservation in India. Calculation of erosion index. Estimation of soil loss. Measurement of soil loss. Preparation of contour maps. Design of grassed water ways. Design of contour bunds. Design of graded bunds. Design of bench terracing system. Problem on wind erosion.			30	CO 1, 2, 3, 4, 5

Reference Books:

Land and Water Management Engineering. 4th Edition, Murthy, V.V.N. 2002. Kalyani Publishers, New Delhi.

Manual of Soil and Water Conservation Practices. Singh Gurmel, C. Venkataraman, G. Sastry and B.P. Joshi. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.

Soil and Water Conservation Engineering.Suresh, R. 2014. Standard Publisher Distributors,New Delhi

Soil and Water Conservation Engineering.4th Edition, Schwab, G.O., D.D. Fangmeier, W.J. Elliot, R.K. Frevert John Wiley and Sons Inc. New York.

Water Harvesting and Recycling: Indian Experiences.Samra, J.S., V.N. Sharda and A.K. Sikka. 2002. CSWCR&TI, Dehradun, Allied Printers, Dehradun.

e-Learning Source:

https://nptel.ac.in/courses/126105012

http://www.jnkvv.org/PDF/05042020172047Soil-5.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	2	2	1	1	1	3	1	3	3	3	3	3	1
CO2	3	1	2	2	1	1	1	3	1	3	3	3	3	3	1
CO3	3	1	2	2	1	1	1	3	1	3	3	3	3	2	1
CO4	3	1	2	1	1	1	1	3	1	3	3	2	3	2	1
CO5	3	1	2	2	1	1	1	3	1	3	3	3	3	3	1

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

Integral University, Lucknow

Effective from Session: 2018-19							
Course Code	AG131	**Title of the Course**	Fundamentals of Genetics	**L**	**T**	**P**	**C**
Year	**I**	**Semester**	II	**2**		**1**	**3**
Course Objectives	1. Basic knowledge of concept and history of genetics. 2. To learn about the Mendelian Genetics 3. To impart the knowledge of the structure and functions of different cell organelles 4. To familiarize the students about the basics of gene interactions and genetic variance 5. To study the replication, transcription and translation in prokaryotes and eukaryotes.						

Course Outcomes	
CO1	Students learned about the definition, history and concept of genetics
CO2	Know the experiments performed by Mendel and also the Mendel's Law
CO3	Students familiarize with the different cell organelles, structure and functions
CO4	Gained the knowledge of the various gene interactions, cytoplasmic genes and the genetic variance
CO5	Studied the mechanism of replication, transcription and translation in both prokaryotes and eukaryotes

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.Architecture of chromosome; chromonemata, chromosome matrix, chromomeres, centromere,secondary constriction and telomere; special types of chromosomes. Chromosomal theory ofinheritance- cell cycle and cell division- mitosis and meiosis. Probability and Chi-square.Dominance relationships	8	CO 1, 2
2	**Unit 2**	Epistatic interactions with example.Multiple alleles, pleiotropism and pseudoalleles, Sex determination and sex linkage, sexlimited and sex influenced traits, Blood group genetics, Linkage and its estimation, crossing overmechanisms, chromosome mapping. Structural and numerical variations in chromosome andtheir implications	8	CO 2, 4
3	**Unit 3**	Use of haploids, dihaploids and doubled haploids in Genetics. Mutation,classification, Methods of inducing mutations & CIB technique, mutagenic agents and induction ofmutation. Qualitative & Quantitative traits, Polygenes and continuous variations, multiple factorhypothesis, Cytoplasmic inheritance. Genetic disorder	8	CO 3, 5
4	**Unit 4**	Nature, structure & replication of geneticmaterial. Protein synthesis, Transcription and translational mechanism of genetic material, Geneconcept: Gene structure, function and regulation, Lac and Trp operons	8	CO 4, 5
Practicals				
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 cross-over analysis (through two point test cross and three point test cross data). Study on sex linked inheritance in Drosophila. Study of models on DNA and RNA structures.			30	CO 1, 2, 3, 4, 5

Reference Books:

Fundamentals of Genetics Singh B D. Kalyani Publishers, New Delhi

Understanding Genetics (I Ed.) Norman,V. Rothwell. Oxford University Press, Oxford

Principles of Genetics (II Ed). Gardner E J, Simmons M J &Snustard D P. John Wiley & Sons, New York

Selected Problems in Genetics (Vol.1-3). Srivastava&Tyagi. Anmol Publications Pvt. Ltd., New Delhi

e-Learning Source:

Latest Genetics Books and Update :https://www.intechopen.com/books/subject/agricultural-and-biological-sciences

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

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

Integral University, Lucknow

Effective from Session: 2018-19							
Course Code	AG132	**Title of the Course**	Agricultural Microbiology	**L**	**T**	**P**	**C**
Year	**I**	**Semester**	II	**1**		**1**	**2**
Course Objectives	1. To know about microbes structure 2. Familiar with different types of useful microbes in agriculture. 3. Knowledge of microbiology in silage production, biofertilizers, biopesticides, biofuel production and biodegradation of agro-waste 4. Knowledge of different microbes, their mode of reproduction, genetics						

Course Outcomes	
CO1	Student is able to know regarding microbial world, cell structure, Prokaryotic and eukaryotic microbes
CO2	Learn about Bacterial genetics, Role of microbes in soil fertility and crop production
CO3	Students are able to know about sowing time of different varieties according to temperature
CO4	Regarding atmospherics biological nitrogen fixation, Rhizosphere and phyllosphere
CO5	By the end of course students will be able to understand the role of microbes in human welfare.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Unit 1**	Introduction. Microbial world: Prokaryotic and eukaryotic microbes. Bacteria: cell structure,chemoautotrophy, photo autotrophy, growth	4	CO 1, 2
2	**Unit 2**	Bacterial genetics: Genetic recombination transformation, conjugation and transduction, plasmids, transposon	4	CO 2, 4
3	**Unit 3**	Role of microbes in soil fertility and crop production: Carbon, Nitrogen, Phosphorus andSulphur cycles.Biological nitrogen fixation- symbiotic, associative and asymbiotic. Azolla, bluegreen algae and mycorrhiza. Rhizosphere and phyllosphere	4	CO 3, 5
4	**Unit 4**	Microbes in human welfare: silageproduction, biofertilizers, biopesticides, biofuel production and biodegradation of agrowaste.	3	CO 4, 5
Practicals				
Introduction to microbiology laboratory and its equipments; Microscope- parts, principles of microscopy, resolving power and numerical aperture. Methods of sterilization. Nutritional media and their preparations. Enumeration of microbial population in soil- bacteria, fungi, actinomycetes. Methods of isolation and purification of microbial cultures. Isolation of Rhizobium from legume root nodule. Isolation of Azotobacter from soil. Isolation of Azospirillum from roots. Isolation of BGA. Staining and microscopic examination of microbes.			30	CO 1, 2, 3, 4, 5

Reference Books:

Soil Microbiology - R.M. Aggarwal, 2013. Wisdom Press/Dominant Publishers and Distributers

Fundamental Agricultural Microbiology K R Aneja, New Age International Publishers

Biofertilizer Technology, Singh and Purohit, 2008. Agrobios

Agricultural Microbiology, Rangaswamy, G, PHI Publication

e-Learning Source:

Agricultural Microbiology Question Bank download from: http://www.agrimoon.com/wpcontent/uploads/Agriculture-Microbiology-Question-Bank.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	3	2	2	1	1	1	3	3	3	3	3	1
CO2	3	3	3	2	2	2	1	1	1	2	2	3	2	2	1
CO3	3	3	3	3	3	2	1	1	2	3	3	3	3	2	1
CO4	3	3	3	3	3	1	2	2	2	3	3	3	3	2	1
CO5	3	3	3	3	3	1	3	3	3	3	3	3	3	3	1

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

Integral University, Lucknow

Effective from Session: 2018-19							
Course Code	AG133	**Title of the Course**	Fundamentals of Crop Physiology	**L**	**T**	**P**	**C**
Year	**I**	**Semester**	II	**1**		**1**	**2**
Course Objectives	1. To introduce the basic knowledge of crop physiology. 2. To introduce the history of crop physiology 3. To introduce the recent advances in crop physiology 4.To familiar students different practical aspects of crop physiology						

Course Outcomes	
CO1	Students will be able to know what are the basic technologies involved in physiology and how they are used in crop improvement
CO2	Students can use the basic knowledge regarding plant physiology in crop improvement.
CO3	impart knowledge to the students on different plant metabolic processes and their functions in plants
CO4	By the end of course the students will be able to study the growth and development of plants
CO5	study of nutrients and plant growth regulator and their applications in agriculture

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Unit 1**	Introduction to crop physiology and its importance in Agriculture; Plant cell: an Overview; Diffusion and osmosis; Absorption of water, transpiration and Stomatal Physiology	4	CO 1
2	**Unit 2**	Mineralnutrition of Plants: Functions and deficiency symptoms of nutrients, nutrient uptake mechanisms;Photosynthesis: Light and Dark reactions, C3, C4 and CAM plants	3	CO 2
3	**Unit 3**	Respiration: Glycolysis, TCAcycle and electron transport chain; Fat Metabolism: Fatty acid synthesis and Breakdown	4	CO 3
4	**Unit 4**	Plantgrowth regulators: Physiological roles and agricultural uses, Physiological aspects of growth anddevelopment of major crops: Growth analysis, Role of Physiological growth parameters in crop productivity	4	CO 4, 5
Practicals				
Study of plant cells, structure and distribution of stomata, imbibitions, osmosis, plasmolysis, measurement of root pressure, rate of transpiration, Separation of photosynthetic pigments through paper chromatography, Rate of transpiration, photosynthesis, respiration, tissue test for mineral nutrients, estimation of relative water content, Measurement of photosynthetic CO 2 assimilation by Infra Red Gas Analyser (IRGA).			30	CO 1, 2, 3, 4, 5

Reference Books:

Plant Physiology. Salisbulry. 2007. CBS. New Delhi

Plant Growth Substances. CBS. Richard, N. Arteca. 2004. New Delhi

Abiotic stress adaptation in plants: Physiological, Molecular and Genomic foundation Aswanipareek, S.K. Sopory, Hans BohnertGovindjee.

Plant Physiology S N Pandey and B K Sinha, Vikas Publishers

Handbook of Crop Physiology, 2014 CRC Press by Mohammad Pessarakli

e-Learning Source:

Crop Physiology I and II Edition, 2014 Download from: https://www.elsevier.com/books/cropphysiology/sadras/978-0-12-417104-6

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

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

Integral University, Lucknow

Effective from Session: 2018-19							
Course Code	BM161	**Title of the Course**	**Fundamentals of Agricultural Economics**	**L**	**T**	**P**	**C**
Year	**I**	**Semester**	II	**2**	**0**	**0**	**2**
Course Objectives	• To understand scope and nature of economics • To understand basic concepts of desire, demand and supply • To understand consumer's equilibrium, price determination and how to run industry • To understand money barter system, inflation, deflation • To understand role of banking in modern economy and elements of economics						

Course Outcomes	
CO1	Students will learn scope and nature of economics
CO2	Students will learn basic concepts of desire, demand and supply
CO3	Students will understand consumer's equilibrium, price determination and how to run industry
CO4	They will understand how money barter system, inflation, deflation
CO5	They will understand role of banking in modern economy and elements of economics

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Unit 1**	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.	7	CO 1
2	**Unit 2**	Basic concepts: Goods and services, desire, want, demand, utility, cost and price, wealth, capital, income and welfare. Agricultural economics: meaning, definition, characteristicsof agriculture, importance and its role in economic development. Agricultural planning and development in the country. Demand: meaning, law of demand, schedule and demand curve, determinants, utility theory; law of diminishing marginal utility, equi-marginal utility principle	8	CO 2
3	**Unit 3**	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. Laws ofreturns: Law of variable proportions and law of returns to scale. Cost: concepts, short run and long run cost curves. Supply: Stock v/s supply, law of supply, schedule, supply curve, determinants of supply, elasticity of supply. Market structure: meaning and types of market, basic features of perfectly competitive and imperfect markets. Price determination under perfect competition;short run and long run equilibrium of firm and industry, shut down and break even points.	8	CO 3
4	**Unit 4**	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. Population: Importance, Malthusian and Optimum population theories, natural and socioeconomic determinants, current policies and programmes on population control. Money: Barter system of exchange and its problems, evolution, meaning and functions of money, classification of money, supply, general price index, inflation and deflation.	6	CO 4
5	**Unit 5**	Banking: Role in modern economy, types of banks, functions of commercial and central bank, credit creation policy. Agricultural and public finance: meaning, micro v/s macro finance, need for agricultural finance, public revenue and public expenditure. Tax: meaning, direct and indirect taxes, agricultural taxation, VAT. Economic systems: Concepts of economy and its functions, important features of capitalistic, socialistic and mixed economies, elements of economic planning.	6	CO 5

Reference Books:

Fundamentals of Agricultural Economics 2016. A Marjeet Singh, A N Sadhu and J Singh, Himalya Publishing House Fundamentals of Entrepreneurship. Nandan H. 2011. PHI Learning Pvt Ltd India.

Essentials of Management: An International Perspective, 2nd Ed. Harold Koontz & Heinz Weihrich. Tata Mc-Graw Hill Publishing Pvt Ltd.

The Agribusiness Book. Mukesh Pandey & Deepali Tewari. 2010. IBDC Publishers

e-Learning Source:

Get Latest PDF books from: http://www.agrimoon.com/principles-of-agricultural-economics-pdf-book/

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

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

Integral University, Lucknow

Effective from Session: 2018-19							
Course Code	AG134	**Title of the Course**	**Agri-Informatics**	**L**	**T**	**P**	**C**
Year	**I**	**Semester**	II	**1**		**1**	**2**
Course Objectives	1. Understand analogy of computer and MS Office. 2. basic knowledge of Internet And WWW. 3. Knowledge and concept Agri-Informatics. 4. Use of IT application and different IT tools in Agriculture 5. Knowledge and concept e-Agriculture						

Course Outcomes	
CO1	Knowledge and anatomy of computer including Operating Systems and Applications of MS Office
CO2	Knowledge of World Wide Web (www) and internet their Concepts and components
CO3	Agriculture Expert System, Soil Information Systems for supporting Farm decisions
CO4	Preparation of contingent crop-planning using IT tools. Smartphone Apps in Agriculture for farm advises, market price, postharvest management.
CO5	Use of Information and Communication Technology in Agriculture

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Unit 1**	Introduction to Computers, Operating Systems, definition and types, Applications of MSOffice for document creation & Editing, Data presentation, interpretation and graph creation, statistical analysis, mathematical expressions, Database, concepts and types, uses of DBMS inAgriculture, World Wide Web (www): Concepts and components. Introduction to computer programming languages, concepts and standard input/output operations.	4	CO 1
2	**Unit 2**	e-Agriculture, concepts and applications, Use of ICT in Agriculture. Computer Models for understanding plant processes. IT application for computation of water and nutrient requirement of crops, Computer-controlled devices (automated systems) for Agri-input management.	4	CO 2
3	**Unit 3**	Smartphone Apps in Agriculture for farm advisory, e-banking markets market price, postharvest management etc; Geospatial technology for generating valuable agri-information. Decision support systems, concepts, components and applications in Agriculture.	4	CO 3
4	**Unit 4**	Agriculture Expert System, Soil Information Systems etc for supporting Farm decisions. Preparation of contingent cropplanning using IT tools.	3	CO 4,5
Practicals				
Study of Computer Components, accessories, practice of important DOS Commands. Introduction of different operating systems such as windows, Unix/ Linux, Creating, Files & Folders, File Management. Use of MS-WORD and MS Power-point for creating, editing and presenting a scientific Document. 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). Introduction of programming languages. Hands on Crop Simulation Models (CSM) such as DSSAT/Crop-Info/CropSyst/ Wofost; Computation of water and nutrient requirements of crop using CSM and IT tools. Introduction of Geospatial Technology for generating valuable information for Agriculture. Hands on Decision Support System. Preparation of contingent crop planning. Forecasting and early warning			32	CO 1, 2, 3, 4, 5

Reference Books:

Agri Informatics: An Introduction (Industry Series), by R Chakravarthy, ICFAI UNIVERSITY PRESS

E-Agriculture: Concepts and Applications (Agriculture Series),Rahul Gupta (Author), ICFA UNIVERSITY PRESS

Sinha P.K. Computer Fundamentals, BPB Publishing

Computer Fundamental and programming, Pradip Dey and Manas Ghosh.

Agro-Informatics, G. Vanitha, New Delhi Publishing Agency.

e-Learning Source:

https://agrigyan.in/agri-informatics-book-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	3	2	1	2	1	3	2	2	2	3	3	3	3	3
CO2	2	3	2	2	1	1	3	2	2	2	3	3	3	3	3
CO3	3	3	1	1	1	1	3	1	1	2	3	3	3	3	3
CO4	3	3	1	1	1	1	3	1	1	2	3	3	3	2	3
CO5	2	3	2	1	1	1	3	1	2	2	3	3	3	3	3

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

Integral University, Lucknow

Effective from Session: 2018-19							
Course Code	AG135	**Title of the Course**	**Fundamentals of Entomology**	**L**	**T**	**P**	**C**
Year	**I**	**Semester**	II	**3**		**1**	**4**
Course Objectives	• Basics knowledge of Entomology including systematic, history and classification • Knowledge of external morphology of insects, their systems of body and sensory organs • Knowledge of diapauses and metamorphosis in life of insects • Type of insect larvae and pupa • Orders of class insects and classification upto family • Taxonomic study – history, importance and development and binomial nomenclature						

Course Outcomes	
CO1	Know about the concept of systematic, history and classification of insects
CO2	After completion of course the students will have the knowledge of external morphology of insects
CO3	Basics of all the body system (digestive, circulatory, excretory, respiratory, nervous, secretory (Endocrine) and reproductive system of insects)
CO4	Orders of class insects and classification upto family
CO5	Knowledge of biology and characteristics of insect pests of different orders

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Unit 1**	Introduction to phylum arthropoda. Importance of class Insecta. Insect dominance. History of entomology in India, Importance of entomology in different fields. Definition, division and scope of entomology.	10	CO 1, 2
2	**Unit 2**	Comparative account of external morphology-types of mouth parts, antennae, legs, wings and genetalia. Structure, function of cuticle & moulting and body segmentation,	10	CO 2
3	**Unit 3**	Anatomy of digestive, Circulatory, Sensory, respiratory, glandular, excretory, nervous and reproductive systems. Types of reproduction. Postembryonic development-eclosion.	10	CO 3
4	**Unit 4**	Matamorphosis. Types of egg larvae and pupa. Classification of insects up to orders, sub-order and families of economic importance and their distinguished characters. Plant mites – morphological features, important families with examples.	12	CO 4,5
Practicals				
Insect collection and preservation. Identification of important insects. General body organization of insects. Study on morphology of grasshopper or cockroach. Preparation of permanent mounts of mouth parts, antennae, legs and wings. Dissection of grasshopper and caterpillar for study of internal morphology. Observations on metamorphosis of larvae and pupae. Dissection of cockroaches.			32	CO 1, 2, 3, 4, 5

Reference Books:

Handbook of Entomology by T V Prasad 2016. Kindle Edition.

Introduction to General and Applied Entomology. Awasthi, V.B. Scientific Publishers, Jodhpur, 379 p

The Insects: Structure and Function. Chapman, R.F. 1981. Edward Arnold (Publishers) Ltd, London

General Entomology. Mani, M.S. Oxford and IBH Publishing Co. Pvt Ltd., New Delhi

An introduction to Entomology, Srivastava, P.D. and R.P.Singh. 1997. Concept Publishing Company, New Delhi, 269p

e-Learning Source:

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

https://www.davuniversity.org/images/files/study-material/ento%20(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	2	1	1	3	2	3	2	3	1	2	2	3	3	3	1
CO2	3	2	2	3	2	3	2	3	1	2	2	3	3	3	1
CO3	2	1	2	3	2	3	1	2	1	2	2	3	3	3	1
CO4	2	1	3	3	2	3	1	2	1	2	2	3	3	3	1
CO5	1	1	3	3	2	3	1	2	1	2	2	3	3	3	1

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

Integral University, Lucknow

Effective from Session: 2018-19							
Course Code	LN111	**Title of the Course**	Communication Skills and Personality Development	**L**	**T**	**P**	**C**
Year	**I**	**Semester**	II	**1**		**1**	**2**
Course Objectives	• Knowledge of Professional, cultural and cross-cultural communication • Basics concept of structural and functional grammar; meaning and process of communication, verbal and nonverbal communication • Knowledge of reading and comprehension of general and technical articles, precise writing, summarizing, abstracting • Basic concepts of group discussion, organizing seminars and conferences • Time management: Personal organization, prioritizing and balancing; Cosmopolitan culture						

Course Outcomes	
CO1	Knowledge of Professional, cultural and cross-cultural communication
CO2	Basics concept of structural and functional grammar; meaning and process of communication, verbal and nonverbal communication
CO3	Knowledge of reading and comprehension of general and technical articles, precise writing, summarizing, abstracting
CO4	Basic concepts of group discussion, organizing seminars and conferences
CO5	Time management: Personal organization, prioritizing and balancing; Cosmopolitan culture

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hr.**	**Mapped CO**
1	**Unit 1**	Communication Skills: Structural and functional grammar; meaning and process of communication, verbal and nonverbal communication	4	CO 1
2	**Unit 2**	Listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedure	4	CO 2
3	**Unit 3**	Reading and comprehension of general and technical articles, precise writing, summarizing, abstracting; individual and group presentations, impromptu presentation, public speaking	4	CO 3, 4
4	**Unit 4**	Group discussion. Organizing seminars and conferences. Voice modulation basics and their usage for meaningful impact on people; Attributes of an effective leader; Stress and conflict management; Time management: Personal organization, prioritizing and balancing; Cosmopolitan culture; Impact of non-verbal communication; Science of body language; Role of team work	4	CO 5
Practicals				
Listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures. Reading and comprehension of general and technical articles, precise writing, summarizing, abstracting; individual and group presentations.			30	CO 1, 2, 3, 4, 5

Reference Books:

How to Win Friends and Influence People in the Digital Age. Carnegie, Dale. 2012. Simon & Schuster.

The Seven Habits of Highly Successful People. Covey Stephen R. 1989. Free Press

Human Communication: Motivation, Knowledge & Skills.Spitzberg B, Barge K &Morreale, Sherwyn P. 2006. Wadsworth

The Art of Communication. Verma, KC. 2013. Kalpaz.

e-Learning Source:

https://www.udemy.com/course/communication-skills-and-personality-development/

https://onlinecourses.swayam2.ac.in/cec22_cm03/preview

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

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