

B.Sc. Agri. Biology

Syllabus

AFFILIATED COLLEGES

Program Code: ***

2021 – 2022 onwards



BHARATHIAR UNIVERSITY

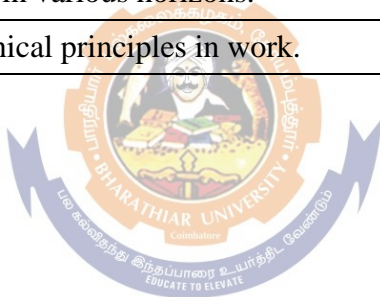
(A State University, Accredited with “A++” Grade by NAAC,
Ranked 21st among Indian Universities by MHRD-NIRF)

Coimbatore - 641 046, Tamil Nadu, India

Instruction: PEOs are:

- **Statement of areas or fields where the graduates find employment**
- **Preparedness of graduates to take up higher studies**

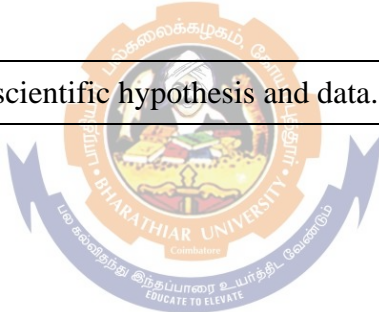
Programme Educational Objectives (PEOs)	
The B.Sc. Agri. Biology programme describe accomplishments that graduates are expected to attain within five to seven years after graduation	
PEO1	Good scientific knowledge in Agri. Biology.
PEO2	Critical thinking and problem solving ability.
PEO3	Analytical ability and administrative skills.
PEO4	Design & development of solutions for health problems with medicinal plants.
PEO5	Effective functioning in Individual and Team works.
PEO6	Project Management.
PEO7	Leadership qualities.
PEO8	Effective communication skills
PEO9	Intellectual skills in various horizons.
PEO10	Application of ethical principles in work.



Instruction: Programme Specific Outcomes (PSOs)

These are what the students should be able to do at the time of graduation. The PSOs are programme specific. PSOs are written by the department offering the programme. There usually are five to seven PSOs for a department.

Programme Specific Outcomes (PSOs)	
After the successful completion of B.Sc. Agri. Biology programme, the students are expected to	
PSO1	Attaining subject knowledge in terms of individual course as well as holistic programme.
PSO2	Identify, classify and compare the features of different plant groups.
PSO3	To create a domain for student community who prefer to opt for agriculture enterprises management as profession.
PSO4	Capacity building of students to acquire skills to venture and management of agriculture based industries and business
PSO5	Able to present scientific hypothesis and data.



Instruction: Programme Outcomes are narrow statements that describe what the students are expected to know and would be able to do upon the graduation. These relate to the skills, knowledge, and behaviour that students acquire through the programme.

Programme Outcomes (POs)	
On successful completion of the B.Sc. Agri. Biology programme	
PO1	The students could work in Research Institutes and raise useful crop varieties
PO2	The students become an Entrepreneur in Nurseries, Green house farming and Micro propagation.
PO3	The students become an Ecologist and Environmental Consultant and hence help in developing a pollution – free environment
PO4	On successful completion of this outcome based curriculum will enable the students in analyzing biology, agriculture and management together to meet the global and local demand of food and other agriculture based products
PO5	The students could be employed as Plant Biochemist and analyse biochemical processes specific to plants
PO6	The students can become a farming consultant and thereby use his/her knowledge in scientifically improving the existing agriculture practices
PO7	The students become Plant Pathologist and analyse the pathogenesis of newly identified plant diseases and pests affecting the crops
PO8	The students become a Plant Geneticist and help in producing genetically modified plants to cater the needs of the society
PO9	The students become Plant Explorer, Taxonomist, thereby identifying and classifying new species of plants
PO10	The students get opportunities of becoming an efficient forest and park ranger

BHARATHIAR UNIVERSITY, COIMBATORE: 641 046

B.Sc. AGRICULTURE (Affiliated Colleges)

(Syllabus for the students those who are admitted from the Academic year 2021-2022 onwards)

SCHEME OF EXAMINATION - CBCS PATTERN

Part	Study Components	Course Title	Ins.hrs/week	Examinations				Credits
				Dur.	CIA	Mark	Total Mark	
SEMESTER I								
I	Language I		6	3	50	50	100	4
II	English I		6	3	50	50	100	4
III	Core Paper I. Agricultural Crop Diversity and Culture Techniques - I (Kharif)		8	3	50	50	100	4
	Core Practical – I		2	-	-	-	-	-
	Allied Paper I – Plant Diversity		4	3	30	45	75	3
	Allied Practical – I		2	-	-	-	-	-
IV	Environmental Studies #		2	3	-	50	50	2
Total			30	15	180	245	425	17
SEMESTER II								
I	Language II		6	3	50	50	100	4
II	English II		6	3	50	50	100	4
III	Core Paper II. Agricultural Crop Diversity and Culture Technique -II (Rabi)		8	3	50	50	100	4
	Core Practical – Paper I & Paper II		2	3	50	50	100	4
	Allied Paper II – Embryology and Reproductive Biology		4	3	30	45	75	3
	Allied Practical – Paper I & Paper II		2	3	25	25	50	2
IV	Value Education- Human Rights #		2	3	-	50	50	2
Total			30	21	255	320	575	23
SEMESTER III								
I	Language III		6	3	50	50	100	4
II	English III		6	3	50	50	100	4
III	Core Paper III- Cultivation and Management of Cash Crops & Plantation Crops		5	3	50	50	100	4
	Core Practical – III		2	-	-	-	-	-
	Allied Paper III –Chemistry – I		4	3	30	45	75	3
	Allied Practical – III		2	-	-	-	-	-
IV	Skill Based Subject Paper I- Mushroom Cultivation		3	3	30	45	75	3
	Tamil @ /Advanced Tamil # (or) Non-Major Elective–I : Yoga for Human Excellence # / Women’s Rights # Constitution of India#		2	3	-	50	50	2
Total			30	18	210	290	500	20
SEMESTER – IV								

I	Language IV	6	3	50	50	100	4
II	English IV	6	3	50	50	100	4
III	Core Paper IV - Agro Practices (Irrigation, Maintenance of Soil fertility and Nutrient status)	4	3	50	50	100	4
	Core Practical - Paper III & Paper IV	2	3	30	45	75	3
	Allied Paper IV- Chemistry –II	4	3	30	45	75	3
	Allied Practical – Paper III & Paper IV	2	3	25	25	50	2
IV	Skill Based Subject Paper II-Ornamental Horticulture and Landscape Gardening	2	3	20	30	50	2
	NAAN MUTHALVAN-Digital Skills for Employability – Office Fundamentals http://kb.naanmudhalvan.in/Special:Filepath/Microsoft Course Details.xlsx	2	-	25	25	50	2
	Tamil @ / Advanced Tamil #(or) Non-major elective –II : General Awareness #	2	3	-	50	50	2
	Total	30	24	280	370	650	26
	SEMESTER – V						
III	Core Paper V- Plant Genetics, Breeding and Biostatistics	5	3	50	50	100	4
	Core Paper VI- Farming technology (Organic and Integrated Farming, Green House)	5	3	50	50	100	4
	Core Paper VII - Post – Harvest Technology	5	3	50	50	100	4
	Core Paper VIII- Agro Based Industries	4	3	50	50	100	4
	Core Practical -V (Based on Core Paper V,VI,VII,VIII)	4	-	-	-	-	-
	Elective – I	4	3	50	50	100	4
IV	Skill Based Subject Paper III – Dairy Products Technology	3	3	30	45	75	3
	Total	30	18	280	295	575	25
	SEMESTER – VI						
III	Core Paper IX- Fundamentals of Agro-economics and Trading	5	3	50	50	100	4
	Core Paper X- Entrepreneurship development and business management	5	3	50	50	100	4
	Elective – II	5	3	50	50	100	4
	Elective – III	5	3	50	50	100	4
	Core Practical – Paper V (Based on Core Paper V,VI,VII,VIII)		3	50	50	100	4
	Core Practical – Paper VI (Based on Core Paper IX,X)	4	3	30	45	75	3
	Elective IV - Practical (Agricultural Informatics Lab)	2	3	20	30	50	2
IV	Skill Based Subject Practical (Based on Skill papers I, II and III)	2	3	20	30	50	2
	NAAN MUTHALVAN- Medical coding for	2	-	25	25	50	2

	employability						
V	Extension Activities @	-	-	50	-	50	2
	Total	30	24	395	380	775	31
	Total	180	120	1600	1900	3500	140

@ No University Examinations. Only Continuous Internal Assessment (CIA)

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List of Elective papers (Colleges can choose any one of the paper as electives)

Elective – I	A	Agricultural Informatics
	B	Agricultural Entomology
Elective – II	A	Agricultural Marketing and Cooperation
	B	Agricultural Pest and Pest Control
Elective – III	A	Agricultural Finance and Business Management
	B	Trends in Farm Machinery
Elective – IV	-	Elective Practical Lab – Agricultural Informatics Lab





***First
Semester***

Course code	AGRICULTURAL CROP DIVERSITY AND CULTURE TECHNIQUES - I (KHARIF)			L	T	P	C
Core/Elective/Supportive	Core paper – I			120			4
Pre-requisite	Basic knowledge in Agro-meteorology and basic knowledge in production technology of various Kharif crops			Syllabus Version	2021-2022		
Course Objectives:							
The main objectives of this course are to: <ul style="list-style-type: none"> • Understanding the weather and climatic factors affecting crops. • Learn the cultivation practices of important kharif cereals and pulses. • Gain the knowledge on production technology of economically important oil seeds • Study the types and methods of cultivation of a selected fiber crops • To implement the knowledge on cultivation of various Kharif crops in agricultural farm 							
Expected Course Outcomes:							
On the successful completion of the course, students are able :							
1	Scientifically understand the significance of meteorology in agriculture					K2	
2	Gain the technical know-how and cultural practices in cultivation of cereals and pulses.					K2	
3	Acquire the skills and knowledge in cultivation of fibre and forage crops					K4	
4	To overview the structure and reproduction of Lichens.					K3	
5	To Implement knowledge on management of plant diseases to increase crop yield.					K3	
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create							
Unit:1	Introduction to Agro-meteorology				30 hours		
Introduction to Agro-meteorology - importance - Weather and climatic factors affecting crops							
Unit:2	Production Technology of Cereals				15 hours		
Production Technology (origin, geographical distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield) of Cereals: Rice, Maize, Kharif Sorghum, Pearl millet and Minor millets.							
Unit:3	Production Technology of Pulses				30 hours		
Production Technology (origin, geographical distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield) of Pulses: Pigeon pea, Mungbean, Horse gram, Moth bean, Cowpea.							

Unit:4	Production Technology of Oilseeds	30 hours
Production Technology (origin, geographical distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield) of Oilseeds: Soybean, Castor, Niger, Groundnut, Sesame.		
Unit:5	Production Technology of Fibre crops	15 hours
Production Technology (origin, geographical distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield) of Fiber crops: Cotton, Jute, Sun hemp, Dhaincha. Production Technology of Forage crops : Rain fed and Irrigated grasses.		
Total Lecture hours		120 hours
Practicals:		
<ol style="list-style-type: none"> 1. Introduction to agro-meteorological instruments 2. Cultivation of various Kharif crops may be carried out in model farms inside the campus or outstation studies carried out in nearby agricultural farms 3. Rice nursery preparation and transplanting/seed bed preparation and sowing of Kharif crops 4. Calculations of seed rate, Effect of seed size on germination and seedling vigour 5. Study types of weeds and their control experiments in these crops 6. Study of fertilizer experiments on rice, maize, sorghum and millets 7. Study of yield contributing characters, yield calculations, harvesting and yield estimation of above crops 8. Study of forage experiments. 		
Text Books		
1	Hand book of Agriculture, ICAR Publication, 6th edition, 2006.	
2	Chhida Singh, Prem Singh and Rajbir Singh Modern Techniques of raising field crops, 2nd edition.	
3	Rajendra Prasad Field Crops.	
4	Reddy SR, Principles of Agronomy, Kalyani Publishers, Third edition.	
5	S.S. Cheema, B.K. Dhaliwal and T.S. Sahota Theory and Digest Agronomy.	
Reference Books		
1	M.M. Hosmani, B.M. Chittarpur and H.B. Babalad. Farm Productivity New Century New Challenges.	
2	V.G. Vaidya, K.R. Sahasrabudhe and V.S. Khuspe, Crop production and field experimentation Continental Prakashan, Pune.	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		

Mapping with Programme Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	S	S	S	S	S	M	M
CO2	M	S	M	M	S	S	S	S	S	S
CO3	S	S	M	M	S	S	M	S	M	S
CO4	M	S	S	S	M	S	S	M	S	S
CO5	S	M	S	S	S	S	M	S	S	M

*S-Strong; M-Medium; L-Low





***Second
Semester***

Course code	AGRICULTURAL CROP DIVERSITY AND CULTURE TECHNIQUE -II (RABI)		L	T	P	C
Core/Elective/Supportive	Core paper – II		120			4
Pre-requisite	Knowledge gained about Rabi crops production technology		Syllabus Version		2021-2022	
Course Objectives:						
The main objectives of this course are :						
<ul style="list-style-type: none"> • To acquire the knowledge of Rabi crops cultivation • To learn the cultural practices employed in cultivation of few common cereals and pulses • Gain the skills to cultivate some economically important oilseeds, aromatic and medicinal plants 						
Expected Course Outcomes:						
On the successful completion of the course, student are able to:						
1	Trained to cultivate a various cereals and pulses					K2
2	Developed skills to cultivate various oil seeds					K2
3	Developed skills to profitably manage aromatic plants cultivation					K3
4	Trained to cultivate Medicinal plants					K2
5	Understand production technology of tuber and other forage crops					K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create						
Unit:1	Production Technology of other Cereals and Pulses				15 hours	
Production Technology (origin, geographical distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield) of following Cereals: Barley, Rabi sorghum, Pulses: chickpea, lentil, peas, French bean						
Unit:2	Production Technology of other Oilseeds				30 hours	
Production Technology (origin, geographical distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield) of following Oilseeds: safflower, sunflower, linseed, rapeseed and mustard Sugar crops: sugarcane, sugarbeet.						
Unit:3	Production Technology of Aromatic Plants				30 hours	
Production Technology (origin, geographical distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield) of Aromatic plants: Mentha, Lemon grass, Citronella, Palma Rosa Isabgol, Posta.						
Unit:4	Production Technology of Medicinal plants				30 hours	

Production Technology (origin, geographical distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield) of following medicinal plants: Vinca rosea, Senna, Gloriosa superb, Andrographis, Brammi, Centella asiatica, Neem.		
Unit:5	Production Technology of tuber crops and other Forage crops	15 hours
Production technology (origin, geographical distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield) of Commercial crops: Potato, sweet potato, tapioca, yam, colocasia. Production technology of Forage crops: Maize, Barseem, Lucerne, Oats.		
Total Lecture hours		120 hours
Practicals:		
<ol style="list-style-type: none"> 1. Cultivation of various Rabi crops may be carried out in model farms inside the campus or outstation studies carried out in nearby agricultural farms 2. Seed bed preparation and sowing of sugarcane and sunflower 3. Calculations on seed rate and study of fertilizer experiments on Rabi cereals, pulses and oil seeds. 4. Identification of weeds in Rabi cereals, pulses, sugarcane, sunflower 5. Application of herbicide and study of weed control experiments 6. Study the yield contributing characters rabi crops. Yield and quality analysis of Sugarcane 7. Crop distribution in the state and the region; Important agronomic experiments of rabi crops and visit to research stations related to rabi crops. 		

Text Books	
1	Hand book of Agriculture, ICAR Publication, 6th edition.
2	Chhida Singh, Prem Singh and Rajbir Singh Modern Techniques of raising field crops, 2nd edition.
3	Rajendra Prasad Field Crops.
4	Reddy SR Principles of Agronomy Kalyani Publishers Third edition.
5	Fageria MS Vegetable Crop Production, Kalyani Publishers.
6	Syamal MM Production Technology of Medicinal and Aromatic plants

Reference books	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	

Mapping with Programme Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	S	S	M	M	M	M	M	S	S
CO2	M	S	S	M	S	S	M	M	M	S
CO3	S	S	S	M	M	S	M	M	S	S
CO4	M	S	S	M	M	S	S	S	S	S
CO5	S	M	S	M	M	M	M	S	S	M

*S-Strong; M-Medium; L-Low





***Third
Semester***

course code	CULTIVATION AND MANAGEMENT OF CASH CROPS & PLANTATION CROPS			L	T	P	C
Core/Elective/ Supportive	Core paper - III			75			4
Pre-requisite	Basic knowledge about cultivation and management practices of plantation crops and its types.			Syllabus Version	2021- 2022		
Course Objectives:							
The main objectives of this course are : <ul style="list-style-type: none"> To learn the difference of plantation crops from other agricultural crops To study the biology and agro practices of various plantation crops To acquire the skills from establishment to management of various types of plantation 							
Expected Course Outcomes:							
On the successful completion of the course, students are able to:							
1	Learned the basic steps involved in establishment and maintenance of selected plantation crops.					K1	
2	Acquired skills in seed selection, sowing, pruning, tapping and shade management methods .					K2	
3	Trained in monitoring and maintenance of irrigation, fertilizing and crop growth.					K3	
4	Learned the harvest methods and processing of plant produce					K3	
5	Learned about the plantation spices					K4	
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create							
Unit:1	Introduction about plantation crops			20 hours			
Introduction to plantation crops; definition, types of plantation crops, Tamilnadu and Indian scenario, topography, Yield gap, commercial Importance.							
Unit:2	Plantation of Tea, Coffee and Cocoa			15 hours			
Plantation of Tea, Coffee and Cocoa: Botany of the species, Climate and soil requirement, varieties, planting and plantation establishment, shade management, pruning, manuring, irrigation, plant protection, harvesting and processing, yield							
Unit:3	Plantation of Banana, Coconuts and Arecanut			15 hours			
Plantation of banana, coconuts and arecanut: Introduction, climate and soil requirement, propagation, planting, establishment of plantation, manuring, pest management, plant protection, harvest and yield.							
Unit:4	Plantation of Rubber and oil palm			15 hours			

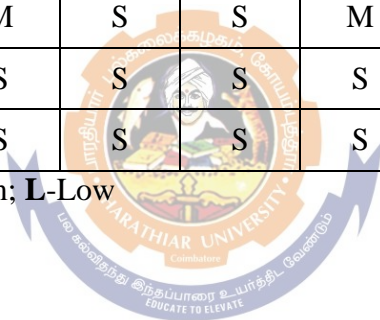
Plantation of Rubber and oil palm : Botany of the species, Climate and soil requirement, propagation and plantation establishment, tapping, pruning, plant protection, harvest, processing and yield.		
Unit:5	Plantation of Cashew and Spice	10 hours
Plantation of Cashew and spice : Introduction, climate and soil requirement, propagation and plantation establishment, tapping, pruning, plant protection, harvest, processing and yield.		
	Total Lecture hours	75 hours
Practicals:		
Cultivation of various plantation crops may be carried out in model farms inside the campus or outstation studies carried out in nearby plantation farms /estates.		
<ol style="list-style-type: none"> 1. Steps involved in land preparation for various plantation crops in syllabus. 2. Seed/ Saplings selection procedure 3. Establishment of plantation 4. Type of irrigation and fertilizer application employed for each plantation crop. 5. Tapping, pruning, shade management methods. 6. Harvesting, processing and yield. 		

Text Books	
1	Hayes, W. B. Fruit Growing in India. Kitab Publishing Co., Allahabad.
2	Shanmugavelu, K. G. Production Technology of Fruit Crops, SBA Publishers
3	Singh, Ranjeet. Fruits. National Book Trust Ltd., New Delhi.
4	Sham Singh. Fruit Growing. Kalyani Publishers, New Delhi.
5	Bose, T. K. and S. K. Mitra. Propagation of Tropical and Subtropical Horticultural
6	Crops, Naya Udyog, 206, BidhanSavani, Kolkatta-700016.
Reference books	
1	Baker, H. Fruits. Mitchell Meagrely Publications, London.
2	Singh, A. Fruit Production and Technology. Kalyani Publishers, New Delhi.
3	Yadav, P. K. Fruit Production Technology. International Book Distributing Co., Division, Lucknow, Inida. .
4	Sharma, R. R. Fruit Production Problems and Solutions. International Book Distributing Co., Division, Lucknow, India.

5	Kumar, P. Management of Horticultural Crops. (HortSciene Series Vol. 11, New India Publishing Agency, NIPA). Kumar, P. Management of Horticultural Crops. (HortSciene Series Vol. 11, New India Publishing Agency, NIPA).
6	Kunte, Y. N, Kawthalkar, M. P., Yawalkar, K.S. Principles of Horticulture and Fruit growing, Agro-Horticultural Pub.House, Nagpur
7	Textbook of Production Technology for Fruits & Plantation Crops B.G Chhipa, R.S Rathore, 2018.
8	Crop production manual A guide to fruit and vegetable production in the Federated States of Micronesia - Compiled by Sayed Mohammad Naim Khalid, 2020.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	

Mapping with Programme Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	S	M	S	S	M	M
CO2	S	S	M	M	S	S	S	S	M	M
CO3	S	M	M	S	S	M	S	S	M	M
CO4	S	S	S	S	S	S	S	S	S	M
CO5	S	S	S	S	S	S	S	S	S	M

*S-Strong; M-Medium; L-Low





***Fourth
Semester***

course code		AGRO PRACTICES (IRRIGATION, MAINTENANCE OF SOIL FERTILITY AND NUTRIENT STATUS)	L	T	P	C
Core/Elective/ Supportive		Core paper - IV	75			4
Pre-requisite		Basic knowledge in understanding soil water-plant relationship. Knowledge in types of irrigation methods. Knowledge in the strategies to maintain soil fertility.	Syllabus Version		2021-2022	
Course Objectives:						
The main objectives of this course are :						
<ul style="list-style-type: none"> • To understand soil water- plant relationship importance of irrigation • To learn various types of irrigation methods, design, components, cost, care and maintenance • To study the role of macro and micronutrients in plant growth • To learn the strategies to maintain the soil fertility and productivity. 						
Expected Course Outcomes:						
On the successful completion of the course, students are able to:						
1	Gain knowledge about Irrigation.					K1
2	Learned the types, design, cost, components of irrigation system.					K2
3	Gained knowledge on role of different nutrients in maintaining soil fertility and productivity					K5
4	Figure out the evaluation methods of soil fertility					K2
5	Acquired skills in determining amount and application of manures and fertilizers					K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create						
Unit:1	Introduction on Irrigation				20 hours	
Introduction, Irrigation in Indian agriculture and present status, Water budget of India, Water resources and their development, Sources of water for crop plants. Importance of Irrigation- Soil, water, plant relationship.						
Unit:2	Methods of Irrigation				20 hours	
Measurement of soil moisture, methods for measurement of irrigation water, Infiltration and its measurement, Water requirement of important crops, Different irrigation methods (design, components, maintenance of surface, sub-surface and pressurized irrigation methods).						
Unit:3	Soil fertility and productivity				10 hours	
Soil fertility and soil productivity: Essential nutrient elements and functions, deficiency symptoms. Mechanism of Nutrient transport / uptake to plants and nutrient availability. Role of microorganisms in organic matter decomposition and humus formation, importance of C:N ratio and pH in plant nutrition.						

Integrated plant nutrient management		
Unit:4	Soil fertility evaluation methods	15 hours
Soil fertility evaluation methods. Critical levels of different nutrients and hidden hunger in soil. DRIS Approach, critical limit approach,. Manures and fertilizer classification and manufacturing process. . NPK fertilizers: composition and application methodology, deficiency symptom by visual diagnosis		
Unit:5	Application of Manures and Fertilizers	10 hours
Secondary & Micronutrient fertilizers their types, composition, reaction in soil and effect on crop growth. Fertilizer control order. Plant nutrient toxicity symptoms and remedial measures. Biofertilizers. Nutrients use efficiency (NUE) and management. Effect of potential toxic elements in soil and plant.		
Total Lecture hours		75 hours
Practicals:		
<ol style="list-style-type: none"> 1. Determination of bulk density of soil 2. Study of different methods of irrigation. 3. Visit to different pressurized irrigation system manufacturers. 4. Determination of pH in soil samples 5. Study of nutrient content of different manures and fertilizers 6. Study of different methods of fertilizer application 7. Fertilizer Adulteration test 8. Use of leaf colour chart for nutrient deficiency diagnosis 		

Text Books	
1	Kanwar, J. S. Soil Fertility-Theory and Practice. Published by ICAR, New Delhi.
2	Tisdale, S.L., W.L. Nelson, J.D. Beaton and J.L. Havlin, Soil Fertility and Fertilizers, Published by Prentice - Hall of India, Ltd., New Delhi
3	Brady, N. C. and Ray R. Well. The Nature and Properties of Soils. Pearson Education (Singapore) Pvt. Ltd. Indian Branch, 482 F.I.E., New Delhi
4	Purohit, S.S. and Dushyent Gehlot. Trends in Organic Farming in India. AGROBIOS Agro House, Behind Nasrani Cinema, Chopasani Road, Jodhapur
5	Acharya, C.L., P.K. Ghosh and A. Subba Rao. Indigenous Nutrient Management

Reference Books	
1	Practices-Wisdom alive in India – 2001. Indian Institute of Soil Science, Nabi bagh, Berasia Road, Bhopal.
2	More, S.D., K.G. Kachhave, A.S. Dhawan and V.D. Patil. Organic Farming, Issues and Strategies. Atul Book Agency, Pune
3	Michael, A.M. Irrigation: Theory and Practice. Vikas Publishing House Pvt. Ltd., Delhi.
4	Murthy, V. V. N. Land and Water Management. Kalyani Publishers, Ludhiana.
5	Michael, A.M. and T.P. Ojha. Principles of Agricultural Engineering. Vol. II, Jain Brothers, Jodhpur.
6	Shivnappan, R.K. Sprinkler Irrigation. Oxford IBM Publishing Co. Pvt.Ltd., New Delhi.
7	Shivnappan, R. K. Drip Irrigation. Keerti Publishers House, Trivandraum
8	Radhey Lal. Irrigation Hydraulics. Saroj Prakashan, Allahabad.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	

Mapping with Programme Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	S	M	M	M	S	S
CO2	S	S	M	M	M	S	M	M	M	M
CO3	M	M	S	M	S	M	S	M	S	S
CO4	S	S	S	M	M	M	S	S	S	S
CO5	S	S	S	M	M	M	S	S	S	S

*S-Strong; M-Medium; L-Low



***Fifth
Semester***

Course code	PLANT GENETICS, BREEDING AND BIOSTATISTICS			L	T	P	C
Core/Elective/Supportive	Core paper -V			75			4
Pre-requisite	Basic knowledge gained in Plant genetics. Knowledge in breeding and biostatistics			Syllabus Version	2021-2022		
Course Objectives:							
The main objectives of this course are: 1. To learn Mendelian Inheritance and type of cross 2. To understand Linkages and crossing over 3. To get thorough knowledge plant genetics and breeding							
Expected Course Outcomes:							
On the successful completion of the course, student are able to:							
1	Get a thorough knowledge of inheritances and cross						K1
2	Know about Linkages and crossing over						K2
3	Understand the descriptive characters Plant genetics, structure, function and genetic code						K3
4	Understand the concept of plant breeding						K3
5	Understand the Biostatistics Data, Types and methods of collection of Data, Sampling techniques and various tests						K3
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create							
Unit:1	Mendelian Inheritance and type of cross					15 hours	
Mendelian inheritance, Monohybrid and Dihybrid cross, Test cross, Back cross, Incomplete dominance, Gene Interaction (Complementary, Supplementary, Duplicate and Inhibitory), Polygenic inheritance.							
Unit:2	Linkages and crossing over					15 hours	
Linkages and crossing over Multiples alleles - Blood groups in man, Mutation types, physical and Chemical Mutagens, Sex determination in plants.							
Unit:3	Plant Genetics					15 hours	
Polyploidy Cytoplasmic inheritance, Population Genetics, Gene structure and function, Genetic code, DNA barcoding in plants.							
Unit:4	Plant Breeding					15 hours	
Plant breeding - Objectives, Plant introduction, Selection, Hybridization, hybrid vigour, - Breeding for disease resistance. Evolution – Evolutionary theories- Lamark, Darwin, Deviris- Modern synthetic theory.							

Unit:5	Biostatistics	15 hours
Biostatistics Data, Types and methods of collection of Data, Sampling techniques, Frequency distribution. Presentation of Data – Tabulation – Parts of Table, Types of table, Graphic representation of data- Histogram. Measures of central tendency– Arithmetic Mean, Median and Mode. Measures of dispersion – Standard Deviation and standard error. Test of significance – ChiSquare test Goodness of fit.		
Total Lecture hours		75 hours
Practicals :		
<ol style="list-style-type: none"> 1. Observation of charts for Mendelian ratios, Gene interaction and Linkage – Simple Problems in genetics. 2. Simple problems in mean, median, mode and Chi square test. 		
Text Books		
1	Gupta, P.K. & M.S. Swaminathan. (2000). Cytology, genetics and Evolution. Rastogi Publication, Meerut.	
2	Gupta, P.K. (2004). Elements of genetics. FNA 2nd Edition.	
3	Meyyan, R.P. (2000). Genetics & Evolution. Saras Publication, Nagercoil.	
4	Chaudhari, H.K. (2005). Elementary principles of plant breeding (25th Ed.). Oxford & IBH Publishing Co. (P) Ltd., New Delhi.	
5	Arumugam, N. (2003). Basic concepts of Biostatistics. Saras Publications, Nagercoil.	
Reference Books		
1	Palanichamy, S & M. Manoharan. (1994). Statistical methods for biologists. Paramount Publication, Palani.	
2	Sinha, U. and Sinha, S. (1989). Cytogenetics, Plant Breeding & Evolution. Vikas Publishing House, New Delhi.	
3	S.P. Gupta, S.P. (2001). Statistical methods. Sultan Chand & Sons, Educational Publishers, New Delhi	
4	Verma, P.S. and Agarwal, V.K. (1999). Concepts of Evolution. S. Chand & Company Ltd., New Delhi	
5	Sinnott, E.W., Dunn, L.C. and Dobshansky, J. (1958). Principles of Genetics (5th Edition) McGraw Hill Publishing Co., New York.	
6	Strickberger, M.W. (1976). Genetics (2nd Ed.). MacMillan Publishing Co. Inc., New York.	
7	Shukla, R.S. and Chandel, P.S. (1996). Cytogenetics, Evolution & Plant Breeding. S. Chand & Company Ltd., New Delhi.	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		

Mapping with Programme Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	M	S	M	S	S	S
CO2	S	S	S	S	M	S	M	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low



Course code	FARMING TECHNOLOGY (ORGANIC AND INTEGRATED FARMING, GREEN HOUSE)		L	T	P	C
Core/Elective/Supportive	Core paper- VI		60			4
Pre-requisite	Basic knowledge in farming technology Knowledge gained in poultry and dairy barn. Knowledge in farming systems		Syllabus Version		2021- 2022	
Course Objectives:						
The main objectives of this course are :						
<ul style="list-style-type: none"> To learn the planning, construction and uses of farmstead and green house To gain the knowledge over poultry and dairy barn To understand the pros and cons of different farming systems like integrated and organic farming 						
Expected Course Outcomes:						
On the successful completion of the course, student are able to:						
1	Trained to plan, construct and manage farmstead and green houses					K2
2	Gained knowledge on various types of farming systems.					K2
3	Acquired knowledge in Green House Technology					K3
4	Gain knowledge of Farming systems and its components.					K2
5	Acquired skills to initiate and manage integrated farming and organic farming					K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create						
Unit:1	Introduction of Farmstead				12 hours	
Introduction, Location, Size and arrangement of farmstead . Planning of farm residence, Septic tank, Farm house design. Farm Silo and their type. Irrigation Methods Hand watering, Flooding, Perimeter Watering, Sprinkler Irrigation, Drip Irrigation . Disposal field - Soak pit, Bore- hole latrine. Farm fencing, types, its uses						
Unit:2	Types of Dairy barn				12 hours	
Animal shelter – its types, Types of dairy barn 1.Stanchion barn a) face in type b) Face out type, 2. Loose housing barn, 3. Open air barn, Milking parlour, Pen barn, Community barn. Poultry housing and their types - 1.Wire floored poultry houses, 2.Deep litter poultry houses, 3.Cage houses Brooder Houses, Poultry equipments						
Unit:3	Green house technology				12 hours	
Green house technology - History, scope and Advantages of greenhouse, Site selection, Green house effect.Types of greenhouses; on the basis of span, shape, glazing/covering material. se, Greenhouse orientation and Layout of greenhouse .Effect of temperature, pH, CO ₂ , light, Ventilation. Cooling systems and Methods. Fertigation and Humidification inside greenhouse						

Unit:4	Farming systems, classification and components	12 hours
Farming systems - Definition and Scope Classification and Components. Components of Farming Systems . Integrated Farming Systems (IFS) -Advantages of IFS,4 Models for Irrigated and Rainfed situations . Cropping systems – Introduction and Types, Indices for Evaluation of Cropping Systems		
Unit:5	Organic Farming	12 hours
Organic farming – Definition and Principles .Benefits and constraints of organic farming , 8 Components of organic farming .Sustainable agriculture - definition, goal and current concepts Precision farming- importance and scope. Factors affecting ecological balance and ameliorative measures.		
Total Lecture hours		60 hours
Practicals :		
<ol style="list-style-type: none"> 1. Study of Farm Fencing & its types 2. Study of Planning and cost estimation of Greenhouse types, Irrigation , Cooling Systems & Ventilation of Green Houses 3. Preparation of integrated farming system model for wetlands and dry lands 4. Preparation of enriched farmyard manure, vermi-compost 5. Study of profitable utilization of agricultural wastes. 		
Text Books		
1	A. M. Michael, and T. P. Ojha Principles of Agricultural Engineering.. Vol. I, Jain Brothers., New Delhi	
2	Sawant B.P., Potekar J. M. and H. W. Awari. A text book of Greenhouse and Post Harvest Technology. Nikita Publication, Latur	
3	P. V. Nelson.Green House Operation and Management. Reston Pub. Co. Inc. Apprentice Hall Co. Reston, Virginia	
4	K. Radha Manohar, and C. Igathinathane, Greenhouse – Technology & Management. Publications, Hyderabad	
5	Tiwari, GN. and R. Green House Technology – Fundamentals, Design, Modelling and Application..K. Goyal. Naroso Publishing Co. Bombay	
6	B.N. and Maiti S. 1984 Cropping systems - Theory and practice. Chatterjee. Oxford and IBH Publishing Co., Calcutta, India	
Reference Books		
1	Palanniappan S.P. Cropping systems in tropics – Principles and practices –1985. Willey Eastern Ltd., New Delhi	
2	Panda S.G. Soil management and organic farming. 2006. AGROBIOS, New Delhi	
3	Thapa U. and Tripathi P Organic Farming , . 2006. Organic Farming in India, Problems and Prospect	
4	K Palanippa S.P. and Anandurai Organic Farming – theory and practice, 1999. Scientific Publishers, Jodhpur.	

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	

Mapping with Programme Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low



Course code	POST – HARVEST TECHNOLOGY			L	T	P	C
Core/Elective/Supportive	Core paper - VII			60			4
Pre-requisite	Basic knowledge in post-harvest technology. Knowledge gained in overcoming the problems occurring in harvesting, threshing. Learned the techniques to increase the horticultural produce			Syllabus Version	2021-2022		
Course Objectives:							
The main objectives of this course are :							
<ul style="list-style-type: none"> To understand the importance of Post-harvest technology to overcome problems occurring in harvesting, threshing, transport drying, milling and marketing. To learn the methods, significance of drying grain for storage To acquire skills in cleaning, sorting, grading, separation and milling of agricultural produce. To learn the techniques to increase the shelf life of horticultural produce 							
Expected Course Outcomes:							
On the successful completion of the course, students are able to:							
1	Gained the knowledge and skills of post harvest technology of agricultural and horticultural produce.					K2	
2	Learned to utilize various equipments used for drying, sorting, grading and milling of agricultural produce.					K2	
3	Acquired scientific knowledge and methods to increase the shelf life of fruits and vegetables					K4	
4	Learned techniques of preservation of fruits and vegetables					K3	
5	Trained to prepare jams, squash, pickles, syrups, ketchups and jellies					K3	
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create							
Unit:1		Importance of Post Harvest Technology			12 hours		
Importance of Post Harvest Technology, Unit Operations in grain processing, Problems occurring during harvesting, threshing, transport, drying, milling and milling & marketing. Moisture Content and its measurement, Drying and its importance: Methods of grain drying, Thin layer and deep bed drying, Grain dryers, Equilibrium moisture content.							
Unit:2		Storage Structures			12 hours		
Food grain storage structures Bulk and Bag storage structures -Types of storage structures: a) Traditional storage structures- Morai type, Bukhari type, Kothar type, Grain bins- Cylindrical, Rectangular bins b) Improved storage structures – Pusa bin, Pucca Kothi, Metal bins • Bag storage structure& design							

Unit:3	Equipments Cleaning, Milling	12 hours
Cleaning – Equipments for cleaning; cleaning, grading, sorting .Types of Screen openings, Cleaning equipments .Grading and Separation equipment. Milling ; Size reduction procedure, Size reduction Machinery. Milling of paddy - Types of rice milling machinery. Technology of parboiling of paddy Principles of parboiling. Principles of refrigeration and cold storage .Oil expression and extraction.		
Unit:4	Harvesting Horticultural produce	12 hours
Horticultural produce: Maturity, harvesting and handling in relation to extended shelf-life and storage quality of fruits, vegetables and flowers-Maturity and harvesting indices, Factors responsible for maturity, ripening and deterioration of horticultural produce. Methods used for harvesting and post-harvest treatment for delaying ripening.		
Unit:5	Packaging and storing	12 hours
Packaging and storing: Respiration and transpiration rate during packaging and storage. Methods of pre -cooling, grading. Methods of packaging, storage and transport of fruits, vegetables and flowers. Importance and scope of fruits and vegetable preservation. Principles and methods of preservation of fruits and vegetables.		
Total Lecture hours		60 hours
Practicals:		
<ol style="list-style-type: none"> 1. Pre-harvest and post-harvest application of chemical substances. 2. Harvesting, packaging, storage and marketing of cut flowers 3. Canning of fruits and vegetables- preparation jam, squash, juice, syrup, pickles etc., 		

Text Books	
1	K. M. Sahay and K. K. Singh Unit Operations of Agricultural Processing. Vikas Publishing House Pvt. Ltd., New Delhi.
2	M. Michael & T. P. Ojha. Principles of Agricultural Engineering Vol. I, Farm Power & Machinery, Farm Buildings and Post harvest technology. Jain Brothers., Jodhapur
3	A. Chakravarty Post Harvest Technology of Cereals, Pulses and Oilseeds.. Oxford and IBH, Publishing Com. Pvt. Ltd., New Delhi.
4	G.A. Henderson and R.C. Perry Agricultural Processing Engineering.. AVI Publishing Co. West-Port, Connecticut, USA
5	C.W. Hall. Mohan Makhijani Drying Farm Crops. at Rekha Printers, New Delhi.
6	Sawant B.P., Potekar J. M. and H. W. Awari.A text book of Greenhouse and Post Harvest Technology. Nikita Publication, Latur

Reference Books	
1	Pantastico, E. R., B. Post Harvest Technology, Handling, Utilization of Tropical and Sub-tropical Fruits and Vegetables. The AVI Publishing Co., West-Post, Connecticut, USA.
2	Salunke, D. K. and Desai, B. B. Post Harvest Biotechnology of Vegetables. II CRC Press, Boca Raton, Florida
3	Kader, A. A. Post Harvest Technology of Horticultural Crops. Publication Co. 3311, University of California, Division of Agricultural and Natural Resources, California
4	Varma, L. R. and V. K. Joshi. Post Harvest Technology of Fruits and Vegetables, Vol. II. Indus Publishing Company, New Delhi-110 027
5	Shrivastva, R.D and Kumar Sanjeev. Fruits and Vegetables(Principle and Practices). 3 rd

	Edition.
6	Saraswathy.S,T.L.Preethi,S.Natarajan.Post Harvest Management of Horticultural Crops.AGROBIOS (INDIA).
7	Chadda .K.L. Handbook of Horticulture. ICAR
8	Jature,S.J, S.J Shinde and V.S.Khandare.A Text Book of Post Harvest Management &Value addition of Fruits and Vegetables Shri Rajlakshmi Prakashan.Aurangabad
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	

Mapping with Programme Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	M	S	M	S	S	S
CO2	S	S	S	S	M	S	M	S	S	S
CO3	S	S	S	S	M	S	M	S	S	S
CO4	S	S	S	S	M	S	M	S	S	S
CO5	S	S	S	S	M	S	M	S	S	S

*S-Strong; M-Medium; L-Low



Course code	AGRO BASED INDUSTRIES			L	T	P	C
Core/Elective/Supportive	Core paper - VIII			60			4
Pre-requisite	Basic knowledge on importance of agro-based industries. Gained knowledge in industrial process.			Syllabus version		2021-2022	
Course Objectives:							
The main objectives of this course are :							
<ul style="list-style-type: none"> To understand the importance of agro-based industries in Indian economy and employment To study the status and industrial process of various agro-based industries To learn the course of action involved in setting up of agro-based industries. 							
Expected Course Outcomes:							
On the successful completion of the course, students are able to:							
1	Gained the knowledge on the role of agro-based industries in rural and Indian economy						K1
2	Trained in processing methods involved in various types of agro-based industries.						K2
3	Learned the modes operating involved in establishing a agro-based industry						K3
4	Gained knowledge on setting up of Agro-based Industries						K2
5	Understand Growth and modernization of Agro-based industries						K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create							
Unit:1	Importance of Agro-based Industries					12 hours	
Agro -based Industries Importance and Need, IMP, Need .Classification of Agro -based Industries on the various basis .Role of Agro -processing Industries in the Indian Economy and employment, Trading, EXIM.							
Unit:2	Present status of Agro-based Industries					12 hours	
Agro -based Industries- Sugar Mills: Present status of sugar mills in India, Products and By Products. Cotton Ginning mills; Present status, Products and By Products Dal mills : Present status, Processing management:- Methods; Dry milling, wet milling, Rice mills : Present status, Processing, Products Fruit Processing Industries: Present status, Examples, Need and scope							
Unit:3	Processing procedures					12 hours	
Soybean Processing Present status Processing Procedure Products and by products . Mango pulp processing Industry-Present status Processing Management Products and By Products . Milk Processing Present status, Production and Processing of Important value-added products. Grape wine making Industries -Present status Economic Importance Post Harvest management wine making process.							
Unit:4	Setting up of Agro-based industries					12 hours	
Steps in setting up of Agro - based Industries 1) Identification of Project 2) Market Analysis 3) Technical and Organizational Analysis 4) Financial and Economic Analysis 5) Feasibility Report Preparation 6) Finance 7) Government Aid 8) Monitoring and Evaluation .Constraints in establishing agrobased industries -1) Infrastructural constraints 2) Technological constraints 3) Social and the cultural constraints 4) Resource utilization constraints .							

Unit:5	Growth and modernization of Agro-based industries	12 hours
Growth and modernization of Agro based Industries -Government Initiatives for growth, modernization and development of Agrobased Industries . Employment and income generation from agro based industries at macro level and overall impact in the development .Employment and income generation from Agro-processing, Forward and backward, Export, Research, Transport. Marketing of commercial crops with special reference to all marketing functions and price analysis. Commercial commodities (cotton, sugarcane, onion, grapes, banana, citrus, mango, cut flowers –roses, gerbera, gladiolus, etc) vegetables (cauliflower, cabbage, tomato, potato, onion, ladies finger, brinjal). Existing levels of processing and future potential. Export and export potential.		
	Total Lecture hours	60 hours
Practicals		
1. Visit to Agro -Processing Industries		

Text Books	
1	Srivastava, U.K. Agro-processing Strategy for Acceleration and Exports. Oxford University Press YMCA, Library Building, Jai Singh Road, New Delhi -110 001.
2	Diwase, Smita. Agri-Business Management. Everest Publishing House, Everest Lane, 536, ShaniwarPeth, AppaBalwantChowk, Pune – 411 030.

Reference Books	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	

Mapping with Programme Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	M	S	S	S	S
CO2	S	S	M	S	S	M	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	M
CO4	S	S	M	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	M

*S-Strong; M-Medium; L-Low



***Sixth
Semester***

Course code		FUNDAMENTALS OF AGROECONOMICS AND TRADING	L	T	P	C
Core/Elective/Supportive		Core paper - IX	75			4
Pre-requisite		Basic knowledge in micro and macroeconomics. Gained the knowledge of marketing and selling.	Syllabus Version			2021-2022
Course Objectives:						
The main objectives of this course are :						
<ul style="list-style-type: none"> • Understanding the fundamentals of micro and macroeconomics. • To learn the differences and functioning of marketing and selling • To train in marketing management • To study the various market legislation, rural marketing and agricultural marketing. 						
Expected Course Outcomes:						
On the successful completion of the course, students are able to:						
1	Gained knowledge on the basics of micro and macroeconomics, their importance and application.					K1
2	Acquired skills in marketing management					K2
3	Trained in trade practices of rural marketing and agricultural marketing.					K3
4	Learn on rural marketing					K4
5	Know about study of agricultural marketing					K2
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create						
Unit:1	Significance of Micro and Macro Economics				15 hours	
Nature and significance of Micro and Macro Economics-Subject matter, Definition, Importance or utility and limitations of Micro and Macro economics. Utility function: Marginal Utility Analysis, Indifference curve; Budget line, Marginal rate of substitution, Consumer's equilibrium. Theory of demand and supply						
Unit:2	Marketing Management				15 hours	
Marketing management - Meaning, definition of marketing, marketing management & Marketing concepts .Difference between marketing and selling . Entities to be marketed in market place. Functions of marketing management. Marketing planning process. Development of marketing strategies.						
Unit:3	Market Legislations				15 hours	
Evolution of market legislation. Procedures, need and scope for market legislation. Regulation of market. Growth and development of regulated markets. Review of Agricultural Produce Market Acts in India. Regulated Market Act, 1937, Organization of regulated markets, constitution of market committee, finance of the market committee, functions of market committee.						
Unit:4	Rural Marketing				15 hours	

Profile of rural marketing- definition, classification, strategies, characteristics, changing pattern of rural market, problems in rural marketing. Difference between urban and rural market. Dos and don'ts for rural marketing and rural industries. Rural segmentation - Targeting and positioning. Rural product and prices – Introduction, packing, pricing methods, rural branding. Rural distribution / channels of distribution, functions of rural sales persons		
Unit:5	Study on Marketing	15 hours
Importance of agricultural commodities in agricultural marketing. Marketing of cereals., pulses- rice, mung . Average cost of processing paddy to rice, whole pulses in to split pulses, comparison of different rice milling methods. Study on price spread of important crops and producer's share in consumer's rupee. Marketing of mango, citrus and grapes. Marketing of vegetables. Improving efficiency in commodity marketing. Role of co-operative and regulated market in commodity marketing.		
	Total Lecture hours	75 hours
<u>Practicals:</u>		
<ol style="list-style-type: none"> 1. Classification of markets 2. Visit to a local weekly market to study various marketing functions 3. Study of marketing channels for different agricultural commodity 4. Marketing Institution in India 5. Measurement of Marketing Efficiency 		

Text Books	
1	Dewett K. K., M. H. Navalur. Modern Economic Theory, S. Chand Publication, New Delhi
2	M. L. Seth. Principles of Economics, Lakshmi Narain Agarwal Educational Publishers, Agra
3	Dewett K. K., J. D. Verma. Elementary Economic theory, S. Chand Publication, New Delhi. by S. Subba Reddy Agricultural Economics, Oxford and IBH Publ. Co. Pvt. Ltd 3)
4	Acharya, S. S. and N.L. Agrawal, Agricultural marketing in India. Oxford and IBH publishing co. Ltd. , Janpath, New Delhi. 110 001.5 th edition
5	Mamoria, C.B. and R.L. Joshi. Principles and practices of marketing in India. KitabMahal, thorn hill road, Allahabad.
6	Panvar, J.S. Beyond consumer marketing. Response books sage publications, NewDelhi

Reference Books	
1	Rajan Nijhawan, food safety and standards act 2006, rules 2011, regulations 2011. International law Book Company, church road, kashmere gate, Delhi. 12 th edition
2	Subbareddy, P. Raghu ram, Agricultural economics, oxford and IBH publishing company Pvt. Ltd. 2004
3	Acharya, S.S. and N.L. Agrawal. Agricultural Marketing in India. Oxford and IBH Publishing company Pvt. Ltd., 66, Janpath, New Delhi 110001
4	Mamoria, C.B. and R.L. Joshi. Principles and Practice of Marketing in India. KitabMahal, Thorn hill Road, Allahabad

5	Acharya, S.S. and N.L. Agrawal. Agricultural Marketing in India Oxford and IBH Publishing Co. Ltd., 66, Janpath, New Delhi. 110 001
6	Mamoria, C.B. and R.L. Joshi. Principles and Practices of Marketing in India. Kitab Mahal, Thorn Hill Road, Allahabad
7	Panvar, J.S. Beyond Consumer Marketing. Response Books Sage Publications, New Delhi.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	

Mapping with Programme Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	S	S	M	S	S	S	S
CO2	S	S	M	S	S	S	S	S	S	M
CO3	S	S	S	S	S	M	S	S	S	S
CO4	S	S	M	S	S	S	S	S	S	M
CO5	S	M	S	S	S	S	S	S	S	M

*S-Strong; M-Medium; L-Low




Course code		ENTREPRENEURSHIP DEVELOPMENT AND BUSINESS MANAGEMENT	L	T	P	C
Core/Elective/Supportive		Core paper - X	75			4
Pre-requisite		Basic knowledge in entrepreneur and entrepreneurship. Gained knowledge in entrepreneurial skills	Syllabus Version			2021-2022
Course Objectives:						
The main objectives of this course are to : <ul style="list-style-type: none"> To learn the conceptual differences between entrepreneur and entrepreneurship. To get trained in entrepreneurial skills. To gain knowledge on various institutions involved in entrepreneurship development To acquire skills to establish farming as a business 						
Expected Course Outcomes:						
On the successful completion of the course, students are able to:						
1	Trained to become a entrepreneur and to establish enterprises					K2
2	Gained knowledge on various programmes and institutions involved in entrepreneurship development					K3
3	Trained to institute and manage farming as a business					K3
4	Learn about types of enterprises					K3
5	Learn about Agri Business Management					K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create						
Unit:1	Concept, Characteristics of entrepreneurs				15 hours	
Entrepreneur : Concept, Characteristics, functions & classification of entrepreneurs . Entrepreneurship: Concept, Role of Entrepreneurship in Economic development, Factors affecting Entrepreneurial Growth: Economic factors, Non-Economic factors, Barriers to entrepreneurship						
Unit:2	Policies, EDP				15 hours	
Policies & Programmes for entrepreneurs : Small scale industrial policies, industrial policy resolution 1948,1956,1977,1980,1990,1991 .Entrepreneurial Development Programmes (EDP): Introduction, meaning, phases in entrepreneurial development, importance of EDP, objectives of EDP						
Unit:3	Institutions for Entrepreneurship Development				15 hours	
Institutions for Entrepreneurship Development: Entrepreneurship Development Institute of India, National Institute for Entrepreneurship and Small Business Development, Centre for Entrepreneurship Development their objectives & Activities						

Unit:4	Types of enterprises	15 hours
Enterprise: Concept & Definition. Types of enterprises, difference between small & large enterprises Small scale enterprises: Steps in setting up small scale enterprises, role of small scale enterprises in economic development		
Unit:5	Agri Business Management	15 hours
Agri Business Management: Meaning, definition and scope of agri – business. Importance of agri – business in Indian economy, Characteristics or features of Agri-business constraints in agri business management. Farming as a business : Characteristics of farming .		
Total Lecture hours		75 hours
<u>Practicals:</u>		
<ol style="list-style-type: none"> 1. Study of Law of Demand and Supply. 2. Study of agriculture marketing and marketing strategies 3. Study of stages of PLC. 4. Study of Marketing Cost, Price and Margin, Price for any two agro-based products. 5. Study of Steps in Entrepreneurship 6. Identification and selection of business idea 7. Preparation of business plan 8. Visit to Entrepreneurship development Institute. 		
Text Books		
1	V. Gangadhar et al. Entrepreneurship Development. Kalyani Publishers, Ludhiana	
2	J.M. talathi et al. Introduction to Agricultural Economics & Agribusiness Management. Ane Books Pvt.Ltd. New Delhi	
3	Ellis, R.S., Educational Psychology. D.N. Van No Strand Co. Inc. New York.	
4	Entrepreneurship Development Institute of India (1987), Developing New Entrepreneurs, EDIT, Ahmedabad, NISIET. Library : 338-93/EDI/87/25104	
Reference books		
1	Khanka S.S. (2001), Entrepreneurial Development chand and company Ltd, 7361, Ramnagar, New Delhi – 110055	
2	Vasant Desai (2004), Dynamics of Entrepreneurial Development and Management.	
3	Agarwal R.C. Fundamentals of Entrepreneurship	
4	Akhouri, M.M., P. Mishra S.P. and Sengupta, Ritha (1989). Trainers manual on developing entrepreneurial motivation, NIESBUD, NEW Delhi.	
	Entrepreneurship Development Institute of India (1987), Developing New Entrepreneurs, EDIT, Ahmedabad, NISIET. Library : 338-93/EDI/87/25104.	
	Betty Gordan B (1979). Entrepreneurship, playing to win. Taraporewala, Bombay.	
	Mancuso Joseph (1974). The entrepreneurs handbook (1st and 2nd). Arteck House.INC, USA	
	Singh A.K., Lakhan singh, R.Roy Burman (2006). Dimensions of Agricultural Extension. Aman publishing House, Meerut.	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		

Mapping with Programme Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	M	S	S	S	S	S
CO2	S	S	S	M	M	S	S	S	S	S
CO3	S	S	S	M	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low





***Skilled
Based
Subject***

Course code	SKILLED BASED SUBJECT			L	T	P	C	
Core/Elective/Supportive	PAPER -1- MUSHROOM CULTIVATION			45			3	
Pre-requisite	Basic Knowledge gained in Mushroom Cultivation			Syllabus Version		2021-2022		
Course Objectives:								
The main objectives of this course are :								
1. Identify business opportunities in chosen sector / sub-sector and plan and market and sell products / services								
2. Work out the economics of Mushroom Cultivation								
Expected Course Outcomes:								
On the successful completion of the course, students are able to:								
1	Gained knowledge in identification of edible mushrooms						K1	
2	Learn about Preparation of media, Isolation, spawn and packing						K2	
3	Knowledge in purchase of chemicals, containers and raw materials for mushroom bed preparation						K3	
4	Learn about Pest and Disease management						K4	
5	Preparation of spawn of Coirpith composting						K5	
6	Marketing Coirpith compost						K6	
K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create								
Unit:1	Familiarization of Mushrooms					09 hours		
Introduction to the world of mushrooms - Familiarization of different edible mushrooms, poisonous, hallucinogenic and medicinal mushrooms								
Unit:2	Preparation of media, Isolation, spawn and packing					09 hours		
Preparation of solid and liquid media -Isolation and pure culturing - Preparation of spawn (mother spawn and commercial spawn) - Inoculation of spawn and incubation - Different types of spawn and packing - Collection and cultivation of different mushrooms (Pleurotus, Calocybe, Volvariella,)								
Unit:3	Purchase of chemicals and raw materials					09 hours		
Purchase of chemicals, containers and raw materials for sterilization - Sterilization of substrates for bed preparation - Oyster mushroom bed preparation using different substrates - Milky mushroom bed preparation - Preparation of casing materials and casing of laid out beds								
Unit:4	Pest and Disease Management					09 hours		
After care of mushrooms – pest and disease management - Mushroom house design -Harvesting, packaging and marketing mushrooms and mushroom products - Processing of harvested mushrooms and value addition								
Unit:5	Coirpith composting					09 hours		
Preparation of spawn for coirpith composting - Procuring coirpith from nearby centres - Composting of coirpith -Packing of coirpith compost - Marketing of coirpith compost - Visit on mushroom enterprises for familiarisation of activities, Evaluation, Practical Examination								
<u>Practicals</u>								

1. Morphology and identification of local mushroom Flora and preserved specimen of mushroom	
2. Study of different species of mushrooms.	
3. Diagrammatic study of life cycle of typical mushroom	
Total Lecture hours	
45 hours	
Text Books	
1	Advances in Horticulture Vol. XIII Chadha, K. L. & Sharma, S. R. 2001. Malhotra Publication House, New Delhi.
2	Ahlawat O.P. and Tewari R.P. 2007. Cultivation technology of paddy straw mushroom (Volvariellavolvacea) Technical Bulletin- National Research Centre for Mushroom (Indian Council of Agricultural Research) Chambaghat, Solan-173 213, HP
3	Chadha K L & Sharma S R. 2001. Advances in Horticulture (Mushroom). Vol. XIII. Malhotra Publ. House, New Delhi
4	Chang S T & Hayes W A. 1997. The Biology and Cultivation of Edible Mushrooms. Academic Press, New York.

Reference books	
1	Chang S T & Miles P G. 2002. Edible Mushrooms and their Cultivation. CRC Press, Florida
2	Dhar B L. 2005. Cultivation Technology of High Temperature Tolerant White Button Mushroom. DIPA, ICAR, New Delhi
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	

Mapping with Programme Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	M	S	S	M	M	S	M
CO2	S	M	M	S	S	S	M	M	S	S
CO3	S	M	M	S	S	M	S	M	M	M
CO4	S	S	S	M	M	S	S	M	S	S
CO5	S	S	S	S	M	S	M	S	S	S

*S-Strong; M-Medium; L-Low

Course code	SKILL BASED SUBJECT			L	T	P	C
Core/Elective/ Supportive	PAPER-II ORNAMENTAL HORTICULTURE AND LAND SCAPE GARDENING			45			3
Pre-requisite	Basic Knowledge on ornamental horticulture and landscape gardening			Syllabus Version		2021- 2022	
Course Objectives: The main objectives of this course are : <ol style="list-style-type: none"> 1. Familiarization with principles and practices of landscaping and ornamental gardening. 2. Landscape designs, its principles and practices of landscaping and ornamental Gardening structure, features. 							
Expected Course Outcomes: On the successful completion of the course, students are able to:							
1	Learn about Importance of Ornamental Horticulture					K 2	
2	Establishment of orchards					K 6	
3	Know about lawn making and maintenance					K 6	
4	Acquire knowledge about Indoor Gardening					K 2	
5	Implement the knowledge on Principles of pruning and systems of training of fruit plants and rejuvenation of orchards					K 3	
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create							
Unit:1	Importance of Ornamental Horticulture			09 Hours			
Importance and scope of ornamental horticulture in India - Botanical classification of fruits. -Cultivation of annuals- Commercial cultivation of rose, canna, Chrysanthemum, marigold and Gladiolus							
Unit:2	Establishment of orchards			09 Hours			
Establishment of orchards; Selection of site, systems of planting.- Orchard soil management.							
Unit:3	Lawn Making			09 Hours			
Making and maintenance of Lawn-Making and maintenance of Hedge and edging. - Elementary knowledge of common shrubs, climbers and trees and their various uses.							
Unit:4	Indoor Gardening			09 Hours			
Indoor gardening - Styles of gardens with special reference to Mughal and Japanese gardens. - Flower arrangement and techniques to prolong vase life of flowers							
Unit:5	Fruit plants			09 Hours			

Principles of pruning and systems of training of fruit plants. - Unfruitfulness - its causes and measures to overcome it. - Fruit drop - its causes and measures to control it. - Rejuvenation of orchards. - Brief studies of Polyembryony, Parthenocarpy and incompatibility

PRACTICAL

1. Identification of ornamental plants.
2. Practice of making garlands, Bouquet and arrangements in vases.
3. Practice of potting and re-potting of plants.
4. Visit to ornamental gardens and research station.

Total Lecture hours

45 Hours



Course code	SKILL BASED SUBJECT			L	T	P	C
Core/Elective/ Supportive	Paper III - DAIRY PRODUCTS TECHNOLOGY			45			3
Pre-requisite	Basic knowledge about dairy products technology			Syllabus Version	2021-2022		
Course Objectives:							
The main objectives of this course are :							
<ol style="list-style-type: none"> 1. Prepare and maintain work area and processing machineries for production of dairy products 2. Prepare for production of dairy products 3. Supervise production of dairy products. 							
Expected Course Outcomes:							
On the successful completion of the course, students are able to:							
1	Understand Milk, Milk products, Milk by-products and its ranking					K2	
2	Learn about Value Addition to Milk					K2	
3	Study about Nutritive value, legal standards and methods of manufacturing of special milk					K3	
4	Overview of Methods of manufacturing of Acidophilus milk, yoghurt, standardized milk, reconstituted milk, recombined milk and toned milk					K4	
5	Know about the Methods of manufacturing of Indigenous milk products.					K2	
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create							
Unit:1	Milk and Milk Products					09 hours	
Introduction – Milk- Milk Products- Milk by-products- Ranking wise Milk production- composition of milk (Different species)							
Unit:2	Value Addition					09 hours	
Value Addition to Milk- Why process the Milk- Processing of Milk							
Unit:3	Nutritive Value and Legal standards					09 hours	
Milk Products- Nutritive value, legal standards and methods of manufacturing of special milk-sterilized milk, homogenized milk, flavored milk & drink, fermented milk							
Unit:4	Manufacturing Methods of various milk and its by-products					09 hours	
Methods of manufacturing of Acidophilus milk, yoghurt, standardized milk, reconstituted milk, recombined milk and toned milk							

Unit:5	Methods of manufacturing of Indigenous milk products	09 hours
Methods of manufacturing of Indigenous milk products- paneer, chhana, ghee, khoa, dahi, cream, butter, lassi, cream, ice-cream, condensed milk, milk powder, cheese, dairy by products		
Practical :		
1. Demonstration of preparation of flavored milk, paneer, ghee, khoa, dahi and ice-cream in laboratory.		
2. Study of cost of preparation of different milk products.		
3. Visit of a milk processing plants		
Total Lecture hours		45 hours
Text Books		
1	Devendra, C. and G. B. McElroy. Goat and Sheep Production in Tropics – Long man Group Ltd., London.	
2	Wong, et al. Fundamentals of Dairy Chemistry. Publishers Van Nastrand Rain hold Comp. New York	
3	Ling, E.R. Text Book and Dairy Chemistry. Chapman Hall Ltd., London.	
4	Sukumar de Outline of Dairy Technology.	

Reference Books	
1	Dairy processing Hand book
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	

Mapping with Programme Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	M	S	S	S
CO3	S	S	M	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	M	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-



***Elective
Courses***

Course code	ELECTIVE I				L	T	P	C
Core/Elective/ Supportive	A. AGRICULTURAL INFORMATICS				60	-	-	4
Pre-requisite	Basic knowledge on computer and its applications in Agriculture				Syllabus Version		2021 - 2022	
<p>Course Objectives: The main objectives of this course are to:</p> <ol style="list-style-type: none"> To introduce the concept of computer and its applications in Agriculture. To create knowledge on MS words, MS –Excel, MS Access and PowerPoint to meet the new corporate world. To provide insight about Applications of computer in Agriculture field 								
Expected Course Outcomes:								
On the successful completion of the course, students are able to:								
1	Learn about anatomy of computers.						K 1	
2	Understand kinds of operating systems.						K 2	
3	Create Documents, Tables and Spreadsheets						K 2	
4	Know about creation and use of PowerPoint presentations, DBMS and MS Access						K 3	
5	Gain knowledge on Computer Models in Agriculture						K 5	
<p>K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create</p>								
Unit:1	Basics of computer						12 Hours	
Introduction to Computers, Anatomy of Computers, Input and Output Devices. Units of Memory, Hardware, Software and Classification of Computers. Personal Computers, Types of Processors, booting of computer, warm and cold booting. Computer Viruses, Worms and Vaccines.								
Unit:2	Operating Systems						12 Hours	
Operating System – DOS and WINDOWS. Disk Operating System (DOS): Some fundamental DOS Commands, FORMAT, DIR, COPY, PATH, LABEL, VOL, MD, CD and DELTREE, Rules for naming files in DOS and Types of files. WINDOWS: GUI, Desktop and its elements, WINDOWS Explorer, working with files and folders; setting time and date, starting and shutting down of WINDOWS. Anatomy of a WINDOW, Title Bar, Minimum, Maximum and Close Buttons, Scroll Bars, Menus and Tool Bars.								
Unit:3	Microsoft office-I						12 Hours	

Applications – MSWORD: Word, processing and units of document, features of word-processing packages. Creating, Editing, Formatting and Saving a document in MSWORD; MSEXCEL: Electronic Spreadsheets, concept, packages. Creating, Editing and Saving a spreadsheet with MSEXCEL. Use of in-built Statistical and other functions and writing expressions. Use of Data Analysis Tools, Correlation and Regression, t-test for two-samples and ANOVA with One-way Classification. Creating Graphs.

Unit:4	Microsoft office-II	12 Hours
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MS Power Point: Features of Power Point Package. MSACCESS: Concept of Database, Units of database, creating database; Application of innovative ways to use information and communication technologies (IT) in Agriculture.

Unit:5	Computer Models in Agriculture	12 Hours
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Computer Models in Agriculture: statistical, weather analysis and crop simulation models, concepts, structure, inputs-outputs files, limitation, advantages and application of models for understanding plant processes, sensitivity, verification, calibration and validation. IT application for computation of water and nutrient requirement of crops, Computer-controlled devices (automated systems) for Agri-input management, Smartphone mobile apps in Agriculture for farm advises, market price, postharvest management etc; Geospatial technology, concepts, techniques, components and uses for generating valuable agri-information

Practical

1. Practice of important DOS Commands.
2. MS WORD - Creating, editing and presenting a scientific Document, Handling of Tabular data
3. MS POWER POINT - Creating animation, video tools, art tool, graphics, template & designs
4. MS-EXCEL - Creating a spreadsheet, use of statistical tools, writing expressions, creating graphs, analysis of scientific data, handling macros.
5. MS-ACCESS: Creating Database, preparing queries and reports, demonstration of Agri-information system.
6. Introduction to World Wide Web (WWW) and its components, creation of scientific website, presentation and management agricultural information through web.
7. Hands on practice on Crop Simulation Models (CSM), DSSAT/Crop-Info/Crop Syst/ Wofost.
8. Preparation of Inputs file for CSM and study of model outputs, computation of water and nutrient requirements of crop using CSM and IT tools.
9. Use of smart phones and other devices in agro-advisory and dissemination of market information.
10. Introduction of Geospatial Technology, demonstration of generating information important for Agriculture.

	Total Lecture hours	60 Hours
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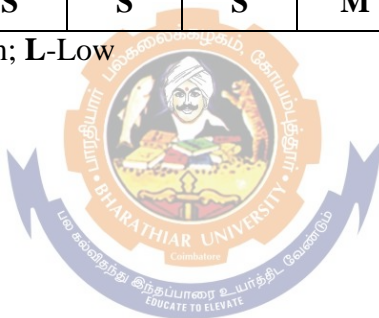
Text Books

1	Pradeep K. Sinha and PritiSinha Computer Fundamentals, III edition, BPB Publications, B-14, Connaught Place, New Delhi – 110 001.
2	Mastering Office Professional for window 95, BPB Publications, B-14, Connaught Place, New Delhi – 110 001.

Reference Books	
1	P.K. Sinha Computer Fundamentals, BPB Publications, B-14, Connaught Place, New Delhi – 110 001
2	Statistical Methods for Agricultural workers by V.G. Panse and P.V. Sukhatma, ICAR, New Delhi.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	

Mapping with Programme Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	M	S	S	S	S
CO2	S	S	M	S	S	M	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	M
CO4	S	S	M	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	M
CO6	S	S	S	S	S	M	S	M	S	S

*S-Strong; M-Medium; L-Low



Course code	ELECTIVE I			L	T	P	C
Core/Elective/ Supportive	B : AGRICULTURAL ENTOMOLOGY			60	-	-	4
Pre-requisite	Knowledge on major pests, damage symptoms caused by the pests and its management on various crops. Knowledge on apiculture & sericulture.			Syllabus Version		2021-2022	
<p>Course Objectives: The main objectives of this course are to:</p> <ol style="list-style-type: none"> To learn the fundamental characters and types of insects. To gain knowledge on major insects causing damage to common crops cultivated locally To acquire skills in apiculture and sericulture 							
Expected Course Outcomes:							
On the successful completion of the course, students are able to:							
1	Gained knowledge on salient features of Phylum Arthropoda and Hexapoda members					K 3	
2	Acquired knowledge on characteristic features of damage causing insects of common crops cultivated locally.					K 2	
3	Study of Morphology of insects which damages crops					K 3	
4	Study of Morphology of insects which damages fruits					K 4	
5	Study of Morphology of insects which damages cash crops					K 3	
6	Gain knowledge on Bee-keeping					K 5	
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create							
Unit:1		Systematic and Taxonomy				12 Hours	
Systematic and Taxonomy – Classification and characteristics of Phylum Arthropoda & Characteristics of Hexapoda							
Unit:2		Morphology of insects -I				12 Hours	
Morphology of insects, Major pests in following crops(a. Scientific name, b. Symptoms of insect damages, c. Lifecycle of insect/pests); Cereals- Paddy,Jawar,Bajra,Maize . Pulses- Pigeon pea, cow pea, Bengal and green gram . Oilseed crops- Ground nut, Soya bean .							
Unit:3		Morphology of insects -II				12 Hours	
Morphology of insects, Major pests in following crops(a. Scientific name, b. Symptoms of insect damages, c. Lifecycle of insect/pests);Fruits- Mango, Grapes, Pomegranate, Citrus, Banana. Vegetable crops- Brinjal, Okra, Tomato, Chilly, Onion, Cabbage & cauliflower							

Unit:4	Morphology of insects -III	12 Hours
Morphology of insects, Major pests in following crops(a. Scientific name, b. Symptoms of insect damages, c. Lifecycle of insect/pests);Cash crops- Sugarcane, cotton. Plantation crops – Tea, coffee		
Unit:5	Bee-Keeping & Silkworm rearing	12 Hours
Honey Bees and Bee-keeping, Bee products . Silkworms and Sericulture & Pests of stored products and their management		
Total Lecture hours		60 Hours
Text Books		
1	Richards O.W. and R.G. Davies – Imms’ General Text Book of Entomology –Vol. I and I	
2	Reference Books: 1. Shrivastava K. P., A Text book of Applied Entomology, Kalyani Publishers, New Delhi.- Vol.1 and Vol.2	
3	Dr. S. Manisegaran and Dr. R. P. Soundararajan, Pest Management In Field Crops (Principles And Practices)	
4	Saxena R. C. and Srivastava R. C., PrasadT. V, Entomology at a Glance, Third Edition.	
5	Handbook of Entomology New Vishals Publication, Revised Edition e-reading: http://ecourses.iasri.res.in/	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		

Mapping with Programme Outcomes										
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	S	S	S	S	S	M	S
CO2	S	S	S	M	S	S	S	S	S	S
CO3	S	S	S	M	S	S	M	S	M	S
CO4	S	S	M	S	M	S	S	S	S	S
CO5	S	S	S	S	S	M	S	M	M	S
CO6	S	S	S	S	S	S	S	M	S	M

*S-Strong; M-Medium; L-Low

Course code	ELECTIVE II		L	T	P	C
Core/Elective/ Supportive	A : AGRICULTURAL MARKETING AND COOPERATION		60	-	-	4
Pre-requisite	Basic knowledge of Agricultural marketing and finance.		Syllabus Version		2021-2022	
Course Objectives: The main objectives of this course are : 1. Optimization of Resource use and Output Management 2. Increase in Farm Income 3. Growth of Agro-based Industries						
Expected Course Outcomes: On the successful completion of the course, students are able to:						
1	Get a thorough knowledge about Agricultural Marketing					K 1
2	Understanding Marketing Functions and services					K 2
3	Recognize Export and Import.					K 3
4	Get an idea about Meaning and Concept of Cooperation, principles of Cooperation.					K 4
5	Get an idea about National cooperative federations.					K 5
6	Inculcating Cooperative farming					K 4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create						
Unit:1	Agricultural Marketing				12 Hours	
Agricultural Marketing: Market, Meaning, scope and classification of markets. Definition of agricultural marketing, demand, supply and price. Marketable surplus, marketed surplus. Integrated marketing. General theory of markets and marketing. Demand for agricultural products. Production and market supply. Price Determination and price analysis under different market structures						
Unit:2	Marketing Functions and services				12 Hours	
Marketing Functions and services. Marketing costs, margins and efficiency. Defects of Present system of marketing of agricultural produce. Steps taken by the Indian Government and possibilities of improvements. Fixation of agricultural Prices. Marketing Institutions: Regulated and cooperative markets. Market Research						
Unit:3	Export and Import				12 Hours	
Export: The concept of export as a district business activity in agricultural sector of the Indian economy, its importance and role in economic development. Policies of export of food grains and agricultural commodities pursued by the Indian Government. Import vs. export value of cereals and other agricultural commodities. Agencies engaged in exporting agricultural goods						
Unit:4	Cooperation				12 Hours	

Cooperation: Meaning and Concept of Cooperation, principles of Cooperation (Equality, universality, distributive, justice, democracy, unity, honorary services and voluntarism). Place of thrift in cooperation, economic planning and cooperation. History and Progress of cooperative movement in India. Structure and organization of agricultural cooperation in India		
Unit:5	National cooperative federations	12 Hours
National cooperative federations, courses of slow growth of agricultural cooperatives, suggestions for rapid development. National Bank for Agriculture and Rural development (1982). Cooperative farming: Meaning thereof, New classification cooperative farming, cooperative joint farming, cooperative collective farming. Advantages thereof. Reasons for apathy of farmers in adopting cooperative joint farming.		
Total Lecture hours		60 Hours
Text books		
1	Acharya, S. S. And N. L. Agrawal. Agricultural marketing in India.(fifth edition) oxford and IBH publishing company pvt. Ltd., 66 Janpath, new Delhi - 110001	
2	S. S. China. Agricultural marketing in India. kalyani publisher, New Delhi 100 002	
References books		
1	S. Subba reddy <i>et al</i> .agriculture economics.(2010) oxford and ibh publishing company Pvt. Ltd., 66 , Janpath, New Delhi – 110001	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		

Mapping with Programme Outcomes										
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	M	S	S	M	M	S
CO2	S	S	S	M	M	S	S	M	S	S
CO3	S	S	S	M	S	S	M	M	S	S
CO4	S	M	S	S	S	M	M	M	S	M
CO5	S	S	M	S	S	M	S	S	S	S
CO6	S	M	M	S	S	M	M	S	S	M

*S-Strong; M-Medium; L-Low

Course code	ELECTIVE PAPER II			L	T	P	C
Core/Elective/ Supportive	B : AGRICULTURAL PEST AND PEST CONTROL			75	-	-	4
Pre-requisite	Basic knowledge on agricultural pest and pest controlling techniques.			Syllabus Version	2021-2022		
Course Objectives: The main objectives of this course are to: <ol style="list-style-type: none"> 1. Trained to identify the crop damage caused by pests. 2. Gained knowledge on various pests of locally cultivated various types of crops. 3. Acquired skills in ecologically sustainable integrated pest management. 							
Expected Course Outcomes: On the successful completion of the course, students are able to:							
1	Study about the plant pathogens and their impacts.			K 1			
2	Understand the History pest management, and about Integrated Pest Management.			K 2			
3	Understand various Components/Tools of IPM.			K 3			
4	Overview of IPM strategies			K 4			
5	Know Advantages of IPM. Food safety standards Pesticide residue and their management			K 5&K6			
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create							
Unit:1	Introduction to Plant Pests			15 Hours			
Introduction to Plant pathogens, pests and disorders, their impact on agriculture global, Indian and Tamilnadu scenario. Common pests of field crops, cash crops and plantation crops in Tamilnadu.							
Unit:2	History of pest management			15 Hours			
History of pest management and ecological backlashes. Integrated Pest Management (IPM)- definition, Scope, Importance, principles of IPM							
Unit:3	Components/Tools of IPM			15 Hours			
Components/Tools of IPM-(Cultural / agronomic method, Physical method, Mechanical Method, Biological method, Legal method-Insecticide Act-1968, HPR, Chemical method, - , Genetic and Regulatory methods, Resent trends (NCIPM))IPM.							
Unit:4	IPM strategies			15 Hours			

IPM strategies for–(Cash crops- Sugarcane, cotton. Cereals- Paddy,Jawar,Bajra. Pulses- Pigeon pea.Oilseed crops- Ground nut, Fruits- Mango, Grapes, Pomegranate, Citrus, Banana, Vegetable crops- Brinjal, Okra, Tomato, Chilly, Onion, Cabbage and cauliflower, Cash crops- coconut, arecanut, Plantation crops- tea, coffee, cocoa.

Unit:5	Advantages of IPM	15 Hours
Advantages of IPM, Food safety standards Pesticide residue and their management		
Total Lecture hours		75 Hours

Text books	
1	Dhaliwak, G. S. and R. Arora. Integrated Pest Management- Concepts and Approaches. Kalyani Publishers, New Delhi
2	Shrivastava K. P., A Text book of Applied Entomology, Kalyani Publishers, New Delhi.- Vol.1 and Vol.2
3	Saxena R. C. and Srivastava R. C., Entomology At a Glance, Agrotech Pub., Udaipur

Reference books	
1	Dhaliwal G. S., Ram sing and Vikas Jindal. A text book of Integrated Pest Management, Kalyani Publishers, New Delhi
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	

Mapping with Programme Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	S	M	S
CO2	S	S	M	S	S	S	S	S	S	M
CO3	S	S	S	S	S	S	S	S	M	S
CO4	S	S	M	S	S	S	S	S	S	M
CO5	S	S	M	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low

Course code	ELECTIVE PAPER III			L	T	P	C
Core/Elective/ Supportive	A : AGRICULTURAL FINANCE AND BUSINESS MANAGEMENT			75	-	-	4
Pre-requisite	Knowledge on agricultural finance and business management			Syllabus Version		2021- 2022	
Course Objectives: The main objectives of this course are to: 1. Understand Agricultural Finance – Credit and its importance 2. Learn about Types of loans and classification of agricultural credit, Budgeting, Time Management							
Expected Course Outcomes: On the successful completion of the course, students are able to:							
1	Understand Agricultural Finance – Credit and its importance			K 1 & K 2			
2	Learn about Types of loans and classification of agricultural credit.			K 3			
3	Know about Types of Loan, according to liquidity			K 4			
4	Gain knowledge on Business Management,			K 5			
5	Overview on Budgeting, Time Management, Financial Management			K 6			
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create							
Unit:1	Agricultural Finance			15 Hours			
Agricultural Finance - Credit - Meaning, Importance and credit control. - Definition, need for finance in agriculture, characteristics of good agricultural finance (credit). - Decision on the use of credit, Principles of farm credit (Equity or Increasing Risk, Added Cost and Added Return, Cost of Credit and no loss no profit goal of farming and opportunity cost Principle.							
Unit:2	Types of loans and classification of agricultural credit			15 Hours			
Types of loans and classification of agricultural credit. - Qualifications of a borrower, Analysis and three R's and credit (Return, Repayment Capacity and Risk-bearing Capacity). Analysis of three C's of Credit (Character, Capacity and Capital).							
Unit:3	Types of Loan, according to liquidity			15 Hours			
Types of Loan, according to liquidity, budgeted loan, loan amortization, even payment method, decreasing method. - Crop index reflecting use and farm finance. - Role and Rural Credit Institutions (Recommendations of the Banking Commission, Integrated Scheme of Rural Finance (Credit), Institutional Agencies, Taccan. - Sources of agricultural finance (Commercial banks, RRB, Lead Bank, NABARD, Cooperative Credit (PACs, Land Development Banks, National Cooperative Federation, Farmers' Service Cooperatives).							
Unit:4	Business Management			15 Hours			

Business Management - Meaning of management, functions of management, role of managers and scope of management in agricultural business. Role and objectives in management references. - Decision making by individuals as well as by groups. - Functional areas of management and their relationship with agriculture production, finance, marketing and human resources as coordination thereof. -Importance and nature of planning, useful generalization of planning forecasting technique with the help of a planning model, components of strategic management.	
Unit:5	Budgeting
	15 Hours
Budgeting in a basic planning technique. Time management, a technique for planning use of manager's own time. - Leadership in Management, Types and Leadership for production, planning and control activities (inventory, control, quality control, cost control) and financial management, financial forecasting and planning acquisition of funds. - Acquaintance of book-keeping and cash account(s). Knowledge of business environment for operation of bank account cheques, bank draft etc.	
Total Lecture hours	
75 Hours	
Text Books	
1	Patnkar, S.V. Financial Management. Everest Publishing House Everest, Pashuram Apartment, 12, Sankalp Society, Paud Phata Road, Opp. Jog Hospital, Pune- 411 038
2	Jain, S.C. Management in Agriculture Finance. Vora and Company. Publishers Pvt. Ltd., 3 Round Building, Kalbadevi, Mumbai – 400 002.
References books	
1	Prasana Chandra. Financial Management. Tata McGraw Hill Publishing Co. Ltd., New Delhi
2	Kahlon, A. S. and Karam Singh. Managing Agricultural Finance - Theory and Practice. Allied Publisher Pvt. Lt., 165, J. N. Heredia Marg, Ballard Estate, Mumbai – 400 038.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	

Mapping with Programme Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	S	M	S
CO2	S	S	M	S	S	S	S	S	S	M
CO3	S	S	S	S	S	S	S	S	M	S
CO4	S	S	M	S	S	S	S	S	S	M
CO5	S	S	S	S	S	S	S	S	M	S

*S-Strong; M-Medium; L-Low

Course code	ELECTIVE III				L	T	P	C
Core/Elective/ Supportive	B: TRENDS IN FARM MACHINERY				75	-	-	4
Pre-requisite	Basic knowledge on Farm Machinery.				Syllabus Version		2021 - 2022	
Course Objectives: The main objectives of this course are to:								
<ol style="list-style-type: none"> To learn the scope of mechanization to modernize the agropractices over traditional machinery. To understand the I.C. engines, working principles and repair of two stroke and four stroke engines. To get trained in selection and operation of tractor, tillage implements, seed drill, paddy transplanters, plant protection equipment and harvesting equipment. To acquire operating skills of equipment for land development and soil conservation. 								
Expected Course Outcomes:								
On the successful completion of the course, students are able to:								
1	Gain information about Farm Power						K 1	
2	Understand Mechanization, Benefits, Limitations and suggestions						K 2	
3	Understand about Tractors and its types						K 3& K4	
4	Get a thorough knowledge about Implementation of intercultural operations. Harvesting and Threshing Equipments						K 5	
5	Learn about the Plant protection equipments. Equipment for land development and soil conservation.						K 5&K6	
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create								
Unit:1		Farm Power					15 Hours	
Farm Power in India: Sources Farm Power in India : Sources 1) Human Power 2) Animal Power 3) Mechanical Power 4) Electrical Power 5) Renewable Energy. Traditional farm equipments and machines employed in agriculture practices. Pros and cons of traditional farm machinery.								
Unit:2		Mechanization					15 Hours	
Scope of Mechanization- Benefits of Farm Mechanization, Limitations & Suggestions. I.C. Engines, Working Principles, Two stroke and Four stroke engines .Components of I.C. Engine. I.C. Engine Terminology, Different Systems of I.C Engine								
Unit:3		Tractors and its types					15 Hours	
Tractors, Types, Selection of tractor, Tillage implements, Primary and secondary tillage implements, Sowing and Planting, Paddy Transplanter								
Unit:4		Intercultural operations					15 Hours	
Implements for intercultural operations. Harvesting and Threshing Equipments								

Unit:5	Plant protection equipments	15 Hours
Plant protection equipments. Equipment for land development and soil conservation		
Total Lecture hours		75 Hours
Text books		
1	Elements of Agricultural Engineering. Dr. Jagadishwar Sahay. Forth Edition, 2004	
2	Principles of Agricultural Engineering. Vol-I. T. P. Ojha and A. M. Michael. Jail Brothers, New Delhi	
3	Farm Tractor –Repair and Maintenance by S.C. Jain and C.R. Rai.	
4	Elements of Farm Machinery. A. C. Shrivastava. Oxford & IBH Publishing.	
5	Farm Machinery and Equipment. Smith and Wilkes	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		

Mapping with Programme Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	S	M	S
CO2	S	S	S	S	S	S	S	S	S	M
CO3	S	S	S	S	S	S	S	S	M	S
CO4	S	S	S	S	S	S	S	S	S	M
CO5	S	S	S	S	S	S	S	S	M	S

*S-Strong; M-Medium; L-Low



Allied Subject

Course code	ALLIED-I	L	T	P	C
Core/Elective/ Supportive	PLANT DIVERSITY	75	-	-	4
Pre-requisite	Basic knowledge on diversity of plant kingdom. Knowledge on organization, reproduction and classification of Algae, Fungi, Pteridophytes, Gymnosperms and Angiosperm.	Syllabus Version	2021 - 2022		
Course Objectives: The main objectives of this course are to:					
<ol style="list-style-type: none"> To understand the structural diversity of plant kingdom To learn the thallus organization, reproduction and classification of members of major divisions of plant kingdom with help of few type species To gain knowledge on angiosperm taxonomy 					
Expected Course Outcomes:					
On the successful completion of the course, students are able to:					
1	A thorough knowledge of general characters and classification of algae, bryophytes and Pteridophytes	K 1			
2	Gained knowledge about general characters and classification of fungi and lichens	K 2			
3	Overall view about Gymnosperms and its type species	K 3& K4			
4	Appreciate Palaeobotany and geological timescale	K 5			
5	A thorough knowledge of descriptive term used in taxonomy and its classification	K 5&K6			
6	Able to understand the descriptive characters of families along with their economic importance	K2			
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create					
Unit:1	Domain Classification	15 Hours			
Highlights of Five kingdom and three domain classification. Major divisions of plant kingdom. Differentiation of non-vascular and vascular plants, spore and seed producing plants					
Unit:2	Classification of Algae	15 Hours			
Algae :Range of thallus organization, pigmentation, reserve food and reproduction; Classification of Algae - G.M. Smith, Study of the structure, reproduction and life cycle of Spirulina, Nostoc and Caulerpa .Bryophytes; Classification of Bryophytes (Rothmaler 1951). Structure and reproduction of Riccia .					
Unit:3	Fungi and Lichen	15 Hours			
Fungi and Lichen : Range of thallus organization, nutrition and reproduction of fungi; Classification of fungi (Alexopoulos & Mims 1973) structure and reproduction of Saccharomyces and Aspergillus. Types and ecological significance of Lichens					
Unit:4	Pteridophytes	15 Hours			
Pteridophytes ;Classification of Pteridophytes (K.R.Sporne) Stelar evolution, Structure and Reproduction of Azolla. Gymnosperms; Classification of Gymnosperms (K.R.Sporne) Structure and					

Reproduction of Cycas . Brief introduction to Paleobotany and Geological time scale.		
Unit:5	Angiosperm taxonomy	15 Hours
Morphology -Descriptive terms used in Angiosperm taxonomy –Parts of plant, Phyllotaxy, Inflorescence, floral parts and arrangement, fruits. Taxonomy and its significance. Systems of classification - Natural - Bentham & Hooker, Modern Takhtajan (outline only). Detailed study on Fabaceae, Asteraceae, Poaceae.		
Total Lecture hours		75 Hours
Practicals		
<ol style="list-style-type: none"> 1. Study of types mentioned in the syllabus 2. Algae- Spirulina, Caulerpa, Gracillaria 3. Bryophytes- Riccia 4. Fungi and Lichens- Saccharomycetes, Aspergillus, Lichens 5. Pteridophytes- Azolla 6. Gymnosperms- Cycas 7. Paleobotany 8. Angiosperms- Fabaceae, Asteraceae, Poaceae 		
Text books		
1	Algae-S.Sundararajan.,Anmol Publications.,New Delhi	
2	Cryptogamic Botany. Vol.I- G.M. Smith.Tata McGraw Hill.,New Delhi	
3	A text Book of Botany - Algae - B.P. Pandey. S.Chand & Co., NewDelhi	
4	Algae - B.P. Pandey S.Chand & Co., NewDelhi	
5	Fungi- SKSingh.,Campus Books Int.,NewDelhi	
Reference books		
1	Botany for degree students, Bryophyta B.R Vashista. S. Chand & Co New Delhi	
2	Bryophytes-Morphology,growth and differentiation Prem Puri- Atma Ram & Sons Delhi	
3	A text Book of Botany - Pteridophytes - B.P. Pandey. S.Chand & Co., NewDelhi	
4	Pteridophyta - Vashishta, P.C S.Chand & Co., NewDelhi	
5	Morphology of Pteridohytes - K.R. Sporne. BI Publications NewDelh	
6	An introduction of Embryophyta - Pteridophyta - N.S.Parihar	
7	Cryptogamic Botany. Vol.II- G.M. Smith. Tata McGraw Hill, New Delhi	
8	Morphology of Gymnosperms .- K.R. Sporne.BI Publications NewDelhi	
9	An introduction of Palaeobotany - Arnold.,Agrobios., Jodhpur	
10	Gymnosperms - P.C. Vashishta S.Chand & Co., NewDelhi	
11	Phytogeography and Paleobotany.,Kumar.,N.C.,Emkay Publication.,Delhi	
12	Taxonomy of Angiosperms. Singh, V. and D.K. Jain, S.Chand & Co., NewDelhi	
13	An Introduction to Systematic Botany. AK Ganguly & NCKumar.,Emkay Pub.,Delhi	
14	Flowering Plants. Orgin and Despersal.,A M Takhtajan., Oliver Boyd Ltd.,Edinburgh	
15	Taxonomy of vascular plants Lawrence, G.H.M., 1951. Tata Mc Grw-Hill, New Delhi	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		

Course code	<u>ALLIED PAPER II</u>			L	T	P	C
Core/Elective/ Supportive	EMBRYOLOGY AND REPRODUCTIVE BIOLOGY			120			4
Pre-requisite	Basic knowledge in plant anatomy, morphology, reproduction of flowering plants.			Syllabus Version	2021- 2022		
Course Objectives:							
The main objectives of this course are to:							
<ol style="list-style-type: none"> 1. To learn the biology of reproductive process in plant kingdom 2. To understand the structure and development of micro and megasporangium 3. To study the agents of pollination and the adaptive features of flowers. 4. To understand the process of double fertilization and its significance 5. To learn embryo development, seed dispersal and fruit types 							
Expected Course Outcomes:							
On the successful completion of the course, students are able :							
1	Figure out embryology						K2
2	A thorough knowledge of fertilization						K2
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create							
Unit:1	Meristems					30 hours	
Structure and function of Apical Meristems - Root Apex and Shoot Apex - Theories of Meristems. Structure and function of simple and permanent tissues - Parenchyma, Collenchyma, Sclerenchyma, Xylem and Phloem. Structure and types of stomata. Types of reproduction (Vegetative, asexual and sexual), Alternation of generation in cryptogams and phanerogams, Heterospory and origin of seed habit.							
Unit:2	Morphology of angiosperm flower					15 hours	
Morphology of angiosperm flower. Structure and development of microsporangium, male gametophyte, Types of ovules, megasporangium, female gametophyte (Polygonum type)							
Unit:3	Pollination					30 hours	
Pollination- types and structural adaptations of flowers. The ecological importance of pollinators and pollination modes. Conserving Pollinators For Agriculture, Forestry And Nature							
Unit:4	Double fertilization					30 hours	
Double fertilization, endosperm - Structure, development and types of endosperm. Structure and development of dicot embryo (Capsella) and Monocot embryo (Paddy). Polyembryony,							

Parthenocarpy and Apomixis

Unit:5	Seed	15 hours
Seed- Structure - Types - Importance - Seed dormancy – Stages of Seed Development - Dispersal mechanism. Fruit- Formation, Parts and Types		
Total Lecture hours		120 hours
Practicals:		
<ol style="list-style-type: none"> 1. Morphology of angiosperm flowers 2. Structure of Microsporangium 3. Microsporogenesis 4. Pollen germination 5. Structure of megasporangium 6. Megasporogenesis 7. Endosperm, types, haustorium 8. Embryo development – 3 stages. 9. Seed structure- seed coat anatomy 		
Text Books		
1	An introduction to the Embryology of Angiosperms - P.Maheswari	
2	The Embryology of Angiosperms, S.S. Bhojwani & Bhatnagar, S.P. Vani Educational Books New Delhi	

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]