

KURUKSHETRA UNIVERSITY

KURUKSHETRA

(Established by the State Legislature Act-XII of 1956)

('A⁺⁺' Grade, NAAC Accredited)



Revised Scheme of Examination for Under-Graduate Programme

Subject: Botany
(1st to 8th Semesters)

**With Multiple Entry-Exit, Internship and CBCS-LOCF in
accordance to NEP-2020 w.e.f. 2025-26 (in phased manner)**

PLOs for Life Sciences

PLOs	UG Certificate in Life Sciences
After the completion of UG certificate in Life Sciences, the student should be able to:	
PLO_1: Knowledge and Understanding	· Demonstrate the knowledge of basic principles, concepts, facts and broad linkage of chosen subjects of Life sciences.
PLO_2: Skills And creativity	· Selecting and using relevant methods, tools, and materials to assess the appropriateness of approaches for solving problems associated with the chosen subjects of Life sciences.
PLO_3: Application of knowledge and Skills	· Apply the acquired operational or theoretical knowledge, and a range of practical skills to select and use basic methods, tools, materials, and information to generate solutions to specific problems relating to the chosen subjects of Life sciences.
PLO_4: Critical thinking	· Listen carefully, read texts, make judgments and make decisions based on analysis of data and evidence.
PLO_5: Ethics	· Put forward convincing arguments to respond to the ethical and moral issues associated with the chosen subjects, practice ethical and moral values in one's life.
PLO_6: Communication	· Express scientific thoughts and ideas effectively in writing and orally and communicate on scientific activities with others using appropriate media.
PLO_7: Lifelong Learning	· Acquire knowledge and skills including learning 'How to learn' that are necessary for participating in learning activities throughout life.
PLO_8: Environmental Awareness	· Demonstrate knowledge of effects of environmental degradation, climate change and pollution, effective waste management.
PLO_9: Digital Literacy	· To use ICT in a variety of learning and work situations.

PLOs	UG Diploma in Life Sciences
After the completion of UG Diploma in Life Sciences, the student should be able to:	
PLO_1: Knowledge and Understanding	· Demonstrate the deeper knowledge and understanding of principles, concepts, facts and broad linkage of chosen subjects of Life sciences.
PLO_2: Skills And creativity	· Selecting and using relevant methods, tools, and materials to assess the appropriateness of approaches from a range of sources for solving complex problems associated with the chosen subjects of Life sciences.
PLO_3: Application of knowledge and Skills	· Apply the acquired operational or theoretical knowledge, and a range of practical skills to select and use appropriate methods, tools, materials, and information to generate solutions to specific problems relating to the chosen subjects of Life sciences.
PLO_4: Critical thinking	· Listen carefully, read texts, make judgments and make decisions based on analysis of data and evidence, present complex information in a clear, scientific and concise manner.
PLO_5: Ethics	· Formulate arguments in support of actions to address the ethical and moral issues associated with the chosen subjects, practice ethical and moral values in one's life.

PLO_6: Communication	Express scientific thoughts and ideas effectively in writing and orally and communicate on scientific activities with others using appropriate media.
PLO_7:Lifelong Learning	Acquire knowledge and skills including learning ‘How to learn’ that are necessary for participating in learning activities throughout life.
PLO_8: Environmental Awareness	Apply knowledge, skills and attitude to mitigate the effects of environmental degradation, climate change and pollution, and effective waste management.
PLO_9:Digital Literacy	To use ICT in a variety of learning and work situations.

PLOs	Bachelor Degree in Life Sciences
After the completion of Bachelor degree in Life Sciences, the student should be able to:	
PLO_1: Knowledge and Understanding	Demonstrate the comprehensive and specialized knowledge and deep understanding of principles, concepts, and facts about current and emerging issues relevant to chosen subjects of Life sciences.
PLO_2: Skills And creativity	Selecting and using relevant methods, tools, and materials to assess the appropriateness of approaches for solving specific problems associated with the chosen subjects of Life sciences.
PLO_3: Application of knowledge and Skills	Apply the acquired operational or theoretical knowledge, and a range of practical skills to analyze quantitative and qualitative data to assess the different approaches to generate solutions to specific problems related to the chosen subjects of Life sciences.
PLO_4: Critical thinking	Listen carefully, read texts, make judgments and make decisions based on analysis of data and evidence, present complex information in a clear, scientific and concise manner.
PLO_5: Ethics	Follow ethical practices in all aspects of research and development, including avoiding unethical practices such as fabrication, falsification or misrepresentation of data or committing plagiarism.
PLO_6: Communication	Able to communicate effectively on complex scientific activities with the scientific community and with society at large, such as, being able to comprehend and write effective scientific reports and design documentation, make effective presentations.
PLO_7:Lifelong Learning	Acquire knowledge and skills including learning ‘How to learn’ that are necessary for participating in learning activities throughout life.
PLO_8: Environmental Awareness	Apply knowledge, skills and attitude to mitigate the effects of environmental degradation, climate change and pollution, effective waste management.
PLO_9:Digital Literacy	To use ICT in a variety of learning and work situations, appropriate software to analyze the data.
PLO_10:Research Aptitude	Ask relevant/appropriate questions, identifying, formulating and analyzing the research problems and to draw conclusions from the analysis.

SEMESTER-2									
Remarks	Course	Paper(s)	Nomenclature of Paper	Credits	Hours/Week	Internal marks	External Marks	Total Marks	Exam Duration
Scheme A&C	CC-2	B23-BOT-201	Plant Taxonomy and Ecology	3	3	20	50	70	3 hrs.
	MCC-3		Practical	1	2	10	20	30	4 hrs.
Scheme C only	DSEC-1	B23-BOT-202	Plant Propagation	3	3	20	50	70	3 hrs.
	4 credits		Practical	1	2	10	20	30	4 hrs.
Scheme Aonly	CC-M2	B23-BOT-203	Angiosperm Diversity & Reproduction	1	1	10	20	30	3 hrs.
	2 credits		Practical	1	2	5	15	20	4 hrs.
Scheme A&C	MDC-2	B23-BOT-204	Seed Plants and Economic Botany	2	2	15	35	50	3 hrs.
	3 credits		Practical	1	2	5	20	25	4 hrs.
Scheme C only	CC-M2	From Available CC-M2 of 4 credits as per NEP							
Scheme A&C	AEC-2	From Available AEC-2 of two credits as per NEP							
	SEC-2	From Available SEC-2 of three credits as per NEP							
	VAC-2	From Available VAC-2 of two credits as per NEP							
Internship of 4 credits of 4-6 weeks duration after 2 nd Semester									

SEMESTER-3									
Remarks	Course	Paper(s)	Nomenclature of Paper	Credits	Hours/Week	Internal marks	External Marks	Total Marks	Exam Duration
Scheme A, B & C	CC-3	B23-BOT-301	Plant Physiology	3	3	20	50	70	3 hrs.
	MCC-4 4 credits		Practical	1	2	10	20	30	4 hrs.
Scheme B & C	MCC-5 4 credits	B23-BOT-302	Plant Stress Physiology	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	4 hrs.
Scheme A, B & C	MDC-3 3 credits	B23-BOT-303	Ornamental plants and their propagation	2	2	15	35	50	3 hrs.
			Practical	1	2	5	20	25	4 hrs.
Scheme A only	CC-M3 4 credits	B25-BOT-304	Plant Physiology and Ecology	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	4 hrs.
Scheme B only	CC-M3(V) 4 credits	From Available CC-M3(V) of 4 credits as per NEP							
Scheme A, B & C	AEC-3 2 credits	From Available AEC-3 of two credits as per NEP							
	SEC-3 3 credits	From Available SEC-3 of three credits as per NEP							
Scheme C only	VAC-3 2 credits	From Available VAC-3 of two credits as per NEP							
Scheme B only	MCC-3	MCC-2 FROM SCHEME C OF FIRST SEMESTER							

SEMESTER-4									
Remarks	Course	Paper(s)	Nomenclature of Paper	Credits	Hours/Week	Internal marks	External Marks	Total Marks	Exam Duration
Scheme A, B & C	CC-4	B23-BOT-401	Cytology and Genetics	3	3	20	50	70	3 hrs.
	MCC-6 4 credits		Practical	1	2	10	20	30	4 hrs.
Scheme B & C	MCC-7 4 credits	B23-BOT-402	Plant Molecular Biology	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	4 hrs.
Scheme B & C	MCC-8 4 credits	B23-BOT-403	Plant Breeding	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	4 hrs.
Scheme B & C	DSE-1 4 credits	B23-BOT-404	Plant Tissue Culture	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	4 hrs.
	Select one option	B23-BOT-405	Bioethics, Biosafety and IPR	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	4 hrs.
Scheme A, B & C	CC-M4(V) 4 credits	From Available CC-M4(V) of 4 credits as per NEP							
	AEC-4 2 credits	From Available AEC-3 of two credits as per NEP							
Scheme C only	VAC-4 2 credits	From Available VAC-4of two credits as per NEP							
Scheme A & B	VAC-3 2 credits	From Available VAC-3of two credits as per NEP							
Internship of 4 credits of 4-6 weeks duration after 4 th Semester (if not done after second semester)									

SEMESTER-5									
Remarks	Course	Paper(s)	Nomenclature of Paper	Credits	Hours/Week	Internal marks	External Marks	Total Marks	Exam Duration
Scheme A, B & C	CC-5 MCC-9 4 credits	B23-BOT-501	Economic Botany and Plant Biotechnology	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	4 hrs.
Scheme B & C	MCC-10 4 credits	B23-BOT-502	Reproduction in Higher Plants	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	4 hrs.
Scheme B & C	DSE-2 4 credits Select One Option	B23-BOT-503	Plant Biochemistry and Metabolism	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	4 hrs.
		B23- BOT-504	Modern Plant Systematics	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	4 hrs.
Scheme B & C	DSE-3 4 credits Select One Option	B23- BOT-505	Natural Plant Products	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	4 hrs.
		B23-BOT-506	Plants and Medicines	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	4 hrs.
Scheme A & C	CC-M5(V) 4 credits	From Available CC-M5(V) of 4 credits as per NEP							
Scheme A, B & C	Internship 4 credits	Internship 4 credit after 4 th semester							

SEMESTER-6									
Remarks	Course	Paper(s)	Nomenclature of Paper	Credits	Hours/ Week	Internal marks	External Marks	Total Marks	Exam Duration
Scheme A, B &C	CC-6 MCC-11 4 credits	B23-BOT-601	Plant Anatomy & Embryology	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	4 hrs.
Scheme B &C	MCC-12 4 credits	B23- BOT-602	Plant Pathology	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	4 hrs.
Scheme B &C	DSE-4 4 credits Select one Option	B23- BOT-603	Agroforestry	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	4 hrs.
		B23-BOT-604	Post-harvest Technology of Fruits & Vegetables	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	4 hrs.
Scheme B &C	DSE-5 4 credits Select one Option	B23- BOT-605	GIS and Remote Sensing	3	3	20	50	70	3 hrs.
			B23- BOT-606	Evolutionary and Behavioural Biology	3	3	20	50	70
		Practical		1	2	10	20	30	4 hrs.
Scheme A only	CC-M6 4 credits	B25- BOT-607	Biotechnology and Applied Botany	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	4 hrs.
Scheme A only	CC-M7(V) 4 credits	From Available CC-M7(V) of 4 credits as per NEP							
Scheme B only	CC-M5(V) 4 credits	From Available CC-M5(V) of 4 credits as per NEP							
Scheme C only	CC-M6(V) 4 credits	From Available CC-M6(V) of 4 credits as per NEP							
Scheme C only	SEC-4 2 credits	From Available SEC-4 of two credits as per NEP							

SEMESTER-7 (FOR HONOURS / HONOURS WITH RESEARCH IN BOTANY)									
Remarks	Course	Paper(s)	Nomenclature of Paper	Credits	Hours/ Week	Internal marks	External Marks	Total Marks	Exam Duration
Honours in Botany/ Honours with Research in Botany (For Scheme B & C)	CC-H1 4 credits	B23- BOT-701	Algae &Fungi	4	4	30	70	100	3hrs.
	CC-H2 4 credits	B23-BOT-702	Bryophytes & Pteridophytes	4	4	30	70	100	3hrs.
	CC-H3 4 credits	B23- BOT-703	Cytogenetics & Plant Breeding	4	4	30	70	100	3hrs.
	DSE-H1 4 credits Select one Option	B23- BOT-704	MOOC Course	4	4	30	70	100	3hrs.
		B23- BOT-705	Basics of Genomics and Proteomics	4	4	30	70	100	3hrs.
		B23- BOT-706	Computational Botany	4	4	30	70	100	3hrs.
	PC-H1 4 credits	B23- BOT-707	Practical Based on B23-BOT-701 TO704/705/706	4	8	30	70	100	6hrs.
	CC-HM1 4 credits	From Available Minor of 4 credits as per NEP							

SEMESTER-8 (FOR HONOURS IN BOTANY)									
Remarks	Course	Paper(s)	Nomenclature of Paper	Credits	Hours/Week	Internal marks	External Marks	Total Marks	Exam Duration
Honours In Botany (For Scheme B & C)	CC-H4 4 credits	B23-BOT-801	Microbiology and Biostatistics	4	4	30	70	100	3hrs.
	CC-H5 4 credits	B23-BOT-802	Natural Resources & Biodiversity	4	4	30	70	100	3hrs.
	CC-H6 4 credits	B23-BOT-803	Gymnosperm & Ethanobotany	4	4	30	70	100	3hrs.
	DSE-H2 4 credits Select one option	B23-BOT-804	Molecular Genetics	4	4	30	70	100	3hrs.
		B23-BOT-805	Plant Morphogenesis	4	4	30	70	100	3hrs.
	PC-H2 4 credits	B23-BOT-806	Practical Based on B23-BOT-801 TO804/805	4	8	30	70	100	6hrs.
	CC-HM2 4 credits	From Available Minor of 4 credits as per NEP							

OR

SEMESTER-8 (FOR HONOURS WITH RESEARCH IN BOTANY)									
Remarks	Course	Paper(s)	Nomenclature of Paper	Credits	Hours/ Week	Internal marks	External Marks	Total Marks	Exam Duration
Honours with Research in Botany (For Scheme B & C)	CC-H4 4 credits	B23-BOT-801	Microbiology and Biostatistics	4	4	30	70	100	3hrs.
	CC-H5 4 credits	B23-BOT-802	Natural Resources & Biodiversity	4	4	30	70	100	3hrs.
	Project/ Dissertation 12 credits	B23-BOT-807	Project/ Dissertation	8+4	-	-	-	-	-
	CC-HM2 4 credits	From Available Minor of 4 credits as per NEP							

Session: 2025-26			
Part A – Introduction			
Subject		BOTANY	
Semester		4 th	
Name of the Course		Basics of Medicinal Plants	
Course Code		B23-VAC-408	
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)		VAC-4	
Level of the course (As per Annexure-I)		100-199	
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):		After studying this course, the students will be able to understand: 1. History and importance of medicinal plants at national and international level. 2. Different systems of medicine and methods to extract active compounds as well as preparation of herbal remedies. 3. Students will gain knowledge about important medicinal plants and their parts used for herbal therapy. 4. Students will get acquainted with state and national level boards to manage conservation and sustainable use of medicinal plants. 5. * Students will understand and get acquainted with practical aspects of collection, storage of medicinal plants, preparation of herbal remedies by different methods, grading and post-harvest handling of medicinal plants, essential oil extraction and microscopic evaluation of drug adulteration.	
		Theory	Practical Total
Credits	2	0	2
Contact Hours	2	0	2
THEORY			
Max. Marks: 50 Internal Assessment Marks: 15 End Term Exam Marks: 35		Time: 3 Hours	
Part B-Contents of the Course			
Instructions for Paper- Setter 1. Nine questions will be set in all. All questions will carry equal marks. 2. Question No.1 will be short answer type covering the entire syllabus and will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each unit. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.			
Un it	Topics		Contact Hours
I	Introduction to Medicinal Plants & Traditional Wisdom What are medicinal plants? Their role in Ayurveda Importance of preserving Indian traditional knowledge Role of Household herbal practices across Indian subcontinent in primary healthcare.		7
II	Traditional system of medicine in India, Concept and principles of		7

	Ayurveda, Siddha, Unani and Homeopathy. Methods of extraction of active compounds: polar and non-polar extraction; extraction of essential oils; Types of herbal remedies: maceration, infusion, decoction, tinctures, compress, bathing, pills and ointments.	
III	Some important medicinal plants of India and their uses: <i>Aloe vera</i> , <i>Ocimum sanctum</i> , <i>Mentha spicata</i> , <i>Swertia chirata</i> , <i>Azadirachta indica</i> , <i>Justicia adhatoda</i> , <i>Terminalia arjuna</i> , <i>T. chebula</i> , <i>Withania somnifera</i> , <i>Asparagus racemosus</i> , <i>Tinospora cordifolia</i> , <i>Acacia nilotica</i> ,	8
IV	National Medicinal Plant Board and State Medicinal Plant Boards- objectives and functions. Role of Sacred groves in medicinal plants conservation. Role of documentation of community knowledge in future drug development. Famous herbal markets of India.	8
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation : 04 • Seminar/presentation/assignment/quiz/class test etc. : 04 • Mid-Term Exam : 07		End Term Examination Theory : 35
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • Kochhar, S. L. (2016). Economic Botany in the Tropics (4thed.). Macmillan Publishers India. • Council of Scientific and Industrial Research (CSIR). (1986). Useful Plants of India. CSIR. • Jain, S. K. (1995). Manual of Ethnobotany (2nded.). Scientific Publishers. • Kirtikar, K.R. & Basu, B.D. (1934). Indian Medicinal Plants. Lalit Mohan Basu, Allahabad • Khare, C.P. (2007). Indian Medicinal Plants: An Illustrated Dictionary. Springer Verlag Berlin. • Arya Vaidya Sala (2005). Indian Medicinal Plants: A Compendium of 500 Species, Orient Longman, Hyderabad • Kala, C.P. (2010). Medicinal Plants of Uttarakhand. Biotech. Books, India. • Bhattacharjee, K. (2009). Handbook of Medicinal and Aromatic Plants. Pointer Publisher. • Panda, H.(2013). Handbook of Ayurvedic Medicines. National Institute of Industrial Research, Delhi 7 • Chaturvedi, A.(2008). Ethnobotany and Taxonomy of Angiosperms. Rashtrasant Tukadoji Maharaj Nagpur University Press. • Dutt, A.(2009). An Introduction to Medicinal Plants, 1st Edition. Adhyayan Publishers, and distributors.		

Session: 2025-26			
Part A – Introduction			
Subject	BOTANY		
Semester	3 rd		
Name of the Course	Biofertilizers		
Course Code	B23-SEC-307		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	SEC-3		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand the concept, importance, and advantages of biofertilizers in natural farming. 2. Identify different types of biofertilizers and explain their specific functions in crop production. 3. Apply biofertilizers through appropriate techniques such as seed treatment, soil treatment, and root dipping. 4. Evaluate the role of biofertilizers in sustainable agriculture and recognize government support and success cases. 5. Demonstrate practical skills in handling, applying, and promoting biofertilizers through farm visits, observations, and presentations.		
	Theory	Practical	Total
Credits	2	1	3
Contact Hours	2	2	4
THEORY			
Max. Marks: 50 Internal Assessment Marks: 15 End Term Exam Marks: 35	Time: 3 Hours		
PRACTICAL			
Max. Marks: 25 Internal Assessment Marks: 5 End Term Exam Marks: 20	Time: 4 Hours		
Part B-Contents of the Course			
Instructions for Paper- Setter 1. Nine questions will be set in all. All questions will carry equal marks. 2. Question No.1 will be short answer type covering the entire syllabus and will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each unit. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.			
Unit	Topics		Contact Hours
I	Definition and concept of biofertilizers, difference between chemical fertilizers and biofertilizers, importance of biofertilizers in natural farming, advantages of biofertilizers including eco-friendly nature, low cost, and improvement of soil health.		7
II	Types of biofertilizers and their functions including Rhizobium for legumes, Azotobacter and Azospirillum for cereals and vegetables, Blue-Green Algae (BGA) and Azolla for rice fields, Phosphate Solubilizing Bacteria (PSB), and Mycorrhiza for root symbiosis.		7

III	Application techniques of biofertilizers including seed treatment, soil treatment, and root dipping, storage and shelf-life of biofertilizers, precautions for handling and application, and compatibility with organic manure and compost.	8
IV	Role of biofertilizers in sustainable agriculture, contribution to organic farming, improvement of crop yield and soil fertility naturally, government support and schemes for promoting biofertilizers, and success stories or case studies of farmers using biofertilizers.	8
V	• Identification of different types of biofertilizers • Demonstration of seed treatment and soil application • Preparation of a basic compost mix with biofertilizer • Visit to an organic farm or KrishiVigyan Kendra (KVK) • Observation of vegetative growth difference with and without biofertilizers. • Prepare a simple chart/poster showing use of biofertilizers in crops	30

Suggested Evaluation Methods

Internal Assessment: >Theory • Class Participation : 04 • Seminar/presentation/assignment/quiz/class test etc. : 04 • Mid-Term Exam : 07 >Practical • Class Participation : NA • Seminar/Demonstration/Viva-voce/Lab records etc. : 05 • Mid-Term Exam : NA	End Term Examination Theory : 35 Practical : 20
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Part C-Learning Resources

Recommended Books/e-resources/LMS: • SubbaRao, N. S. (2018). Soil Microbiology and Sustainable Crop Production. CRC Press. • Gaur, A. C. (2008). Biofertilizers in Sustainable Agriculture. Indian Council of Agricultural Research. • Sharma, A. K. (2002). Biofertilizers for Sustainable Agriculture. Agrobios. • Bhattacharyya, P. & Chakraborty, G. (2019). Organic Farming in India: Problems and Prospects. New India Publishing Agency. • Palaniappan, S. P., & Annadurai, K. (1999). Organic Farming: Theory and Practice. Scientific Publishers. • Singh, R. P. (2016). Biofertilizers and Biopesticides. Scientific Publishers. • Kumar, A., & Rai, R. K. (2019). Biofertilizers and their Applications. New India Publishing Agency. • Kannaiyan, S., Kumar, K., & Govindarajan, K. (2016). Biofertilizers Technology. Scientific Publishers.

Session: 2025-26			
Part A – Introduction			
Subject	BOTANY		
Semester	3 rd Or 5 th		
Name of the Course	Organic Farming		
Course Code	B23-VOC-109		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	VOC-1		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand the basics of organic farming and its winter relevance. 2. Select and grow suitable winter vegetables organically. 3. Prepare and use organic fertilizers and pest control solutions. 4. Manage irrigation, soil health, and crop care efficiently. 5. Harvest, market, and maintain records for a small winter vegetable business.		
	Theory	Practical	Total
Credits	2	2	4
Contact Hours	2	4	6
THEORY			
Max. Marks: 50 Internal Assessment Marks: 15 End Term Exam Marks: 35	Time: 3 Hours		
PRACTICAL			
Max. Marks: 50 Internal Assessment Marks: 15 End Term Exam Marks: 35	Time: 4 Hours		
Part B-Contents of the Course			
Instructions for Paper- Setter 1. Nine questions will be set in all. All questions will carry equal marks. 2. Question No.1 will be short answer type covering the entire syllabus and will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each unit. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.			
Unit	Topics	Contact Hours	
I	Introduction to Organic Farming and Its Importance Benefits of organic over chemical farming Basic principles of organic farming (Health, Ecology, Fairness, Care) Importance of growing organic vegetables in winter Market demand and consumer trends Introduction to popular winter vegetables: spinach, radish, carrot, cabbage, peas, beetroot, etc.	7	
II	Choosing suitable vegetables based on climate, soil, and demand Seed selection: indigenous and certified seeds Nursery techniques and transplanting methods Crop rotation and companion planting for vegetables Farm layout: raised beds, furrows, and spacing Seasonal calendar for winter vegetable sowing	7	

III	Preparation and use of organic fertilizers: Vermicompost, Farmyard manure, Jeevamrit, Beejamrit, Panchgavya, Green manure Bio-pesticides: neem oil, garlic-ginger spray, dashparni ark Soil structure, drainage, and mulching for vegetables Composting kitchen and garden waste Preventing and controlling pests/diseases in leafy and root vegetables Safe, low-cost remedies for common winter vegetable issues	8
IV	Irrigation techniques: drip, alternate row watering. Monitoring crop health and timely intercultural operations Harvesting schedule for different vegetables Post-harvest handling: sorting, grading, storing Local marketing: vegetable carts, farmer markets, direct home delivery Introduction to organic certification & FSSAI basics for small businesses Creating a mini organic kitchen garden business model	8
V*	Practical and Field Work • Preparing vegetable beds and compost pits • Sowing/transplanting spinach, methi, radish, and peas • Preparing and applying Jeevamrit/organic sprays • Monitoring growth, applying mulch, and weeding • Harvesting leafy and root vegetables • Post-harvest cleaning, bundling, and simple packing • Visit to local organic farms or home garden models • Interacting with a local organic vegetable grower • Cost calculation and record-keeping for a small wintervegetable plot Students' practical report submission and presentation.	60

Suggested Evaluation Methods

Internal Assessment: >Theory • Class Participation : 04 • Seminar/presentation/assignment/quiz/class test etc. : 04 • Mid-Term Exam : 07 >Practical • Class Participation : 05 • Seminar/Demonstration/Viva-voce/Lab records etc. : 10 • Mid-Term Exam : NA	End Term Examination Theory : 35 Practical : 35
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Part C-Learning Resources

Recommended Books/e-resources/LMS: • Palaniappan, S. P., & Annadurai, K. (1999). <i>Organic Farming: Theory and Practice</i>. Scientific Publishers. • Narayan, S. (2005). <i>Organic Farming for Sustainable Agriculture</i>. Agrobios. • Lal, R., & Stewart, B. A. (2012). <i>Soil Water and Agronomic Productivity</i>. CRC Press. • Bose, T. K., & Som, M. G. (2021). <i>Vegetable Crops</i>. Naya Udyog. • Yawalkar, K. S. (2004). <i>Vegetable Crops in India</i> (4thed.). Agrobios. • Reddy, S. R. (2016). <i>Principles of Crop Production</i>. Kalyani Publishers. • Singh, S. P. (2017). <i>Production Technology of Vegetables and Flowers</i> (3rded.). CBS Publishers. • Gaur, A. C. (2008). <i>Biofertilizers in Sustainable Agriculture</i>. Indian Council of Agricultural Research. • Bhattacharyya, P., & Chakraborty, G. (2019). <i>Organic Farming in India: Problems and Prospects</i>. New India Publishing Agency. • Sharma, A. K. (2002). <i>Biofertilizers for Sustainable Agriculture</i>. Agrobios.

- SubbaRao, N. S. (2018). *Soil Microbiology and Sustainable Crop Production*. CRC Press.
- Michael, A. M. (2009). *Irrigation Theory and Practice*. Vikas Publishing.
- Rangaswamy, R., & Mahajan, P. K. (2017). *Marketing of Agricultural Produce*. Kalyani Publishers.
- Tripathi, L., & Kumawat, S. (2020). *Post-harvest Management of Horticultural Crops*. New India Publishing Agency.
- Dhaliwal, M. S. (2021). *Handbook of Vegetables*. Kalyani Publishers

Session: 2025-26			
Part A – Introduction			
Subject	BOTANY		
Semester	4 th		
Name of the Course	Floriculture		
Course Code	B23-VOC-209		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	VOC-2		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Prepare soil mixtures for potted plants, hanging baskets, and field cultivation. 2. Identify and cultivate various flowering, succulent, cacti, and water plants. 3. Apply propagation techniques like cutting, layering, budding, and grafting. 4. Perform post-harvest handling, marketing, and value addition in floriculture. 5. Create floral arrangements, terrariums, and dry flower art through practical skills.		
	Theory	Practical	Total
Credits	2	2	4
Contact Hours	2	4	6
THEORY			
Max. Marks: 50 Internal Assessment Marks: 15 End Term Exam Marks: 35		Time: 3 Hours	
PRACTICAL			
Max. Marks: 50 Internal Assessment Marks: 15 End Term Exam Marks: 35		Time: 4 Hours	
Part B-Contents of the Course			
Instructions for Paper- Setter 1. Nine questions will be set in all. All questions will carry equal marks. 2. Question No.1 will be short answer type covering the entire syllabus and will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each unit. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.			

Unit	Topics	Contact Hours
I	Floriculture: An Introduction. History of Gardening in India. Importance and scope of Floriculture in India. Various components of Floriculture Industry in India Routine Garden operations. Sexual and vegetative methods of plant propagation; Role of plant growth regulators in floriculture. Preparation of soil mixtures for growing plants in pots, hanging basket, indoor plants.	7
II	Ornamental Plants: Flowering annuals; Herbaceous perennials; Climbers; Shrubs and ornamental trees; Ornamental bulbous and foliage plants; Cacti and succulents; Palms and Cycads; Ferns and Selaginellas; Indoor gardening; Aquatic Plants.	7
III	Principles of Garden Designs: English, Italian, Persian and Japanese gardens; Features of a garden (garden wall, fencing, steps, hedge, edging, lawn, flower beds, shrubbery, borders, water garden. Some famous gardens of India. Modern trends in Floriculture- terrarium, hanging baskets, kokedama, air plants.	8
IV	Commercial floriculture: Factors affecting flower production; Production and packaging of cut flowers; Methods to prolong vase life. Cultivation of Important cut flowers-Carnation, Chrysanthemum, Gerbera, Gladiolous and Lilium).Diseases and Pests of Ornamental Plants.	8
V*	Practical and Field Work - Investigating the effect of different flower preservatives on the vase life of common ornamental flowers. - Settingup a laboratory scale hydroponics setup. - Study of different diseases in ornamental plants. - Preparation of soil mixtures for plants. - Study of propagation techniques of plants. - Study of terrarium making. - Study of floral arrangements (Bouquet formation). - Study of dry flowers art.	60

Suggested Evaluation Methods

Internal Assessment: >Theory - Class Participation : 04 - Seminar/presentation/assignment/quiz/class test etc. : 04 - Mid-Term Exam : 07 >Practical - Class Participation : 05 - Seminar/Demonstration/Viva-voce/Lab records etc. : 10 - Mid-Term Exam : NA	End Term Examination Theory : 35 Practical : 35
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Part C-Learning Resources

Recommended Books/e-resources/LMS:

- Prasad, S. & Kumar, U. (2010). A Handbook of Floriculture. Agrobios (India).
- Ravinath. D. (2007). Floriculture: A Viable Business. Excel Books.
- Arora, J.S. (2007). Introductory Ornamental Horticulture, 8th Edition. Kalyani Publications.
- Council of Scientific and Industrial Research (CSIR). (1986). Useful Plants of India. Publications & Information Directorate, CSIR.
- Paliwal, H. K.(2009). Ornamental Gardening. National Book Trust India, New Delhi.
- Singh, A.K. & Kumar A. (2023). Plant Propagation and Nursery management. S.K. Kataria and sons.
- Sabina, G.T. & Peter, K.V. (2008). Ornamental Plants for Gardens. New India Publ. Agency.
- Reddy, S., Janakiram, B., Balaji, T., Kulkarni, S. & Misra, R.L. (2007). Hightech Floriculture. Indian Society of Ornamental Horticulture, New Delhi.
- Bhattacharjee, S.K. (2006). Advances in Ornamental Horticulture. Vols. I-VI. Pointer Publ.
- Prasad, S. & Kumar, U. (2003). Commercial Floriculture. Agrobios.
- Singh, B., Singh, N. & Kumar, K. (2015). Common Garden Plants. Unique Publications Panipat.
- Kashyap, B., Thakur, A.K. & Bassi, S.K. (2019). Floriculture. S. Dinesh and Co. Jalandhar.

Session: 2025-26	
Part A – Introduction	
Subject	BOTANY
Semester	1st
Name of the Course	Plant Diversity
Course Code	B23-BOT-103
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-M1
Level of the course (As per Annexure-I)	100-199
Pre-requisite for the course (if any)	
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1: The general characteristics of microorganisms, algae and fungi will be understandable to students. 2: Students will acquire a conceptual knowledge of plant cell and tissue system 3: Students will acquire a conceptual grasp of bryophytes and pteridophytes. 4: Students will acquire knowledge about the fundamental features of gymnosperms. 5*. Student will gain the knowledge about the practical aspects related to identification, structure, economic values of microorganisms, algae, fungi, bryophytes, pteridophytes gymnosperms, and angiosperms.

Credits	Theory	Practical	Total
	1	1	2
Contact Hours	1	2	3

THEORY

Max. Marks: 30 Internal Assessment Marks:10 End Term Exam Marks: 20	Time: 3 Hours
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PRACTICAL

Max. Marks: 20 Internal Assessment Marks: 05 End Term Exam Marks: 15	Time: 4 Hours
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Part B-Contents of the Course

Instructions for Paper-Setter

- Nine questions will be set in all. All questions will carry equal marks.
- Question No.1 will be short answer type covering the entire syllabus and will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each unit. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.

Unit	Topics	Contact Hours
I	Diversity at Cellular level: Prokaryotic and Eukaryotic Cell; Plant cell structure and brief idea about plant tissues	4
II	Morphological features and economic importance of viruses, bacteria and fungi	4
III	Morphological features and economic importance of algae, bryophytes and pteridophytes.	4
IV	Morphological features and economic importance Gymnosperms.	3

V*	• Identification of some common Algae and Fungi. • Morphological study of Marchantia and Funaria. • Morphological study of Seleginella and Pteris • Morphological study of Cycas and Pinus.	30
Suggested Evaluation Methods		
Internal Assessment: > Theory • Class Participation: 04 • Seminar/presentation/assignment/quiz/class test etc.: NA • Mid-Term Exam: 06 > Practicum • Class Participation: NA • Seminar/Demonstration/Viva-voce/Lab records etc.: 05 • Mid-Term Exam: NA		End Term Examination: Theory : 20 Practical : 15
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • Wiley, J.M., Sherwood, L.M. & Woolverton, C.J.(2019). Prescott's Microbiology.11th Edition. McGraw Hill International. • Lee, R.E. (2018). Phycology.5thEdition. Cambridge University Press. • Ahluwalia, A.S. (2020).Phycology: Principles, Processes and Applications. Daya Publishing House, New Delhi. • Mehrotra, R.S. & Aggarwal, A.(2013).Fundamentals of Plant Pathology, Tata McGraw-Hill Publishing company Ltd, New Delhi • Sethi, I.K. & Walia, S.K. (2011). Textbook of Fungi & Their Allies, MacMillan Publishers Pvt. Ltd., Delhi. • Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R. (2005). Biology. Tata McGraw Hill, Delhi, India. • Sharma, O.P. (2017).Text Book of Pteridophyta, McMillan India Ltd. • Thakur, A.K. and Bassi, S.K. (2008). Diversity of Microbes and Cryptogams. S. Chand Publishing. • Vashishta, P.C., Sinha, A.K., Kumar, A., (2010). Pteridophyta .S. Chand Publishing. • Vashishta, P.C., Sinha, A.K., Kumar, A., (2010).Gymnosperms. S. Chand Publishing.		

Session: 2025-26			
Part A - Introduction			
Subject	BOTANY		
Semester	2 nd		
Name of the Course	Angiosperm Diversity and Reproduction		
Course Code	B23-BOT-203		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-M2		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand morphological variations in angiosperms. 2. Students will gain knowledge about taxonomy, including the rules of nomenclature and other essential aspects. 3. Students will acquire an understanding of angiosperm families and diversity within them. 4. Understand modes of vegetative and sexual reproduction in plants. 5. Describe pollination, fertilization, and reproductive structures in flowering plants.		
	Theory	Practical	Total
Credits	1	1	2
Contact Hours	1	2	3
THEORY			
Max. Marks: 30 Internal Assessment Marks: 10 End Term Exam Marks: 20	Time: 3 Hours		
PRACTICAL			
Max. Marks: 20 Internal Assessment Marks: 5 End Term Exam Marks: 15	Time: 4 Hours		
Part B-Contents of the Course			
Instructions for Paper- Setter 1. Nine questions will be set in all. All questions will carry equal marks. 2. Question No.1 will be short answer type covering the entire syllabus and will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each unit. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.			
Unit	Topics		Contact Hours
I	Morphology of angiosperms: Types of root stem and leaves and their modifications in brief. Flower and its parts alongwith their significance.		4
II	Major principles of Botanical Nomenclature. Brief idea about herbaria, botanical gardens, floras, monographs and journals. Definitions of Artificial, natural and phylogenetic classification. Brief idea about APG IV classification.		4
III	Diagnostic features and economic importance of the following families: Malvaceae, Leguminosae, Lamiaceae, Solanaceae, Asteraceae and Poaceae.		3
IV	Vegetative propagation in angiosperms. Sexual reproduction in Angiosperms-structure of Anther and Ovary Brief idea about Pollination and fertilization. General structure of a dicot and monocot seed		4
V*	- Study of Modifications of Leaves. Stem and Root (5 each) - Study of methods of vegetative propagation through layering, grafting, cutting bulbils etc.		30

	- Study of vegetative and floral characters of the one or two member of each family theory syllabus (Description, V.S. flower, section of ovary, floral diagram/s, floral formula/e). - Excursion Report: Report on excursion tours with photographs, collection, preservation and preparation of herbarium sheets and specimens related to Angiosperms. Mounting of a collected, properly dried and pressed specimen of minimum 10 wild plants with herbarium label.	
Suggested Evaluation Methods		
Internal Assessment: >Theory - Class Participation : 04 - Seminar/presentation/assignment/quiz/class test etc. : NA - Mid-Term Exam : 6 >Practical - Class Participation : NA - Seminar/Demonstration/Viva-voce/Lab records etc. : 5 - Mid-Term Exam : NA		End Term Examination Theory : 20 Practical : 15
Part C-Learning Resources		
Recommended Books/e-resources/LMS: - Singh, G.(2021).Plant Systematics: An Integrated Approach, CRC Press. - Sharma, O.P.(2017).Plant Taxonomy, McGraw Hill Publication - Gangulee, Das and Datta (2011).College Botany Volume 2,New Central Book Agency - Singh, Pande & Jain (2005) .A Textbook of Botany: Reproduction, Development and Ecology, Rastogi Publication. - Dirr, M.A. & Heuser, Jr. C.W. (2006).The Reference Manual of Woody Plant Propagation From Seed to Tissue Culture. Timber Press, Inc. Portland, OR. 2nd edition. - Simpson, G.M. (2005).Plant Systematics. Academic Press. - Pandey, A.K. (2022). Reproductive Biology of Angiosperms. CRC Press.		

Session: 2025-26			
Part A – Introduction			
Subject	BOTANY		
Semester	1 st		
Name of the Course	Fundamentals of Botany		
Course Code	B23-BOT-104		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	MDC-1		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Explain cell structure, type of cells and functions of cell organelles. 2. Explain cell division and type of tissues. 3. Students will gain a foundational understanding of the biology of micro organisms, algae and fungi. 4. Students will develop a conceptual understanding of bryophytes and pteridophytes. 5*.Students will be able to learn the practical aspects of microorganisms, algae, fungi and students will be able to identify the major groups of plants and compare the characteristics in between different groups.		
	Theory	Practical	Total
Credits	2	1	3
Contact Hours	2	2	4
THEORY			
Max. Marks: 50 Internal Assessment Marks: 15 End Term Exam Marks: 35	Time: 3 Hours		
PRACTICAL			
Max. Marks: 25 Internal Assessment Marks: 05 End Term Exam Marks: 20	Time: 4 Hours		
Part B-Contents of the Course			
Instructions for Paper- Setter 1. Nine questions will be set in all. All questions will carry equal marks. 2. Question No.1 will be short answer type covering the entire syllabus and will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each unit. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.			
Unit	Topics		Contact Hours
I	Basics of Cell Biology: Prokaryotic vs. eukaryotic cells; Plant and Animal Cell Cell organelles and their functions in brief.		7
II	Cell division: brief idea about Mitosis. Brief idea about plant tissues.		7
III	General characteristics in brief and economic importance of viruses, bacteria algae and fungi		8
IV	General characteristics and economic importance of Bryophytes and Pteridophytes		8

V*	• Difference between animal and plant cell with the help of photographs/ charts. • Study of Mitosis from prepared slides/charts/ photographs • Cynobacteria & Algae: Study of slides of <i>Nostoc</i> and <i>Volvox</i> through permanent slides. • <i>Agaricus</i>: Specimens of button stage and full Grown mushrooms. • <i>Marchantia</i> & <i>Funaria</i>- morphology of thallus through permanent slides. • <i>Selaginella</i> & <i>Pteris</i>-morphology of plants through specimen study. • Excursion Report: Report on excursion tours with photographs, collection, preservation and preparation of herbarium sheets and specimens related to Bryophytes and Pteridophytes. Mounting of a collected, properly dried and pressed specimen (Wet or Dry) of minimum 10 Bryophytes and Pteridophytes	30
Suggested Evaluation Methods		
Internal Assessment: >Theory • Class Participation : 04 • Seminar/presentation/assignment/quiz/class test etc. : 04 • Mid-Term Exam : 07 >Practical • Class Participation : - • Seminar/Demonstration/Viva-voce/Lab records etc. : 05 • Mid-Term Exam : NA		End Term Examination Theory : 35 Practical : 20
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • Pandey, B.P. (2007). Botany for Degree Students: First Year. S.Chand Publishing. • Dutta, A.C.(1998). Botany for Degree Students. Oxford Univ. Press. • Pandey S.N., Mishra S, P.& Trivedi P.S.(2015). A Text Book of Botany (Vol.-I), Vikas Publishing, New Delhi • Singh, Pandey and Jain (2019). A Text book of Botany, 5th Edition. Rastogi Publication. • Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R. (2005). Biology. Tata McGraw Hill, Delhi, India. • Thakur, A.K. and Bassi, S.K. (2008). Diversity of Microbes and Cryptogams. S. Chand Publishing. • Gupta, P.K. (2003). Cell and Molecular Biology. Rastogi Publications. • Tayal, M.S.(2004). Plant Anatomy. Rastogi Publication.		

Session: 2025-26			
Part A - Introduction			
Subject	BOTANY		
Semester	2 nd		
Name of the Course	Seed Plants and Economic Botany		
Course Code	B23-BOT-204		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	MDC-2		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course: 1. Students will acquire knowledge about the fundamental characteristics of gymnosperms and their importance. 2. Students will acquire a basic understanding of angiosperm morphology. 3. Students will develop a conceptual understanding of important plants that yield food vegetables and oil. 3. Students will acquire knowledge about the cultivation techniques of essential plants. 4. Students will be able identify and acquire knowledge about important medicinal plants and spices.		
	Theory	Practical	Total
Credits	2	1	3
Contact Hours	2	2	4
THEORY			
Max. Marks: 50 Internal Assessment Marks: 15 End Term Exam Marks: 35	Time: 3 Hours		
PRACTICAL			
Max. Marks: 25 Internal Assessment Marks: 05 End Term Exam Marks: 20	Time: 4 Hours		
Part B-Contents of the Course			
Instructions for Paper- Setter 1. Nine questions will be set in all. All questions will carry equal marks. 2. Question No.1 will be short answer type covering the entire syllabus and will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each unit. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.			
Unit	Topics		Contact Hours
I	General characteristics of Gymnosperms and economic importance Gymnosperms. General Characters of Angiosperms.		7
II	Brief idea about following - monocot and dicot plants. Herbs, Shrubs, Climbers and Trees. Annul, biennial and perennial plants.		7
III	Morphology and economic importance of Food plants – Rice and Wheat; Pulses - Gram and Pea; Vegetables- Potato and Tomato; Oils: Mustard.		8
IV	Morphology and economic importance of the following: Spices: Turmeric, Coriander, Ginger and Cumin, Medicinal Plants: Neem, Aloe vera, Ocimum and Giloy.		8
V*	- Cycas & Pinus–morphology through specimen or live plant study. - Study of vegetative and floral characters of the one or two members of following families- Solanaceae, Malvaceae, Lamiaceae, Leguminosae, Gingiberaceae and		30

	Poaceae • Study of Economically important plants: Wheat, Rice, Gram, Pea, Ginger, Coriander, Mustard, Neem, Aloe and ocimum • Collection and preparation of reports on various crops and economically important plants being cultivated/wildly available in your area. Collect and paste pictures or dried samples of 10 common food plants, medicinal plants and spices.	
Suggested Evaluation Methods		
Internal Assessment: >Theory • Class Participation : 04 • Seminar/presentation/assignment/quiz/class test etc. : 04 • Mid-Term Exam : 07 >Practical • Class Participation : NA • Seminar/Demonstration/Viva-voce/Lab records etc. : 5 • Mid-Term Exam : NA		End Term Examination Theory : 35 Practical : 20
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • Vashishta, P.C., Sinha, A.K., Kumar, A., (2010). Gymnosperms, S. Chand. Delhi, India • Pandey, B. P. (2004). Economic Botany (7thed.). S. Chand & Company. • Kochhar, S. L. (2016). Economic Botany in the tropics (4thed.). Macmillan Publishers India. • Sambamurty, A. V. S. S. (2005). Textbook of Economic Botany. New Age International. • Council of Scientific and Industrial Research (CSIR). (1986). Useful plants of India. Publications & Information Directorate, CSIR. • Jain, S. K. (1995). Manual of Ethnobotany (2nd ed.). Scientific Publishers. • Vasishta, B. R. (2003). Botany for Degree Students: Economic Botany. S. Chand & Company. • Singh, V., Pande, P.C., Jain, D.K. (2018). Economic Botany. Rastogi Publications. • Rajan, S. Sundar. (2007). College Botany Vol V, Part1: Taxonomy and Economic Botany Himalaya Publishing House. • Singh, G. (2021). Plant Systematics: An Integrated Approach, CRC Press. • Sharma, O.P. (2017). Plant Taxonomy, Mc Graw Hill Publication.		

Session: 2025-26			
Part A - Introduction			
Subject	BOTANY		
Semester	3 rd		
Name of the Course	Ornamental plants and their propagation		
Course Code	B23-BOT-303		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	MDC-3		
Level of the course (As per Annexure-I)	200-299		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Recognize major food-producing plants and categorize them into cereals, fruits, vegetables, and spices. 2. Identify plants used in clothing, medicine, and other household purposes. 3. Explain how economically important plants contribute to industries and agriculture. 4. Demonstrate awareness of basic plant care and eco-friendly conservation practices. 5. Create simple visuals and collections to reflect the use of plants in everyday life.		
	Theory	Practical	Total
Credits	2	1	3
Contact Hours	2	2	4
THEORY			
Max. Marks: 50 Internal Assessment Marks: 15 End Term Exam Marks: 35	Time: 3 Hours		
PRACTICAL			
Max. Marks: 25 Internal Assessment Marks: 05 End Term Exam Marks: 20	Time: 4 Hours		
Part B-Contents of the Course			
Instructions for Paper- Setter 1. Nine questions will be set in all. All questions will carry equal marks. 2. Question No.1 will be short answer type covering the entire syllabus and will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each unit. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.			
Unit	Topics		Contact Hours
I	History of gardens in India; Popular gardens of India; Types of gardens: Formal and Informal gardens; Styles of gardens: Italian gardens, English gardens and Japanese gardens. Terrace gardening		7
II	Important shrubs, trees, palms, ferns, cycads, climbers, indoor plants, aquatic plants as ornamentals (5 plants to be studied in each category).		7
III	Protected cultivation of ornamentals; Scope of floriculture in India. How to grow plants from seeds, cuttings, bulbs, bulbils and leaves.		8
IV	Vegetative propagation- techniques of cutting, budding, grafting and layering; Artificial pollination for fruit/seed/hybrid seed production (Cucurbits and Adenium).		8
V*	- Tools, implements and containers used in ornamental gardening. - Preparation of nursery beds – flat, raised and sunken beds - Identification and brief description of various trees and shrubs		30

	grown in gardens as ornamental (10 shrubs and 10 trees) • Identification and brief description of various summer and winter herbaceous annual ornamental plants (10 summer and 15 winter annuals). • To study propagation by separation and division technique. • To study propagation by cuttings, layering, grafting and budding • Raising nursery of one summer and one winter annual in seedling trays (Kochia, Zinnia, Marigold Salvia etc.)	
Suggested Evaluation Methods		
Internal Assessment: >Theory • Class Participation : 04 • Seminar/presentation/assignment/quiz/class test etc. : 04 • Mid-Term Exam : 07 >Practical • Class Participation : NA • Seminar/Demonstration/Viva-voce/Lab records etc. : 5 • Mid-Term Exam : NA		End Term Examination Theory : 35 Practical : 20
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • Council of Scientific and Industrial Research (CSIR). (1986). Useful Plants of India. Publications & Information Directorate, CSIR. • Paliwal, H. K.(2009). Ornamental Gardening. National Book Trust India, New Delhi. • Singh, A.K. & Kumar A. (2023). Plant Propagation and Nursery Management. S.K. Kataria and sons. • Arora, J.S. (2016). Introductory Ornamental Horticulture, 8th Edition. Kalyani Publishers. • Sabina, G.T. & Peter KV. (2008). Ornamental Plants for Gardens. New India Publ. Agency. • Reddy. S, Janakiram, B., Balaji, T., Kulkarni, S. & Misra, R.L. (2007). Hightech Floriculture. Indian Society of Ornamental Horticulture, New Delhi. • Bhattacharjee, S.K. (2006). Advances in Ornamental Horticulture. Vols. I-VI. Pointer Publ. • Prasad, S. & Kumar, U. (2003). Commercial Floriculture. Agrobios • Singh, B., Singh, N. & Kumar, K. (2015).Common Garden Plants. Unique Publications Panipat. • Kashyap, B., Thakur, A.K. & Bassi, S.K. (2019). Floriculture. S. Dinesh and Co. Jalandhar • Kashyap, B., Thakur, A.K. & Bassi, S.K. (2020). Gardening and Floriculture. S. Dinesh and Co. Jalandhar		

Session: 2025-26			
Part A - Introduction			
Subject	BOTANY		
Semester	3 rd		
Name of the Course	Plant Physiology and Ecology		
Course Code	B25-BOT-304		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-M3		
Level of the course (As per Annexure-I)	200-299		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand how plants absorb and transport water, minerals, and nutrients. 2. Learn the basic process of photosynthesis and respiration in plants. 3. Know how plants grow and how hormones regulate their development. 4. Grasp the fundamentals of heredity, genes, and genetic interactions. 5. Perform simple experiments to visualize plant functions and inheritance.		
	Theory	Practical	Total
Credits	3	1	4
Contact Hours	3	2	5
THEORY			
Max. Marks: 70 Internal Assessment Marks: 20 End Term Exam Marks: 50	Time: 3 Hours		
PRACTICAL			
Max. Marks: 30 Internal Assessment Marks: 10 End Term Exam Marks: 20	Time: 4 Hours		
Part B-Contents of the Course			
Instructions for Paper- Setter 1. Nine questions will be set in all. All questions will carry equal marks. 2. Question No.1 will be short answer type covering the entire syllabus and will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each unit. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.			
Unit	Topics		Contact Hours
I	Plant water relations: diffusion, osmosis, active and passive transport of water. Water potential and transpiration; Translocation of solutes. Role of micro and macro nutrients.		11
II	Photosynthesis and Respiration: Photosynthetic pigments and their role. Steps of photosynthesis (light and dark reactions).C4 and CAM cycle Respiration, Photorespiration.		11
III	Plant Growth and Plant Growth Regulators: Phases of plant growth. Overview of Growth regulators: Auxin, gibberellins, cytokinins, ABA, ethylene. Seed dormancy and germination. Photoperiodism and Vernalization		11
IV	Ecology: Scope and importance; levels of organization. Environmental factors and their impact on plants- climatic factors, edaphic factors, topographic; and Biotic factors. Brief idea about Population and community Ecology. Ecological succession in Brief. Phyto-geography: Phyto-geographical regions of India; vegetation types of India (forests).		12

V*	• Demonstration of imbibitions by plaster of Paris method. • To separate photosynthetic pigments by thin layer/paper chromatography. • To demonstrate suction due to transpiration. • To determine the osmotic pressure of the cell sap of Rheo leaf epidermal peeling by plasmolytic method. • To determine the rate of photosynthesis by using Wilmott's bubbler. • To estimate the chlorophyll content of given sample • Determination of pH, and analysis of two soil samples for carbonates, chlorides and sulphates by rapid field test. • Determination of minimal quadrat size for the study of herbaceous vegetation in the college campus or nearby fields by species area curve method (species to be listed). • Quantitative analysis of herbaceous vegetation in the college campus or nearby fields for frequency and comparison with Raunkiaer's frequency distribution law.	30
Suggested Evaluation Methods		
Internal Assessment: >Theory • Class Participation : 05 • Seminar/presentation/assignment/quiz/class test etc. : 05 • Mid-Term Exam : 10 >Practical • Class Participation : NA • Seminar/Demonstration/Viva-voce/Lab records etc. : 10 • Mid-Term Exam : NA		End Term Examination Theory : 50 Practical : 20
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • Verma, S.K. & Verma, M.(2008). Plant Physiology, Biochemistry and Biotechnology. S. Chand, Publishing. • Pandey, B.P. (2007). Botany for Degree Students: First Year. S. Chand Publishing. • Pandey, S.N & Sinha, B. K.(2018).Plant Physiology .Vikas Publishing House Pvt. Ltd. 4th edition • Jain,V.K.(2017).Fundamentals of Plant Physiology, 20th Edition. S. Chand publishing. • Gupta, N.K., Bala, M., Sangha, M.K., & Gupta, S. (2016).Practical in Plant Physiology and Biochemistry. Scientific Publishers, India • Taiz,L., Zeiger, E., Moller, I.M. & Murphy, A.(2015).Plant Physiology and Development. Sinauer Associates Inc. USA. 6th edition. • Salisbury, F.B. & Ross, C.W. (2002).Plant Physiology, 7th edition. Wordsworth Publishing Co. Belmont CA. • Smith, T.M. & Smith, R.L. (2014). Elements of Ecology, 9th edition. Pearson. • Chapman, J.L. & Reiss, M.J. (1999). Ecology: Principles and Applications. Cambridge Press.		

Session: 2025-26			
Part A - Introduction			
Subject	BOTANY		
Semester	6 th		
Name of the Course	Biotechnology and Applied Botany		
Course Code	B25-BOT-607		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-M6		
Level of the course (As per Annexure-I)	300-399		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Understand basic concepts and tools of biotechnology and their applications. 2. Learn how plants are grown in controlled lab conditions and their benefits. 3. Identify various useful plants and their economic and traditional significance. 4. Gain knowledge of eco-friendly farming techniques and sustainable practices. 5. Develop observational, presentation, and model-making skills through hands-on activities.		
	Theory	Practical	Total
Credits	3	1	4
Contact Hours	3	2	5
THEORY			
Max. Marks: 70 Internal Assessment Marks: 20 End Term Exam Marks: 50		Time: 3 Hours	
PRACTICAL			
Max. Marks: 30 Internal Assessment Marks: 10 End Term Exam Marks: 20		Time: 4 Hours	
Part B-Contents of the Course			
Instructions for Paper- Setter 1. Nine questions will be set in all. All questions will carry equal marks. 2. Question No.1 will be short answer type covering the entire syllabus and will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each unit. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.			
Unit	Topics		Contact Hours
I	Introduction to biotechnology Tools used: plasmids, enzymes, PCR, electrophoresis DNA fingerprinting – concept and importance		4
II	Laboratory Conditions required for growing plant cells Concept of callus and liquid culture Process of growing new plants through organogenesis Applications in plant conservation and crop improvement		4
III	Overview of food plants: grains, pulses, vegetables, fruits Plants used for oil, fiber, medicine, spices, and timber Basic understanding of traditional plant knowledge (ethnobotany)		4
IV	Role of good microbes: biofertilizers and biopesticides Introduction to compost and vermicompost Basics of organic farming methods		3

	Modern practices: hydroponics and vertical gardening	
V*	• Preparation of MS medium. • To prepare the slants and petri plates for plant tissue culture. • Demonstration of <i>in-vitro</i> sterilization and inoculation methods using leaf and nodal explants of tobacco, Datura, Brassica etc. • Study of anther, embryo and endosperm culture, micropropagation, somatic embryogenesis & artificial seeds through photographs. • Identification and study of some important medicinal plants. • Identification and study of some important cereals. • Identification and study of some important pulses. • Identification and study of some important spice yielding plants. • Preparation of Compost	30
Suggested Evaluation Methods		
Internal Assessment: >Theory • Class Participation : 05 • Seminar/presentation/assignment/quiz/class test etc. : 10 • Mid-Term Exam : 05 >Practical • Class Participation : NA • Seminar/Demonstration/Viva-voce/Lab records etc. : 10 • Mid-Term Exam : NA		End Term Examination Theory : 50 Practical : 20
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • Gupta, P.K. (1994).Introduction to Biotechnology. Rastogi Publications. • Bhojwani, S.S. & Razdan, M.K. (1996). Plant Tissue Culture: Theory and Practice. Elsevier Science • Singh, B.D. (2009). Biotechnology: Expanding Horizons. Kalyani Publications. • Cotton , C.M. (1996). Ethnobotany: Principles and Applications. John Wiley & Sons, Inc., New York, NY. • Verma, S. K. & Verma, M.(2008).Plant Physiology, Biochemistry and Biotechnology. S. Chand Publishing. • Kocchar, S.L. (2016). Economic Botany: A Comprehensive Study, 5th Edition, Cambridge India. • Wickens, G.E. (2001).Economic Botany: Principles and Practices. Springer. • Singh,V., Pande, P.C. & Jain, D.K.(2018).Economic Botany. Rastogi Publications.		

Session: 2025-26			
Part A – Introduction			
Subject	BOTANY		
Semester	2 nd		
Name of the Course	Aquaponics		
Course Code	B25-SEC-232		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	SEC-2		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Define aquaponics and explain its basic concept and components. 2. Describe the advantages of aquaponics over traditional farming methods. 3. Identify the essential parts of an aquaponic system, including fish tanks, grow beds, and filters. 4. Recognize the role of aquaponics in sustainable and integrated farming systems. 5. Understand the potential of aquaponics for small-scale and home-based farming setups.		
	Theory	Practical	Total
Credits	2	1	3
Contact Hours	2	2	4
THEORY			
Max. Marks: 50 Internal Assessment Marks: 15 End Term Exam Marks: 35	Time: 3 Hours		
PRACTICAL			
Max. Marks: 25 Internal Assessment Marks: 5 End Term Exam Marks: 20	Time: 4 Hours		
Part B-Contents of the Course			
Instructions for Paper- Setter 1. Nine questions will be set in all. All questions will carry equal marks. 2. Question No.1 will be short answer type covering the entire syllabus and will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each unit. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.			
Unit	Topics		Contact Hours
I	Concept and definition of aquaponics Advantages over traditional farming Components of aquaponics: fish tank, grow bed, water circulation Opportunities for small and home-based farmers		7
II	Types of aquaponic systems: media bed, NFT, DWC Selection of small-scale fish species: tilapia, carp, catfish Selection of vegetables and herbs: spinach, coriander, mint, lettuce, tomatoes		7

	Low-cost system setup for small spaces (balcony, terrace, backyard)	
III	Nitrogen cycle and role of bacteria Maintaining water quality: pH, ammonia, nitrites, nitrates Fish feeding schedule and plant care Simple disease prevention methods for fish and plants	8
IV	Techniques for harvesting fish and vegetables Post-harvest handling: washing, grading, and storage Local marketing methods: home delivery, farmers' markets, community groups Basic record-keeping, cost calculation, and profit estimation	8
V	Practical & Skill Development • Construction of a small aquaponic system using tubs, barrels, or PVC pipes • Preparation and installation of grow beds, fish tanks, and water circulation system • Fish stocking and feeding management (tilapia, carp, catfish) • Sowing seeds and transplanting leafy vegetables and herbs into grow beds • Monitoring and testing water quality (pH, ammonia, nitrites, nitrates) using simple kits • Cleaning and maintaining the filter and water pump system • Safe harvesting techniques for both fish and vegetables • Record keeping of daily activities, cost calculation, and basic profit analysis	30
Suggested Evaluation Methods		
Internal Assessment: >Theory • Class Participation : 04 • Seminar/presentation/assignment/quiz/class test etc. : 04 • Mid-Term Exam : 07 >Practical • Class Participation : NA • Seminar/Demonstration/Viva-voce/Lab records etc. : 05 • Mid-Term Exam : NA		End Term Examination Theory : 35 Practical : 20
Part C-Learning Resources		
Recommended Books/e-resources/LMS: • Somerville, C., Cohen, M., Pantanella, E., Stankus, A., & Lovatelli, A. (2014). <i>Small-scale aquaponic food production: Integrated fish and plant farming</i>. Food and Agriculture Organization of the United Nations (FAO). • Love, D. C., Fry, J. P., Genello, L., Hill, E. S., Frederick, J. A., Li, X., & Semmens, K. (2015). An international survey of aquaponics practitioners. <i>PLOS ONE</i>, 10(7), e0133676. https://doi.org/10.1371/journal.pone.0133676 • Rakocy, J. E., Masser, M. P., & Losordo, T. M. (2006). <i>Recirculating Aquaculture Tank Production Systems: Aquaponics—Integrating Fish and Plant Culture</i>. Southern Regional Aquaculture Center Publication No. 454. • Lennard, W. (2017). <i>Aquaponics: The basics</i>. Aquaponic Solutions. • Nelson, R. (2014). <i>Aquaponic Food Production: Raising Fish and Plants for Food and Profit</i>. Nelson and Pade Inc.		

Session: 2025-26			
Part A – Introduction			
Subject	BOTANY		
Semester	6 th		
Name of the Course	Natural Farming		
Course Code	B25-VOC-346		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	VOC-3		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Recognize the principles of natural farming and explain the concept, classification and advantage of natural farming. 2. Gain knowledge about soil health and nutrients requirement by plants and their natural resources. 3. Information about biological control and various types of natural pesticides, weed management and preparation of crop calendar. 4. To know about Post harvest handling, marketing of natural products, food laws and ITK in natural farming. 5. Learn about various methods of natural farming. Preparation of bio manures and bio pesticides, post-harvest handling, local marketing of natural products.		
	Theory	Practical	Total
Credits	2	2	4
Contact Hours	2	4	6
THEORY			
Max. Marks: 50 Internal Assessment Marks: 15 End Term Exam Marks: 35	Time: 3 Hours		
PRACTICAL			
Max. Marks: 50 Internal Assessment Marks: 15 End Term Exam Marks: 35	Time: 4 Hours		
Part B-Contents of the Course			
Instructions for Paper- Setter 1. Nine questions will be set in all. All questions will carry equal marks. 2. Question No.1 will be short answer type covering the entire syllabus and will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each unit. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.			
Unit	Topics		Contact Hours
I	Introduction to Natural Farming. Principles and Practices of Natural Farming. Indian Heritage of Natural Farming. Farming based livelihood systems- Concept of farming system and integrated farming system-Definition, goal and advantages. Classification of farming systems. Concept of Cow based Natural Farming.Land, feed and water requirement of traditional farming method, Advantages of cow based natural farming methods		7
II	Soil Biology and Nutrition in Natural farming: concept of essential, beneficial, functional and trace elements in soils; Formation of soil organic matter and its management in agroecosystem, carbon sequestration, soil carbon and nitrogen management indices, Soil quality and health, soil quality indicators, characteristics of a healthy soil, Best management practices (BMPs) for promoting soil health and monitoring of soil-health: minimum tillage, mulching, organic residue incorporation, cover crops, green manuring, crop rotation, conducive environment for beneficial microbes, mixed cropping, intercropping, composts,		8

	use of FYM, biochar, bioculture formulations, Horn manure, Samadhi Khad, Jeevamrit, Panchagavya, vermicompost, biogas manures (liquid and solid) etc. Microbial mediated nutrient availability and exchange in soil,	
III	Introduction and history of biological control of pests and diseases, Microbial biopesticides: biopesticides for natural farming, Different phytopathogenic biocontrol agents: Entomopathogenic biocontrol agents: Production, quality assessment and methods of application of biopesticides. Botanicals as pesticides: neem oil, garlic-chili spray, other plant-based formulations. Other physical agent for pest control: yellow sticky traps etc. Regulatory system of biopesticides in India, Weed management in crops using mulching. Use of companion plants and trap crops to reduce pest damage. Selection of indigenous crops for better responses under natural farming. Crop calendar aligned with summer winter and rainfall season.	8
IV	Post-harvest handling: cleaning, grading, and storing under shade Local marketing options: farmer's markets, direct sales, online platforms Role of farmer producer organizations in natural farming products business; Need of healthy food, Concept of healthy food, safe food, organic food, green food, pesticide free food etc. Interrelationship between natural farming and human health, Effect of natural farming on Nutrients, taste, safety, immune system, antibiotic resistance, antioxidant value and protection of environment, conservation of nutrients in processed foods, Food standards, food laws and labelling of natural foods, ITKs in human food and nutrition and health, Mission Life Style for Environment (LiFE)	7
V*	Practical and Field Work • Visit of natural farms to understand the concept, components and management practices • Study of different farming systems • Isolation and purification of microbial cultures, Enumeration of microbial population in soil- bacteria, fungi, actinomycetes, • Selection of crops for natural farming according to agro-ecological zones. • Study of Traditional seed treatment methods • Study of methods of crop residue management • Preparation of crop calendar for different sowing seasons under various microclimates • Preparation of Neemaster, Dashparniark ,Ginger- Garlic- Chilli extract Beejamrutha, Jeevamrutha, Ghana Jeevamrutha and its uses • Livestock waste utilization and recycling/ Familiarization with various fertilizers and manures • Mulching techniques to conserve soil moisture. • Identification and management of common pests and diseases. • Practical report writing and group presentation • Market survey and listing of natural farming foods available in the market, Preparation of nutrithali,	60
Suggested Evaluation Methods		
Internal Assessment: ➤ Theory • Class Participation : 04 • Seminar/presentation/assignment/quiz/class test etc. : 04 • Mid-Term Exam : 07		End Term Examination Theory : 35 Practical : 35

➤ Practical

- Class Participation : 05
- Seminar/Demonstration/Viva-voce/Lab records etc. : 10
- Mid-Term Exam : NA

Part C-Learning Resources**Recommended Books/e-resources/LMS:**

- Elsas, J.D.V, Jansson J.K. and Trevors (2006). Modern Soil Microbiology. Second Edition. CRC Press. Boca Raton.
- Das, D.K. (2015) Introductory Soil Science. 4th Edition, Kalyani Publishers, ISBN-13. 978-9327257540
- Agarwal, A and Udipi, S. (2014). Text Book of Human Nutrition. Jaypee Medical Publication, Delhi.
- Akshay Krishi Parivar (2022). Bhumi Suposhan-Commemorative Publication of the Nationwide Bhumi Suposhan and Samrakshan Abhiyan. AKP Publication No.11. pp 212.
- AOAC International (2016) AOAC Official Methods of Analysis. 20th Edition, Association of Official Analytical Chemists. Washington DC.
- Behera, UK. 2013. A Text Book of Farming Systems. Agrotech Publishing House, Udaipur, Rajasthan
- Bhattacharyya, P., &Chakraborty, G. (2019). *Organic Farming in India: Problems and Prospects*. New India Publishing Agency.
- Chander, M and Subrahmanyawari, B. 2017. Organic Livestock Farming. Indian Council of Agricultural Research, New Delhi
- Choudhary, S.L., G.S. Sharma and Y.L. Nene (2000) Ancient and Medieval History of Indian Agriculture and its relevance to Sustainable Agriculture in the 21st Century. Proceedings of the summer school held from 28th May to 17th June 1999, Rajasthan College of Agriculture, Udaipur, India. Pp.363.
- Danstan P. Ambrose. 2018. The Insects: Beneficial and Harmful Aspects, Kalyani Publishers
- Das, P., Das, S.K., Arya, H.P.S., Reddy, G. Subba, Mishra, A. and others: Inventory of Indigenous Technical Knowledge in Agriculture: Mission Mode Project on Collection, Documentation and Validation of Indigenous Technical Knowledge, Document 1 to 7, Indian Council of Agricultural Research, New Delhi.
- Gaur, A. C. (2008). *Biofertilizers in Sustainable Agriculture*. Indian Council of Agricultural Research.
- Khurana, A. and Kumar, V. 2020. State of Organic and Natural Farming: Challenges and Possibilities, Centre for Science and Environment, New Delhi. Syllabus for UG Programme B.Sc. Ag. (Hons.) – Natural Farming 22
- Lamuela- Raventós (2019). Organic food and the impact on human health, Critical Reviews in Food Science and Nutrition, 59:4, 704-714, DOI: 10.1080/10408398.2017.1394815
- Narayan, S. (2005). *Organic Farming for Sustainable Agriculture*. Agrobios.
- Palaniappan, S. P., &Annadurai, K. (1999). *Organic Farming: Theory and Practice*. Scientific Publishers.
- Rangaswamy, R., & Mahajan, P. K. (2017). *Marketing of Agricultural Products*. Kalyani Publishers.
- Reddy, S. R. (2016). *Principles of Crop Production*. Kalyani Publishers.
- Reddy, S.R. 2016. Farming System and Sustainable Agriculture, Kalyani Publishers, New Delhi.
- Sangwan Satpal. 2007. Level of Agricultural Technology in India (1757- 1857). In. Nene YL. ed. Glimpses of the Agricultural Heritage of India. Asian Agri-History Foundation.pp.397-413.
- Sawhney SK and Singh R (2000). Introductory Practical Biochemistry. Narosa Publishing House, New Delhi.
- Kalia M (2002) Food Analysis and Quality Control. Kalyani Publishers, New Delhi.
- Sharma, S. K., Choudhary, R., Ravishankar, N., Jat, G., Sharma, R. K., Yadav, S. K. and Jain, R. K, 2022. Natural Farming: Concept, Importance, Scope and Status. Technical Bulletin, Directorate of Research, Maharana Pratap University of Agriculture and Technology, Udaipur. Pp 1-16.
- Shiva V, Shiva M and Singh V (2013). Poisons in Our Food- Links between Pesticides and Diseases, Natraj Publishers, Dehradun
- Singh, J.P., et al. 2015. Region Specific Integrated Farming System Models, ICAR Indian Institute of Farming Systems Research, Modipuram. Details of the Course — Semester I 33
- SubbaRao, N. S. (2018). *Soil Microbiology and Sustainable Crop Production*. CRC Press.
- Tripathi, L., &Kumawat, S. (2020). *Post-harvest Management of Horticultural Crops*. New India Publishing Agency.