UNDER GRADUATE PROGRAMME – B.Sc., BOTANY CHOICE BASED CREDIT SYSTEM (CBCS PATTERN) (FOR THE CANDIDATES ADMITTED FROM 2023 - 2024 ONWARDS)

SEM	PART	COURSE CODE	TITLE OF THE COURSE	NATUR E OF COURS E	IH	СР	EX H	EX. MAI CIA	AM RKS ESE	TOTAL
			TAMIL COURSE - I/ HINDI COURSE - I/	LAN	6	3	3	25	75	100
	Ι	23UTAM101	FRENCH COURSE - I		_	_				
	II	23UGEN101 23UAEN101	I/ ADVANCED ENGLISH COURSE I	ENG	6	3	3	25	75	100
	III	23UBO1C01	CC: PLANT DIVERSITY I (ALGAE, FUNGI, LICHEN & PLANT PATHOLOGY)	CC	4	4	3	25	75	100
Ι	III	23UBO1C02	CC: CELL BIOLOGY, GENETICS AND PLANT BREEDING	CC	3	4	3	25	75	100
	III	23UAZ1A01	ALLIED: ZOOLOGY I	GEA	5	3	3	20	55	75
	III	23UBO2CP1	CORE PRACTICAL I	CC	2	-	-	-	-	-
	III	23UAZ2AP1	ALLIED ZOOLOGY PRACTICAL	GEA	2	-	-	-	-	-
	IV	15UVAL101	VALUE EDUCATION	AEC	2	2	2	-	50	50
	Ι	23UTAM202	TAMIL COURSE - II/ HINDI COURSE -II/ FRENCH COURSE - II	LAN	6	3	3	25	75	100
	Π	23UGEN202 23UAEN202	GENERAL ENGLISH COURSE - II/ ADVANCED ENGLISH COURSE - II	ENG	6	3	3	25	75	100
п	III	23UBO2C03	CC: PLANT DIVERSITY II (CRYPTOGAMIC BOTANY, GYMNOSPERMS AND PALAEBOTANY)	CC	7	5	3	25	75	100
	III	23UBO2CP1	CORE PRACTICAL I	CC	2	4	3	25	75	100
	III	23UAZ2A02	ALLIED: ZOOLOGY II	GEA	5	3	3	20	55	75
	III	23UAZ2AP1	ALLIED ZOOLOGY PRACTICAL	GEA	2	4	3	20	30	50
	IV	21UENS202	ENVIRONMENTAL STUDIES (MOOC Course)	AEC	2	2	2	-	50	50
	Ι	23UTAM303	TAMIL COURSE - III/ HINDI COURSE - III/ FRENCH COURSE - III	LAN	6	3	3	25	75	100
	П	23UGEN303 23UAEN303	GENERAL ENGLISH COURSE - III/ ADVANCED ENGLISH COURSE - III	ENG	6	3	3	25	75	100
III	III	23UBO3C04	CC: PLANT ANATOMY AND EMBRYOLOGY (Skill Development)	CC	5	4	3	25	75	100
	III	23UBO3A03	ALLIED: CHEMISTRY I	GEA	4	3	3	20	55	75
	III	23UBO4CP2	CORE PRACTICAL II	CC	2	-	-	-	-	-

	III	23UCH4AP2	ALLIED CHEMISTRY PRACTICAL II	GEN	2	-	-	-	-	-
	IV	21UBTA301 21UATA301 21UGEA303	BASIC TAMIL COURSE - I/ ADVANCED TAMIL COURSE- I/ INDIAN KNOWLEDGE SYSTEM	AEC	2	2	3	25	25 50	50
	IV	23UBO3SB1	SKILL BASED I: NURSERY TECHNIQUES AND GARDENING	SEC	3	2	3	25	75	100
	IV	21UNCCWS1	(Entrepreneurship) WOMEN STUDIES-NON-	AEC	2	-	2	-	50	50
	Ι	23UTAM404	TAMIL COURSE – IV/ HINDI COURSE - IV/ ERENCH COURSE - IV	LAN	6	3	3	25	75	100
	П	23UGEN404 23UAEN404	GENERAL ENGLISH COURSE - IV/ ADVANCED ENGLISH COURSE - IV	ENG	6	3	3	25	75	100
	III	23UBO4C05	CC: FUNDAMENTALS OF COMPUTER AND BIO- INFORMATICS (<i>Employability</i>)	CC	5	4	3	25	75	100
IV	Ш	23UBO4CP2	CORE PRACTICAL II	CC	2	4	3	52	75	100
	III	23UCH2A04	ALLIED: CHEMISTRY II	GEA	4	3	3	20	55	75
	III	23UCH4AP2	ALLIED CHEMISTRY PRACTICAL	GEA	2	4	3	20	30	50
	IV	21UBTA402 21UATA402	BASIC TAMIL COURSE - II ADVANCED TAMIL COURSE - II	AEC	2	2	3	25	25	50
		21UHUR404	HUMAN RIGHTS					-	50	
	IV	23UBO4SB2	SKILL BASED II: HOME GARDENING (<i>Entrepreneurship</i>)	SEC	3	2	3	25	75	100
	Ш	23UBO5C06	CC: TAXONOMY OF ANGIOSPERMS & ECONOMIC BOTANY	CC	5	5	3	25	75	100
	III	23UBO5C07	CC: PHARMACOGNOSY	CC	4	5	3	25	75	100
	III	23UBO5C08	CC: PLANT ECOLOGY & PHYTOGEOGRAPHY	CC	5	5	3	25	75	100
	III	23UBO5E01/ 23UBO5E02	ELECTIVE: PLANT BIOTECHNOLOGY/ ELECTIVE: PLANT BIOCHEMISTRY (<i>Employability</i>)	DSE	4	4	3	25	75	100
V	III	23NBO5E02	NON MAJOR ELECTIVE: APPLIED BOTANY (INTERDISCIPLINARY) (<i>Skill</i> <i>Development</i>)	GEN	4	4	3	25	75	100
	III	23UBO6CP3	CORE PRACTICAL III	CC	2	-	-	-	-	-
	III	23UBO5SB3	SKILL BASED III: MUSHROOM CULTIVATION AND TECHNOLOGY (Entrepreneurship)	SEC	3	2	3	25	75	100
	IV	23IDSBB01	SKILL BASED V: HERBAL COSMETICS AND HANDICRAFTS	SEC	3	2	3	25	75	100

	III	23UBO6C09	CC: PLANT PHYSIOLOGY	CC	5	5	3	25	75	100
	III	23UBO6C10	CC: HORTICULTURE	CC	5	5	3	25	75	100
	III	23UBO6C11	CC: MICROBIOLOGY	CC	5	5	3	25	75	100
	III	23UBO6E03/ 23UBO6E04	ELECTIVE: BIOINSTRUMENTATION / ELECTIVE: BIOPHYSICS AND BIOSTATISTICS	DSE	5	4	3	25	75	100
	III	23UBO6CP3	CORE PRACTICAL III	CC	2	4	3	25	75	100
VI	IV	23UBO6SB4	SKILL BASED IV: POST HARVEST TECHNOLOGY OF FRUITS AND VEGETABLES (<i>Skill Development</i>)	SEC	3	2	3	25	75	100
	IV	23IDSBB01	SKILL BASED VI: HERBAL COSMETICS AND HANDICRAFTS (INTERDISCIPLINARY) (<i>Entrepreneurship</i>)	SEC	3	2	3	25	75	100
			EXTENSION AND CO- CURRICULAR ACTIVITIES (NSS/ NCC/SPORTS/ NECTAR/ RSP/ YRC/ AICUF/ CHETNA WOMEN CELL)			1	-	-	-	50
		23UCYS605	CYBER SECURITY			2	2	2	-	50
			SWAYAM/ MOOC/ NPTEL COURSE			2				
			Total		180	140 + 2 + 2				3800 + 50

IH - Instructional hours

CP - Credit points CC - Core Courses

DSE - Discipline Specific Elective

ESE -End Semester Examination

CIA - Continous Internal Assessment

PART WISE TOTAL MARKS

S.No.	PART	COURSE	TOTAL CREDIT POINTS	TOTAL MARKS
1	PART I	LANGUAGE COURSE	12	400
2	PART II	ENGLISH - GENERAL/ADVANCED	12	400
		CORE – THEORY & PRACTICAL		
3	PART III	ALLIED – THEORY & PRACTICAL		
		ELECTIVE	95	2100
		BASIC TAMIL/ADVANCED TAMIL (75)		
		GENERAL AWARENESS/ HUMAN RIGHTS		
		(75)	4	150
4	FARIIV	SKILL BASED (6 COURSES)	12	600
		ENVIRONMENTAL STUDIES	2	50
		VALUE EDUCATION	2	50
5		CO CURRICULAR ACTIVITIES		
5	PARIV	NSS/NCC/SPORTS/YRC	1	50
	TOTAL		140	3800
		CYBER SECURITY	2	50
		MOOC/SWAYAM / NPTEL	2	-
	GRAND		140 +2 +	3800
	TOTAL		2	+ 50

ABBREVIATIONS	NATURE OF COURSE
LAN	LANGUAGE
ENG	ENGLISH
CC	CORE
GEN	GENERIC (Allied)
DSA	DISCIPLINE SPECIFIC ALLIED
AEC	ABILITY ENHANCEMENT COURSE
SEC	SKILL ENHANCEMENT COURSE
GEN	GENERIC ELECTIVE (NME)
DSE	DISCIPLINE SPECIFIC ELECTIVE

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VALUE ADDED COURSES

NATURE OF	COURSE	TITLE OF THE	INSTRUCTIONAL	INSTITUTION
COURSE	CODE	COURSE	HOURS	OFFERING
				THE COURSE
		FLORICULTIRE		
CERTIFICATE	12CCFB001	AND BONSAI	60 Hrs	Nirmala College
COURSE		MEDICINAL	60 Ura	for Women,
	13CCMB001	BOTANY	OU HIS	Coimbatore

SKILL DEVELOPMENT COURSES

NATURE OF COURSE	COURSE CODE	TITLE OF THE COURSE	INSTRUCTIONAL HOURS	INSTITUTION OFFERING THE COURSE
SKILL DEVELOPMENT COURSE		DIGITAL FLUENCY	45 Hrs	Nirmala College for Women, Coimbatore
SKILL DEVELOPMENT COURSE		ARTIFICIAL INTELLIGENCE IN BOTANY	6645 Hrs	Nirmala College for Women, Coimbatore

SEMESTER I COURSE CODE: 23UBO1C01 TITLE OF THE COURSE: CORE 1: PLANT DIVERSITY I

COURSE OBJECTIVES:

- 1. To gain knowledge on the diversity of Algae, Fungi and Lichens.
- 2. To study the economic importance of Algae, Fungi and Lichens.
- 3. To study the various plant diseases and their control measures.

COURSE OUTCOMES:

At the end of the course the students will be able to:

CO1	Compare the life cycle of Nostoc and Chlorella	K2
CO2	Explain the structure and reproduction of Sargassum and Gracillaria.	K2
CO3	Compare the structure and reproduction of Albugo, Saccharomyces and	K2
	Puccinia.	
CO4	Interpret the structure and reproduction with special reference to Usnea	K3
CO5	Compare the symptoms and causal organisms of plant diseases.	К3

SYLLABUS

Credits: 4 Instructional Hours: 60

UNIT I: ALGAE – Classification, Morphology and life cycle (K2) (12 Hours)

General characteristics of various classes of Algae. Classification of Algae (Fritsch, 1935), Morphology, reproduction and life-cycles of the following genera, *Nostoc* and *Chlorella*.

UNIT II: ALGAE - Morphology and life cycle (K2)

Detailed study of morphology, reproduction and life cycle of the following genera *Volvox, Sargassum* and *Gracilaria*. Economic importance of Algae. (*Self study: Economic importance of Algae*)

UNIT III: FUNGI (K2)

General characteristics of Fungi, Ecology and significance, range of thallus organization, Cell wall composition, nutrition, reproduction. Classification of Fungi (Alexopolous& Mims, 1973). Detailed study of morphology, reproduction and life cycle of following genera *Albugo*, *Saccharomyces* and *Puccinia*. Economic importance of Fungi. (*Self study: Economic importance of Fungi*)

UNIT IV: LICHEN (K3)

General characteristics of Lichen; Classification, External and Internal structural organization, Types of Lichen. Economic importance of Lichens. Structure and reproduction with special reference to *Usnea*.

(12 hours)

(12 Hours)

(12 Hours)

UNIT V: PLANT PATHOLOGY (K3)

Study of the following plant disease symptoms, causal organisms, disease cycle and control measures of Blast of Rice, Red rot of Sugarcane, Citrus canker, Tikka disease, Tobacco Mosaic Virus (TMV), Early Blight of Potato.

(Beyond the curriculum: Study about Current sugarcane disease scenario and management strategies)

TEXT BOOKS

- 1. Vashishta B.R. and A.K. Sinha. *Botany for Degree students- Fungi.* S. Chand & Co. New Delhi, India. (2011)
- 2. Kumar, H.D. *Introductory Phycology* (2nd Edition). Affiliated EastWest Press Pvt. Ltd., Delhi. (1999)

REFERENCE BOOKS

- 1. Pandey, B.P. College Botany Vol. I: Algae, Fungi, Lichens, Bacteria, Viruses, Plant Pathology, Industrial Microbiology and Bryophyta. S. Chand & Company Ltd., New Delhi. (2001).
- 2. Vashishta, B.R., Sinha, A.E and Singh, V.P. *Algae*. S Chand and Company Ltd., New Delhi. (2013).
- 3. Srivastava H.N. *Plant Pathology*. Pradeep Jain for Pradeep Publications, 4th Edition, Jalandhar, New Delhi. (1999)

BLENDED LEARNING:

UNIT V- PLANT PATHOLOGY							
Торіс	Links						
Blast disease of Rice	https://www.youtube.com/watch?v=KAlvzK_391s						
Red rot of Sugarcane	https://www.youtube.com/watch?v=OzkN9SfXgZc						
Citrus canker	https://www.youtube.com/watch?v=QiBUj6xOh_U						
Tikka disease of groundnut	https://www.youtube.com/watch?v=yywjong7yEE						
Tobacco Mosaic Virus	https://www.youtube.com/watch?v=Z0WLbtsQh9Y						

MAPPING OF CO'S WITH POs/PSO'S

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3		3		2	2	2		2		2	2
CO2	3	3		3	2	3	2				3	2	3
CO3	3	3		3	2	3	2			2	3	2	2
CO4	3	3		3		2	2	2				2	2
CO5	3	3		3	2	3			2		3	2	3

(Correlation: 3-High, 2-Medium, 1-Low)

S.No.	Assessment Methods	Frequency of Assessment
1	End Semester Examination	Once in a Semester
2	CIA I	Once in a Semester
3	CIA II	Once in a Semester
4	Model Examination	Once in a Semester
5	Assignment (Unit I and Unit II)	Twice in a Semester
6	Seminar (Unit III and Unit IV)	Twice in a Semester
7	Field work (Unit V)	Once in a Semester

Course Designed by: Dr. M. Saradha	Verified by HOD: Dr. J. Carolin Joe Rosario
Checked by CDC: Dr. G.Chitra	Approved by:
	Principal

SEMESTER I COURSE CODE: 23UBO1C02 **TITLE OF THE COURSE: CORE 2: CELL BIOLOGY, GENETICS AND PLANT BREEDING**

COURSE OBJECTIVES:

- To gain knowledge on the structure and functions of cell organelles.
- To know about cellular components and utilize energy in cells. •
- To predict the phenotypic classes and their ratios from a monohybrid cross involving dominant and recessive alleles.
- To learn about sources of Germplasm, Hybridization, Heterosis, Hybrids combining ability • and achievements.

COURSE OUTCOMES:

At the end of the course the students will be able to:

CO1	Analyze the formation, structure, components and function of cells.	K2			
CO2	Discuss the role of nucleic acids and its types.	K2			
	Apply the ratio of a specific genotype or phenotype from a cross involving multiple				
CO3	independently assorting genes.	K2			
CO4	Describe gene recombination, chromosome structure and variation in plant species.	K3			
	Distinguish different types of techniques ranging from selecting plants with				
CO5	desirable characteristics for propagation.	K3			
SYLLABUS					

Credits: 4 **Instructional Hours: 60**

UNIT I: PLANT CELL AND CELL ORGANELLES (K2) (12 Hours)

General account of cell - Cell Theory, Prokaryotic and eukaryotic cells. Plant Cell -Cell wall, plasma membrane. Cell organelles: Mitochondria, Chloroplast, Ribosomes, Nucleus and Chromosome (Structure and function only).

(Self study: Plant Cell - Cell wall, plasma membrane)

UNIT II: STRUCTURE AND TYPES OF NUCLEIC ACIDS (K2) (12 Hours)

Cell division- Mitosis and Meiosis. Nucleic acids - DNA Structure and its functions, DNA replication in Eukaryotes, Conservative, Semi-conservative and discontinuous replication. RNA -Structure and its types. Mechanism of Protein Synthesis in Prokaryotes.

(Beyond the curriculum- Cell signaling- Signal molecules, Receptors- Intracellular and Cell surface receptors)

UNIT III: GENETICS (K2)

Mendelism: Law of segregation and Monohybrid cross, Law of independent assortment and Dihybrid cross, Testcross and Back cross, Genetic Interaction: Allelic gene interaction- Incomplete dominance, Non- Allelic Gene interaction- Complementary genes and Epistasis.

(12 Hours)

UNIT IV: GENE TECHNIQUES (K3)

Linkage- Complete and incomplete linkage and its importance, Factors affecting linkage. Crossing over-Types, Mechanism and significance, factors affecting crossing over. Genetic code, Chromosomal mutations, Mutagens and its types. (*Self study: Mutation, Physical and chemical mutagens*)

UNIT V: PLANT BREEDING TECHNIQUES (K3)

Importance and scope of Plant breeding, Centres of origin and domestication of crop plants, Hybridization - types, techniques, Emasculation and Bagging. Methods - self-pollinated crops and cross pollinated crops, Hybrid vigour. Achievement in crop breeding - Rice (*Oryza sativa*) and Cotton (*Gossypium hirsutum*). (*Self study: Scope of Plant breeding*)

TEXT BOOKS:

- 1. Shukla. R.S. and P.S.Chandel. *Cytogenetics, Evolution, Biostatistics and Plant Breeding*, S.Chand & Company, New Delhi. (2009).
- 2. Arumugam N. and R.P. Meyyan. *Genetics and Evolution*, Saras Publications, Nagercoil. (2015).

REFERENCE BOOKS:

- 1. Verma P. Sand V.K.Aggarwal. Genetics, S.Chand & Company, New Delhi. (2007).
- 2. Phundan Singh. Genetics, Kalyani Publishers, New Delhi. (2016).
- 3. Verma P.S. and V.K. Aggarwal. *Cell Biology, Genetics, Molecular Biology, Evolution and Ecology*. S. Chand & Company, New Delhi. (2014).

BLENDED LEARNING:

UNIT IV- GENE TECHNIQUES						
Торіс	Links					
Linkage-Complete and	https://www.youtube.com/watch?v=CSiRfK5EaeI					
incomplete linkage and its	https://www.youtube.com/watch?v=4pd_3vlkH7U					
importance, Factors						
affecting linkage.						
Crossing over-Types,	https://www.youtube.com/watch?v=Ntc2vD4aR8Q					
Mechanism and	https://www.youtube.com/watch?v=jZ60_LffC30					
significance, factors						
affecting crossing over.						
Genetic code	https://www.youtube.com/watch?v=215d0eiO71w					
Chromosomal mutations	https://www.youtube.com/watch?v=jfN1Naa3in0					
Mutagens and its types.	https://www.youtube.com/watch?v=4mrp5uI9anE					
	https://www.youtube.com/watch?v=YT7-mnkSbLs					

(12 Hours)

(12 Hours)

MAPPING OF CO'S WITH POs/PSO'S

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	3	2	2	2	2		3	3		3	3
CO2	3	2	3	2			2		3	3		3	3
CO3	2	2	3	2			2		3	3	3	3	3
CO4	2	2	3	2	2	2			3	3	3	3	3
CO5	3	2	3						3	3	3	3	3

(Correlation: 3-High, 2-Medium, 1-Low)

S.No.	Assessment Methods	Frequency of Assessment
1	End Semester Examination	Once in a Semester
2	CIA I	Once in a Semester
3	CIA II	Once in a Semester
4	Model examination	Once in a Semester
5	Assignment (Unit I and Unit II)	Twice in a Semester
6	Seminar (Unit III and Unit IV)	Twice in a Semester
7	Field work (Unit V)	Once in a Semester

Course Designed by: Dr. P. Prathyusha	Verified by HOD: Dr. J. Carolin Joe
	Rosario
Checked by CDC: Dr. G.Chitra	Approved by:
	Principal

SEMESTER I COURSE CODE: 23UBO1A01 TITLE OF THE COURSE: ALLIED BOTANY I (FOR I B.SC. ZOOLOGY STUDENTS) (ALGAE, FUNGI, PLANT PATHOLOGY, CRYPTOGAMS, GYMNOSPERMS, PLANT TAXONOMY, ECONOMIC BOTANY AND APPLIED BOTANY)

COURSE OBJECTIVES

- To gain an appreciation of the complexity and diversity of plants- Algae, Fungi and plant diseases.
- To compare and understand the structure and lifecycle of Gymnosperms.
- Convey and foster understanding of the differences of morphology, vegetative and reproductive structure of angiosperms and economic importance.

COURSE OUTCOMES

At the end of the course the students will be able to:

CO1	Describe the complexity and diversity in life cycle of plants	K2			
	Compare the structure and methods of reproduction in cryptogams and				
CO2	gymnosperms	K2			
	Analyze and compare the various families and understand its economic				
CO3	importance	K3			
CO4	Demonstrate the various process in sugar industry and biodiesel production	K2			
	Exemplify the mushroom cultivation, Single Cell Protein production and				
CO5	biofertilizers	K2			
SYLLABUS					

Credits: 3

Instructional Hours: 60

UNIT I: ALGAE, FUNGI AND PLANT PATHOLOGY (K1) (12 Hours) Structure, Reproduction and life cycle of Algae - *Volvox*. Fungi- *Saccharomyces*.

Plant Pathology- Symptoms, causative organism and control measures of Red rot of Sugarcane and Tikka disease of Groundnut. Host plant resistance in pest and Disease management.

UNIT II: CRYPTOGAMS (K1)

Cryptogams (Bryophytes, Pteridophytes and Gymnosperms). Structure, Reproduction and Life cycle of Bryophyte - *Funaria*, Pteridophyte - *Adiantum* Gymnosperm – *Cycas* (Developmental details are not required).

UNIT III: TAXONOMY (K2)

Outline of Bentham and Hookers' system of classification, Morphology- Leaf shape and Phyllotaxy, Inflorescence - Recemose, Cymose and Special types (Verticillaster and Cyathium). Study of the following families with their economic importance Annonaceae, Cucurbitaceae, Lamiaceae, Euphorbiaceae and Poaceae.

UNIT IV: ECONOMIC BOTANY (K2)

Sugar yielding plants-Sugarcane, Oil yielding plants – *Jatropha curcus* (Physicnut) and *Ricinus communis* (Castor oil plant), Fiber yielding plants: *Gossypium hirsutum*

(**12 Hours**) production

(12 Hours)

(12 Hours)

(Cotton) and *Corchorus capsularis* (Jute). Beverages - *Coffea arabica* (Coffee) and *Camellia sinensis* (Tea).

UNIT V: APPLIED BOTANY (K3)

(12 Hours)

Mushroom cultivation – *Agaricus bisporus* (Button mushroom), Production of Single Cell Protein (SCP) - Definition, Advantages of Single Cell Proteins and Algae as Single Cell Protein. Biofertilizers (Nitrogen fixing Bacteria-*Rhizobium*). (*Self-study: Nitrogen fixing Bacteria*)

MAPPING OF	CO'S	WITH	POs/PSO'S
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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3		2		2		2			3	3	3
CO2	3	3		2	2				2	2	3	3	3
CO3	3	3		2		3		2		2		2	3
CO4	3		3			2	2			2		3	3
CO5	3	2		2			2	2		3	3	3	3

Correlation: 3 - High, 2 - Medium, 1- Low

ASSESSMENT TOOLS

S.No.	Assessment Methods	Frequency of Assessment
1	End Semester Examination	Once in a Semester
2	CIA I	Once in a Semester
3	CIA II	Once in a Semester
4	Model examination	Once in a Semester
5	Assignment (Unit I and Unit II)	Twice in a Semester
6	Seminar (Unit III and Unit IV)	Twice in a Semester
7	Quiz (Unit V)	Once in a Semester

TEXT BOOKS:

- 1. Gangulee and Kar. College botany Vol.II. Mcgraw Hill, New Delhi. (2011).
- 2. Vasishta B.R. Botany for Degree students Algae. S. Chand & Co, New Delhi. (2002)

REFERENCE BOOKS

- 1. John Webster and Roland W.S. Weber. *Introduction to Fungi*. Cambridge University Press, New York. (2005).
- 2. Gangulee, H C Das, K.S. and Dutta C.T. *College Botany Vol.I.* MacMillan .CO, Kolktta. (2018).
- 3. Narayanasamy, R.V and Krishnamoorthy, K.V. *Outlines of Botany*. S. Chand & Co, New Delhi. (2011).

BLENDED LEARNING:

UNIT V- APPLIED BOTANY					
Торіс	Links				
Mushroom cultivation –	https://www.youtube.com/watch?v=RvIEdwG3bTw				
Agaricus bisporus					
Production of Single Cell	https://www.youtube.com/watch?v=B4zEWu9Jlxk				
Protein (SCP)					
Algae as Single Cell Protein	https://www.youtube.com/watch?v=YQ6leA5_gq8				
Biofertilizers (Nitrogen	https://www.youtube.com/watch?v=CzmLnYRndKI				
fixing Bacteria)					
Rhizobium	https://www.youtube.com/watch?v=i1bDAaFkmp4				

Course Designed by: Dr. U. Danya	Verified by HOD: Dr. J. Carolin Joe Rosario
Checked by CDC: Dr. G.Chitra	Approved by:
	Principal

SEMESTER - II COURSE CODE: 23UBO2C03 TITLE OF THE COURSE: CORE: PLANT DIVERSITY II: CRYPTOGAMIC BOTANY, GYMNOSPERMS AND PALAEOBOTANY

COURSE OBJECTIVES:

- 1. To identify the characteristics, reproduction and life cycle of Bryophytes.
- 2. To identify the characteristics, reproduction and life cycle of Pteridophytes.
- 3. To identify the characteristics, reproduction and life cycle of Gymnosperms.
- 4. To know the distinction between Vascular and Non-Vascular Cryptogams.
- 5. To learn about different kinds of fossils.

COURSE OUTCOMES:

At the end of the course the students will be able to:

CO1	Compare the structure and reproduction of Marchantia and Polytrichum.	K2
CO2	Explain the structure and reproduction of Selaginella and Equisetum.	K2
CO3	Differentiate the structure and reproduction of Adiantum and Marsilea.	K2
CO4	Explain the structure and reproduction of Cycas and Gnetum.	K2
CO5	DifferentiateLepidodendron and Lepidocarpon fossil forms.	K3

SYLLABUS

Credit: 4 **Instructional Hours: 105**

UNIT I: BRYOPHYTES (K2)

General characteristics of Bryophytes; Classification of Bryophytes (Reimers, 1954), Systematic position, Distribution, Structure and Reproduction and Life cycle of Marchantiales- Marchantia and Polytrichales - Polytrichum (Excluding development). Economic importance of Bryophytes.

UNIT II: PTERIDOPHYTES - Classification, Structure and Life cycle (K2) (21 Hours)

General characteristics of Pteridophytes; Classification of Pteridophytes (K.R.Sporne, 1975).Systematic position, Distribution, Structure, Reproduction and Life cycle of Selaginella and Equisetum (Excluding development), Heterospory and origin of Seed Habit. (Self-study: Heterospory and origin of Seed Habit)

UNIT III: PTERIDOPHYTES - Structure and Life cycle (K2)

Systematic position, Distribution, Structure, Reproduction and Life cycle of the following Genera: Adiantum and Marsilea (Excluding development). Stelar evolution in Pteridophytes. Economic importance of Pteridophytes. (Self-study: Economic importance of Pteridophytes)

UNIT IV: GYMNOSPERMS (K2)

Gymnosperms, Distribution, Structure, Reproduction and life cycle of Cycas and Gnetum (Excluding development). Economic importance of Gymnosperms.

(21 Hours)

(21 Hours)

(21 Hours)

UNIT V: PALEOBOTANY (K3)

Geological time scale and Radiocarbon dating, Fossils and different types of fossils – Compression, Impression, Petrifaction, Coal balls. Detailed study of internal and External morphology and Reproduction of fossil forms: Stem – *Lepidodendron* and Seed-*Lepidocarpon*.

(Beyond the curriculum- External morphology and Reproduction of fossil forms: Williamsonia)

TEXT BOOKS

- 1. Pandey, B.P (2011). College Botany. S.Chand & Co., New Delhi. India.
- 2. Singh V, Pande PC and Jain DK (2010). A text book of Botany. 4th Edition. Rastogi Publications, Meerut, India.
- 3. Arumugam N. Annie Ragland and V.Kumaresan (2016). College Botany Vol. 3. Saras Publications, India.

REFERENCE BOOKS

- 1. Pandey, B.P (2010). Botany for Degree students. S.Chand & Co, New Delhi. India.
- 2. Sporne K.R(1970). Morphology of Pteridophytes. Hutchinson. London.
- 3. Foster A.S and Gifford, (1974). Comparative Morphology of vascular plants W. H. Freeman and Company. London.
- 4. Vasishta P.C. Sinha A.K. and Anil Kumar, (2011). Gymnosperms. S.Chand & Co, New Delhi. India

BLENDED LEARNING:

UNIT V- PALEOBOTANY						
Торіс	Links					
Geological time scale	https://www.youtube.com/watch?v=rWp5ZpJAIAE					
	https://www.youtube.com/watch?v=r5AVDboxlKw					
Radiocarbon dating	https://www.youtube.com/watch?v=Kcuz1JiMk9k					
	https://www.youtube.com/watch?v=osA8TX0cwYI&t=225s					
Fossils and different types of fossils -	https://www.youtube.com/watch?v=osrheh70Yb4					
Compression, Impression, Petrifaction,	https://www.youtube.com/watch?v=fd630LR9FvU					
Coal balls						
Detailed study of internal and	https://www.youtube.com/watch?v=3wEjP8GwPfw					
externalmorphology and Reproduction of	https://www.youtube.com/watch?v=9_hAUDgAcBQ					
fossil forms: Stem – Lepidodendron						
Detailed study of internal and	https://www.youtube.com/watch?v=9_hAUDgAcBQ					
externalmorphology and Reproduction of						
fossil forms: Seed -Lepidocarpon.						

MAPPING OF CO'S WITH POs/PSO'S

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3		3		2	2		2			2	
CO2	3	3		3	2	3		2			3	2	3
CO3	3	3		3		2	2		2			2	
CO4	3	3		3	2	3		2		2	3	2	3
CO5	3	3		3	2	3	2		2		3	2	3

(Correlation: 3 - High, 2 - Medium, 1 - Low)

S.No.	Assessment Methods	Frequency of Assessment
1	End Semester Examination	Once in a Semester
2	CIA I	Once in a Semester
3	CIA II	Once in a Semester
4	Model examination	Once in a Semester
5	Assignment (Unit I and Unit II)	Twice in a Semester
6	Seminar (Unit III and Unit IV)	Twice in a Semester
7	Quiz (Unit V)	Once in a Semester

Course Designed by: Dr. U. Danya & M.Saradha	Dr.	Verified by HOD: Dr. J. Carolin Joe Rosario
Checked by CDC: Dr. G.Chitra		Approved by:
		Principal

SEMESTER II COURSE CODE: 23UBO2A02 TITLE OF THE COURSE: ALLIED BOTANY II (ANATOMY, ECOLOGY, PHYSIOLOGY, HORTICULTURE AND PHARMACOGNOSY) (For I B.Sc. Zoology Students)

COURSE OBJECTIVES

- Distinguish between Simple and Complex tissues and their distribution in root, stem and leaf.
- Adaptation of plants in relation to water and make the learner to realize the importance of forests.
- To learn various physiological activities in plants.
- Techniques used in plant propagation, products of horticultural plants.
- Awareness traditional systems of medicine, medicinal plants, properties and active principles.

COURSE OUTCOMES

At the end of the course the students will be able to:

CO1	Differentiate between simple and complex tissues and distribution of tissues in	K2
	roots and stem	
CO2	Describe the plants based on morphological and anatomical features in	K2
	relations to their habitat	
CO3	Explain the various physiological activities of plants	K2
CO4	Explore the propagation technique to cultivate and conserve the various plants	K3
CO5	Implement the knowledge in daily life about the usage of medicinal plants	K3

SYLLABUS

Credits: 3

Instructional Hours: 75

UNIT I: PLANT ANATOMY (K2)

Meristem - Structure and classification. Brief account on simple tissues (Parenchyma, Collenchyma and Sclerenchyma) and Complex tissues - Primary xylem and Primary phloem (excluding ontogeny). Primary structure of Dicot Stem, Rootand Leaf, Structure of Monocot Stem, Root and Leaf. (*Self study: Structure of Monocot stem & root*)

UNIT II: ECOLOGY (K2)

Morphological and anatomical adaptations in Hydrophytes - *Eichhornia* and *Hydrilla*, Xerophytes - *Nerium* and *Opuntia* and Halophytes - *Rhizophora*.

UNIT III: PLANT PHYSIOLOGY (K2)

Absorption of water - Active and passive absorption. Mechanism and factors affecting Transpiration, Photosynthesis - Structure of chloroplast, light and dark reactions. Phytohormones-Auxin and Cytokinin.

UNIT IV: HORTICULTURE (K3)

Vegetative propagation methods - Cuttings - Root and Stem cuttings, Layering – Ground layering and Air layering, Grafting - Cleft and Bark grafting. Bonsai – Introduction and Styles of Bonsai.

(15 Hours)

(15 Hours)

(15 Hours)

(15 Hours)

UNIT V: PHARMACOGNOSY (K3)

Identifying features and medicinal properties of the following: Carminatives and Gastro intestinal Regulators - Ginger (*Zingiberofficinale*), Antitussives - Tulsi (*Ocimum sanctum*), Antiseptic – Turmeric (*Curcuma longa*) and Brain Tonic- Indian Wort (*Centella asiatica*). (*Self-study:* Brain Tonic- *Centella asiatica*).

BLENDED LEARNING:

UNIT IV- HORTICULTURE								
Торіс	Links							
Vegetative propagation	https://www.youtube.com/watch?v=VN_p20dDrnY							
Root and Stem cuttings	https://www.youtube.com/watch?v=gxfUO3pYizI							
Ground layering	https://www.youtube.com/watch?v=7UvDZKzUtZc							
Air layering	https://www.youtube.com/watch?v=nRoQDs0d-jU							
Grafting	https://www.youtube.com/watch?v=tFWvZzMv2Io							
Cleft grafting	https://www.youtube.com/watch?v=JjNYr_O5NzQ							
Bark grafting	https://www.youtube.com/watch?v=atOdPM6FmL0							
Bonsai – Introduction	https://www.youtube.com/watch?v=0FCJF2_os3E							
Styles of Bonsai https	www.youtube.com/watch?v=-ou_765Dctw							

MAPPING OF CO'S WITH POs/PSO'S

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3		2			2		2				3	3
CO2	3	3		3		3		2		2	2	2	3
CO3	3		3			2	2		2			3	3
CO4	3			3	2			3				3	3
CO5	3		2	3			2		2			2	2

Correlation: 3 - High, 2 - Medium, 1- Low

S.No.	Assessment Methods	Frequency of Assessment
1	End Semester Examination	Once in a Semester
2	CIA I	Once in a Semester
3	CIA II	Once in a Semester
4	Model examination	Once in a Semester
5	Assignment (Unit I and Unit II)	Twice in a Semester
6	Seminar (Unit III and Unit IV)	Twice in a Semester
7	Quiz (Unit V)	Once in a Semester

TEXT BOOKS:

- 1. Manibhushan Rao. K. *Text book of Horticulture*, Laxmi Publications Pvt Ltd. Karnataka. (2005).
- 2. Kumar.N. Introduction to Horticulture. (First Edition). Rajalakshmi Publiction. Nagercoil, TamilNadu. (2010).

REFERENCE BOOKS

- 1. Pandey, B.P. Plant Anatomy. (First edition). S.Chand & Co., New Delhi. India. (2012).
- 2. Shukla & Chandel. *Plant Ecology & Soil Science*. (*First Edition*). S.Chand & Co. New Delhi. India. (2005).
- 3. Wallis T.E. *Text book of Pharmacognosy. (Fifth edition).* CBS publishers & Distributors, Delhi. (2011).

Course Designed by: Dr. U. Danya	Verified by HOD: Dr. J. Carolin Joe Rosario					
Checked by CDC: Dr. G.Chitra	Approved by:					
	Principal					

SEMESTER - II COURSE CODE: 23UBO2CP1 TITLE OF THE COURSE: CORE PRACTICAL I

COURSE OBJECTIVES:

- 1. To observe and identification of algae, fungi, lichens, bryophytes, Pteridophytes and Gymnosperm.
- 2. To prepare micropreparation of Bryophytes, Pteridophytes and gymnosperm and showing the internal characters.
- 3. To observe crop plants infected by the pathogens included in the syllabus.
- 4. To study cell organelles, hybridization techniques.
- 5. To learn about Mendelian principles.

COURSE OUTCOMES:

At the end of the course students will be able to

CO1	Prepare micropreparation and identification of given algae, fungi,	K3
	Bryophytes, Pteridophytes and Gymnosperms specimens.	
CO2	Identification and control measures of diseases mentioned in the syllabus	K3
CO3	Solve the given genetics problem.	K3
CO4	Identify and sketch the Algae, Fungi, Lichen, Cell biology, Plant breeding,	K2
	Bryophyte, Pteridophyte, Gymnosperm and Paleobotany specimens.	
CO5	Illustrate the observations and results of experiments through record work.	K2

SYLLABUS

Credits: 5

Instructional Hours: 30

UNIT I: PLANT DIVERSITY I - Algae, Fungi

Study of vegetative and reproductive structures of *Nostoc*, *Chlorella* and *Volvox* through permanent slides.

Sargassum and Gracilaria- specimensAlbugo and Puccinia- specimensSaccharomces - Permanent slide demonstration only

UNIT II: LICHENS AND PLANT PATHOLOGY

Lichens: Study of growth forms of lichens (crustose, foliose and fruticose) Disease: Identify the diseases mentioned in the theory through specimens

UNIT III: CELL AND MOLECULAR BIOLOGY, GENETICS AND PLANT BREEDING

Study of Cell Organelle through slides and Photographs.

Observation of charts for Mendelian ratios, gene interaction and linkage -Simple problems in Genetics.

Study of hybridization techniques-Emasculation, Bagging and Heterosis - Hybrid Vigour. Individual Experiment - DNA Isolation and chloroplast isolation.

Demonstration on Mitochondria Isolation.

UNIT IV: PLANT DIVERSITY- II (CRYPTOGAMIC BOTANY)

Study of the types mentioned below **Bryophytes**:

Marchantia- Thallus spotters only *Polytrichum*- Thallus spotters and cone slide Demonstration only.

Pteridophytes:

- Stem and Cone only
- Stem, cone - slide Demonstration only
- Rachis, Sorus
- Stem, Sporocarp slides

Unit V: PLANT DIVERSITY-II (GYMNOSPERMS AND PALAEOBOTANY)

Gymnosperms: *Cycas* and *Gnetum* **Palaebotany**: Lepidodendron and Lepidocarpon

REFERENCE BOOKS

1. Ashok Bendre. A Text Book of Practical Botany, 1 & 2. Rastogi publications, Meerut. (2006).

2. Manik M. Dhore, Minal J. Keche, Ujwala G. Malode, Vanita and U. Pochhi. *A Text Book of Practical Botany - B.Sc.-I*, Nabh Prakashan Publication, Amravati. (2012).

3.B.P. Pandey. *Modern Practical Botany Vol I and III*. S. Chand & Company PVT.Ltd. Noida. (2014).

MAPPING OF CO'S WITH POs/PSO'S

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	2	1	3					3	3	3
CO2	3	3	2	2	3	3					3	3	3
CO3	3				3	2			3		3	3	3
CO4	3	3		2	2	3					3	3	3
CO5	3	3		2	2	3					3	3	3

(Correlation: 3-High, 2-Medium, 1-Low)

S.No.	Assessment Methods	Frequency of Assessment					
1.	Internal Exam	Once in a Semester					
	Major Practicals						
	Minor Practicals						
	Spotters						
	Record						
2.	End Semester Exam	End of the year					

Course Designed by: Dr. M.Saradha & Dr. P. Prathyusha	Verified by HOD: Dr. J. Carolin Joe Rosario
Checked by CDC: Dr. G.Chitra	Approved by:
	Principal

SEMESTER - II COURSE CODE: 23UBO2AP1 TITLE OF THE COURSE: ALLIED BOTANY PRACTICALS

COURSE OBJECTIVES

- To gain an appreciation of the complexity and diversity of plants- Algae, Fungi Bryophytes Pteridophytes and Gymnosperms and diseases of plants
- To distinguish between Simple and Complex tissues and their distribution in root, stem and leaf.
- To Convey and foster understanding of the differences of morphology, vegetative and reproductive structure of angiosperms and economic importance.
- To understand the adaptation of plants in relation to Various habitats and learn about various physiological activities in plants.
- To know the techniques used in plant propagation, products of horticultural plants and to create awareness about the traditional medicinal plants.

COURSE OUTCOMES

At the end of the course the students will be able to:

CO1	Prepare micropreparation and identification of given root, stem, leaf and						
	Gymnosperms specimens.						
CO2	Analyze and identify the various family characters by giving reasons	K4					
CO3	Identify and sketch spotters of the Algae, Fungi, Plant pathology, Bryophytes, Pteridiphytes, Gymnosperm, Applied Botany, Ecology, Physiology, Horticulture and Pharmacognosy	K2					
CO4	Individually complete the plant physiology experiments and Quadrats, Line & Belt transcets	K3					
CO5	Illustrate the observations and results of experiments through record work.	K3					

SYLLABUS

Credits: 4 Instructional Hours: 30

UNIT I: PLANT DIVERSITY I &II

Algae:	Volvox,
Fungi:	Saccharomyces cervisiae
Bryophytes:	Funaria
Pteridophytes:	Adiantum
gymnosperms:	Cycas
Plant pathology:	Red rot of sugarcane, Tikka disease of groundnut

UNIT II: PLANT ANATOMY

Tissues – Parenchyma, Collenchyma and Sclerenchyma Complex Tissues: Xylem and phloem. Primary structure of Dicot stem and Monocot stem Dicot root and Monocot root Monocot leaf and Dicot leaf.

UNIT III: TAXONOMY AND ECONOMIC BOTANY

A study of the following families with their economic importance Annonaceae, Cucurbitaceae, Lamiaceae, Euphorbiaceae and Poaceae

Sugar yielding plants:SugarcaneOil yielding plants:Ricinus communisFibre yielding plants:Cotton and JuteBeverages:Coffee and Tea.Mushroom Cultivation: Milky and Oyster mushroom

UNIT IV: PHYSIOLOGY AND ECOLOGY

Experiments to demonstrate: Transpiration pull Evolution of O₂ during photosynthesis CO₂ is essential for Photosynthesis Adaptations of *Eichhornia (Hydrophyte)* Nerium (Xerophyte)

UNIT V: HORTICULTURE AND PHARMACOGNOSY

Diagrams or specimens for the topics: Cutting, Layering, Grafting and Bonsai Diagrams or specimens for the topics: *Zingiber officinale, Ocimum Sanctum, Curcuma longa* and *Centella asiatica*.

REFERENCE BOOKS

- 1. Ashok Bendre. A Text Book of Practical Botany, 1 & 2. Rastogi publications, Meerut. (2006).
- 2. Manik M. Dhore, Minal J. Keche, Ujwala G. Malode, Vanita and U. Pochhi. *A Text Book of Practical Botany B.Sc.-I*, Nabh Prakashan Publication, Amravati. (2012).
- 3.B.P. Pandey. *Modern Practical Botany Vol I and III*. S. Chand & Company PVT.Ltd. Noida. (2014).

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	3				3					
CO2	3	3	3	3				3	1		3	1	
CO3	3	3	3				2	3			3		3
CO4	3	3	3	3	2	2	3	3	3	3	3	1	3
CO5	1	2	1	1	2	2	1	1	1	2	2	2	2

MAPPING OF CO'S WITH POs/PSO'S

(Correlat2ion: 3-High, 2-Medium, 1-Low)

S.No.	Assessment Methods	Frequency of Assessment					
1.	Internal Exam	Once in a Semester					
	Major Practicals						
	Minor Practicals						
	Spotters						
	Record						
2	End Semester Exam	End of the year					

Course Designed by: Dr. U. Danya	Verified by HOD: Dr. J. Carolin Joe Rosario
Checked by CDC: Dr. G.Chitra	Approved by:
	Principal

SEMESTER - III COURSE CODE: 23UBO3C04 TITLE OF THE COURSE: CORE: PLANT ANATOMY AND EMBRYOLOGY (SKILL DEVELOPMENT)

COURSE OBJECTIVES:

- 1. To discuss the structure and functions of the Meristematic, Simple and Complex tissues
- 2. Able distinguish between Dicot and Monocot Roots, Stem and Leaves.
- 3. Identify the male and female gametophytes in the seed plants.
- 4. Discuss the development of the endosperm and embryo.

COURSE OUTCOMES:

At the end of the course the students will be able to:

CO1	Differentiate the internal tissues of the plant	K2
CO2	Compare the primary structures of dicots and monocots	K2
CO3	Interprets the knowledge on anomalous secondary growth in dicots and	K3
	monocots	
CO4	Summarize the embryology of angiosperms	K3
CO5	Differentiate the structure and development of dicot and monocot embryo	K3

SYLLABUS

Credits: 4 Instructional Hours: 75

UNIT I: ANATOMICAL STRUCTURES OF PLANTS (K2)

Meristems - Characteristics of Meristem, Classification based on origin, position and function. Shoot and root apex, Theories - Shoot apex - Apical cell theory, Histogen, Tunica and Corpus, Root apex - Korper - Kappe theory. Stomata -Structure, types and functions, Sclereids, Raphides (*Colocasia*), Cystolith (*Ficus* leaf) and Starch grains (Rice). Laticifers: Distribution, Structure and Types.(*Self study: Types of stomata*)

UNIT II: PLANT TISSUES (K2)

Simple permanent tissues - Parenchyma, Collenchyma and Sclerenchyma. Complex tissues - xylem and phloem (structure and function only). Primary structure of Dicot root, stem and leaf. Primary structure of monocot root, stem and leaf.

UNIT III: SECONDARY STRUCTURES AND ANOMALI (K3)

Secondary growths in Dicot stem and root. Anomalous secondary thickening in Dicot Stems of Coral jasmine (*Nyctanthes arbor-tristis*), Cork Swallow-Wort (*Leptadaenia*), Anomalous Secondary growth in Monocot Stem-*Dracaena*. Wood technology- Physical, Chemical and mechanical properties of wood, Seasoning of wood, Defects in wood, Methods of preservation of wood and Uses of wood.

(Self study: Seasoning of wood)

(15 Hours)

(15 Hours)

(15 Hours)

UNIT IV: EMBRYOLOGY (K3)

Introduction and scope of embryology, Structure and Function of Microsporangium, Development of Male gametophyte including abnormal features. Structure and Function of Megasporangium, Types of ovules, Development of Female gametophyte (Polygonum type).

UNIT V: DEVELOPMENTAL BOTANY (K3)

Fertilization: Pollen germination, Pollen tube- growth, Double fertilization. Endosperm-Structure, Types (Nuclear, Helobial, Cellular and Ruminate) and function. Structure and Development of Dicot embryo (*Capsella*) and Monocot embryo (*Luzula*). (*Beyond the Curriculum – Histological techniques in Anatomy*)

TEXT BOOKS:

- 1. Vasishta, P.C. A Text Book of Plant Anatomy. S. Nagin & Co., Jullunder & New Delhi. (1977).
- 2. Bhojwani, S.S. & Bhatnagar, S.P. *The Embryology of Angiosperms (4thEdition)*. Vikas Publishing House(P)Ltd., UBS Publisher's Distributors, New Delhi. (2000).

REFERENCE BOOKS:

- 1. Foster, A.S. *Practical Plant anatomy*. Van Nostrand & East West Press, New Delhi. (1949).
- 2. Esau, K. *Vascular Differentiation in Plants*. Holt, Rinehart & Winston, N.Y., Chicago, SanFrancisco, Toronto, London. (1965).
- 3. Eames, A.J., & Mc Daniels, L.H. *An Introduction to Plant anatomy*. Tata-McGraw-Hill Publishing Co., (P)Ltd., Bombay, New Delhi. (1979).
- 4. Maheswari, P. *Recent Advances in the Embryology of Angiosperms*. International Society of Plant Morphologists, University of Delhi. (1963).

BLENDED LEARNING:

Торіс	Links
Fertilization: Pollen germination	https://youtu.be/bUjVHUf4d1I
Pollen tube – growth	https://youtu.be/Mm_ZDOpegDY
Endosperm- Structure	https://youtu.be/eqEyy5CGZXQ
Types of Endosperm	https://youtu.be/VWVxd3c5rIU
(Nuclear, Helobial, Cellular and Ruminate)	
Functions of endosperm	https://youtu.be/CVXCRRf5IW
Structure and Development of Dicot embryo	https://youtu.be/DPcSTA3EUE4
(Capsella)	
Structure and Development of Monocot embryo	https://youtu.be/G5OFPmR2yL8
(Luzula)	

(15 Hours)

(15 Hours)

MAPPING OF CO'S WITH POs/PSO'S

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1		2		2		2		2		2	2	3	3
CO2		2		2		3		3		3	2	3	3
CO3	2			2		2		2		2		3	3
CO4	2	2			3				3		3	3	3
CO5	2	2			1			1	1		2	1	1

(Correlation: 3-High, 2-Medium, 1-Low)

S.No.	Assessment Methods	Frequency of Assessment				
1	End Semester Examination	Once in a Semester				
2	CIA I	Once in a Semester				
3	CIA II	Once in a Semester				
4	Model Examination	Once in a Semester				
5	Assignment (Unit I and Unit II)	Twice in a Semester				
6	Seminar (Unit III and Unit IV)	Twice in a Semester				
7	Field survey (Unit V)	Once in a Semester				

Verified by HOD: Dr. J. Carolin Joe		
Rosario		
Approved by:		
Principal		

SEMESTER: III COURSE CODE: 23UBO3SB1 TITLE OF THE COURSE: SKILL BASED I NURSERY TECHNIQUES AND GARDENING

COURSE OBJECTIVES

- To learn about methods of propagation of plants.
- To gain knowledge about seed production technology. •
- To inculcate knowledge on conservation of plants.
- To learn different vegetable cultivation methods.

COURSE OUTCOMES

At the end of the course the students will be able to:

CO1	Explain about the application of herbal health care products.	K1
CO2	Describe the various herbal treatments available for hair.	K1
CO3	Summaries the therapeutic face care treatments.	K2
CO4	Exemplify the care and maintenance of Eye.	K2
CO5	Compare the treatments available to enhance the beauty of hand and foot	K3

SYLLABUS

Credits: 2 **Instructional Hours: 45**

UNIT I: NURSERY (K1)

Nursery - definition, objectives and scope and building up of infrastructure for nursery, planning and seasonal activities, Methods of Planting crops - direct seeding and transplants.

UNIT II: SEED (K1)

Structure and types - Seed dormancy; causes and methods of breaking dormancy - Seed storage: Seed banks, factors affecting seed viability, Seed production technology- Role and Concept, Seed testing and certification.

UNIT III: CONSERVATION (K2)

Genetic erosion - In situ- Election of target taxa for conservation, gene pool concepts, ecogeographic surveys and field surveying and *Ex-situ* conservation- field gene banks, botanic gardens, arboreta, samples of seed, tubers, tissue explants, pollen, DNA maintained under special artificial conditions. Hardening of plants: Greenhouse - mist chamber, shed roof, shade house and glass house.

Unit IV: GARDENING (K2)

Definition, Objectives and Scope, Different types of gardening - Landscape and home gardening, Computer applications in landscaping, parks and its components. Plant materials and design, Gardening operations: Soil laying, Manuring, Watering, Management of pests and diseases and harvesting.

Unit V: CULTIVATION PRACTICES (K3)

Sowing, raising of seeds and seedlings, Transplanting of seedlings, Study of cultivation of different vegetables - Cabbage, Brinjal, Lady's finger, Onion and Carrots, Storage and marketing procedures.

(9 Hours)

(9 Hours)

(9 Hours)

(9 Hours)

(9 Hours)

TEXT BOOKS

1. Bose T.K. & Mukherjee, D. *Gardening in India*. Oxford & IBH Publishing Co., New Delhi. 1972. 2. Kumar, N. *Introduction to Horticulture*, Rajalakshmi Publications, Nagercoil. 1997.

REFERENCE BOOKS

1. Agarwal, P.K. *Hand Book of Seed Technology*, Dept. of Agriculture and Co-operation, National Seed Corporation Ltd., New Delhi. 1993.

2. Janick Jules. *Horticultural Science*. (*3rd Ed.*), W.H. Freeman and Co., San Francisco, USA. 1979.

BLENDED LEARNING:

UNIT IV- GARDENING							
TOPIC	LINK						
Definition, Objectives and Scope of	https://www.youtube.com/watch?v=638PZqS7H-g						
Landscape gardening	https://www.youtube.com/watch?v=V7k6b0VsJWI						
home gardening	https://www.youtube.com/watch?v=8CrcC92B-TA						
Computer applications in landscaping	https://www.youtube.com/watch?v=thaeC99H8FE						
	https://www.youtube.com/watch?v=xBGALG-hxVc						
Parks and its components	https://www.youtube.com/watch?v=V5KODz92wLc						
Plant materials and design	https://www.youtube.com/watch?v=jirgOkCFkn8						
	https://www.youtube.com/watch?v=uRqpaVj-1bk						
Gardening operations: Soil laying,	https://www.youtube.com/watch?v=Eu9_HGDi5cI						
Manuring, Watering, Management of pests	https://www.youtube.com/watch?v=Y6BgWWPFGss						
and diseases and harvesting.							

MAPPING OF CO'S WITH POs/PSO'S

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2			2		2			3	2	3	3
CO2	3		2		2		2		2	3	2	3	3
CO3	3		2	2			2		2	3	2	3	3
CO4	3		2		2		2		2	3	2	3	3
CO5	3		2		2		2		2	3	2	3	3

(Correlation: 3-High, 2-Medium, 1-Low)

S.No.	Assessment Methods	Frequency of Assessment
1	End Semester Examination	Once in a Semester
2	CIAI	Once in a Semester
3	CIA II	Once in a Semester
4	Model Examination	Once in a Semester
5	Assignment (Unit I and Unit II)	Twice in a Semester
6	Seminar (Unit III and Unit IV)	Twice in a Semester
7	Field survey (Unit V)	Once in a Semester

Verified by HOD: Dr. J. Carolin Joe
Rosario
Approved by:
Principal

SEMESTER - IV COURSE CODE: 23UBO4C05 TITLE OF THE COURSE: CORE: FUNDAMENTALS OF COMPUTER AND BIOINFORMATICS (EMPLOYABILITY)

COURSE OBJECTIVES:

- To impart computer basics, internet and MS-Office tools.
- To learn basic principles of using Windows operation system.
- To be able to access the Internet, Worldwide web and search engines and locate www addresses.
- To educate the interdisciplinary nature of advances in bioinformatics and computational biology.

COURSE OUTCOMES:

At the end of the course the students will be able to:

CO1	Describe about computer basics, hardware, software and its applications.	K2
CO2	Evaluate basics of internet, e-mail such as sending, forwarding and receiving mail	K3
	and information on the web.	
CO3	Discuss the basics of MS-Office tools.	K2
	Analyze effective query strategies for accessing data in a wide variety of biological	K3
CO4	data bases.	
	Apply fundamental bioinformatics methods to analyze protein sequence and	
CO5	structure data, genomic DNA sequence and gene expression.	K3

SYLLABUS

Credits: 4

Instructional Hours: 75 UNIT I: BASICS OF COMPUTERS (K2)

Introduction to computer- Function and Components of a computer, Characteristics of Computers, Types of Computers, Languages - Machine language, Low and High level languages, Compilers and Translators. Memory Units-RAM (random-access memory), ROM (read-only memory), PROM (programmable read-only memory), EPROM (Electrically erasable programmable read-only memory), Flash memory. Input, Output and Storage devices.

(Self study- Input, Output and Storage devices)

UNIT II: FUNDAMENTALS OF NETWORKS (K3)

Operating systems - classification and function, Computer Networks- Internet, Intranet. Types of networks - Local area network (LAN), Wide Area Network (WAN), World Wide Web (WWW). Web pages, Web browsers and Websites. Introduction to Electronic mail (E-mail)- Names and addresses, Mailing Basics, Signature, File attachment, Replying and Forwarding E-mail messages, Smiley's (EMOTICONS).

UNIT III: MS OFFICE AND AUTOMATION (K2)

Microsoft Excel - Accessing MS-Excel, spread sheet, Basics operation performed in MS-Word- Creating, Saving, Modifying, Renaming, Deleting, Moving and Editing a document. Microsoft PowerPoint- Creating, Designing, module development. Microsoft Access- creating, Querying database.

(15 Hours)

(15 Hours)

(15 Hours)

UNIT IV: BIOLOGICAL DATABASE (K3)

Scope and Importance of Bioinformatics. Classification of Biological Databases, Generalized databases- sequence database -nucleic acid and Protein database (NCBI, DDBJ, SWISS PROT, GenBank, PDB). Specialized databases- Kyoto Encyclopedia of Genes and Genomes (KEGG), Bibliographic Database-PubMed and AGRICOLA. Virtual Library. Uses of Databases. Data warehouse and mining.

UNIT V: BIOLOGICAL SEQUENCE ALIGNMENT (K3) (15 Hours)

Biological Sequence Alignment-FASTA, Similarity search using BLAST, Pairwise (Dot Matrix) and Multiple Sequence alignment. Gene finding – Prokaryotic and Eukaryotic Gene Structure, Gene prediction using GenScan. Protein prediction, Biomolecular visualization using RasMol. **IoT tools for remote monitoring system in plants.** (*Industry 4.0*)

(Beyond the Curriculum – Detection and Identification of Genome in Plants)

TEXT BOOKS

- 1. Supratim Choudhuri. Bioinformatics for Beginners, Kindle edition.USA. (2014).
- 2. Rajaraman.V. *Fundamentals of Computer*. Prentice Hall of India PVT Ltd. New Delhi. (2015).

REFERENCE BOOKS

- 1. Peter Nortan. Introduction to Computers, Tata Mc Graw-Hill, New Delhi (2008).
- 2. Shanmugavel. P. Trends in Bioinformatics, Pointer publishes, Jaipur. (2006).
- 3. Thiagaraja. B & Rajalakshmi. Computational Biology, MJP Publishers, Chennai. (2009).
- 4. Rastogi.S.C *et al.*, *Bioinformatics methods and applications*. Prentice Hall of India Pvt Ltd, New Delhi, India. (2013).

UNIT V- BIOLOGICAL SEQUENCE ALIGNMENT							
Торіс	Links						
Biological Sequence Alignment-FASTA & Similarity search using BLAST	https://youtu.be/IrHDOEDtwD4						
Pairwise (Dot Matrix)	https://youtu.be/xeSV9R3Fg38						
Multiple Sequence alignment	https://youtu.be/TZaA4j19w						
Gene finding – Prokaryotic & Eukaryotic	https://youtu.be/Mm6LYxJSLD8						
Gene prediction using GenScan	https://youtu.be/3gaV6PdLSKE						
Protein prediction	https://youtu.be/EweuU2fEgjw						
Biomolecular visualization using RasMol	https://youtu.be/NDDn-iUgUCE						

BLENDED LEARNING

(15 Hours)

MAPPING OF CO'S WITH POs/PSO'S

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	3	2	2	2			3	3	3	3	
CO2	2	2	3	2				2		3	3	3	
CO3	2	2	3	2			2			3	3	3	3
CO4	2		3	2	2	2		2	3	3	3	3	3
CO5	2		3	2	2	2	2		3	3	3	3	3

(Correlation: 3-High, 2-Medium, 1-Low)

S.No.	Assessment Methods	Frequency of Assessment
1	End Semester Examination	Once in a Semester
2	CIA I	Once in a Semester
3	CIA II	Once in a Semester
4	Model Examination	Once in a Semester
5	Assignment (Unit I and Unit II)	Twice in a Semester
6	Seminar (Unit III and Unit IV)	Twice in a Semester
7	Workshop participation (Unit V)	Once in a Semester

Course Designed by: Dr. J.Carolin Joe	Verified by HOD: Dr. J. Carolin Joe
Rosario & Dr.Sr. Arul Sheeba Rani	Rosario
Checked by CDC: Dr. G.Chitra	Approved by:
	Principal

SEMESTER: IV COURSE CODE: 23UBO4SB2 TITLE OF THE COURSE: SKILL BASED II: HOME GARDENING (ENTREPRENEURSHIP)

COURSE OBJECTIVES

- To identify and propagate medicinal herbs and shrubs
- Be able to cultivate mushrooms
- To focus on various gardening techniques.
- To create positive relationships with environment.

COURSE OUTCOMES

At the end of the course the students will be able to:

CO1	Explain the basic cultivation process of medicinal plants	K2
CO2	Apply the knowledge of therapeutic uses of flowering plants in daily life	K2
CO3	Implement the cultivation process in daily life	K3
CO4	To create awareness and improve skills for growing fresh and safe vegetables	K3
CO5	To create different types of garden	K3

SYLLABUS

Credits: 2 Instructional Hours: 45

UNIT I: MEDICINAL PLANT CULTIVATION (K2) (9 Hours)

Cultivation of Medicinal herbs- Distribution, Description, cultivation and uses Nilavembu (Andrographis paniculata,) Tulasi (Ocimum sanctum), Aloe (Aloe vera), Karpooravalli (Plectranthus amboinicus) Pudina (Mentha arvensis) Maruthani (Lawsonia inermis). (Self study: Maruthani (Lawsonia inermis)

UNIT II:MEDICINAL IMPORTANCE OF FLOWERING SHRUBS (K2) (9 Hours)

Distribution, Description, Cultivation and Therapeutic uses of flowers - Shoe flower (*Hibiscus rosa- sinensis*), Jasmine (*Jasminum officinalis*), Rose (*Rosa spp.*), Pin Wheel Jasmine (*Tabernae montanadivaricata*) and Champaka (*Michaelia champaka*). (*Self study:Shoe flower*)

UNIT III: MUSHROOM CULTIVATION (K3)

Mushroom cultivation – Description, Spawn preparation, Methods of cultivation of Oyster and milky mushroom - medicinal and nutritive value – Delicious recipes of mushroom (any five) – Ingredients and methods of preparation.

UNIT IV: INTRODUCTION TO HORTICULTURE (K3)

Kitchen gardening- introduction, Distribution, Description, Cultivation of vegetables like Amaranthus, Lady's finger (*Ablemoschus esculentus*), Radish (*Raphnaus sativus*), Tomato (*Lycopersicum esculentum*), Curry leaf (*Murraya konenjii*).

(9 Hours)

(9 Hours)
UNIT V: SPECIAL TYPES OF GARDENS (K3)

Terrace gardening- Principles and different features of Terrace gardening, Bottle garden, Terrarium, Indoor plants –Introduction and popular indoor plants, Bonsai –Introduction, kinds, origin and principle, Hanging basket plants (General).

TEXT BOOKS

- 1. Arora J.J. *Introductory ornamental Horticulture*. Kalyani Publishers, New Delhi. (2010).
- 2. Pandey R.K.and S.K.Ghosh, *A Hand book on Mushroom cultivation*. Emkay Publications, New Delhi. (2014).

REFERENCE BOOKS

- 1. George Acquaah Prentice. *Horticulture Principles and Practices*. Hall of India Private Ltd., NewDelhi. (2001).
- 2. Edward Jarald E. and Sheeja Edwin Jarald. *Colour Atlas of Medicinal Plants*. CBS Publishers and Distributors. NewDelhi, Bangalore (India). (2008).
- 3. Panda, H. *Medicinal Plants cultivation and their uses*. Asia Pacific Basinen Press.Inc New Delhi. (2013).

UNIT IV- INTRODUCTION TO HORTICULTURE								
Торіс	Links							
Kitchen gardening- introduction,	https://www.youtube.com/watch?v=oglc8N-QTm0							
Distribution, Description,	https://www.youtube.com/watch?v=9oAAjCnnsOI							
Cultivation of vegetables like	https://www.youtube.com/watch?v=lISyONobcLA							
Amaranthus,	https://www.youtube.com/watch?v=ytk45GDlyQQ							
Lady's finger	https://www.youtube.com/watch?v=WmQjkObiTUU							
(Ablemoschusesculentus),	https://www.youtube.com/watch?v=ybEUoJnqlEY							
Radish (Raphnaussativus),	https://www.youtube.com/watch?v=VTls5a2jrc0							
	https://www.youtube.com/watch?v=YfvmWMo3sak							
Tomato (Lycopersicumesculentum)	https://www.youtube.com/watch?v=th2leLbzltM							
	https://www.youtube.com/watch?v=ll7ijXpDkFs							
Curry leaf (Murrayakonenjii).	https://www.youtube.com/watch?v=5FTpyOewEzY							
	https://www.voutube.com/watch?v=Ixrb8Vvax3Y							

BLENDED LEARNING:

(9 Hours)

MAPPING OF CO'S WITH POs/PSO'S

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3		2		3					2			
CO2	3	2	2				2			2			
CO3	3		3							3	3	3	3
CO4	3									3	2	2	2
CO5	3	2	2		3			3		3		2	2

(Correlation: 3-High, 2-Medium, 1-Low)

S.No.	Assessment Methods	Frequency of Assessment
1	End Semester Examination	Once in a Semester
2	CIA I	Once in a Semester
3	CIA II	Once in a Semester
4	Model Examination	Once in a Semester
5	Assignment (Unit I and Unit II)	Twice in a Semester
6	Seminar (Unit III and Unit IV)	Twice in a Semester
7	Field visit (Unit V)	Once in a Semester

Course Designed by: Dr. M. Saradha & Dr.Sr. Arul Sheeba Rani	Verified by HOD: Dr. J. Carolin Joe Rosario
Checked by CDC: Dr. G.Chitra	Approved by:
	Principal

SEMESTER - IV COURSE CODE: 23UBO4CP2 TITLE OF THE COURSE: CORE PRACTICAL II

COURSE OBJECTIVES:

1. Able to distinguish between Dicot and Monocot Roots, Stem and Leaves and their structure and functions

- 2. To identify the male and female gametophytes in the seed plants and the development of embryo
- 3. To impart computer basics, internet and MS-Office tools using windows operating system.
- 4. To educate the interdisciplinary nature of advances in bioinformatics and computational biology.

COURSE OUTCOMES:

At the end of the course the students will be able to:

CO1	Represent the anatomical sections and identify the dicot and monocot stem, leaf	K4
	and root.	
CO2	Interpret the knowledge on the structure and development of dicot and monocot	K4
	embryo	
CO3	Study the stages and development of male gametophytes, ovule and represent the	K2
	Embryo mounting	
CO4	Demonstrate the importance of computer hardware, software & its applications	K3
	and bioinformatics methods to analyze Protein, genomic DNA sequence and gene	
	expression	
CO5	Illustrate the observations and results of experiments through record work.	K3

SYLLABUS

Credits: 5

Instructional Hours: 30

UNIT I: PLANT ANATOMY

The study of tissues mentioned in the theory

Stem - Primary structure: Dicot - Tridax, Cucurbita Monocot-Chloris,

Root - Primary structure Dicot- Tridax, Monocot - Canna, Leaf - Dicot - Nerium, Monocot- Chloris.

UNIT II: PLANT ANATOMY

Stem - Normal secondary growth-*Eupatorium*, Anomalous secondary growth-*Nyctanthes*, *Leptadaenia*, Monocot - *Dracaena* (Permanent slide), Root-Normal secondary growth –*Eupatorium*.

UNIT III: PLANT EMBRYOLOGY

T.S of anther-Slide Structure of pollen Germination Stages of development of male gametophyte Structure of Ovule(slide) Types of ovule(slide) Stages of development of embryo sac- Polygonum type (slide) Embryo mounting-Different stages of development of dicot embryo-Tridax.

UNIT IV: FUNDAMENTALS OF COMPUTER

Creating, editing and printing a document in MSWord Creating a table in MS-Word, Creating a chart in MS-Excel Preparing a presentation in MS-power-point Web browsing E-mailing.

UNIT V: BIOINFORMATICS

Gene finding Protein prediction Bio-Molecular Visualization using RASMOL or any other soft-wares.

REFERENCE BOOKS

- 1. Ashok Bendre. A Text Book of Practical Botany, 1 & 2. Rastogi publications, Meerut. (2006).
- 2. Manik M. Dhore, Minal J. Keche, Ujwala G. Malode, Vanita and U. Pochhi. *A Text Book of Practical Botany B.Sc.-I*, Nabh Prakashan Publication, Amravati. (2012).
- 3.B.P. Pandey. *Modern Practical Botany Vol I and III*. S. Chand & Company PVT.Ltd. Noida. (2014).

MAPPING OF CO'S WITH POs/PSO'S

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1		2		2		2		2		2	2	3	3
CO2		2		2		3		3		3	2	3	3
CO3	2	2			3				3		3	3	3
CO4	2	1			2			2	2		1	1	1
CO5	3	2	3	2	2	2	2	3	3	3	3	3	3

(Correlation: 3-High, 2-Medium, 1-Low)

S.No.	Assessment Methods	Frequency of Assessment
1.	Internal Exam Major Practicals Minor Practicals Spotters Record	Once in a Semester
2.	End Semester Exam	End of the year

Course Designed by: Dr. U.Danya	Verified by HOD: Dr. J. Carolin Joe Rosario				
Checked by CDC : Dr. G.Chitra	Approved by:				
	Principal				

SEMESTER - V

COURSE CODE: 23UBO5C06

TITLE OF THE COURSE: CORE: TAXONOMY OF ANGIOSPERMS AND ECONOMIC BOTANY

COURSE OBJECTIVES:

- To identify all kinds of plants on earth with their names, distinctions, distribution, morphology, characteristics and affinities.
- To correlate the studies with scientific data contributed by various researches in the field of botanical science.
- To promote understanding of the interrelationships among fields of inquiry within Plant biology.

COURSE OUTCOMES:

At the end of the course the students will be able to:

	Describe the plant morphological terminologies and use it accurately in the	
CO1	description and identification of plant species.	K2
	Discuss the principles and rules of plant nomenclature and to publish a new taxon.	
CO2		K2
	Identify and provide family characteristics of flowering plants.	
CO3		K2
	Classify and diagnose several characteristics of the major families.	
CO4		K2
	Illustrate the evolutionary sequence as well as genetic relationships among different	
CO5	groups of plants.	K3

SYLLABUS

Credits: 5 **Instructional Hours: 75**

UNIT I: DESCRIPTIVE TAXONOMY (K2)

Descriptive terms used in Vegetative and Reproductive Morphology (Root, Stem, Leaf, Inflorescence, Flower and Fruit) Systems of classification - Natural-Bentham and Hooker, Modern -Takhtajan (outline only).

(Self-study: Morphology- Leaf)

UNIT II: TECHNIQUES IN TAXONOMY (K2) Industry 4.0 (15 Hours)

Herbarium techniques, Digital Herbarium and uses, Nomenclature-ICBN, (Priority, Typification, Effective and Valid publication, Author citation) Activities of BSI, Modern trends in taxonomy. (Self-study: Herbarium techniques)

UNIT III: DESCRIPTION OF FAMILIES: POLYPETALAE (K2) (15 Hours) А

detailed study of the families and their economic importance of Polypetalae: Annonaceae, Brassicaceae, Rutaceae, Anacardiaceae, Curcurbitaceae and Apiaceae.

UNIT IV: DESCRIPTION OF FAMILIES: GAMOPETALAE (K2) (15 Hours)

A detailed study of the families and their economic importance of Gamopetalae: Rubiaceae, Asclepiadaceae, Acanthaceae, Lamiaceae, Amarantaceae and Euphorbiaceae.

UNIT V: DESCRIPTION OF FAMILIES: MONOCHLAMYDEAE (K3) (15 Hours)

A detailed study of the families and their economic importance of Monochlamydeae: Zingiberaceae, Cannaceae, Liliaceae, Arecaceae, Orchidaceae & Poaceae. (*Beyond the curriculum – Taxonomic key preparation*)

TEXT BOOKS:

- 1. Pandey. B. P. *Taxonomy of Angiosperms*, S. Chand & Company Publications, New Delhi. (2001).
- 2. Sundara Rajan.S. *Practical manual of Angiosperm Taxonomy*, Anmol publications, Bangalore, Karnataka. (2000).

REFERENCE BOOKS:

- 1. Sambamurty A.V.S.S. *Taxonomy of Angiosperms*, I. K International Publishing House. New Delhi. (2005).
- 2. Pulliah.T. Taxonomy of Angiosperms, Regency Publications, New Delhi. (2007).
- 3. Pandey. S.N and Misra. S.P. *Taxonomy of Angiosperms*, Ane's Books India, New Delhi. (2008).

UNIT V- DESCRIPTION OF FAMILIES							
Торіс	Links						
Orchidaceae	https://youtu.be/ZAtWFZeFjFA						
Cannaceae	https://youtu.be/UtDG_GV3EKU						
Zingiberaceae	https://youtu.be/NSEDAu2uJPc						
Liliaceae	https://youtu.be/93qSF2v_JDw						
Poaceae	https://youtu.be/UqMmdV-jxrM						
Arecaceae.	https://youtu.be/lcYL9Lsne9U						

BLENDED LEARNING:

MAPPING OF CO'S WITH POs/PSO'S

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	3	2	3	3	2	1		3	3	2
CO2	3	2	2		3	3	2					3	2
CO3	3	3	3	3	3	3	2	2	2			3	2
CO4	3	3	3	3	3	3	2	2	2			2	2
CO5	3	3	3	3	3	3	2	2	2			2	2

(Correlation: 3-High, 2-Medium, 1-Low)

S.No.	Assessment Methods	Frequency of Assessment
1	End Semester Examination	Once in a Semester
2	CIA I	Once in a Semester
3	CIA II	Once in a Semester
4	Model Examination	Once in a Semester
5	Assignment (Unit I and Unit II)	Twice in a Semester
6	Seminar (Unit III and Unit IV)	Twice in a Semester
7	Field work (Unit V)	Once in a Semester

Course Designed by: Dr. Sr.Arul Sheeba	Verified by HOD: Dr. J. Carolin Joe
Rani	Rosario
Checked by CDC : Dr. G.Chitra	Approved by:
	Principal

SEMESTER: V COURSE CODE: 23UBO5C07 TITLE OF THE COURSE: CORE: PHARMACOGNOSY

COURSE OBJECTIVES:

- 1. To promote understanding of different systems of medicines in the world.
- 2. To study the Morphological and histological structures, chemical constituents, therapeutic and pharmaceutical uses
- 3. To aware of the various Drugs of alternative medicines
- 4. To learn cultivation and medicinal values of various medicinal plants to practice it.

COURSE OUTCOMES:

At the end of the course the students will be able to:

CO1	Summarize the various systems of medicines.	K2
CO2	Implementing the pharmaceutical knowledge of medicinal plants in their daily life	K3
CO3	Execute the knowledge about the unorganized drugs from various plant sources.	K3
CO4	Classifying the herbal drugs which is used for various diseases	K3
CO5	Explore the uses of various propagation technique to cultivate and conserve the	K3
	different medicinal plants	

SYLLABUS

Credits: 5

Instructional Hours: 60

UNIT I: PHARMACOGNOSY (K2)

Pharmacognosy-definition, history and Scope. Ayurveda: Origin, Theory,Diagnosis, treatment methods and plants used in ayurvedic treatments. Siddha:Origin, Basis of Siddha system, Diagnosis, Treatment methods, plants used in Siddha medicine. Homeopathy: Origin, Basic principles, Diagnosis, Treatment methods, Sources of Homeopathic remedies. Unani: Origin, basic theories, Diagnosis, Treatment methods, Sources of Unani remedies.

(Self-study: Ayurvedha)

UNIT II: MEDICINAL PLANTS (K3)

Organized drugs: Morphological, histological studies, Chemical constituents, Therapeutic and pharmaceutical uses of Bark- *Cinchona officinalis*, Leaves-Adathoda vasicaand Eucalyptus globulus, Flower -Syzygium aromaticum, Fruits- Phyllanthus emblica and Seeds- Sesamum indicum. Unorganized drugs:Gum –Acacia arabica, Resin-Pinus roxburghiiand Fixed oil- Ricinus communis.

UNIT III: MEDICINAL PLANT CONSERVATION (K3)

and processing of herbal drugs. Indian trade in Medicinal plants. Diversity hot spots, Endemism-Rare, Endangered and Threatened species. Centers of medicinal plant conservation in India - IBPGRI, CIMAP, CDRI, TAMPCOL and TBGRI.

UNIT IV: PHARMACEUTICAL USES OF PLANTS (K3)

Classification of crude drugs based on Pharmacological classification: Drugs acting on Gastro-intestinal tract, Drugs acting on Respiratory system, Drugs acting on Cardio-vascular system, Drugs acting on Central nervous system.

(12 Hours)

(12 Hours) Collection

(12 Hours)

(12 Hours)

UNIT V: CULTIVATION OF MEDICINAL HERBS (K3)

(12 Hours)

Cultivation of medicinal plants in India: *Gloriosa superba*, *Cassia angustifolia*, *Withania somnifera*, *Catharanthus roseus* and *Rauwolfia serpentina*. Medicinal plants and their phytochemicals exported from India. Drug adulteration and types of adulterants, Drug evaluation methods- Morphological, Microscopical and Physical evaluation methods (In brief).

(Beyond the curriculum- Germplasm conservation of medicinal plants- Introduction, methods of germplasm storage and conservation)

TEXT BOOKS:

- 1. Wallis, T.E. *Text book of Pharmacognosy- Fifth Edition*.CBS publishers and Distributors. New Delhi. (2005).
- 2. Kumar N.C. An introduction to Medicinal Botany and Pharmacognosy. Emkay publications, New Delhi. (2004).

REFERENCE BOOKS:

- 1. Trease and Evans. Pharmacognosy. Fifteenth Edition, Elsevier Health, UK.(2009).
- 2. Tyler.V. E, L. R. Brady, J. E. Habbers, Lea and Febiger Philadelphia. *Pharmacognosy:* 9th *Edition*. Lippincott Williams and Wilkins publications. Philadelphia. (2011).
- 3. Saroskar R..S., and Bhandarkar. S.D. *Pharmacognosy and Pharmaco therapeutics*. *Thirteen Edition*. Revised Publishers Popular Prakashan, Bombay. (2015).
- 5. Kokate C.K., A. Purohit and S.R.Gokhale. *Pharmacognosy- 45th Edition*, Nirali Prakashan, Pune. (2000).

BLENDED LEARNING:

UNIT V- CULTIVATION OF MEDICINAL HERBS						
Торіс	Links					
Cultivation of medicinal plants in India: Gloriosa superba	https://www.youtube.com/watch?v=AOYJhpSbfj8 https://www.youtube.com/watch?v=UF3Dm-ZRI-4					
Cultivation of medicinal plants in India: Cassia angustifolia	https://www.youtube.com/watch?v=ctf6du-OzEg https://www.youtube.com/watch?v=hgwwi_s5kF8					
Cultivation of medicinal plants in India: <i>Withania somnifera</i>	https://www.youtube.com/watch?v=KKqRdMTMh4Y https://www.youtube.com/watch?v=xu_3C5ImOg4					
Cultivation of medicinal plants in India: Catharanthus roseus	https://www.youtube.com/watch?v=6kR2njuPhYU https://www.youtube.com/watch?v=x6kMLHAMxSU					
Cultivation of medicinal plants in India: <i>Rauwolfia serpentine</i>	https://www.youtube.com/watch?v=4kdehZoXiyA https://www.youtube.com/watch?v=gQzgGkm3iKM					
Medicinal plants and their phytochemicals exported from India	https://www.youtube.com/watch?v=bN-3YwYN460 https://www.youtube.com/watch?v=fnrGL147ywU					
Drug adulteration and types of adulterants	https://www.youtube.com/watch?v=LMZ6P2jGL84 https://www.youtube.com/watch?v=Pz6i1EMc6mo					

Drug evaluation methods- Morphological,	https://www.youtube.com/watch?v=yHUxoyxdEZI
Microscopical and Physical evaluation	https://www.youtube.com/watch?v=xOIgZdR3mx8
methods	

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3		2				3		2				
CO2	3		2				3		2			3	
CO3	3		2				3		2			3	3
CO4	3				3		3			3		3	3
CO5	3	2	3	2	1	1	3		2	2		3	3

MAPPING OF CO'S WITH POs/PSO'S

(Correlation: 3-High, 2-Medium, 1-Low)

S.No.	Assessment Methods	Frequency of Assessment				
1	End Semester Examination	Once in a Semester				
2	CIA I	Once in a Semester				
3	CIA II	Once in a Semester				
4	Model Examination	Once in a Semester				
5	Assignment (Unit I and Unit II)	Twice in a Semester				
6	Seminar (Unit III and Unit IV)	Twice in a Semester				
7	Conference Participation (Unit V)	Once in a Semester				

Course Designed by: Dr. U.Danya	Verified by HOD: Dr. J. Carolin Joe
	Rosario
Checked by CDC : Dr. G.Chitra	Approved by:
	Principal

SEMESTER V COURSE CODE: 23UBO5C08 TITLE OF THE COURSE: CORE: PLANT ECOLOGY AND PHYTOGEOGRAPHY

COURSE OBJECTIVES:

- To provide a broad introduction to key concepts in Ecology.
- Develop some basic skills in obtaining processing and evaluating data in lab and field based practicals.
- Improve scientific literacy by learning how ecologists construct knowledge.
- To obtain basic knowledge on Phytogeography.
- To Gain knowledge on different types of forest.

COURSE OUTCOMES:

At the end of the course the students will be able to:

CO1	Demonstrate the understanding of biotic and abiotic factors affects the distribution	K2
	of plants and concept of ecosystem	
CO2	Implement the skills in processing and evaluating data in the vegetation study	K3
CO3	Differentiate the plants based on morphological and anatomical features in	K3
	relations to their habitat	
CO4	Analyse the distribution of species based on phytogeography	K3
CO5	Compare the different types of forest	K4

SYLLABUS

Credit: 5

Instructional Hours: 75

UNIT I: BIOTIC AND ABIOTIC FACTORS (K2)

Light, temperature, soil (Formation of soil, Factors in soil formation and Soil profile), Biotic symbiosis, commensalism, mutualism, predation, parasitism and competitionfactors: Biogeochemical cycles: Nitrogen, Carbon.

(self study: grassland and pond ecosystem)

UNIT II: ECOSYSTEM (K3)

Ecosystem-Concept, structure and function of ecosystem, Producers, consumers and Decomposers, Trophic structure, food chain and food web, Ecological pyramids, Energy flow, grassland and pond ecosystem.

(Beyond the curriculum: Ecological indicators)

UNIT III: ECOLOGICAL ADAPTATIONS (K3)

Methods of studying vegetation- Quadrat and Transects (Line, Bisect and Belt Transect). Morphological and anatomical features in relation to their habitats - Hydrophytes (Hydrilla and Eichhornia), Mesophytes (Neem and Grass), Xerophytes (Opuntia and Nerium) and Halophytes (Rhizophora and Avicenia).

UNIT IV: PHYTOGEOGRAPHY (K3)

Distribution and its types (Continuous, Discontinuous and Endemic distribution and its type-Relic- Endemic, Palaeo- Endemic, Neo-Endemic and Pseudoendemic), Theory of land Bridge and Theory of Continental Drift, Migration and its Barriers.

(15 Hours)

(15 Hours)

(15 Hours)

UNIT V: TYPES OF VEGETATION (K4)

(15 Hours)

Principles and vegetational types of India, Moist tropical, Dry tropical forest, Montane subtropical forest, Montane temperate forest, Alpine forest and Mangroveforest. *Exsitu* and *Insitu* conservation of natural resources.

(Self study: Mangrove forest)

TEXT BOOKS

1. Sharma P.D. Elements of Ecology. Rastogi's Company Ltd., Publications. Meerut, UP. (2005).

2. Vashista P.C. Plant Ecology. Vaishali Publications. Nashik, Maharashtra. (2003).

REFERENCE BOOKS

1. Shukla and P. S. Chandel. Plant Ecology and Soil Science, S. Chand & Co., India. (1991).

- 2. Verma and Agarwal. Principles of Ecology, S.Chand & Co. New York. (2004).
- 3. Odum P.and Eugene. Fundamentals of Ecology, Edn. 5, Thomson Brooks/Cole, (2005).

BLENDED LEARNING :

UNIT V- TYPES OF VEGETATION	
Topic	Links
Vegetational types of India	https://www.youtube.com/watch?v=Z8jOcYEtyc0
Moist tropical	https://www.youtube.com/watch?v=kw6DCp9xvWw
Dry tropical forest	https://www.youtube.com/watch?v=rWP6-wFHK71
Montane temperate forest	https://www.youtube.com/watch?v=K8i0K0pZlCM
Alpine forest	https://www.youtube.com/watch?v=my5iCynvVFA
Mangrove forest	https://www.youtube.com/watch?v=-ennmy8Iias
Exsitu and Insitu conservation	https://www.youtube.com/watch?v=e_m4UnURj2E

MAPPING OF CO'S WITH POs/PSO'S

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2		3	2								
CO2	3	2		3		2	2	2			3	3	3
CO3	3	2	2		2	2	2						
CO4	3	2						2					
CO5	3		2		3	2			2			2	3

(Correlation: 3-High, 2-Medium, 1-Low)

S.No.	Assessment Methods	Frequency of Assessment
1	End Semester Examination	Once in a Semester
2	CIA I	Once in a Semester
3	CIA II	Once in a Semester
4	Model Examination	Once in a Semester
5	Assignment (Unit I and Unit II)	Twice in a Semester
6	Seminar (Unit III and Unit IV)	Twice in a Semester
7	Term Paper (Unit V)	Once in a Semester

Course Designed by: Dr. P.Prathyusha	Verified by HOD: Dr. J. Carolin Joe
	Rosario
Checked by CDC : Dr. G.Chitra	Approved by:
	Principal

SEMESTER - V COURSE CODE: 23UBO5E01 TITLE OF THE COURSE: ELECTIVE: PLANT BIOTECHNOLOGY (EMPLOYABILITY)

COURSE OBJECTIVES

- 1. To illustrate the scientific background and laboratory experience in tissue culture.
- 2. To educate the skills necessary to use biotechnological tools for the crop improvement.
- 3. To gain the knowledge on basic molecular genetics, genomic concepts and techniques.
- 4. To provide an understanding on the mechanism of gene regulation and gene expression.

COURSE OUTCOMES

At the end of the course the students will be able to:

CO1	Exemplify the methods of tissue culture.	K1
CO2	Compare the cloning vectors-plasmids, phages, cosmids and transposons.	K2
CO3	Demonstrate the genetic engineering techniques.	K3
CO4	Summarize the application of tissue culture in Forestry, Agriculture and	K3
	Horticulture.	
CO5	Explain the biological control of pathogens.	K4

SYLLABUS

Credits: 4 **Instructional Hours: 60**

UNIT I: INTRODUCTION TO BIOTECHNOLOGY (K1)

Biotechnology – definition and scope, Plant tissue culture – Media preparation, Sterilization, Inoculation and Incubation, Constituents of MS medium, Micro propagation, Anther culture, Isolation and culture of protoplast, Somatic hybridization, Cybrids, Synthetic seeds

UNIT II: INTRODUCTION TO GENE CLONING (K2)

Benefits and risks of GMOs. Large scale production of biofertilizers - (Rhizobium). Single Cell Protein (SCP) as microbial food for future, Mass cultivation and nutritive value of Spirulina, Application of tissue culture - Forestry, Agriculture and Horticulture and Cryopreservation.

UNIT III: GENETIC ENGINEERING (K3)

Genetic engineering: Introduction, principle and applications of genetic engineering, Isolation of specific genes. Cloning Vectors: Plasmid - Ti plasmid and pBR 322 - definition, nomenclature, structure and uses, phages, cosmids and transposons. Enzymes - Restriction endonucleases and DNA ligase and their applications.

UNIT IV: MOLECULAR MARKERS (K3)

Methods of direct gene transfer - Electroporation, Micro injection, Transgenic plants: Agrobacterium mediated gene transfer, Principle and Applications of PCR, RFLP, Southern, Northern and Western blotting techniques.

(12 Hours)

(12 Hours)

(12 Hours)

(12 Hours

UNIT V: ENVIRONMENTAL BIOTECHNOLOGY (K4)

(12 Hours)

Production of transgenic plant- insect pest resistance (Bt cotton). Biological control of pathogens, Oxidation ponds, Waste water treatment and petrochemical plants. Intellectual Property Rights (IPR) and its importance.

TEXT BOOKS

- 1. Kumaresan V. Biotechnology. Saras Publications, Nagarcoil, India. (2015).
- 2. Ignacimuthu.S. Plant Biotechnology, Oxford IBM Publishing Co. New Delhi. (1997).

REFERENCE BOOKS

- 1. Purohit S.S. *Biotechnology- Fundamentals and Application.* 3rd Edn. Student Edition, India. (2007).
- 2. Singh B.D. Biotechnology Expanding Horizons. Kalyani Publishers. India. (2015).
- 3. Dubey R.C. A Text Book of Biotechnology. S.Chand & Co. NewDelhi, India. (1993).

UNIT IV- MOLECULAR MARKERS					
Торіс	Links				
Electroporation	https://microbenotes.com/electroporation- principle-steps-uses/				
Micro injection	https://microbenotes.com/microinjection/				
Transgenic plants: <i>Agrobacterium</i> mediated gene transfer	https://microbenotes.com/agrobacterium-mediated- gene-transfer/				
Principle and Applications of PCR	https://www.ncbi.nlm.nih.gov/pmc/articles/ PMC3768498/				
Southern, Northern and Western blotting techniques	https://www.aaas.org/southern-northern-western- and-eastern-blots				

BLENDED LEARNING :

MAPPING OF CO'S WITH POs/PSO'S

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3		3		3					3	3	2	3
CO2	3		3		2				2	3		2	2
CO3	3		3		3				2	2	2	3	2
CO4	3		3	3	3	3	2		3	2	2	2	3
CO5	3		3			3			2	3	3	3	2

(Correlation: 3-High, 2-Medium, 1-Low)

S.No.	Assessment Methods	Frequency of Assessment
1	End Semester Examination	Once in a Semester
2	CIA I	Once in a Semester
3	CIA II	Once in a Semester
4	Model Examination	Once in a Semester
5	Assignment (Unit I and Unit II)	Twice in a Semester
6	Seminar (Unit III and Unit IV)	Twice in a Semester
7	Quiz (Unit V)	Once in a Semester

Course Designed by: Dr. P.Prathyusha	Verified by HOD: Dr. J. Carolin Joe Rosario
Checked by CDC : Dr. G.Chitra	Approved by:
	Principal

SEMESTER: V COURSE CODE: 21UBO5E02 TITLE OF THE COURSE: ELECTIVE: PLANT BIOCHEMISTRY (EMPLOYABILITY)

COURSE OBJECTIVES

- To afford knowledge on functions of various biomolecules and their metabolism.
- To learn structural and functional properties of carbohydrates, proteins and lipids.
- To elucidate the interrelationships of the cellular components.
- To provide knowledge of the Secondary metabolites and its functions.

COURSE OUTCOMES

CO 1	Describe the catabolic and anabolic pathway of primary metabolites of the plants	K1
CO 2	Acquire knowledge on properties and nature of protein and method of isolating	K2
	and characterizing.	
CO 3	Illustrate the mechanism of enzyme action and interpret the plots of enzymatic	K3
	kinetics	
CO 4	To study the nomenclature of enzymes and vitamins	K3
CO 5	Discover the Secondary metabolites and its biosynthesis pathway	K3

SYLLABUS

Credits: 4 **Instructional Hours: 60**

UNIT I: PRINCIPLES OF BIOCHEMISTRY (K1)

Basic principles: Structure of atoms, molecules and chemical bonds. Van der waal forces, Hydrogen bonding, Electrostatic. Buffer solutions, pH, concentration of solutions and colligative properties.

UNIT II: CARBOHYDRATES & LIPIDS (K2)

Carbohydrates: Classification, structure and properties. Metabolism - Gluconeogenesis, Glycogenolysis and Glycogenesis. Lipids: Classification, structure and properties. Biosynthesis and Oxidation of fatty acids. Plant waxes, cholesterol and lecithin.

UNIT III: PROTEINS (K2)

Structure, classification and properties of Protein. Amino acids: Structure, classification and properties. Biosynthesis and Degradation of amino acids. Mineral nutrition and deficiencies.

UNIT IV: ENZYMES (K2)

Nomenclature and properties of enzymes. Apo-enzymes, co-enzymes and cofactors. Mechanism of enzyme action and Enzyme inhibition; Michaelis-Menten equation and Line waver - burk plot of enzyme activity. Vitamins: Classification, Functions and Deficiencies.

(12 Hours)

(12 Hours)

(12 Hours)

(12 Hours)

BLENDED LEARNING :

UNIT IV- ENZYMES					
Торіс	Links				
Nomenclature and properties of enzymes.	https://youtu.be/FXYnrSDZrcs				
Apo-enzymes, co-enzymes and cofactors	https://youtu.be/EzuKxqojS0Q				
Mechanism of enzyme action and Enzyme	https://youtu.be/S1ErNSn7q-Y				
inhibition					
Michaelis-Menten equation and Line	https://youtu.be/TtdsL8CfNkI				
waver – burk plot of enzyme activity.					
Vitamins: Classification, Functions and	https://youtu.be/OClmJ0wL160				
Deficiencies.					

UNIT V: SECONDARY METABOLITES & PIGMENTS (K2) (12 Hours)

Secondary metabolites: Classification, functions and biosynthesis of Alkaloids, Phenols, Terpenoids and Flavonoids. Plant Pigments - Structure, Classification and functions of chlorophyll, anthocyanins, carotenoids and antho-xanthins.

TEXT BOOKS

- 1. Nelson, D.L. and Cox, M.M. *Lehninger's Principles of Biochemistry (6th Ed.)*, W. H.Freeman Publishers, New York. (2012).
- 2. Berg, J.M., Tymoczko, J.L. and Stryer, L. *Biochemistry* (5th Ed.) WH Freeman & Co., New York. (2002).

REFERENCE BOOKS

- 1. Murray, R.K., Granner, D.K., Mayes, P.A. and Rodwell, V.W. *Harper's Illustrated Biochemistry (26th Ed.)*, The McGraw-Hill Companies, Inc., USA. (2003).
- 2. Zubay, G. Biochemistry. Macmillan Publishing Co., New York. (1988).
- 3. Harold, F.M. The vital force: A study of Bioenergetics. Freeman & Co., New York. (1986).
- 4. Conn, E.E., Stumpf, P.K., Bruring, G. and Doi, R.H. *Outline of Biochemistry* (5th Ed.) John Wiley & Sons, N-Y-Singapore, Toronto. (1998).

5. Wey, P.M. and Harbone, J.B. *Plant biochemistry*. Panima Educational Book agency, New Delhi. (2000).

MAPPING OF CO'S WITH POs/PSO'S

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3		2							3	3	2	2
CO2	3		2							3	3	2	2
CO3	3		2							3	3	3	3
CO4	3		2							3	2	3	3
CO5	3		2							3	2	3	3

(Correlation: 3-High, 2-Medium, 1-Low)

S.No.	Assessment Methods	Frequency of Assessment
1	End Semester Examination	Once in a Semester
2	CIA I	Once in a Semester
3	CIA II	Once in a Semester
4	Model Examination	Once in a Semester
5	Assignment (Unit I and Unit II)	Twice in a Semester
6	Seminar (Unit III and Unit IV)	Twice in a Semester
7	Quiz (Unit V)	Once in a Semester

Course Designed by: Dr. P.Prathyusha	Verified by HOD: Dr. J. Carolin Joe
	Rosario
Checked by CDC : Dr. G.Chitra	Approved by:
	Principal

SEMESTER: V COURSE CODE: 23NBO5E02 TITLE OF THE COURSE: NON-MAJOR ELECTIVE: APPLIED BOTANY (INTERDISCIPLINARY) (SKILL DEVELOPMENT)

COURSE OBJECTIVES

1. To identify the medicinal herbs and know about its uses

- 2. To gain knowledge on the nutritional value of sprouted grams, vegetables and greens.
- 3. To learn about ornamental horticulture and its application
- 4. Discuss mushroom cultivation, processing and its utilization.

COURSE OUTCOMES

At the end of the course the students will be able to:

CO1	Enumerate the uses of medicinal herbs	K2
CO2	Detail the nutritive values of sprouted grams, vegetables and greens.	K2
CO3	Explain the methods and techniques of ornamental horticulture.	K2
CO4	Describe the process of mushroom cultivation.	K2
CO5	Summarize the prospects of Mushroom cultivation	K3

SYLLABUS

Credits: 4 Instructional Hours: 60 UNIT I: MEDICINAL HERBS AND ITS UTILIZATION (K2) (12 Hours)

Medicinal herbs used for home remedies. Medicinal uses of Karpoora valli (*Plectranthusamboinicus*), Tulasi (*Ocimum sanctum*), Vallarai (*Centella asiatica*), Ginger (*Zingiber officinale*)

UNIT II: HEALTH AND BEAUTY (K2)

Sprouted gram preparation, Nutritive values of sprouted grains, vegetables and greens. Uses of Rose water, Red sandal and Saffron for face care.

UNIT III: ORNAMENTAL HORTICULTURE (K2)

Bonsai, Cut flower- Post-harvest technology, Indoor gardening, Rockery, Terrarium. Flower arrangements -components, shapes of flower arrangement and prolonging the vase-life of flowers and Dry decorations - Materials, Preservation, design and colour in dry arrangement. (*Self study: Garland and Bouquet making*)

UNIT IV: COMMERCIAL PRODUCTION OF MUSHROOM (K2) (12 Hours)

Mushroom – Mushroom shedconstruction, Mother spawn, Spawn preparation and bed spawn. Identification of poisonous and edible mushroom, Types of edible mushroom.

UNIT V: MUSHROOM CULTIVATION TECHNIQUES (K3)

Mushroom cultivation, harvesting, processing and marketing. Mushroom recipes (Any three). Project proposal for mushroom cultivation for self employment.

(12 Hours)

(12 Hours)

(12 Hours)

TEXT BOOKS

- 1. N.Kumar. *Introduction to Horticulture*, Oxford & IBH Publishing Company Pvt. Ltd., India. (2010).
- 2. EIRI Board of Consultants & Engineers. *Handbook of Mushroom cultivation, processing & packaging*. Engineers India Research Institute, India. (2006).

REFERENCE BOOKS:

- 1. Wallis, T.E. Text book of Pharmacognosy, CBS publishers and distributors, India. (2005).
- 2. Kumar, N.C. *An introduction to Medicinal Botany and Pharmacognosy*, Emkay publications, India. (2004).

BLENDED LEARNING:

UNIT V- MUSHROOM CULTIVATION TECHNIQUES				
Торіс	Links			
Mushroom cultivation, harvesting, processing and marketing	https://www.youtube.com/watch?v=6i1neX43ngQ https://www.youtube.com/watch?v=hCanJmLRWhA			
Mushroom regines	https://www.youtube.com/watch?v=aRSvi-ODJjM			
Project proposal for mushroom	https://www.youtube.com/watch?v=_Ly3IsB0STA			
cultivation for self employment	https://www.youtube.com/watch?v=CFQASD9zHIY			

MAPPING OF CO'S WITH POS/PSO'S

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	3	2		3				3	3	2	3
CO2	3		3			2				3	3		2
CO3	3		3		2	2					3	2	2
CO4	3	2	3	2		3					3	2	3
CO5	3		3									2	

(Correlation: 3-High, 2-Medium, 1-Low)

S.No.	Assessment Methods	Frequency of Assessment
1	End Semester Examination	Once in a Semester
2	CIA I	Once in a Semester
3	CIA II	Once in a Semester
4	Model Examination	Once in a Semester
5	Assignment (Unit I and Unit II)	Twice in a Semester
6	Seminar (Unit III and Unit IV)	Twice in a Semester
7	Quiz (Unit V)	Once in a Semester

Course Designed by: Dr.M. Saradha	Verified by HOD: Dr. J. Carolin Joe Rosario
Checked by CDC: Dr. G.Chitra	Approved by:
	Principal

SEMESTER: V COURSE CODE: 23UB05SB3 TITLE OF THE COURSE: SKILL BASED III: MUSHROOM CULTIVATION TECHNIQUES (ENTREPRENEURSHIP)

COURSE OBJECTIVES

- Offers to start your own business
- Minimum investment of your own or you can avail loan from banks
- The product is in high demand
- It can be started in your home with less space.

COURSE OUTCOMES

At the end of the course the students will be able to:

CO1	Compare the different types of edible mushrooms.	K2
CO2	Illustrate the mushroom shed construction.	K2
CO3	Exemplify the preparation of seed bed.	K2
CO4	Describe the nutritional values of Oyster and Milky mushroom.	K2
CO5	Explain the post harvesting techniques of mushroom.	K3

SYLLABUS

Credits: 2

Instructional Hours: 45

UNIT I: INTRODUCTION TO MUSHROOMS (K2)

Introduction to mushrooms, Influence of climatic factors- Temperature, Relative Humidity, Rainfall, Light and Carbon dioxide, Impact of climatic factors. Structure and reproduction of mushroom.

UNIT II: CULTURE TECHNIQUES (K2)

Scope and importance of mushroom cultivation- Nutritional value and Medicinal value. Mushroom laboratory-Requirements, Media Preparation-Potato Dextrose Agar medium (PDA), Conservation of mushroom cultures. Preparation of Spawn- Mothers spawn.

UNIT III: DISEASE MANAGEMENT (K2)

Mushroom shed construction, Preparation of seed bed, Management of diseases, pests and fungal attacks- Fungal and Bacterial disease.

(Self study: Preparation of seed bed)

UNIT IV: CULTIVATION OF MUSHROOM (K2)

Cultivation of different types of mushroom- *Pleurotus sajor-caju* (Oyster mushroom), *Calocybe indica* (Milkymushroom) and *Agaricus bisporus* (Button mushroom). Economics in mushroom cultivation.

(9 Hours)

(9 Hours)

(9 Hours)

(9 Hours)

UNIT V: POST HARVESTING TECHNOLOGY AND FOOD PREPARATION (K2) (9 Hours)

Mushroom preservationand processing - Short term- Washing, Packing, Storage and transport. Long term preservation- Canning, Drying and Pickle preparation. Some Indian recipes of mushroom food preparation.

(Self study: Some Indian recipes of mushroom food preparation)

TEXT BOOKS:

- 1. Dubey. RC. A Text Book of Biotechnology. S.Chand & Co. New Delhi, India. (2016).
- 2. Kumaresan V. Biotechnology. Saras Publications, India. (2015).

REFERENCE BOOKS:

- 1. EIRI Board of consultants and Engineers. *Hand Book of Mushroom Cultivation, Processing and Packaging.* Engineers India Research Institute. New Delhi. India. (2006).
- 2. Parveen Garg. *Mushroom Cultivation*. Techno World Press, New Delhi, India. (2015).
- 3. Chopra G.I and Verma. V. A text book of Fungi. Pradeep Publications. India. (2009).

BLENDED LEARNING:

UNIT IV- CULTIVATION OF MUSHROOM						
Торіс	Links					
Cultivation of different types of mushroom- <i>Pleurotus sajor-caju</i>	https://youtu.be/DvCNr8ncTC8					
Calocybe indica	https://youtu.be/wWuq67OgW14					
Agaricus bisporus	https://youtu.be/T8LrW-AFq9g					
Economics in mushroom cultivation.	https://youtu.be/26X33G2PV54					

MAPPING OF CO'S WITH POs/PSO'S

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	3	2		3				3	3	2	3
CO2	3		3			2				3	3		2
CO3	3		3		2	2					3	2	2
CO4	3	2	3	2		3					3	2	3
CO5	3		3									2	

(Correlation: 3-High, 2-Medium, 1-Low)

S.No.	Assessment Methods	Frequency of Assessment
1	End Semester Examination	Once in a Semester
2	CIA I	Once in a Semester
3	CIA II	Once in a Semester
4	Model Examination	Once in a Semester
5	Assignment (Unit I and Unit II)	Twice in a Semester
6	Seminar (Unit III and Unit IV)	Twice in a Semester
7	Quiz (Unit V)	Once in a Semester

Course Designed by: Dr. M. Saradha	Verified by HOD: Dr. J. Carolin Joe			
	Rosario			
Checked by CDC: Dr. G.Chitra	Approved by:			
	Principal			

SEMESTER: VI COURSE CODE: 23UBO6C09 TITLE OF THE COURSE:CORE: PLANT PHYSIOLOGY

COURSE OBJECTIVES

- To understand the dynamic nature of cell behavior.
- To make comparison between related structure and function.
- To introduce some important aspects of plant metabolism and their role in the functioning of the whole plant.
- To understand how plants able to utilize light energy for the biosynthesis of important biomolecules.
- Gain knowledge on practical applications of plant hormones.

COURSE OUTCOMES

At the end of the course the students will be able to:

CO1	Explain the various cellular behavior	K2
CO2	Demonstrate the physiological movement in plants	K3
CO3	Interpreting the mechanism of photosynthesis	K3
CO4	Recognize the important aspects of plant metabolism	K3
CO5	Differentiate the plant growth regulators and physiology of flowering	К3

SYLLABUS

Credits: 5

Instructional Hours: 75

UNIT I: PLANT WATER REGULATION (K2)

Water- Structure, Physical, chemical properties and Importance of Water. Osmosis, Turgor Pressure and Osmotic Pressure. Diffusion, Imbibition Plasmolysis. Absorption of water-Active and Passive, Factors affecting absorption of water. Ascent of sap- Ringing Experiment and Mechanism of ascent of sap.

UNIT II: TRANSPIRATION (K3)

Transpiration - its kind, factor, significance and mechanism. Absorption of Mineral salts (Contact Exchange Theory and Carbonic Acid Exchange Theory). Physiology of stomatal movementandfactors affecting stomatal movements. Mineral nutrition-Role of elements and their deficiency.

(self study: Mineral nutrition-role of elements and their deficiency)

UNIT III: RESPIRATION (K3)

Respiration – Aerobic and Anaerobic -Glycolysis or EMP Pathway, Kreb's cycle or TCA cycle, Electron transport system and Factors affecting respiration. Pentose Phosphate Pathway and its significance.

UNIT IV: PHOTOSYNTHESIS (K4)

Photosynthesis –Definition, Significance and Structure of chloroplast, Pigment system I & II. Light reaction (Hill's reaction) and Dark reaction (C ₃- Calvin cycle and C ₄- Hatch-Slack Pathways). Factors affecting photosynthesis.

(**15 Hours**) n of Minera

(15 Hours)

(15 Hours)

UNIT V: PLANT GROWTH REGULATORS (K3)

Growth- Growth curve (Sigmoid curve), Growth regulators – Physiological effects of auxins, cytokinin, gibberellins, Kinetin's, ethylene and ABA. Physiology of flowering –Photoperiodism and vernalization, Seed dormancy –Causes and methods of breaking dormancy. (*Beyond the curriculum: Germination of seeds*)

TEXT BOOKS:

- 1. Jain V.K. Fundamentals of plant physiology, S.Chand & Co., Bombay. (2001).
- 2. Srivatsava H.N. Plant physiology, Pradeep Publication, Jalandhar. (2004).

REFERENCE BOOKS

- 1. Salisbury and Ross, *Plant physiology*. Wadsworth Publishing Company, California(1985).
- 2. Jain J.L. Biochemistry, S Chand Publication & Co., Bombay. (2009).
- 3. William. D. *Cell physiology & Biochemistry*, MCELROY, Prentice Hall Of India- New Delhi.(2009).

BLENDED LEARNING:

UNIT V- PLANT GROWTH REGULATORS

Торіс	Links
Growth Curve	https://www.youtube.com/watch?v=3oPlCSa39_U
Physiological effects of auxins, cytokinin, gibberellins, Kinetins, ethylene and ABA	https://www.youtube.com/watch?v=8Ji3g4yp4VE
Photoperiodism and vernalization	https://www.youtube.com/watch?v=038G_jlKEAo
Seed dormancy –Causes and methods of breaking dormancy	https://www.youtube.com/watch?v=Hraexfo3lKE

MAPPING OF CO'S WITH Pos/PSO'S

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3											
CO2	3		3		2		2		2				2
CO3	3		3			2				2	2		
CO4	3		3		2			2				3	3
CO5	3									2	2	2	3

(Correlation: 3-High, 2-Medium, 1-Low)

(15 Hours)

S.No.	Assessment Methods	Frequency of Assessment
1	End Semester Examination	Once in a Semester
2	CIA I	Once in a Semester
3	CIA II	Once in a Semester
4	Model Examination	Once in a Semester
5	Assignment (Unit I and Unit II)	Twice in a Semester
6	Seminar (Unit III and Unit IV)	Twice in a Semester
7	Quiz (Unit V)	Once in a Semester

Course Designed by: Dr. M.Saradha	Verified by HOD: Dr. J. Carolin Joe Rosario
Checked by CDC : Dr. G.Chitra	Approved by:
	Principal

SEMESTER - VI COURSE CODE: 23UBO6C10 TITLE OF THE COURSE: CORE: HORTICULTURE

COURSE OBJECTIVES:

- To demonstrate the ability to use qualitative and quantitative observation techniques unique to the field of horticulture.
- To obtain skill at maintaining a schedule, exploring the horticulture world and understanding ٠ relationships between living organisms.
- To demonstrate skills for the greenhouse and nursery industry production and maintenance. •
- To learn techniques in organic farming, the importance of cultivating plants and flowers.

COURSE OUTCOMES:

At the end of the course the students will be able to:

CO1	Apply the fundamentals of plant growth and utilize practical applications in	
	horticulture.	K2
CO2	Acquire basic knowledge and fundamental aspects of horticulture.	K2
CO3	Describe the significance of horticulture to society.	K2
CO4	Distinguish the cultivation of various horticultural crops.	K2
CO5	Demonstrate current technologies used in today's horticultural enterprises.	K3

SYLLABUS

Credits: 4

Instructional Hours: 75

UNIT I: INTRODUCTION TO HORTICULTURE (K2)

Scope and divisions of Horticulture, Classifications in Horticulture- Vegetables, Fruits, Ornamental plants and Spices, Methods of plant propagation: Cutting, Layering and Grafting, Propagation through special organs - Rhizome, Leaf, Stem and Root.

(Self study - Methods of Vegetative propagation)

UNIT II: ORNAMENTAL HORTICULTURE (K2) (15 Hours)

Garden design, Types of Gardens- Formal, Informal, Kitchen garden, Landscape garden, Lawn making, Arboriculture, Topiary, Rockery and Hydroponics. Irrigation - Types of irrigation. Growth regulators in horticulture, Growth retarders, Sex modification, Flower induction and Parthenocarpy.

UNIT III: CULTIVATION TECHNIQUES OF HORTICULTURAL CROPS (K2) (15 Hours)

Olericulture: Cultivation of vegetables-Radish, Cucumber. Pomology: Cultivation of fruits -Mango, Banana.Cultivation of Nuts - Cashew, Badam. Cultivation of spices- Cardamom, Clove. Flowers - Rose, Jasmine. Plantation crops -Pepper, Cocoa.Plant protection measures for horticultural crops.

(Beyond the Curriculum- Pomology)

UNIT IV: ORGANIC FARMING (K2)

Introduction and Status of organic farming, Principles and Components of organic farming, Sources of Organic Matter- Manures, Types of Mulching- Organic and inorganic mulches, Purposes of mulching, Weed control in organic farming. Organic pest control-Biological control, Composting-Principles, Decomposers.

UNIT V: HORTICULTURE IN INDUSTRY (K3)

Extraction of Jasmine concrete, Papain extraction and Vanillin extraction. Bonsai culture of Shrubs and Trees- Principles, Design, Creating, Training, Repotting, Post establishment care and its importance. Flower and their importance, Flower arrangement with Cut flowers- Principle, Tools and materials, Basic floral design, Dried flowers-Drying and arrangements, Green house and Indoor Gardening.

TEXT BOOKS

- 1. Manibhusan Rao.K. *Text book of Horticulture (Second edition)*, Macmillan India limited, New Delhi. (2005).
- 2. Pradeep Sinha. Text book of Horticulture. Sublime publications, New Delhi. (2014).

REFERENCE BOOKS

- 1. George Acquaah. *Horticulture principles and practices. (Second edition)*, Prentice Hall of India private Ltd, New Delhi. (2002).
- 2. Kumar.N. Introduction to Horticulture, Oxford & IBH Publishing, New Delhi. (2010).
- 3. Jitendra Singh. Basic Horticulture. Kalyani publishers. Ernakulam, Kerala. (2017).
- 4. Sheela. VL. Horticulture. MJP Publishers, Triplicane. (2011).

UNIT V- HORTICULTURE IN INDUSTRY						
Торіс	Links					
Extraction of Jasmine concrete	https://youtu.be/a4WS0hfK1fI					
Papain extraction	https://youtu.be/i8cHHQ5K2v4					
Vanillin extraction	https://youtu.be/7dNgCPYgt_w					
Bonsai culture - Principles, Design, Creating, Training,	https://youtu.be/NOiWXaIEVkQ					
Repotting						
Flower arrangement with Cut flowers	https://youtu.be/2AHK6Yk-hV8					
Cut flowers- Principle, Tools and materials, Basic floral	https://youtu.be/b-L8_LSRj_4					
design						
Green house and Indoor Gardening	https://youtu.be/UiIPkcyq95A					

BLENDED LEARNING:

(15 Hours)

MAPPING OF CO'S WITH POs/PSO'S

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3		3	2		2	1	3		3	3	3	3
CO2	3		3	2			1	3		3	2	3	3
CO3	3	2	3	3	3	2	3	3		3	2	3	3
CO4	3	2	3	3	3	2	3	3		3	2	3	3
CO5	3		3	2		3	1	3		3	2	3	3

(Correlation: 3-High, 2-Medium, 1-Low)

S.No.	Assessment Methods	Frequency of Assessment
1	End Semester Examination	Once in a Semester
2	CIA I	Once in a Semester
3	CIA II	Once in a Semester
4	Model Examination	Once in a Semester
5	Assignment (Unit I and Unit II)	Twice in a Semester
6	Seminar (Unit III and Unit IV)	Twice in a Semester
7	Field work (Unit V)	Once in a Semester

Course Designed by: Dr. J.Carolin Joe Rosario	Verified by HOD: Dr. J. Carolin Joe Rosario
Checked by CDC: Dr. G.Chitra	Approved by:
	Principal

SEMESTER - VI COURSE CODE: 23UBO6C11 TITLE OF THE COURSE: CORE: MICROBIOLOGY

COURSE OBJECTIVES:

- To acquire knowledge and understanding of the basic nature of microorganisms and its multiplication methods
- To demonstrate the isolation and culture of microorganisms
- To understand the role of microprisms in improvement of soil
- To study the role of microorganisms in the improvement of soil
- To inculcate knowledge on industrial microbiology and its applications.

COURSE OUTCOMES:

At the end of the course the students will be able to:

CO1	Recognize the fundamentals of microbiology and its utilization.	
		K2
CO2	Acquire basic knowledge and fundamental aspects of studying microorganisms	K2
CO3	To study about Microbiology of Water, Air and Soil	K2
CO4	Distinguish the Microbiology of Food and Dairy products	K3
CO5	To study about Industrial microbiology	K3

SYLLABUS

Credits: 4

Instructional Hours: 75

UNIT I: INTRODUCTION TO MICROBES (K2)

History and scope of microbiology, characterization and classification of microorganisms. Whittaker's five kingdom concept, Bacteria - Morphology, cell structure, cell wall chemistry, growth, nutrition and reproduction. General structure and multiplication methods of microscopic algae, fungi, bacteria, actinomycetes, protozoa, mycoplasmas and viruses.

UNIT II: MICROBIAL TECHNIQUES (K2)

Staining techniques- Simple, differential (Gram staining and acids fast staining). Cultivation and growth of bacteria. Enumeration of bacteria, cultivation of viruses in plants. Culture of microorganisms: Pure cultures, batch and continuous cultures. Control of microorganisms - Physical, Chemical and biological methods.

UNIT III: SOIL AND AQUATIC MICROBIOLOGY (K2)

Microorganisms in soil- Actinomycetes: morphological characters, habitat and economic importance. Microorganisms in water (aquatic)- Archaebacteria: morphological characters, habitat and its types. Microbiology of Domestic water and waste water- Determining sanitary quality, Bacteriological evidence of Pollution. Bacteriological techniques- Standard plate count, Test for the presence of Coliform Bacteria, Membrane-Filter technique.

(Beyond the curriculum-Industrial uses of Bacteria -Lactic acid production and Vinegar production)

(15 Hours)

(15 Hours)

UNIT IV: MICROBIOLOGY OF FOOD AND DAIRY PRODUCTS (K3) (15 Hours)

Microorganisms in food- cooked foods, fruits, vegetables, and meats. Food poisoning- Food borne (Botulism), Microbial examination of foods. Methods of preservation of food Microorganisms in Milk. Pasteurization methods, Test for the quality of milk, Microorganisms in the production of milk products (Butter and Cheese).

UNIT V: APPLIED MICROBIOLOGY (K3)

(15 Hours)

Bioreactor-operation and Types of Bioreactors, stages of fermentation processes-Downstream and upstream stage, Solid substrate fermentation. Fermenters (Stirred tank, bubble columns and airlift. Industrial production of Ethyl alcohol, Acetic Acid (Vinegar), Citric acid, lactic acid, penicillin and vitamin B12.

(Self study- Types of Bioreactors)

TEXT BOOKS

1. Jay, J.M. Modern Food Microbiology, CBS Publishers, New Delhi. (1983).

2. Maheshwari, D. K. A. *Text Book of Microbiology*. S. Chand & Company Ltd. New Delhi. (1999).

REFERENCE BOOKS

- 1. Matthews, K.R., Montville, T. J. and Kniel, K. E. *Food Microbiology: An Introduction*. ASM Press, Washington. (2017).
- 2. Pommervi, J.C. Fundamentals of Microbiology (11th Ed.). Jones & Bartlett Learning, USA. (2018).
- 3. Pelczar, M.J., Reid, R.D. and Chan, E.C.S. *Microbiology*, Tata McGraw Hill Publishing Co., New Delhi. (1993).

UNIT V- APPLIED MICROBIOLOGY					
Торіс	Links				
Bioreactor-operation	https://www.youtube.com/watch?v=EVxPihbZDqA				
Types of Bioreactors	https://www.youtube.com/watch?v=BNamURFs-Uk				
stages of fermentation processes-	https://www.youtube.com/watch?v=SsozxmGX6cM				
Downstreamand upstream stage					
Solid substrate fermentation	https://www.youtube.com/watch?v=bzZqmPyRo34				
Fermenters (Stirred tank, bubble	https://www.youtube.com/watch?v=fQOzHC828aM				
columns and airlift)					
Industrial production of Ethyl	https://www.youtube.com/watch?v=44RzJAFKu0c				
alcohol					
Acetic Acid (Vinegar),	https://www.youtube.com/watch?v=GKwx79EdoE8				
Citric acid,	https://www.youtube.com/watch?v=FMtayizdFiw				
Lactic acid,	https://www.youtube.com/watch?v=vzJwNiyNLLM				
Penicillin	https://www.youtube.com/watch?v=FcDCDpC6wKE				
Vitamin B12.	https://www.youtube.com/watch?v=ZxIn_TapYPk				

BLENDED LEARNING:

MAPPING OF CO'S WITH POs/PSO'S

	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3		3	3					2	2		2	3
CO2	3		3	3					2	2		2	3
CO3	3		3	3					2	2		2	3
CO4	3		3	3					2	2		2	3
CO5	3		3	3					2	2		2	3

(Correlation: 3-High, 2-Medium, 1-Low)

S.No.	Assessment Methods	Frequency of Assessment
1	End Semester Examination	Once in a Semester
2	CIA I	Once in a Semester
3	CIA II	Once in a Semester
4	Model Examination	Once in a Semester
5	Assignment (Unit I and Unit II)	Twice in a Semester
6	Seminar (Unit III and Unit IV)	Twice in a Semester
7	Conference participation (Unit V)	Once in a Semester

Course Designed by: Dr. Sr.M.Arul Sheeba	Verified by HOD: Dr. J. Carolin Joe			
Rani	Rosario			
Checked by CDC: Dr. G.Chitra	Approved by:			
	Principal			

SEMESTER: VI COURSE CODE: 23UBO6E03

TITLE OF THE COURSE: ELECTIVE: BIOINSTRUMENTATION

COUIRSE OBJECTIVES

- To recollect the handling of various basic instruments.
- To know the working principles of modern instruments.
- To learn cytological techniques
- To emphasize learning through lectures and hands-on Laboratory activities.

COUIRSE OUTCOMES

At the end of the course the students will be able to:

CO1	Comprehend the basic principles of various instruments	K1
CO2	Summarizing the working method of various spectroscopy techniques	K2
CO3	Implementing interest in chromatographic and electrophoretic techniques	K3
CO4	Attributing the various techniques of centrifuges	K4
CO5	Organizing the recent techniques using bio-informatics tool.	K4

SYLLABUS

Credits: 4 **Instructional Hours: 75**

UNIT I: CYTOLOGICAL AND MICROSCOPIC TECHNIQUES (K1) (15 Hours)

Microtechniques- Fixation, Dehydration, Embedding, Sectioning, Mounting and Staining, Microtomes and its application, Ocular micrometer, Camera Lucida- Introduction and application, Haemocytometer, pH meter- working principle and application, Microscopy - Scanning Electron Microscope (SEM) and Transmission Electron Microscope (TEM).

(Self study: pH meter)

UNIT II: SPECTROSCOPIC TECHNIQUES (K2)

Colorimeter, Buffers, Enzyme assays, deterrgents and membrane proteins, spectroscopy techniques: Nuclear magnetic resonance spectroscopy (NMR)- principle, working mechanism and application; UV Spectrophometer- principle, working mechanism and application.

UNIT III: ELECTROPHORETIC TECHNIQUES (K3)

Principles, types and application of the following Chromatography: Paper, Ion exchange, TLC, HPLC; Electrophoresis - Polyacrylamide gel electrophoresis (PAGE) and Agarose gel electrophoresis (AGE) - Gel preparation, mechanism, staining and visualization and application.

UNIT IV: MOLECULAR TECHNIQUES (K4)

Centrifuge- Principle, Types and its application, Dialysis- principle, mechanism and application, PCR- Principle, procedure, types and application and Biochipscomponents, working principle, advantage and disadvantage.

(Self study: Biochips)

(15 Hours)

(15 Hours)
UNIT V: BIOSENSING TECHNIQUES (K4)

(15 Hours)

Biosensor- working Principle, components, types and application, immobilization techniques- adsorption, covalent binding, entrapment and membrane confinement, Drug designing, Gene sequencing analysis.

TEXT BOOKS:

- 1. Patki L.R, Bhalchandra B.L, Jeevaji I.H. *An introduction to Microtechnique*, S.Chand and company (Pvt) Ltd, New Delhi. (1987).
- 2. Veerakumari L., A. *Bioinstrumentation*, Kindle Edition (I Edition) MJP Publishers, New Delhi. (2009).

REFERENCE BOOKS:

- 1. Holme D., and H. Peck. *Analytical Biochemistry*, (3rd Edition). Pearson education limited, England. (1998).
- 2. Freifeidler D., *Physical Biochemistry, Application to Biochemistry and molecular Biology (2nd edition).* W.H. Freeman & company, San Francisco. (1982).
- 3. Wilson K, Walker, J. *Principle and techniques of practical biochemistry*, (4th Edition) Cambridge university press, Cambridge. (1994).
- 4. Johansen, DA. Plant Microtechnique, TATA McGraw Hill Book Co., Ins., New Delhi. (1940).

UNIT V- BIOSENSING TECHNIQUES												
TOPIC	LINK											
Biosensor- working Principle, components, types and application	https://youtu.be/VoX85L8zykE											
Immobilization techniques- adsorption,	https://youtu.be/WeJeKwMUGXc											
Covalent binding, entrapment and membrane confinement	https://youtu.be/vLOQcKRWCXQ											
Drug designing	https://youtu.be/SABjhW_mLzc											
Gene sequencing analysis	https://youtu.be/2JUu1WqidC4											

BLENDED LEARNING:

MAPPING OF CO'S WITH POs/PSO'S

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3		3			2		2		3	3	3	
CO2	3		3			2		2		3	3	3	2
CO3	3		3				2			3	3	3	
CO4	3		3			2		2		3	3	3	
CO5	3		2			3		3	3	2	2	2	1

S.No.	Assessment Methods	Frequency of Assessment
1	End Semester Examination	Once in a Semester
2	CIA I	Once in a Semester
3	CIA II	Once in a Semester
4	Model Examination	Once in a Semester
5	Assignment (Unit I and Unit II)	Twice in a Semester
6	Seminar (Unit III and Unit IV)	Twice in a Semester
7	Quiz (Unit V)	Once in a Semester

Course Designed by: Dr. U. Danya	Verified by HOD: Dr. J. Carolin Joe					
	Rosario					
Checked by CDC: Dr. G.Chitra	Approved by:					
	Principal					

SEMESTER: VI COURSE CODE: 23UBO6E04 TITLE OF THE COURSE: ELECTIVE: BIOPHYSICS AND BIOSTATISTICS

COURSE OBJECTIVES

- To obtain the ability to know the Energy requirements in cell metabolism and Thermodynamics
- To study the high energy compounds in biological system and its mechanism.
- To demonstrate experimental statistical skills for the biology students.
- To learn techniques in errors in measurements and statistical analysis.

COURSE OUTCOMES

At the end of the course the students will be able to:

CO1	To study the Energy requirements in cell metabolism and thermodynamics	K1
CO2	Familiar with bioenergetics high energy compounds in biological system	K2
CO3	To impart basic concepts & descriptive statistics	K3
CO4	To gain knowledge on Statistical Analysis	K3
CO5	Implementing knowledge on Errors in measurements	K3

SYLLABUS

Credits: 4 Instructional Hours: 75

UNIT I: THERMODYNAMICS (K1)

(15 Hours)

(15 Hours)

Thermodynamics-Laws of thermodynamics, concept of free energy, unavailable energy & Entropy, Negative entropy change in living system, heat content of food, Bomb calorimetry, Energy generation & energy transfer processes in biochemical reactions. Cellular energetic and metabolic pathway: overview of metabolism: Metabolism pathways, Energy requirements in cell metabolism.

UNIT II: BIOENERGETICS (K2)

High energy compounds in biological system, ATP and phosphoryl group transfers, Metabolism of glucose & formation of ATP, ATP synthesis by rotary catalysis. Couple reactions, Redox potential in biological system, Oxidation-reduction reactions: FAD and NAD+. Overview of major metabolic pathways- Glycolysis, Kreb's cycle, oxidative phosphorylation, electron transport chain, P:O ratio, regulation of oxidative phosphorylation; amino acid, fatty acid and nucleotide metabolism and cofactor mechanism.

UNIT III: BASIC CONCEPTS & DESCRIPTIVE STATISTICS (K1) (15 Hours)

Introductory Biostatistics Statistics, Biostatistics and Biometry, Aims and Applications of Biostatistics. Data Collection, Necessity of Sampling, Types of Sampling Data Processing, Data Summarization, Classification and Methods of classification of Data, Formation of Frequency Distribution. Tabular and Graphic Representation of Data, Line Diagram, Histogram, Frequency Polygon, Frequency Curve, Cumulative Frequency Curve or Ogive, Bar Diagram, pie diagram, Pictogram and Cartogram.

UNIT IV: STATISTICAL ANALYSIS (K3)

Measures of Central Tendency, Dispersion, Correlation & regression Average, Objectives of Averages, Characteristics of an Ideal Measure of Central Tendency Types of Averages, Mean, Median, Mode, Measures of Dispersion, Range, Standard Deviation, Standard Error. Correlation, Types of Correlation, Measures of Simple Correlation, Regression, Simple Regression, Regression Equation.

UNIT V: ERRORS IN MEASUREMENTS (K3)

(15 Hours)

Probability, Test of Hypothesis and Tests of Significance Important Terms and Concepts, Sample point, Sample space, Trial and Event; Classical Definition of Probability, Frequency Definition of Probability, Rules of Probability (Addition Rule and Multiplication Rule) Random, variable and Probability Distribution, Binomial Distribution, Poisson Distribution and Normal Distribution. Test of Significance, Computation Test of Significance, Test for the mean of a Normal Population, chi-square test, 't' test, F-test and their significance, analysis of variance. (ANOVA).

TEXT BOOKS

1.Ackerman E.A. Ellis, L.E.E. & Williams L.E. *Biophysical Science*, Prentice-Hall Inc, Hyderabad. (1979).

2. Arora P. W., P.K. Malhan. *Biostatistics*, Himalayas pub. House, Mumbai. (2002)

REFERENCE BOOKS

- 1. Bloomfield V.A. and Harrington R.E. *Biophysical chemistry*, W.A. Freeman and CO. New York. (1975).
- 2. Casey E.J. *Biophysics, concepts and mechanisms*. Affiliated East west press. New Delhi. (1967).
- 3. Surnder Rao P. S. S. and J. Richard. *An introduction to Biostatistics*, Prentice Hall of India, New Delhi. (1996).

UNIT IV- STATISTICAL ANALYSIS							
Торіс	Links						
Measures of Central Tendency, Characteristics of	https://youtu.be/oSk5hyl-DWs						
an Ideal Measure of Central Tendency.							
Dispersion, Correlation & regression Average, https://youtu.be/64ELhoTvzk0							
Objectives of Averages							
Types of Averages, Mean, Median, Mode,	https://youtu.be/dLJp6DrPArk						
Measures of Dispersion, Range							
Standard Deviation, Standard Error.	https://youtu.be/3UPYpOLeRJg						
Correlation, Types of Correlation, Measures of	https://youtu.be/xxpc-HPKN28						
Simple Cor							
Regression, Simple Regression, Regression	https://youtu.be/QAEZOhE13Wg						
Equation							

BLENDED LEARNING:

(15 Hours)

MAPPING OF CO'S WITH POs/PSO'S

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	3	2	3		2		2	3	3	3
CO2	3	2	2	3	2	3		2		2	3	3	3
CO3	3	2	2	3	2	3		2		2	3	3	3
CO4	3	2	2	3	2	3		2		2	3	3	3
CO5	3			3		3		2		2	3	3	3

(Correlation: 3-High, 2-Medium, 1-Low)

S.No.	Assessment Methods	Frequency of Assessment
1	End Semester Examination	Once in a Semester
2	CIA I	Once in a Semester
3	CIA II	Once in a Semester
4	Model Examination	Once in a Semester
5	Assignment (Unit I and Unit II)	Twice in a Semester
6	Seminar (Unit III and Unit IV)	Twice in a Semester
7	Quiz (Unit V)	Once in a Semester

Course Designed by: Dr. U. Danya	Verified by HOD: Dr. J. Carolin Joe Rosario					
Checked by CDC: Dr. G.Chitra	Approved by:					
	Principal					

SEMESTER - VI COURSE CODE: 23UBO6SB4 TITLE OPF THE COURSE: SKILL BASED IV: POST HARVEST TECHNOLOGY OF FRUITS AND VEGETABLES (SKILL DEVELOPMENT)

COURSE OBJECTIVES

- To learn about preservation of fruits and vegetables.
- To gain knowledge on natural and chemical preservative methods.
- To learn about the preparation of food using fruits and vegetables.
- To inculcate knowledge on food quality.

COURSE OUTCOMES

At the end of the course the students will be able to:

CO1	Interpret the Factors responsible for spoilage of fruits and vegetables.	K2
CO2	Describe the methods of fruit and vegetable preservation.	K2
CO3	Exemplify the Natural and chemical preservation.	K2
CO4	Describe the preparation of jam.	K2
CO5	Explain the preparation of pickle.	K2

SYLLABUS

Credits: 2 **Instructional Hours: 45**

UNIT I: PRESERVATION METHODS (K2)

Basic principles of fruit and vegetables preservation. Factors responsible for spoilage of fruits and vegetables. Methods of fruit and vegetable preservation- Moisture, Heat, salt, sugar, vinegar, deep frying and chemicals.

UNIT II: PRESERVATION OF FRUITS (K2)

Preparation of juices (squash-RTS). Mixed vegetables and single vegetable - Preparation of jam, jelly and marmalades. (from available fruits) (Self-study: Preparation of Jam)

UNIT III: PRESERVATION OF VEGETABLES (K2)

Preparation of Pickles and its types- (Lemon, Garlic, Mango, Tomato and Ginger) fermented, RTS (Ready to serve). Preparation of Tomato Products - Tomato puree, sauce, ketchups, soup and chutney. (Self study: Pickles)

UNIT IV: ADULTERANTS (K2)

Common adulterants and their toxic effects, Preservatives, Acidulants, Chelating -Introduction, types and functions. Food Colors-Types and Effect of processing on color, Food Flavor-Natural flavor and Artificial flavor, Food Packaging Rules, Packaging Techniques, Labeling, Bar-coding.

UNIT V: QUALITY CONTROL (K2)

(9 Hour s)

(9 Hours)

(9 Hours)

(9 Hours)

(9 Hours)

Control of Food quality – Principles of quality control. Government regulations (Food laws and orders), amendments national and international standards - AGMARK, ISO & FSSAI. Role of FDA and Consumer Guidance Society in India.

TEXT BOOKS

- 1. Ashok Pande. *Text book of Food and Nutrition*. Akansha Publishing House New Delhi, India. (2004).
- 2. Srilakshmi B. *Food Sciences (5th Edn.)*. New Age International Publishers. India. (2011).

REFERENCES BOOKS

- 1. Adams M.R. and M.O. Moss. *Food Microbiology*. New Age International Publishers. India. (2015).
- 2. Manoranjan Kalia and Sangita Sood. *Food Preservation and Processing*. Kalyani Publishers. India. (2008).
- 3. Raipth Early. *Guide to Quality Management Systems for the Food Industry*, Springer, Berlin, Germany. (1995).
- 4. Gordon L. Robertson. *Food Packaging: Principles and Practice, Third Edition*. News Port, Marcell Dekkar, Inc. New York. (2013).

BLENDED LEARNING:

UNIT IV- ADULTERANTS							
Торіс	Links						
Common adulterants	https://www.youtube.com/watch?v=rPZnEQQ6eSE						
Toxic effects	https://www.youtube.com/watch?v=J-P261OTpbU						
Preservatives	https://www.youtube.com/watch?v=nMi7sE32W8w						
Preservatives-Acidulants,	https://www.youtube.com/watch?v=18vbNJuzhx8						
Chelating							
Food Colors	https://www.youtube.com/watch?v=rmTd-JGxPPQ						
Food Flavor	https://www.youtube.com/watch?v=VGg-g9TAzJg						
Food Packaging Rules	https://www.youtube.com/watch?v=HCH_cVKJ5lA						
Labeling	https://www.youtube.com/watch?v=v0jfSaVFnnE						
Bar-coding	https://www.youtube.com/watch?v=W1CUIJzHiTc						

MAPPING OF CO'S WITH POs/PSO'S

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3		3	2		2	2			3			3
CO2	3		3	2		2	2			3			3
CO3	3		3							3			3
CO4	3		3	2		2	2			3			3
CO5	3		3							3	2		2

S.No.	Assessment Methods	Frequency of Assessment
1	End Semester Examination	Once in a Semester
2	CIA I	Once in a Semester
3	CIA II	Once in a Semester
4	Model Examination	Once in a Semester
5	Assignment (Unit I and Unit II)	Twice in a Semester
6	Seminar (Unit III and Unit IV)	Twice in a Semester
7	Other component: Quiz (Unit V)	Once in a Semester

Course Designed by: Dr. P. Prathyusha	Verified by HOD: Dr. J. Carolin Joe Rosario
Checked by CDC: Dr. G.Chitra	Approved by:
	Principal

SEMESTER: V&VI COURSE CODE: 21UBOSB03 TITLE OF THE COURSE: SKILL BASED: HERBAL COSMETICS AND HANDICRAFTS (INTERDISCIPLINARY) (ENTREPRENEURSHIP)

COURSE OBJECTIVES

- To learn about beauty care by using homemade herbal products.
- To gain knowledge on herbal beauty preparations
- To provide job opportunities and to become entrepreneur

COURSE OUTCOMES

At the completion of the course the student will be able to

CO1	Explain about the application of herbal health care products.	K2
CO2	Describe the various herbal treatments available for face.	K2
CO3	Summarize the therapeutic hand and foot care treatments.	K2
CO4	Demonstrate the entrepreneur skills.	K3
CO5	Employ the indoor gardening techniques.	K3

SYLLABUS

Credits: 2 **Instructional Hours: 45**

UNIT I: HEALTH AND BEAUTY (K2)

Herbal body wrap, Herbal bath, Herbal bags, Head massage, Dandruff treatment, Herbal Shampoo, Herbal conditioner, Hair dye and hair styling.

UNIT II: FACE (K2)

Face treatment, Herbal scrub, Herbal moisturizer, Types of Bleaching, Types of Facial and Types of Waxing

UNIT III: HAND AND FOOT (K2)

Eye treatment - Anjana, Herbal eye pack, Threading of eyebrow, Bridal makeup, Pedicure, Manicure and Henna designs. (Self study: Henna designs)

UNIT IV: PRINTING TECHNIQUES (K3)

Machine embroidery, Artificial jewellery making, Paper bag making, Printing on clothes -Vegetable, Block and Finger printing, Brush strokes, Line and dot, Wet shading and Dry shading.

UNIT V: INDOOR GARDENING (K3)

Handing basket plants, Terrarium and Bottle garden, Bonsai – Types and requirements, Selection of Indoor plants. Handicrafts -Different types of Mats, Door mat work from Jute, waste cloth and Candle Making.

(9 Hours)

(9 Hours)

(9 Hours)

(9 Hours)

(9 Hours)

TEXT BOOKS

- 1. Panda.H. *Hand book of Herbal medicine*, Asia specific business Press Inc. New Delhi. (2004).
- 2. Patil.D.A. *Medicinal plants, history culture and usage*, Mangalam publications, Kottayam, Kerala. (2010).

REFERENCE BOOKS

- 1. Katie Masopust . *Design Explorations for the Creative Quilter*, C & T Publishing, Concord, CA. (2008).
- 2. James P. Womack and Daniel T. Jones. *Lean Thinking: Banish Waste and Create Wealth in your Corporation*, Taylor & Francis, Abingdon. UK. (1996).
- 3. Pande.H. *Herbal cosmetics hand book*. Asia specific business Press Inc. New Delhi. (2015).
- 4. Pande.H. *Herbal soaps and detergents*. NIIR Project Consultancy Services, New Delhi. (2011).

BLENDED LEARNING:

UNIT V- INDOOR GARDENING	
Торіс	Links
Handing basket plants	https://youtu.be/bAhkuRntDbI
Terrarium and Bottle garden	https://youtu.be/7Lg4tzkHgVo
Bonsai – Types and requirements	https://youtu.be/NOiWXaIEVkQ
Handicrafts –Different types of Mats	https://youtu.be/9gQ-3Sn_wbw
Candle Making	https://youtu.be/CrJ9UE6Nihw

MAPPING OF CO'S WITH POs/PSO'S

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	3	2	3	3
CO2	3	-	-	-	-	-	-	-	-	3	2	3	3
CO3	3	-	-	-	-	-	-	-	-	3	2	3	3
CO4	3	-	-	-	-	-	-	-	-	3	2	3	3
CO5	3	-	-	-	-	-	-	-	-	3	2	3	3

S.No.	Assessment Methods	Frequency of Assessment
1	End Semester Examination	Once in a Semester
2	CIA I	Once in a Semester
3	CIA II	Once in a Semester
4	Model Examination	Once in a Semester
5	Assignment (Unit I and Unit II)	Twice in a Semester
6	Seminar (Unit III and Unit IV)	Twice in a Semester
7	Quiz (Unit V)	Once in a Semester

Course Designed by: Dr. U. Danya & Dr. P.	Verified by HOD: Dr. J. Carolin Joe
Prathyusha	Rosario
Checked by CDC: Dr. G.Chitra	Approved by:
	Principal

SEMESTER - VI COURSE CODE: 23UBO6CP3 TITLE OF THE COURSE: CORE PRACTICAL III

COURSE OBJECTIVES:

- To learn about the technical description of plant morphology, chemical constituents, ecological adaptations and distribution of plant communities.
- To gain practical knowledge on Physiology, vegetative propagation methods and commercial Horticulture.
- To understand the principles of vegetative propagation and staining procedures in microbiology.

COURSE OUTCOMES:

At the end of the practical's the students will be able to

CO1	To demonstrate and study about plant communities, campus flora and adaptations of plants.	K2
CO2	Elucidate Plant Morphology, Economic Botany and Chemical constituents of Medicinal Plants.	K2
CO3	Illustrate the physiological experiments based on photosynthetic processes, vegetative propagation techniques in Horticulture and various staining procedures in Microbiology.	K2
CO4	Proving the individual experiments of Plant physiology	K3
CO5	Transmit the diagrammatic illustration and results of experimental works all the way through a record presentation	K3

SYLLABUS

Credits: 5 Instructional Hours: 30

UNIT I: TAXONOMY OF ANGIOSPERMS AND ECONOMIC BOTANY

Taxonomical studies of selected plant species included in the families mentioned in the theory syllabus. Study of economic products of the plants belonging to the families mentioned in the theory syllabus. Students should submit 20 herbarium sheets at the time of practical examination, Field trip for 5 days to study vegetation and for specimen collection.

UNIT II:PHARMACOGNOSY

Morphology and anatomy of medicinal plants. Identification of medicinal plants and their useful parts listed in the syllabus

UNIT III:PLANT ECOLOGY AND PHYTOGEOGRAPHY

Study of morphological and anatomical adaptations of hydrophytes, xerophytes, including epiphytes and halophytes and mesophytes using representative samples. Determination of frequency and density constituent of plant species in a terrestrial community through quadrat and transect (line, belt). Phytogeographical regions of India.

UNIT IV:PLANT PHYSIOLOGY

Determination of osmotic pressure of cell sap of the given specimen – Rheo leaf. Rate of respiration in flower buds/ germinated seeds using simple Respiroscope (Demonstration only). Separation of leaf pigments by paper chromatography and TLC. Measurement of the rate of photosynthesis under varying condition of CO₂ concentration. Effect of light intensity on O₂ evolution during photosynthesis. Effect of light intensity on transpiration. Determining the rate of transpiration using Ganong's photometer (demonstration only).

and transpiration ratio (Demonstration only). Estimation of protein and carbohydrate (Demonstration only)

UNIT V:HORTICULTURE & MICROBIOLOGY

Demonstration of vegetative methods of propagation – Flower arrangement with cut Flowers. Gram staining method to identify the type of bacteria. Culture media preparation for agar slant, agar plate. Preparation of decimal dilution. Isolation of microorganisms from samples of foods, milk, water air and soil. Staining- simple and gram staining and Test for water quality (Coli form test).

REFERENCE BOOKS

- 1. Sundara Rajan.S. *Practical manual of Angiosperm Taxonomy*, Anmol publications, Bangalore, Karnataka. (2000).
- 2. Maheshwari, D. K.A. *Text Book of Microbiology*. S.Chand & Company Ltd.New Delhi. (1999).
- 3. B.P.Pandey. Modern Practical Volume II, S. Chand & Co Publishers, New Delhi. (1979).
- 4. Panda.H. Hand book of Herbal medicine, Asia specific business Press Inc.New Delhi. (2004).
- 5. George Acquaah. *Horticulture principles and practices. (Second edition)*, Prentice Hall of India private Ltd, New Delhi. (2002).

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	3	2	3	3	2	3	3	3	3	3
CO2	3	2	2	2	3	3	2	2	3	3	3	3	3
CO3	3	3	3	3	3	3	2	2	3	3	3	3	3
CO4	3	3	3	3	3	3	2	2	3	3	3	3	3
CO5	2		2		2	2	2	1	2	2	2	2	2

MAPPING OF CO'S WITH POs/PSO'S

S.No.	Assessment methods	Frequency of Assessment
1	Internal Exam	
	Major practicals	
	Minor practicals	Once in a Semester
	Spotters	
	Record	
2	End Semester Exam	End of the year

Course Designed by: Dr. J.Carolin Joe Rosario	Verified by HOD: Dr. J. Carolin Joe Rosario
Checked by CDC: Dr. G.Chitra	Approved by:
	Principal

ADD ON COURSES UGC Sponsored Career Oriented Programme CERTIFICATE COURSE - FLORICULTURE AND BONSAI SUBJECT CODE: 12CCFB001

COURSE OBJECTIVES:

- To learn about methods of propagation of plants.
- To know the latest development in the field of Bonsai.
- To develop skills in the area of designing, styles and making of bonsai.
- To create knowledge on self employment through entrepreneur skills.
- To create positive relationships with environment.

COURSE OUTCOMES:

At the end of the course the students will be able to:

CO1	Recognize about preliminary techniques about Bonsai.				
CO2	Understand the necessary skills to take care and maintain a Bonsai plant	K2			
CO3	Apply knowledge on Bonsai cultivation and marketing.	K2			
CO4	Implement the acquired knowledge on commercial applications of Floriculture	K2			
	and Bonsai.				
CO5	Acquire knowledge on the methods and techniques of Floriculture.	K3			

SYLLABUS

Instructional Hours: 60

$\mathbf{UNIT} - \mathbf{I}$

Introduction – History – Bonsai as an art. Importance and classification of Bonsai – Selection of plant materials – Aesthetic form and structure of Bonsai.

$\mathbf{UNIT} - \mathbf{II}$

Various styles of Bonsai – formal upright, informal upright, slanting, wind –swell, twin trunk, multi trunk, cascade, semi cascade and Broom.

UNIT – III

Soil – containers – tools and equipments – potting and repotting – training, wiring and pruning.Water and Manuring. Pests and diseases, Maintenance.

UNIT - IV

Flowers and their importance. Floral structure and colour changes. Cultivation and propagation(Rose, Jasmine and Crotons).

$\mathbf{UNIT} - \mathbf{V}$

Applications of flowers in industries. Perfume industry (Perfumes, honey and Culkundu)

TEXT BOOKS:

- 1.T.K. Bose, L.P. Yadav, P. Patil, P. Das and V.A. Partha Sarthy. *Commercial Flowers*. Partha Sankar Basu, Nayaudyog, 206, Bidhan Sarani, Kolkata-700006. (2003).
- 2. S.K. Bhattacharjee and L.C. De. *Advanced Commercial Floriculture*. Aavishkar Publishers, Distributors, Jaipur (Rajasthan) India. (2003).

REFERENCE BOOKS:

1. Arora, J.S. Introductory Ornamental Horticulture. Kalyani Publishers. New Delhi.(2006).

2. Ludhiana Randhawa, G.S. Amitabha Mukhopadhyay. *Floriculture in India*. Allied Publishers Pvt. Ltd., New Delhi. (2004).

3. K.V.Peter. Ornamental plants. New India publishing agency, Pitampura, New Delhi. (2009).

EVALUATION PATTERN:

SECTION A: $5 \times 10 = 50$ Marks

Essay type questions 5 out of 10

UGC Sponsored Career Oriented Programme CERTIFICATE COURSE - MEDICINAL BOTANY SUBJECT CODE: 13CCMB001

COURSE OBJECTIVES:

- To learn about Indian system of medicine
- To gain knowledge about cultivation process and identification of medicinal plants
- To inculcate the experience of morphological, anatomical and therapeutic uses of medicinal plant species.
- To create positive relationships with environment

COURSE OUTCOMES:

At the end of the course the students will be able to:

CO1	Summarize the Indian system of medicine	K2
CO2	Acquire pharmaceutical knowledge of medicinal plants in their daily life	K2
CO3	Describe the morphological, anatomical and therapeutic uses of medicinal	K2
	plant species.	
CO4	Explain the cultivation process of medicinal plants	K2
CO5	To create awareness and improve evaluation skills about medicinal plants in	K3
	India	

SYLLABUS

Instructional Hours: 60

UNIT – I

History and scope of Medicinal Botany. Indian System of Medicine (Siddha and Ayurveda).

UNIT – II

Drugs from leaves (Adhatoda, Aloe vera, Tulsi), Bark (Chinchona), Root (Catharanthus and Rauwolfia).

UNIT – III

Drugs in flowers (*Eugenia*), fruit (Wood apple), Seed (Poppy), Medicinal plant cultivation and propagation.

$\mathbf{UNIT} - \mathbf{IV}$

Morphological and histological studies. Chemical constituents and applications.

$\mathbf{UNIT} - \mathbf{V}$

Drug adulteration, drug evaluation, marketing values and present status of medicinal plants inIndia. Application of Biotechnology in medicinal plants.

TEXT BOOKS:

- 1. Wallis, T.E. *Text book of Pharmacognosy- Fifth Edition*.CBS publishers and Distributors. New Delhi. (2005).
- 2. Kokate C.K., A. Purohit and S.R.Gokhale. *Pharmacognosy- 45th Edition*, Nirali Prakashan, Pune. (2000).

REFERENCE BOOKS:

- 1. Trease and Evans. *Pharmacognosy. Fifteenth Edition*, William Charles Evans, W.B.Saunders, Edinburg London New York Philadelphia St. Louis Sydney Toronto. (2002)
- 2. C. S. Shah, J. S. Quadry, B. S. Shah Prakashan. *A Text book of Pharmacognosy*, 13th Edition, Ahmedabad. (2008).
- 3. R.S.Saroskar and S.D.Bhandarkar. *Pharmacognosy and Pharmacotherapeutics*. Thirteen Edition, Revised Publishers popular Prakashan, Bombay. (2015).
- 4. Bhattacharjee, S.K. Hand Book of Medicinal plants. Pointer Publishers, Jaipur. (2004).
- 6. Kumar N.C. An introduction to Medicinal Botany and Pharmacognosy. Emkay publications, New Delhi. (1993).

EVALUATION PATTERN:

SECTION A: $10 \times 5 = 50$ Marks

Essay type questions 10 out of 15