



PSGR  
Krishnammal College for Women



## **DEPARTMENT OF BOTANY**

### **CHOICE BASED CREDIT SYSTEM (CBCS) & LEARNING OUTCOMES- BASED CURRICULAR FRAMEWORK (LOCF)**

**(Semesters– I - IV)**

**BACHELOR OF BOTANY  
(2022 – 2025 Batch)**



College of Excellence, **nirf** 2023-4<sup>th</sup> Rank  
Autonomous and Affiliated to Bharathiar University  
Reaccredited with A<sup>++</sup> grade by NAAC, An ISO 9001:2015 Certified Institution  
Peelamedu, Coimbatore-641004

**DEPARTMENT OF BOTANY**  
**CHOICE BASED CREDIT SYSTEM (CBCS) & LEARNING OUTCOMES- BASED CURRICULAR**  
**FRAMEWORK (LOCF)**

**BACHELOR OF BOTANY (2022-2025 Batch)**  
**SYLLABUS & SCHEME OF EXAMINATION**

Applicable to students admitted during the academic year 2022 – 2023 onwards (I-IV Sem)

**Programme Learning Outcomes (PLO's)**

Courses within the Botany curriculum will address goals and objectives at the appropriate level through measurable student learning outcomes developed by course instructors

**PLO 1:** Students will be able to remember, comprehend, apply, analyze and synthesize the core concepts in Botany, like evolution, biodiversity, structure and function, information flow, exchange and storage, pathways and transformations of energy and matter.

**PLO 2:** Students will develop the ability to apply and understand the defining characteristics of various processes of science and its uncertainty.

**PLO 3:** Students will also develop the ability to practice the skills of the scientific method. Engage in research projects and apply the quantitative skills to biological problems.

**PLO 4:** Students will be able to communicate and collaborate within and outside of biology and tap into the interdisciplinary nature of science.

**PLO 5:** Students will understand the relationship between science and society and to evaluate the impact of science as well as ethical implications of science in the society.

**PROGRAMME SPECIFIC OBJECTIVES (PSOs)**

**At the end of the programme the student will**

**PSO1:** Obtain strong foundation in classical botany, interdisciplinary subjects such as Bioinformatics, Biostatistics, and advance topics in Cell and Molecular biology, Biochemistry and Plant Biotechnology.

**PSO2:** Build capacity in Horticulture and production of cut flowers from the skill based courses offered.

**PSO3:** Carry out individual short term internship and project work to acquire knowledge on research using basic and advanced instruments/equipments.

**PSO4:** Find opportunities for higher studies in top ranking universities.

**PSO5:** Gain career in teaching/research in Botany.



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BACHELOR OF BOTANY (2022-2025 Batch)  
SYLLABUS & SCHEME OF EXAMINATION

Applicable to students admitted during the academic year 2022 – 2023 onwards (I-IV Sem)

SEM	Part	Subject Code	Title of the Paper		Instruction hours/week	Contact hours	Tutorial	Duration of Examination	Examination Marks			Credits	
									CA	ESE	TOTAL		
I	I	TAM2201/ HIN2201/ FRE2201	Language T/H/F Paper I	Language	6	86	4	3	50	50	100	3	
	II	ENG2201	English Paper-I	English	6	86	4	3	50	50	100	3	
	III A		PL22C01	Core Paper I- Microbiology & Plant diversity I	CC	6	86	4	3	50	50	100	5
			PL21CP1	Core Practical – I	CC	3	45	-	-	-	-	-	-
			CE22A01/ PS22A01/ TH22A09	Allied Chemistry for Biologists Paper-I/ Allied Physics Paper-I/ Allied Paper I -Mathematical for Sciences - I	GE	4	56	4	3	50	50	100	4
						7	101	4	3	50	50	100	5
		CE21AP1 /PS21AP1	Allied Practical Chemistry / Physics	GE	3	45	-	-	-	-	-	-	
IV	NME22B1/A1 NME21ES	Basic Tamil/Advanced Tamil** Introduction to Entrepreneurship	AEC	2	-	-	3	50/ 50	50/ 50	100	2		
II	I	TAM2202/HIN 2202/FRE2202	Language T/H/F Paper - II	Language	6	86	4	3	50	50	100	3	
	II	ENG2102	English Paper-II	English	5	71	4	3	50	50	100	3	
	III A		PL22C02	Core Paper II – Plant diversity II(Bryophytes, Pteridophytes, Gymnosperms, and Palaeobotany)	CC	5	71	4	3	50	50	100	5
			PL21CP1	Core Practical I (Core Paper I & II)	CC	3	45	-	3	50°	50°	100	4

		CE22A02/ PS22A02/ TH22A14	Allied Chemistry for Biologists Paper- II / Physics Paper –II / Allied Paper II – Mathematics for Sciences II	GE	5	71	4	3	50	50	100	4
					8	116	4	3	50	50	100	5
	IIIA	CE21AP1/ PS21AP1	Allied Chemistry Practical/Allied Physics Practical	GE	3	45	-	3	25	50	100	2
	IV	OPS1808	Open course-self study online courses			-		-	-	-	-	-
		NME22B2/A2	Basic Tamil/Advanced Tamil**	AEC		-		-	50	-	50	-
	IV	21PELS1	Professional English for Life Sciences	AEC	3	45	3	2	50	50	100	2
	IIIB	NM12GAW	Foundation Course –1 (General awareness)		Self study (Online)				100	-	100	Grade
<b>III</b>	I	TAM2203/HIN 2203/FRE2203	Language T/H/F Paper III	Language	6	88	2	3	50	50	100	3
	II	ENG2203	English Paper-III	English	5	73	2	3	50	50	100	3
	IIIA	PL22C03	Paper - III Cell and Molecular Biology	CC	5	73	2	3	50	50	100	5
	IIIA	PL22CP2	Core Practical - II (Core Paper III)	CC	2	30	-	-	-	-	-	-
	III	PL22SB01/ PL21SBCE	Skill Based Subject I- Horticulture / Coursera -Climate Change and Health: From Science to Action	SEC	3	41	4	2	100	-	100	
				SEC	3	45	-	-	-	-	-	3
	IIIA	AS22A01/ PS22A01/ PL22A01	Allied- II-Paper I- Zoology / Physics/ Botany	GE	5	73	2	3	30	45	75	3
	IIIA	TH22A09	Allied-II-Paper-I-Maths	GE	7	103	2	3	50	50	100	5
	IIIA	AS22AP1/PS22 AP1	Allied Practical	GE	2	30	-	-	-	-	-	-
	III B	NM22EVS	Foundation Course-II (Environmental Studies)	AEC	Self stud y	-	-	-	100	-	100	Grade **
III B	NM22UHR	Foundation Course-III (Universal Human Values and Human Rights)	AEC	2	28	2	-	100	-	100	2	
<b>IV</b>	I	TAM2204/ HIN2204/ FRE2204	Language T/H/F Paper IV	Language	5	73	2	3	50	50	100	3
	II	ENG2204	English Paper-IV	English	6	88	2	3	50	50	100	3
	IIIA	PL22C04	Core Paper-IV- Plant AnatomyWood Technology and Embryology	CC	5	73	2	3	50	50	100	5
	IIIA	PL22CP2	Core Practical II (CorePaper III & IV)	CC	2	30	-	3	50°	50°	100	4
<b>III/V</b>	III	PL22SB02/ PL21SBCE	Skill Based Subject II- Horticulture	SEC	3	41	4	-	100	-	100	3
			Coursera - Climate Changeand Health: From Science to Action	SEC	3	45	-	-				
<b>IV</b>	IIIA	AS22A02	Allied- II-Paper I- Zoology	GE	5	73	2	3	30#	45#	75	4
	IIIA	TH22A14	Allied-II-Paper-II-Allied Mathematics for Sciences II	GE	7	103	2	3	50	50	100	5
	IIIA	AS21AP1	Allied Practical	GE	2	30	-	3	25*	25*	50	2
	IIIB	NM22DTG	Design Thinking	Finishin g School Part A	2	30	-	-	100	-	100	2

	III	COCOACT	NSS / NCC /YRC/Sports	-	-	-	-	-	-	-	100	1
		JOB1753	Job Oriented Course	JOC		After 12.30 pm	-	Gra de* *	-	-	-	-

**\*\* Outside regular class hours**

**°Core Practical CA & ESE will be evaluated for 100 converted into 50**

**#Allied theory CA & ESE will be evaluated for 50/100 converted into 30/45**

**\*Allied Practical CA & ESE will be evaluated for 50/100 converted into 25/25**

**CC – Core Courses**

**SEC – Skill Enhancement Course**

**GE – Generic Elective**

**CA – Continuous Assessment**

**AEC – Ability Enhancing Course**

**ESE - End Semester Examination**

## **CIA PATTERN**

### **1. Theory – 50:50 = 100 Marks**

<b>INTERNAL COMPONENT</b>	<b>50 Marks</b>
CIA I	10 (Conducted for 60 marks after 50 days)
MODEL EXAM	20 (Conducted for after 85 days 100 marks (Each Unit 20 Marks))
SEMINAR/ASSIGNMENT/QUIZ	10
CLASS PARTICIPATION	7
ATTENDENCE	3
<b>TOTAL</b>	<b>50 Marks + ESE 50 Marks (Conducted for 100 Marks)</b>

### **CIA Pattern**

#### **Question from each unit comprising of**

One question with a weightage of 2 Marks : 2 x 3 = 6

One question with a weightage of 6 Marks (Internal Choice at the same CLO level) : 6 x 3 = 15

One question with a weightage of 12 Marks (Internal Choice at the same CLO level) : 12 x 3 = 36

**Total : 60 Marks**

### **ESE Question Paper Pattern: 5 x 20 = 100 Marks**

#### **Question from each unit comprising of**

One question with a weightage of 2 Marks : 2 x 5 = 10

One question with a weightage of 6 Marks (Internal Choice at the same CLO level) : 6 x 5 = 30

One question with a weightage of 12 Marks (Internal Choice at the same CLO level) : 12 x 5 = 60

**Total : 100 Marks**

### **2. Practical - 50 : 50 = 100 Marks**

<b>Internal Component (Practical)</b>	<b>50 marks</b>
Lab Performance (Practical + Interaction) (12+12)	24
Regularity in record submission	8
Model Examination	15
Attendance	3
<b>Total</b>	<b>50</b>

### **3. SBS pattern:**

<b>INTERNAL COMPONENT</b>	<b>100 Marks</b>
Test 1 (Theory / Practical)	50
Test 2 (Theory / Practical / Project)	50
<b>Total</b>	<b>100 Marks</b>

Departments can plan the above pattern according to their course as Test 1 & 2- Theory / one theory and one practical / both as practical / one theory or practical with one project

### **4. Part IV**

#### **Value education / Environmental Studies/Design Thinking**

<b>INTERNAL COMPONENT</b>	<b>100 Marks</b>
Quiz	50 Marks
Assignment	25 Marks
Project/Case study	25 Marks
<b>Total</b>	<b>100 Marks</b>

## Mapping with Programme Learning Outcomes

### Course 1-PL22C01

<b>CLOs</b>	<b>PLO1</b>	<b>PLO2</b>	<b>PLO3</b>	<b>PLO4</b>	<b>PLO5</b>
CLO1	S	M	M	M	M
CLO2	S	S	S	M	M
CLO3	S	S	M	S	S
CLO4	S	M	S	M	M

### Course 2-PL22C02

<b>CLOs</b>	<b>PLO1</b>	<b>PLO2</b>	<b>PLO3</b>	<b>PLO4</b>	<b>PLO5</b>
CLO1	M	M	M	M	M
CLO2	M	M	S	M	M
CLO3	S	S	M	M	S
CLO4	S	S	M	M	M

### Course 3-PL22CP1

<b>CLOs</b>	<b>PLO1</b>	<b>PLO2</b>	<b>PLO3</b>	<b>PLO4</b>	<b>PLO5</b>
CLO1	S	M	M	M	M
CLO2	S	S	M	M	M
CLO3	S	S	M	M	M
CLO4	S	S	M	M	M

### Course 4-PL22C03

<b>CLOs</b>	<b>PLO1</b>	<b>PLO2</b>	<b>PLO3</b>	<b>PLO4</b>	<b>PLO5</b>
<b>CLO1.</b>	S	S	S	M	S
<b>CLO2.</b>	S	S	S	M	S
<b>CLO3.</b>	S	S	M	M	M
<b>CLO4.</b>	S	S	M	M	M



**Course 5-PL22SB01**

<b>CLOs</b>	<b>PLO1</b>	<b>PLO2</b>	<b>PLO3</b>	<b>PLO4</b>	<b>PLO5</b>
CLO1.	S	S	S	S	S
CLO2.	S	S	S	M	S
CLO3.	M	S	M	S	S
CLO4.	M	M	M	M	M

**Course 6-PL22A01**

<b>CLOs</b>	<b>PLO1</b>	<b>PLO2</b>	<b>PLO3</b>	<b>PLO4</b>	<b>PLO5</b>
CLO1	S	M	M	S	S
CLO2	S	S	M	M	M
CLO3	S	S	S	S	S

**Course7: PL22CO4**

<b>CLOs</b>	<b>PLO1</b>	<b>PLO2</b>	<b>PLO3</b>	<b>PLO4</b>	<b>PLO5</b>
<b>CLO1.</b>	S	S	M	S	M
<b>CLO2.</b>	S	M	S	M	M
<b>CLO3.</b>	S	S	M	S	M
<b>CLO4.</b>	S	S	M	M	M

**Course 8-PL22CP2**

<b>CLOs</b>	<b>PLO1</b>	<b>PLO2</b>	<b>PLO3</b>	<b>PLO4</b>	<b>PLO5</b>
CLO1.	S	S	M	M	S
CLO2.	M	S	S	M	S
CLO3.	S	S	M	S	M
CLO4.	M	S	S	M	S

**Course 9:PL22SB02**

<b>CLOs</b>	<b>PLO1</b>	<b>PLO2</b>	<b>PLO3</b>	<b>PLO4</b>	<b>PLO5</b>
<b>CLO1.</b>	S	S	S	S	M
<b>CLO2.</b>	S	M	S	S	M
<b>CLO3.</b>	M	S	S	M	S
<b>CLO4.</b>	S	S	S	S	S

**Course 10: PL21SBCE**

**Course 11: PL22A02**

<b>CLOs</b>	<b>PLO1</b>	<b>PLO2</b>	<b>PLO3</b>	<b>PLO4</b>	<b>PLO5</b>
<b>CLO1</b>	M	S	M	M	M
<b>CLO2</b>	S	S	M	S	S
<b>CLO3</b>	M	M	M	M	M
<b>CLO4</b>	S	S	S	S	M
<b>CLO5</b>	S	M	M	M	M

**Course 12: PL22AP1**

<b>CLOs</b>	<b>PLO1</b>	<b>PLO2</b>	<b>PLO3</b>	<b>PLO4</b>	<b>PLO5</b>
<b>CLO1.</b>	M	S	M	M	M
<b>CLO2.</b>	S	S	M	S	S
<b>CLO3.</b>	M	M	M	M	M
<b>CLO4.</b>	S	S	S	S	M

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
PL22C01	Core Paper I - Microbiology & Plant diversity I	CORE	86	4	-	5

### Preamble

To study the characteristics and life cycle of Bacteria, Virus, Algae, Fungi and Lichens.  
 To study various plant diseases and their control measures.  
 To impart knowledge on Artificial Intelligence and its types.

### Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Classify the microbes and understand the characteristics of Bacteria and viruses	K1
CLO2	Acquire knowledge about the diversity of Algae based on structure and reproduction	K2
CLO3	Know about the morphology, reproduction and economic importance of fungi and lichens	K2
CLO4	Identify the causes, symptoms and control measures of plant diseases	K2

### Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	M	M	M	M
CLO2	S	S	S	M	M
CLO3	S	S	M	S	S
CLO4	S	M	S	M	M

S- Strong; M-Medium

### Syllabus

#### Unit I : Microbiology

19 hrs

History and scope of microbiology. Structure and reproduction of viruses. Bacteria: Morphology, ultra structure, growth and reproduction. Bacterial classification (Bergey, 1923). Microbial techniques - methods of sterilization, culture media and pure culture techniques. Study of bacterial growth- growth curve. Gram staining.

**Unit II: Algae****19 hrs**

General characteristics of algae, Classification of algae (Fritsch, 1935). A detailed study on structure, reproduction and life cycle of *Anabaena*, *Chlamydomonas*, *Oedogonium*, *Ectocarpus* and *Polysiphonia* (developmental studies on sex organs not required). Economic importance of Algae.

**Unit III: Fungi and Lichens****19 hrs**

General characteristics of Fungi. Classification (Alexopoulos and Mims, 1972). Detailed study of morphology and reproduction of *Albugo*, *Saccharomyces*, *Penicillium*, *Puccinia*, *Polyporus* and *Aspergillus* (developmental studies on sex organs not required). Economic importance of Fungi.

**Lichens:** General characteristics, classification (Alexopoulos and Mims, 1979), reproduction and economic importance of Lichens. Detailed study of *Usnea*.

**Unit- IV Plant Pathology****19 hrs**

Classification of diseases– general symptoms. Penetration and disease development. Morphological and biochemical defense mechanisms in plants. A detailed study of the following plant diseases – Mosaic disease of tobacco, Citrus canker, Late blight of Potato, Red rot of sugarcane, Tikka disease of groundnut (causal organisms, symptoms, disease cycle and bio-control measures).

**Unit-V****10 hrs**

Artificial Intelligence-Definition; Types- Weak AI or Narrow AI, General AI and Super AI. Brief introduction to solutions to real-world problems by implementing the following AI processes/ techniques: 1-Machine Learning, 2- Deep Learning, 3- Natural Language Processing and 4- Robotics. AI to reintegrate biology: Biological knowledge discovery and assembly, Behavioural ecology, Genes to phenotypes, Prediction, evolution, and control of infectious diseases.

**Text Books**

S. No.	Authors	Year of publication	Title of the book	Publishers
1.	Vashishta, B.R., Sinha, A.E and Singh, V.P	2013	Algae	S Chand and Company Ltd., New Delhi
2.	Sharma O.P	2011	Algae	Tata Mc Graw-Hill Education
3.	Sharma O.P	2011	Fungi and allied microorganisms	Tata Mc Graw-Hill Education
4.	Purohit, S.S	2017	Microbiology-Fundamentals	Rastogi Publications, Meerut

			&Applications (7 <sup>th</sup> edition)	
5.	Pandey, B.P	2005	College Botany Vol I	S Chand & Company, New Delhi.
6.	Vashishta B.R./ Sinha A.K. & Kumar Adarsh	2016	Botany for degree students Fungi	S. Chand and Company Ltd., New Delhi

### Reference Books

S. No.	Authors	Year of publication	Title of the book	Publishers
1.	Alexopoulos, CJ, Mims CW & Blackwell M	2007	Introductory Mycology	John Wiley & Sons, New York
2.	Gangulee, HC. & Kar AK	2011	College Botany, Vol-II	New Central Book Agency Pvt. Ltd. Calcutta.
3.	Mehrotra, RS & Aneja, KR	2015	An introduction to Mycology, 2nd Ed.,	New Age International Private Limited, New Delhi

### Online course materials

1. <https://www.researchgate.net/publication/354185787>
2. <https://www.edureka.co/blog/types-of-artificial-intelligence/>
3. <https://www.mygreatlearning.com/blog/what-is-artificial-intelligence/#WhatisArtificialIntelligence>

### Pedagogy

E-content, Lecture, Power point presentation, Seminar, Assignment, Quiz, Group Discussion, Video / Animation

### Course Designers

1. Dr. C. Krishnaveni
2. Dr. M. Kanchana
3. Dr. H. Rehana banu

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
PL22C02	Core Paper II - Plant Diversity II (Bryophytes, Pteridophytes, Gymnosperms and Palaeobotany)	CORE	71	4	-	5

#### Preamble

To study the classification, characteristics and life cycle of Bryophytes, Pteridophytes and Gymnosperms

To study the process of fossilization, geo-chronology and radio-carbon dating

#### Course Outcomes

On the successful completion of the course, students will be able to

CLO Number	CO Statement	Knowledge Level
CLO1	Know the lifecycle of Bryophytes, Pteridophytes and Gymnosperms	K1
CLO2	Understand the characteristics of Bryophytes, Pteridophytes and Gymnosperms	K2
CLO3	Know the process of fossilization	K2
CLO4	Assess the evolutionary features of Bryophytes, Pteridophytes and Gymnosperms	K3

#### Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	M	M	M	M	M
CLO2	M	M	S	M	M
CLO3	S	S	M	M	S
CLO4	S	S	M	M	M

S- Strong; M-Medium

#### Syllabus

##### Unit I - Bryophytes

14hrs

General characteristics, Classification of Bryophytes (Reimers-1954), occurrence, distribution, common species, structure and reproduction of *Marchantia*, *Anthoceros* and *Funaria* (developmental studies on sex organs not required). Economic and ecological importance of Bryophytes.

**Unit II - Pteridophytes****14hrs**

General characteristics and Classification of Pteridophytes (Sporne, 1975). Stellar Evolution Homospory, heterospory and seed habit. Economic importance of Pteridophytes.

**Unit III – Pteridophytes (Contd..)****14hrs**

A detailed study of morphology, anatomy and reproduction of *Psilotum*, *Lycopodium*, *Equisetum* *Marsilea* (developmental studies on sex organs not required).

**Unit IV- Gymnosperms****14hrs**

General characters, distribution and classification of Gymnosperms(Sporne, 1965). Detailed study of morphology, anatomy and reproduction of *Cycas*, *Pinus* and *Gnetum*(developmental studies on sex organs not required).Economic importance of Gymnosperms.

**Unit V- Palaeobotany****15hrs**

Fossils-fossilization process and Types of fossils - compression, impression, petrification, coal balls. Geological time scale. A detailed study of external and internal features and reproduction in *Rhynia*, *Lepidodendron*, *Lepidocarpan*, and *Calamites*.

**Text Books**

S.No	Authors	Year of publication	Title of the book	Publishers
1.	Vasishta.B.R , Sinha & Adarsh Kumar	2012	Botany for Degree students –Bryophyta	S Chand And Company Ltd., New Delhi
2.	Sharma O.P	2011	Bryophyta	Tata Mc Graw-Hill Education
3.	Sharma O.P	2011	Pteridophyta	Tata Mc Graw-Hill Education
4.	Vasishta PC, Sinha AK & Anilkumar	2005	Botany for degree students,	S Chand And Company Ltd., New Delhi.
5.	Pandey, B.P	2003	College Botany Vol II	S Chand & Company, New Delhi

**Reference Books**

S.No	Authors	Year of publication	Title of the book	Publishers
1.	Arnold. C. A.	2013	An Introduction to Palaeobotany	McGraw Hill Book Company, London
2.	Sporne, KR	1974	The Morphology of Gymnosperms	Hutchinson & Co., London.

3.	Sporne, KR	2015	The Morphology of Pteridophytes	Hutchinson & Co., London
4.	Steward.N.Wilson & Rothwell, W. Gar	2005	Palaeobotany and evolution of Plants	Cambridge University Press

### **Pedagogy**

E-content, Lecture, Power point presentation, Seminar, Assignment, Quiz, Group Discussion, Video / Animation

### **Course Designers:**

1. Dr. C. Krishnaveni
2. Dr. K. S. Tamilselvi
3. Dr. B. S. Chithra Devi
4. Dr. R. Sumathi



COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
PL21CP1	Core Practical – I (Theory Paper - I & II – Microbiology, Plant diversity I and Plant Diversity II)	CORE	-	-	90	4

#### Preamble

- To observe, characterize and identify the different types of Algae, Fungi, Lichens, Bryophytes, Pteridophytes, Gymnosperms and fossilized plants.
- To identify and differentiate the various plant diseases and the causative organisms.
- To isolate microorganisms from soil and establish pure cultures
- To distinguish between Gram positive and Gram negative bacteria

#### Course Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Identify the different forms of Algae, Fungi, Lichens, Bryophytes, Pteridophytes, Gymnosperms and fossilized plants.	K1
CLO2	Know the host – pathogen interactions	K2
CLO3	Prepare sterile microbial culture media and demonstrate pure culture techniques	K3
CLO4	Interpret the industrial impact of fermentation process	K3

#### Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	M	M	M	M
CLO2	S	S	M	M	M
CLO3	S	S	M	M	M
CLO4	S	S	M	M	M

S- Strong; M-Medium

## Syllabus: Microbiology & plant Diversity 145 Hrs

**Algae** - *Anabaena, Chlamydomonas, Oedogonium, Ectocarpus* and *Polysiphonia*

**Fungi** - *Albugo, Saccharomyces, Penicillium, Puccinia, Polyporus* and *Aspergillus*

**Lichens** - *Usnea*

**Plant pathology**- Mosaic disease of tobacco, Citrus canker, Late blight of potato, Red rot of sugarcane, Tikka disease of groundnut.

### Microbial Techniques

Sterilization techniques.

Preparation of culture media: Nutrient broth and Nutrient Agar medium

Potato Dextrose Agar Medium

Preparation of slants

Soil dilution, Plating techniques, Enumeration of bacteria and fungi.

Microscopic observation of fungi- Lactoglycerol trypan blue staining,

Microscopic observation of bacteria- Gram staining

Fermentation using yeast

### Plant Diversity II:

45 Hrs

(Bryophytes, Pteridophytes, Gymnosperms and Palaeobotany)

### Study of the following types

**Bryophyta**- *Marchantia, Anthoceros* and *Funaria*.

**Pteridophyta**- *Psilotum, Lycopodium, Equisetum* and *Marsilea*

**Gymnosperms** - *Cycas, Pinus* and *Gnetum*

**Palaeobotany** - *Rhynia, Lepidodendron, Lepidocarpan* and *Calamites*

## Course Designers:

1. Dr. C. Krishnaveni
2. Dr. M. Kanchana
3. Dr. K.S. Tamil Selvi
4. Dr. H. Rehana banu
5. Dr.E. Uma

COURSE NUMBER 21PELS1	COURSENAME SEMESTER– II PROFESSIONAL ENGLISH FOR LIFE SCIENCES	Category	L	T	P	Credit
		-	40	5	--	2

### Objectives

1. To develop the language skills of students by offering adequate practice in professional contexts.
2. To enhance the lexical, grammatical and socio-linguistic and communicative competence of first year physical sciences students
3. To focus on developing students' knowledge of domain specific registers and the required language skills.
4. To develop strategic competence that will help in efficient communication
5. To sharpen students' critical thinking skills and make students culturally aware of the target situation.

### Course outcome

On the successful completion of the course, students will be able to

CLO Number	CO Statement	Knowledge Level
CLO1	Recognize their own ability to improve their own competence in using the language	K1
CLO2	Use language for speaking with confidence in an intelligible and acceptable manner	K2
CLO3	Read independently unfamiliar texts with comprehension and understand the importance of reading for life	K3
CLO4	Understand the importance of writing in academic life	K3
CLO5	Write simple sentences without committing error of spelling or grammar	K3

(Outcomes based on guidelines in UGC LOCF – Generic Elective)

### Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	M	M
CLO2	S	S	S	M	M
CLO3	S	S	M	M	S
CLO4	S	S	M	M	M
CLO5	S	S	S	S	S

S- Strong; M-Medium

## **Syllabus**

### **UNIT 1: Communication**

**8 hours**

**Listening:** Listening to audio text and answering questions listening to Instructions

**Speaking:** Pair work and small group work.

**Reading:** Comprehension passages –Differentiate between facts and opinion

**Writing:** Developing a story with pictures.

**Vocabulary:** Register specific - Incorporated into the LSRW tasks

### **UNIT 2: Description**

**8 hours**

**Listening:** Listening to process description.-Drawing a flow chart.

**Speaking:** Role play (formal context)

**Reading:** Skimming/Scanning- Reading passages on products, equipment and gadgets.

**Writing:** Process Description –Compare and Contrast Paragraph-Sentence Definition and Extended definition- Free Writing.

**Vocabulary:** Register specific -Incorporated into the LSRW tasks.

### **UNIT 3: Negotiation Strategies**

**8 hours**

**Listening:** Listening to interviews of specialists / Inventors in fields (Subject specific)

**Speaking:** Brainstorming. (Mind mapping).Small group discussions (Subject- Specific)

**Reading:** Longer Reading text.

**Writing:** Essay Writing (250 words)

**Vocabulary:** Register specific - Incorporated into the LSRW tasks

### **UNIT 4: Presentation Skills**

**8 hours**

**Listening:** Listening to lectures.

**Speaking:** Short talks.

**Reading:** Reading Comprehension passages

**Writing:** Writing Recommendations Interpreting Visuals inputs

**Vocabulary:** Register specific - Incorporated into the LSRW tasks

### **UNIT 5: Critical Thinking Skills**

**8 hours**

**Listening:** Listening comprehension- Listening for information.

**Speaking:** Making presentations (with PPT- practice).

**Reading :** Comprehension passages –Note making.Comprehension: Motivational article on Professional Competence, Professional Ethics and Life Skills)

**Writing:** Problem and Solution essay– Creative writing –Summary writing

**Vocabulary:** Register specific - Incorporated into the LSRW tasks

**Textbooks**

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	TamilNadu State Council for Higher Education (TANSCHÉ)	English for Life Sciences Semester 1	--	--

**Reference Books**

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	Sreedharan, Josh	The Four Skills for Communication	Foundation books	2016
2	Pillai, G Radhakrishna, K Rajeevan, P Bhaskaran Nair	Spoken English for you	Emerald	1998
3	Pillai, G radhakrishna, K Rajeevan, P Bhaskaran Nair	Written English for you	Emerald	1998

**Evaluation pattern** : Internal 50 marks  
ESE 50 marks

**NOTE :**

**Internals: 5 tests x 10 marks each =Total 50 marks**

Test 1 : Listening

Test 2 : Speaking

Test 3 : Reading

Test 4 : Listening

Test 5 : Speaking

**ESE : Only Reading, Writing and Vocabulary components from all 5 units**

**Question Paper pattern for ESE**

Section A : 5 x 2 = 10 marks

Section B : 4/6 x 5 = 20 marks

Section C : 2/3 x 10 = 20 marks

Total = 50 Marks

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
PL22C03	Paper - III Cell and Molecular Biology	Core	73	2	-	5

### Preamble

- To study the structure and function of basic components of prokaryotic and eukaryotic cells, cell membranes and cell wall
- To study the structure and function of cell organelles
- To appreciate the cellular components underlying mitotic cell division.
- To understand the structure and function of DNA, RNA.
- To appreciate the central dogma of life, protein synthesis

### Course outcomes

On the successful completion of the course, students will be able to

CLO Number	CO Statement	Knowledge Level
CLO1.	Understand the structure and function of prokaryotic and eukaryotic cells, cell membranes, cell wall and cell organelles	K1, K2, K3
CLO2.	Know the process of cell cycle and cell division	K1, K2, K3
CLO3.	Understand the structure and function of DNA, RNA	K1, K2, K3
CLO4.	Appreciate the concept of transcription and translation	K1, K2, K3

### Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1.	S	S	S	M	S
CLO2.	S	S	S	M	S
CLO3.	S	S	M	M	M
CLO4.	S	S	M	M	M

S- Strong; M-Medium

### Syllabus

#### Unit-1

14 hrs

Prokaryotic and eukaryotic cell – structure: cell wall, plasma membrane and cytoplasm – structure and function. Cell organelles- Endoplasmic reticulum, Golgi body, Lysosomes, Vacuoles and Ribosomes, Mitochondria, chloroplast – structure and function.

#### Unit-II

14 hrs

Nucleus- structure and function; Cell cycle, Cell division- mitosis and meiosis. Chromosomes- Structure and function, Classification of chromosomes based on centromere. Special types of chromosomes- Lampbrush and Polytene chromosomes.

#### Unit-III

14 hrs

Nucleic acids: DNA as genetic material, Structure (Watson and Crick Model), and function of DNA. DNA replication- conservative and semi-conservative. Dispersive. Organization of DNA into chromosomes. Gene Mutation – types, causes. Chromosomal aberrations

**Unit-IV****14 hrs**

RNA– structure, function & Types (tRNA, mRNA and rRNA). Central dogma of life  
Transcription– initiation, elongation and termination. Post transcriptional modifications. Genetic  
code- concept and properties, wobble hypothesis.

**Unit- V****15 hrs**

Translation – initiation, elongation and termination. Gene regulation- prokaryotes-operon  
concept- *lac* operon and *trp* operon. Post translational modifications.

**Text Books**

S.No.	Authors	Year of publication	Title of the book	Publishers
1.	Gupta P.K.	2017	Cell and Molecular Biology	Rastogi publications.
2.	Arumugam N & Meyyan RP	2014	Cell Biology, Molecular Biology & Genetics- Vol I	Saras Publications.
3.	Verma, P.S. and Agarwal, V.K	2010	Cytology, Genetics and plant breeding.	S.Chand& Co, New Delhi
4.	Shukla, R.S. and Chandel, P.S.	2009	Cytogenetics, evolution, Biostatistics and Plant Breeding	S. Chand & Co, New Delhi
5.	Verma P.S. and Agarwal V.K.	2004	Cell biology, Genetics, Molecular Biology, Evolution and Ecology.	S. Chand and Company, New Delhi.

**Reference Books**

S.No.	Authors	Year of publication	Title of the book	Publishers
1.	Geoffrey M. Cooper and Robert E. Hausman,	2013	The Cell – A Molecular Approach.	6 <sup>th</sup> Edition, Sinauer Associates, Inc. Publishers - Sunderland, Massachusetts U.S.A.
2.	Clark, D. P., Pazdernik, N. J.	2012	Molecular Biology	Netherlands: Elsevier Science
3.	Ajoy Paul.	2011	Cell and Molecular Biology	3 <sup>rd</sup> edition, Books and Allied Pvt Ltd., Kolkatta
4.	De Robertis and De Robertis.	2011	Cell and Molecular biology	Lippincott Williams and Wilkins. UK

**Pedagogy: E-content, Lecture, Power point presentation, Seminar, Quiz, Group Discussion and Video/ Animation**

**Course Designers**

Dr.K.S. Tamil Selvi

Dr. E. Uma

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
PL22CP2	Core Practical II (Core Paper III and IV)	Core	-	-	60	4

#### Preamble

- To study the structural and functional aspects of various tissue systems and organs of dicots and monocots.
- To discuss the structure and functions of the meristematic, primary & complex tissues.
- To understand the structure of cells in relation to the functional aspects.
- Understand the cellular components underlying cell division.

#### Course outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CLO1	Recall the structure of the cell organelles through electron micrographs.	K1
CLO2	Understand the structure and functions of the meristematic, primary and complex tissues.	K2
CLO3	Distinguish between normal and anomalous secondary growth.	K2
CLO4	Discuss the development of the endosperm and embryo.	K3

#### Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1.	S	S	M	M	S
CLO2.	M	S	S	M	S
CLO3.	S	S	M	S	M
CLO4.	M	S	S	M	S

S- Strong; M-Medium

#### Syllabus

##### Paper III - Cell and Molecular Biology

(30hrs)

- Study of plant cell organelles through photomicrographs/permanent slides- Cell wall, plasma membrane (Fluid Mosaic model), nucleus, Mitochondria, Chloroplast, Endoplasmic reticulum, Golgi body, lysosomes, vacuoles and ribosomes. Lampbrush and polytene chromosomes.
- Study of Nucleic acids by micrographs



DNA (Watson & Crick model), t-RNA (clover leaf model).

- Study of various stages of mitosis using cytological preparation of Onion root tips.
- Study of various stages of meiosis using cytological preparation of Flower bud-anther.

**Paper IV – Plant Anatomy, Embryology and Wood technology:**

**(30hrs)**

**Sectioning and Identification:**

**Plant Anatomy:** Primary structure of Leaf, stem and root of dicot and monocot. Secondary thickening in dicot stem -*Polyalthia* and root-*Vigna*. Anomalous secondary thickening in the stems - *Nyctanthus* and *Boerhaavia*; root – *Beta vulgaris*. Anomalous secondary thickening in the monocot stem-*Dracaena*.

**Spotters: Book diagram/Permanent slides/Photographs**

Meristems – shoot and root apex, Xylem – tracheids and vessels, Phloem. Annual rings, Wood preservatives, Defects in wood.

**Embryology:** T.S of anther, Types of ovules, Types of embryosac- uninucleate, bi-nucleate and mature embryosac; Types of endosperms – nuclear, cellular and helobial. Embryo mounting (*Tridax*).

**Course Designers**

Dr.K.Gajalakshmi

Dr. K.S.Tamil Selvi

Dr.E.Uma

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
PL22SB01	Skill Based Subject I- Horticulture	SBS	41	4	-	3

#### Preamble

- To impart skill-oriented knowledge on the fundamental aspects of horticulture.
- To learn the soil types and their impact on growth of plants
- To know the methods of plant propagation
- To understand the different plant growing structures

#### Course Outcomes

On the successful completion of the course, students will be able to

CLO Number	CO Statement	Knowledge Level
CLO1.	Acquire knowledge about the fundamental aspects of horticulture	K1
CLO2.	Understand the different techniques in gardening	K2
CLO3.	Know the cultivation of horticultural plants through various propagation techniques and structures	K2
CLO4.	Apply the knowledge in flower arrangement technique, hydroponics and microgreens	K3

#### Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1.	S	S	S	S	S
CLO2.	S	S	S	M	S
CLO3.	M	S	M	S	S
CLO4.	M	M	M	M	M

S-Strong; M- Medium

#### Syllabus

##### Unit I

9 hrs

History and importance of horticulture, Branches in horticulture ;Soil types, Inorganic fertilizers–Nitrogen, phosphorous, potassium, mixed fertilizers, organic fertilizers, bio-fertilizers, biopesticides

##### UnitII

9 hrs

Techniques in horticulture -Selection of site, Preparation of soils for garden; Mulching, top-dressing, blanching; Sowing, transplantation; Irrigation - Overhead, Surface, Underground; Weeding and pruning- Principles, Objectives and general technique.

**Unit III****9 hrs**

Plant Propagation techniques- Cutting-root, stem, leaf cutting; Layering- Simple, Tip, Serpentine, Trench, Mound and Air layering; Grafting- Approach, Cleft, Splice, Bark, Side Veneer, Whip and Tongue, Saddle, Bridge Inarch grafting; Budding-T-patch and H-chip budding

Plant propagating structures- Shade Houses, Greenhouse, Hot beds; Lath houses, Mist chambers, Nursery bed, Plastic Mulch, Light Chamber, High-Humidity Chambers.

**Unit IV****8 hrs**

Commercial Horticulture- Study of cut flower, production technology of Carnation, Gerbera, Anthurium, Gladiolus, Post harvest management of cut flowers – Floral decorations, bouquets and dry flowers – Grading, packing and marketing of flowers; Introduction to Hydroponics and Microgreens

**Unit V****8 hrs**

Landscape gardening-Importance; Principles; Garden adornments; Garden Types-Formal, Informal, Free style; Garden features -Walls, Fencing, Hedges, Edges, Arches, Pergola, Lawn, Shrubbery, Rockery, Topiary; Famous Gardens in India.

**Text books**

S.No.	Authors	Year of publication	Title of the book	Publishers
1.	Kumaresan, V	2014	Horticulture	Saras Publications, Nagercoil.
2.	Kumar.N	2010	Introduction to Horticulture	Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi.
3.	Bansil,P.C.	2008.	Horticulture in India.	CBS Publishers and Distributors, NewDelhi.
4.	Manibhushan Rao.K.	1991.	Text Book of Horticulture	Macmillan India Ltd, New Delhi

**Reference Books**

S. No.	Authors	Year of publication	Title of the book	Publishers
1.	Rajan,S. and B.L.Markose,	2007	Propagation of horticultural crops.	Pitam Pura, New Delhi
2.	Bhattacharjee,S.K.	2006	Horticulture, Biotechnology and post harvest technology,	Pointer publishers, Jaipur.
3.	Christopher, E.P,	2001	Introductory Horticulture	Biotech Books, New Delhi.

**Pedagogy:** E-content, Lecture, Power point presentation, Seminar, Assignment, Quiz, Group Discussion, Video / Animation

**Course Designer**

Dr.Sarah Jaison

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
PL21SBCE	SBS / Coursera - Climate Change and Health: From Science to Action	SBS	45	-	-	3

S.No.	Topic of the Course	Link of the Course	Duration in hrs
1.	What is Climate Change?	<a href="https://www.coursera.org/learn/what-is-climate-change?specialization=our-responses-climate-change">https://www.coursera.org/learn/what-is-climate-change?specialization=our-responses-climate-change</a>	6
2.	Tropical Forest Landscapes 101: Conservation & Restoration	<a href="https://www.coursera.org/learn/tropicalforests101">https://www.coursera.org/learn/tropicalforests101</a>	20
3.	Climate change and Indigenous People and local communities	<a href="https://www.coursera.org/learn/climate-change-indigenous-communities">https://www.coursera.org/learn/climate-change-indigenous-communities</a>	14
4.	Our Earth's future	<a href="https://www.coursera.org/learn/earth-climate-change">https://www.coursera.org/learn/earth-climate-change</a>	8

## 1. What is Climate change?

**Week 1** - The Climate System and Climate Change – 2 hours

**Week 2** - Impacts of Climate Change – 2 hours

**Week 3** - Attitudes About Climate Change – 3 hours

## 2. Tropical Forest Landscapes 101: Conservation & Restoration

**Week 1** - Why conserve and restore tropical forest landscapes? – 3 hours

**Week 2** - Ecology of tropical forest landscapes – 3 hours

**Week 3** - Social considerations for restoration and conservation – 3 hours

**Week 4** - Conservation strategies – 3 hours

**Week 5** - Restoration fundamentals – 3 hours

**Week 6** - Agroforestry and agroecology – 3 hours

**Week 7** - Funding conservation and restoration – 4 hours

### **3. Climate change and Indigenous People and local communities**

**Week 1** - Climate change and Indigenous Peoples and local communities – 1 hour

- Introduction – 2 hours

**Week 2** - Climate change impacts on indigenous peoples and local communities – 3 hours

**Week 3** - Coping and adapting to climate change impacts – 3 hours

**Week 4** - Local Indicators of climate change impacts – 2 hours

**Week 5** - The role of IPLC in global climate governance – 3 hours

### **4. Our Earth's future**

**Week 1** - Climate Change Is Happening: See It – 2 hours

**Week 2** - It All Comes Down to the Ocean – 1 hour

**Week 3** - Climate Change is Happening: Model It – 1 hour

**Week 4** - Living with Climate Change – 1 hour

**Week 5** - Mitigate, Adapt, or Suffer? – 2 hours

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
PL22A01	Allied Paper – I: Fundamentals of Botany - I	Allied	73	2	-	4

### Preamble

- To study the characteristics and life cycle of algae, fungi, bryophytes, pteridophytes, gymnosperms and angiosperms
- To gain knowledge of adaptations of plants to different environments
- To learn the horticulture techniques.

### Course outcomes

On the successful completion of the course, students will be able to

CLO Number	CO Statement	Knowledge Level
CLO1	Know about characteristics and life cycle of algae, fungi, bryophytes, pteridophytes, gymnosperms and angiosperms	K1
CLO2	Understand the concept of plant adaptations to different environments	K2
CLO3	Appraise the horticulture techniques.	K2

### Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	M	M	S	S
CLO2	S	S	M	M	M
CLO3	S	S	S	S	S

S- Strong; M-Medium

### Syllabus

#### Unit I

14 hrs

General characteristics and classification of Algae (Fritsch-1935,1948) - A study of distribution, structure, reproduction and life cycle of *Volvox*. \*Economic importance of algae, General characteristics and classification of Fungi (Alexopoulos and Mims, 1979) –A study of distribution, structure, reproduction and life cycle of *Saccharomyces*. \*Economic importance of Fungi. General characteristics, classification (Zahlbruckner,1907), reproduction and \*Economic importance of Lichens.

**Unit II****14 hrs**

\*General characteristics and Classification of Bryophyte (Engler,1892)- Structure, Reproduction and Life cycle of *Riccia*, \*General characteristics and Classification of Pteridophytes (Reimer,1954) - Structure, Reproduction and Life cycle of *Lycopodium*, \*General characteristics and Classification of Gymnosperms (Sporne-1965) - Structure, Reproduction and Life cycle of *Cycas*.

**Unit III****14 hrs**

General Characteristics and Classification of Angiosperms (Bentham and Hooker, 1883). \*Morphology of stem, \*root, \*leaf, \*inflorescence, \*flower and \*fruit. Study of the following families with their Economic importance – Annonaceae, Rutaceae, Rubiaceae, Lamiaceae, Amarantaceae and Poaceae.

**Unit- IV****14 hrs**

Ecology –\*Plant adaptations. Xerophytes - *Nerium*, *Opuntia*. Mesophytes -*Helianthus*, *Hibiscus*. Hydrophytes-*Hydrilla*, *Nelumbium*. \*Phytogeography –\*Vegetations of Tamil Nadu: \*Evergreen, \*scrub jungle, \*Mangrove

**Unit V****15 hrs**

Horticulture: scope and importance, \*propagation methods –\*cutting, \*layering and \*grafting techniques), gardening and landscaping, \*irrigation methods, manures, lawns, indoor plants, bonsai techniques.

**Note: \*Online Learning****Text Books**

S.No.	Authors	Year of publication	Title of the book	Publishers
1.	Srivastava, H.N	2004	Algae	Pradeep Publications, Delhi
2.	Srivastava, H.N.	2004	Fungi.	Pradeep Publications, Delhi
3.	Srivastava, H.N.	2004	Pteridophytes	Pradeep Publications, Delhi
4.	Pandey, P.B	2001	Plant Anatomy	S. Chand & Co, New Delhi
5.	Singh, V. and Jain	1981	Taxonomy of Angiosperms	Rastogi Publications, New Delhi
6.	Purohit S.S & Ranjan .R	2003	Ecology, Environment and Pollution (First Edition)	Agrobios, India, Jodhpur

## Reference Books

S.No	Authors	Year of publication	Title of the book	Publishers
1.	Sharma O.P.	2009.	Plant Taxonomy	Tata McGraw Hill Comp, New Delhi
2.	Pandey, B. P.	1992	Taxonomy of Angiosperms	S. Chand & Co, New Delhi

**Pedagogy:** Powerpoint, lecture, seminar, quiz and discussion.

## Course Designers

Dr. R. Sumathi



COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
PL22AP1	Allied Paper - Practical	Allied	-	-	60	2

### Preamble

- To observe and identify the different types of Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms.
- To obtain knowledge on anatomy of plants.

### Course outcomes

On the successful completion of the course, students will be able to

CLO Number	CO Statement	Knowledge Level
CLO1	Differentiate the different forms of Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms.	K1
CLO2	Preparation of culture media.	K2
CLO3	Illustrate the internal structure of plant tissues.	K3
CLO4	Analyse the various pigments in plants	K3

### Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1.	M	S	M	M	M
CLO2.	S	S	M	S	S
CLO3.	M	M	M	M	M
CLO4.	S	S	S	S	M

S- Strong; M-Medium

### Syllabus

#### Semester- III

30 hrs

#### Specimens

Bryophytes - Habit of *Riccia*

Pteridophytes - Habit of *Lycopodium cernum*, *L. clavatum*, *L. phlegmaria*

Gymnosperms - Habit of *Cycas*, Male cone, Female cone

Taxonomy - Study of plants belonging to the families (Annonaceae, Rutaceae, Rubiaceae, Lamiaceae, Amaranthaceae, and Poaceae) and their economic importance

Ecology- Habit of *Nerium*, *Opuntia*, *Helianthus*, *Hibiscus*, *Hydrilla*, *Nelumbium*

#### Slides

Algae - *Volvox*- Daughter colonies, Oogonia and Antheridia.

Fungi - *Saccharomyces*-Single cell structure

Bryophytes - *Riccia*- Reproductive Structures-Antheridium, Archegonium and Sporangium

Pteridophytes - *Lycopodium*- L.S. of Cone

Gymnosperms - *Cycas*- T.S. of Corolloid root

### **Sectioning**

Bryophytes - *Riccia*- T.S. of Thallus

Pteridophytes - *Lycopodium*- T.S.of Stem

Gymnosperms - *Cycas* - T.S. of Leaflet, T.S. of Rachis

**Demonstration** – cutting, layering, Grafting and bonsai

## **Semester- IV**

**30 hrs**

### **Slides**

Anatomy - Simple Tissues (Parenchyma, Sclerenchyma and Collenchyma),  
Complex Tissues (Xylem and Phloem)

Embryology - T.S. of Mature anther, 8- nucleated Embryosac, Mature Embryo

### **Sectioning**

Anatomy- Primary structure of Dicot stem,root and leaf

Primary structures of Monocot stem and root

Secondary structure of stem and root

### **Experiments**

Physiology - Determination of osmotic potential by Plasmolytic method.

Separation of leaf pigment by Paper chromatography.

Microbiology- Preparation of Potato Dextrose Agar Medium, Serial dilution techniques

### **Demonstration Experiments**

Physiology – hill reaction,

Tissue culture – sterilization, preparation of MS medium, inoculation, callus induction and organogenesis.

**Spotters** Microbiology – fermentor, culture methods

## **Course Designers**

Dr. R. Sumathi

<b>COURSE NUMBER</b>	<b>COURSE NAME</b>	<b>CATEGORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDIT</b>
NM22EVS	<b>Foundation Course-II – Environmental Studies</b>	AEC	Self-study	-	-	Grade

**Unit I - Multidisciplinary Nature of Environmental studies** **3 hrs**

Prologue, Definition, Scope and Significance, Need for public awareness.

**Unit II - Natural resources** **3 hrs**

Renewable and non-renewable resources, Natural resources and associated problems. Forest resources, Water resources, Mineral resources, Food resources, Energy resources, Land resources, Role of an individual in conservation of natural resources and Equitable use of resources for sustainable lifestyles.

**Unit III – Ecosystems** **3 hrs**

Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Food chains and food webs, Ecological pyramids, Ecological succession, Types of ecosystems

**Unit IV - Biodiversity and its conservation** **4 hrs**

Introduction, Levels of biodiversity - genetic, species and ecosystem, Biogeographical classification of India, Value of biodiversity, Biodiversity at global, National and local levels, India as a megadiversity nation, Hotspots of biodiversity, Threats to biodiversity, Endangered and Endemic species of India, Conservation of biodiversity.

**Unit V - Environmental Pollution** **4 hrs**

Definition – Air, Water, Soil, Marine, Noise and Thermal pollution, Nuclear hazards, Solid waste management, Disaster management, Role of an individual in pollution management, Case studies

**Unit VI - Social issues and the environment** **4 hrs**

From unsustainable to sustainable development, Urban problems related to energy, Water conservation, Climatic changes, Wasteland reclamation, Consumerism and waste products, Environment protection Acts, Air Act, Water Act, Wildlife Protection Act, Forest Conservation Act, Enforcement of environment legislation, Public awareness

**Unit VII - Human population and the environment** **4 hrs**

Population growth and explosion, Family Welfare programme, Environment and human health, Human Rights, Value Education, HIV/AIDS, Women and child welfare, Role of information technology in Environment and human health

### **Unit VIII - Field work**

**5 hrs**

Topics for field work and project, Guidelines for field work and project, Project report.

### **References**

1. Agarwal.K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad –380 013, India, Email: [maping@icenet.net](mailto:maping@icenet.net)(R)
3. Brunner.R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc.480p
4. Clark.R.S, Marine Pollution, Clanderson Press Oxford (TB)
5. Cunningham.V.P, Cooper, T.II.Gorhani.E & Hepworth.M.T, 2001, EnvironmentalEncyclopedia, Jaico Publ. House, Mumbai 1196p
6. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
7. Down to Earth, Centre for Science and Environment (R)
8. Gleick.H.P, 1993, Water in crisis, Pacific Institute for Studies in Dev. Environment &Security, Stockholm Env. Institute Oxford Univ. Pres 173 p
9. Hawkins.R.E, Encyclopedia of Indian Natural History, Bombay Natural History Society,Bombay ®
10. Heywood.V.II & Watson.R.T.1995, Global Biodiversity Assessment. CambridgeUniv.Press 11.10p
11. Jadhav.II & Bhosale.V.M.1995. Environmental Protection and Laws. Himalaya Pub.House, Delhi 284 p.
12. Mekinney.M.I & Schoeh.R.M 1996, Environmental Science systems & Solutions, Webenhanced edition 639p.
13. Mhaskar.A.K, Matter Hazardous, Techno-Science Publications (TB)
14. Miller.T.G. Jr., Environmental Science, Wadsworth Publishing Co,(TB)
15. Odum.E.P 1971, Fundamentals of Ecology, W.B.Saunders Co. USA. 574p
16. Rao.M.N & Datta.A.K. 1987, Waste Water treatment, Oxford & IBM Publ. Co. Pvt. Ltd.345 p.
17. Sharma.B.K. 2001, Environmental Chemistry, Goel Publ. House, Meerut
18. Survey of the Environment, The Hindu (M)
19. Townsend.C, Harper.J and Michael Begon, Essentials of Ecology, Blackwell Science(TB)
20. Trivedi.R.K, Handbook of Environmental Laws, Rules, Guidelines, compliances andStandards, Vol I and II Enviro Media (R).
21. Trivedi.R.K and P.K.Goel, Introduction to air pollution, Techno-

Sciences Publications(TB)

22. Wagner.K.D. 1998, Environmental Management. W.B.Saunders  
Co., Philadelphia, USA499p

(M) Magazine; (R) Reference; (TB) Textbook

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
PL22C04	Paper - IV – Plant Anatomy, Wood Technology and Embryology	Core	73	2	-	5

### Preamble

- To know the anatomical structure of the Angiosperm plants
- To identify woods of commercial importance
- Methods of preserving and seasoning woods.
- To study the structure and development of embryo

### Course outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Know the fundamental structure of different plant tissue system	K1
CLO2	Understand the development of different types of cells in plant system	K2
CLO3	Identify the quality of wood	K3
CLO4	Analyse the Anatomical variation between the plant species	K4

### Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	M	S	M
CLO2	S	M	S	M	M
CLO3	S	S	M	S	M
CLO4	S	S	M	M	M

S- Strong; M-Medium

### Syllabus

#### Unit I

(15 hrs)

**Plant Anatomy:** General account on Meristems. \*Shoot Apical Meristems, theories - apical cell theory, histogen, tunica and corpus\*. Root Apical Meristems- Korper and Kappe theory and Quiscent centre theory. Simple tissues- parenchyma, collenchyma and sclerenchyma.

#### Unit II

(14 hrs)

Evolution of plant vascular system. Complex tissues – primary xylem and phloem, secondary xylem and phloem. Primary structure of dicot and monocot stem; dicot and monocot root. Anatomical structure of dicot and monocot leaf. Epidermal Tissues -Types of stomata and \*Secretory tissues\*.

#### Unit III

(15 hrs)

Formation of Secondary thickening in Dicot stem and Dicot root. Anomalous secondary thickening in Dicot stems - *Nyctanthus* and *Boerhaavia*; Dicot root of *Beta vulgaris*.

\*Anomalous secondary thickening in monocot stem – *Dracaena*\*

**Unit IV: (14 hrs)**

Wood Technology: Brief account on the formation and types of woods. Annual rings and Dendrochronology. Physical, Chemical, and Mechanical properties of wood. \*Defects in woods\*. \*Seasoning of woods\*, Methods of preservation of wood, and uses of wood.

**Unit V: (15 hrs)**

**Embryology:** Microsporogenesis and development of male gametophyte; Megasporogenesis and development of female gametophyte. Structure of 8 nucleate monosporic embryo sac (*Polygonum*), Bisporic (*Allium*), tetrasporic (*Peperomia*). \*Fertilization and Double Fertilization\*. \*Types of endosperm\*. Development of monocot (*Luzulla*) and dicot (*Capsella*) embryo.

**Note: \*Blended Learning**

**Text Books**

S.No	Authors	Year of publication	Title of the book	Publishers
1.	Pandey.BP.	2001	Plant Anatomy	Sixth Revised edition. S.Chand and company.
2.	Tayal, MS	2004	Plant Anatomy	Rastogi Publications
3.	Katherine Esau	2011	Anatomy of seed plants	John Wiley and Sons. U.S.A.
4.	Singh, V., Pande, PC. and Jain, DK	2018	Anatomy and Embryology of Angiosperms	Rastogi Publications
5.	Christian Brischke	2020	Wood Protection and Preservation	Mdpi AG

**Reference Books**

S.No	Authors	Year of publication	Title of the book	Publishers
1.	D.F.Cutter, C.E.J Bottla, D.W.Stevenson,	2011	Plant Anatomy, An applied Approach	Blackwell Publishing. Australia.
2.	Franz F. P. Kollmann, Wilfred A. Côté	2020	Principles of Wood Science and Technology	Springer Berlin, Heidelberg
3.	Bhojwani, SS.,	2020	The Embryology of	S Chand publishers

	Bhatnagar, SP and Dantu, PK		Angiosperms	
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**Pedagogy: E-content, Lecture, Power point presentation, Seminar, Quiz, Group Discussion and Video/ Animation**

**Links for blended learning**

S.No.	Unit	Topic	Link for the topic
1.	Unit I	Shoot Apical Meristems, theories - apical cell theory, histogen, tunica and corpus	<a href="https://www.youtube.com/watch?v=03K82iPyWS0">https://www.youtube.com/watch?v=03K82iPyWS0</a>
2.	Unit II	Secretory tissues	<a href="https://www.youtube.com/watch?v=03K82iPyWS0">https://www.youtube.com/watch?v=03K82iPyWS0</a>
3.	Unit III	Anomalous secondary thickening in monocot stem – <i>Dracaena</i>	<a href="https://m.youtube.com/watch?v=lp4rIgsRdLc">https://m.youtube.com/watch?v=lp4rIgsRdLc</a> <a href="https://byjus.com/biology/ts-of-dracaena-stem/">https://byjus.com/biology/ts-of-dracaena-stem/</a>
4.	Unit IV	Defects in woods	<a href="https://www.youtube.com/watch?v=9zT3qaZJxIw">https://www.youtube.com/watch?v=9zT3qaZJxIw</a>
		Seasoning of woods	<a href="https://www.youtube.com/watch?v=qHzIWI7CS8E">https://www.youtube.com/watch?v=qHzIWI7CS8E</a>
5.	Unit V	Fertilization and Double Fertilization	<a href="https://www.youtube.com/watch?v=dgFY7WUTASQ">https://www.youtube.com/watch?v=dgFY7WUTASQ</a>
		Types of endosperm	<a href="https://www.youtube.com/watch?v=bUjVHUf4d1I">https://www.youtube.com/watch?v=bUjVHUf4d1I</a>

**Course Designer**

Dr.M.Kamalam



COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
PL22CP2	Core Practical II (Core Paper III and IV)	Core	-	-	60	4

### Preamble

- To study the structural and functional aspects of various tissue systems and organs of dicots and monocots.
- To discuss the structure and functions of the meristematic, primary & complex tissues.
- To understand the structure of cells in relation to the functional aspects.
- Understand the cellular components underlying cell division.

### Course outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CLO1	Recall the structure of the cell organelles through electronmicrographs.	K1
CLO2	Understand the structure and functions of the meristematic, primary and complex tissues.	K2
CLO3	Distinguish between normal and anomalous secondary growth.	K2
CLO4	Discuss the development of the endosperm and embryo.	K3

### Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1.	S	S	M	M	S
CLO2.	M	S	S	M	S
CLO3.	S	S	M	S	M
CLO4.	M	S	S	M	S

S- Strong; M-Medium

### Syllabus

#### Paper III - Cell and Molecular Biology

(30hrs)

- Study of plant cell organelles through photomicrographs/permanent slides- Cell wall, plasma membrane (Fluid Mosaic model), nucleus, Mitochondria, Chloroplast, Endoplasmic reticulum, Golgi body, lysosomes, vacuoles and ribosomes. Lampbrush and polytene chromosomes.

- Study of Nucleic acids by micrograph
- DNA (Watson & Crick model), t-RNA (clover leaf model).
- Study of various stages of mitosis using cytological preparation of Onion root tips.
- Study of various stages of meiosis using cytological preparation of Flower bud-anther.

**Paper IV – Plant Anatomy, Embryology and Wood technology: (30hrs)**

**Sectioning and Identification:**

**Plant Anatomy:** Primary structure of Leaf, stem and root of dicot and monocot. Secondary thickening in dicot stem -*Polyalthia* and root-*Vigna*. Anomalous secondary thickening in the stems - *Nyctanthus* and *Boerhaavia*; root – *Beta vulgaris*. Anomalous secondary thickening in the monocot stem-*Dracaena*.

**Spotters: Book diagram/Permanent slides/Photographs**

Meristems – shoot and root apex, Xylem – tracheids and vessels, Phloem. Annual rings, Wood preservatives, Defects in wood.

**Embryology:** T.S of anther, Types of ovules, Types of embryosac- uninucleate, bi-nucleate and mature embryosac; Types of endosperms – nuclear, cellular and helobial. Embryo mounting (*Tridax*).

**Course Designers**

Dr.K.Gajalakshmi  
 Dr. K.S.Tamil Selvi  
 Dr.E.Uma

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
PL22SB02	Skill Based Subject II - Horticulture	SBS	41	4	-	3

### Preamble

- To impart the knowledge on the horticultural wealth of India
- To get acquainted to commercial floriculture
- To develop skill in post-harvest technology
- To understand the concept of packing and marketing of horticultural products
- To understand agripreneurship and its concepts

### Course outcomes

On the successful completion of the course, students will be able to understand the following:

CLO Number	CLO Statement	Knowledge Level
CLO1.	Understand the techniques involved in cultivation and maintenance of commercial flowers	K1
CLO2.	Apply the techniques in commercial horticulture	K2
CLO3.	Skilled in the post-harvest technology	K3
CLO4.	Understand the strategies to become women entrepreneurs.	K3

### Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1.	S	S	S	S	M
CLO2.	S	M	S	S	M
CLO3.	M	S	S	M	S
CLO4.	S	S	S	S	S

S- Strong; M-Medium

### Syllabus

#### Unit I

8 hrs

Scope and importance of commercial floriculture in India. Production techniques of commercial flower crops - Rose, Chrysanthemum, Tuberose, Gladiolus, Dahlia, Marigold, Jasmine, Crossandra, Bird of Paradise, Lilies and Heliconia. Postharvest management of flower crops

#### Unit II

7 hrs

Flower arrangement concepts and Ikebana- techniques, types, suitable flowers and cut foliage. Dry flowers- dehydration techniques and preservation. Floral arts and adornments, Bonsai culture and maintenance

**Unit III****8 hrs**

Importance of post-harvest technology in horticulture crops, pre-harvest factors affecting quality, post-harvest losses and factors responsible for deterioration of horticulture produce; Maturity indices, physiological and biochemical changes during ripening process, hastening and delaying of ripening process

**Unit IV****9 hrs**

Harvesting, handling, curing, grading and pre-cooling of horticulture produce; Packaging, types of packages, recent advances in packaging, use of grape guard in packaging, cushioning materials; Transportation and modes of transport; Marketing of fresh produce; Pre and post-harvest treatments for extending storage life; Principles and methods of storage.

**Unit V****9 hrs**

Agripreneurship: definition, nature, scope, importance, types, functions and dimensions, characteristics of successful entrepreneur, approaches to entrepreneurship, Factors affecting entrepreneurial growth - psychological factors, cultural factors, social factors, economic factors, personality factors, Women entrepreneurship concept, importance, problems and remedies

**Text Books**

S.No.	Authors	Year of publication	Title of the book	Publishers
1.	Kumaresan, V	2014	Horticulture	Saras Publications, Nagercoil.
2.	Bansil,P.C.	2008	Horticulture in India.	CBS Publishers and Distributors, NewDelhi
3.	K.L.Chadda,	2009	Advances in Horticulture.	Malhotra Publishing House, New Delhi.
4.	Dhillon, W.S.	2013	Fruit Production In India	Narendra Publishing House. New Delhi

**Reference Books**

S.No.	Authors	Year of publication	Title of the book	Publishers
1.	Rajan, S and Markose, B.L.	2007	Propagation of horticultural crops.	New India Publishing Agency, New Delhi
2.	Bhattacharjee, S.K.	2006	Horticulture, Biotechnology and post harvest Biotechnology	Pointer publishers, Jaipur.
3.	Kumar, N.J.B. M. Md. Abdul Khaddar, Ranga Swamy, P. and Irrulappan, I.	1997	Introduction to spices, Plantation crops and Aromatic plants.	Oxford & IBH, New Delhi.

**Pedagogy:** E-content, Lecture, Power point presentation, Seminar, Quiz, Group Discussion and Video/ Animation

**Course Designer**

Dr.Sarah Jaison

<b>COURSE NUMBER</b>	<b>COURSE NAME</b>	<b>CATEGORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDIT</b>
<b>PL21SBCE</b>	<b>SBS / Coursera - Climate Change and Health: From Science to Action</b>	<b>SBS</b>	<b>45</b>	<b>-</b>	<b>-</b>	<b>3</b>

<b>S.No.</b>	<b>Topic of the Course</b>	<b>Link of the Course</b>	<b>Duration in hrs</b>
1.	What is Climate Change?	<a href="https://www.coursera.org/learn/what-is-climate-change?specialization=our-responses-climate-change">https://www.coursera.org/learn/what-is-climate-change?specialization=our-responses-climate-change</a>	6
2.	Tropical Forest Landscapes 101: Conservation & Restoration	<a href="https://www.coursera.org/learn/tropicalforests101">https://www.coursera.org/learn/tropicalforests101</a>	20
3.	Climate change and Indigenous People and local communities	<a href="https://www.coursera.org/learn/climate-change-indigenous-communities">https://www.coursera.org/learn/climate-change-indigenous-communities</a>	14
4.	Our Earth's future	<a href="https://www.coursera.org/learn/earth-climate-change">https://www.coursera.org/learn/earth-climate-change</a>	8

### **5. What is Climate change?**

**Week 1** - The Climate System and Climate Change – 2 hours

**Week 2** - Impacts of Climate Change – 2 hours

**Week 3** - Attitudes About Climate Change – 3 hours

### **6. Tropical Forest Landscapes 101: Conservation & Restoration**

**Week 1** - Why conserve and restore tropical forest landscapes? – 3 hours

**Week 2** - Ecology of tropical forest landscapes – 3 hours

**Week 3** - Social considerations for restoration and conservation – 3 hours

**Week 4** - Conservation strategies – 3 hours

**Week 5** - Restoration fundamentals – 3 hours

**Week 6** - Agroforestry and agroecology – 3 hours

**Week 7** - Funding conservation and restoration – 4 hours

## **7. Climate change and Indigenous People and local communities**

**Week 1** - Climate change and Indigenous Peoples and local communities – 1 hour

- Introduction – 2 hours

**Week 2** - Climate change impacts on indigenous peoples and local communities – 3 hours

**Week 3** - Coping and adapting to climate change impacts – 3 hours

**Week 4** - Local Indicators of climate change impacts – 2

hours **Week 5** - The role of IPLC in global climate governance – 3 hours

## **8. Our Earth's future**

**Week 1** - Climate Change Is Happening: See It – 2 hours

**Week 2** - It All Comes Down to the Ocean – 1 hour

**Week 3** - Climate Change is Happening: Model It – 1 hour

**Week 4** - Living with Climate Change – 1 hour

**Week 5** - Mitigate, Adapt, or Suffer? – 2 hours

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
PL22A02	Allied Paper II – Fundamentals of Botany- II	Allied	73	2	-	4

#### Preamble

- To Gain Knowledge of the anatomy of plants
- To Gain Knowledge of the embryology of plants
- To study the metabolism of plants
- To know about the plant tissue culture techniques
- To Gain Knowledge of the microbial techniques

#### Course outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Appreciate the anatomy of plants	K1
CLO2	Appreciate the embryology of plants	K2
CLO3	Appreciate the metabolism of plants	K3
CLO4	Understand the plant tissue culture techniques	K3
CLO5	Understand the microbial techniques	K2

#### Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	M	S	M	M	M
CLO2	S	S	M	S	S
CLO3	M	M	M	M	M
CLO4	S	S	S	S	M
CLO5	S	M	M	M	M

S- Strong; M-Medium

#### Syllabus

##### Unit I

14 hrs

A brief account of meristems. Simple and complex permanent tissues Primary structure of dicot and monocot stem, root and leaf; \*Secondary structure of dicot stem and root\*.

##### Unit II

15 hrs

Microsporogenesis and development of male gametophyte, megasporogenesis and development of female gametophyte, structure of monosporic 8 – nucleate embryo sac (*Polygonum*). \*Types of endosperm\*, \*development of dicot and monocot embryos\*.

##### Unit III

15hrs

Plant Physiology- \*osmosis and \*diffusion\*. Passive and Active absorption of water,

Photosynthesis - Photosynthetic apparatus, light and dark reaction. \*Transpiration\*.Plant movements, \*plant growth regulators –Auxin and Cytokinin\*.

#### Unit IV

14hrs

Tissue culture: Concept and Techniques– Sterilization, \*Medium preparation (MS medium)\*, Callus culture, organogenesis and regeneration. \*Hardening and field transfer\*.

#### Unit-V Microbial techniques

15 hrs

\*Methods of sterilization\*, \*Culture media- PDA\*, \*Serial dilution techniques\*. Pure culture techniques, Microbial growth and Growth curve. Typical Fermentation process.

**Note: \*Blended Learning**

#### Text books

S.No	Authors	Year of publication	Title of the book	Publishers
1.	Jain.V.K	2017	Fundamentals of plant physiology	Chand & Company, New Delhi
2.	Kalyan Kumar, De.	2004	An Introduction to Plant Tissue Culture.	New Central Book Agency Pvt.Ltd. Howrah.
3.	Kumaresan, V	2001	Biotechnology	Saras Publication, Nagercoil, TamilNadu
4.	Verma.	1985	Text book Plant Physiology	Emkay publication, New Delhi.

#### Reference books

S.No	Authors	Year of publication	Title of the book	Publishers
1.	Sharma, P.D	2010.	Microbiology	Rastogi Publications, Meerut.
2.	Michael J. Pelczar, E.C.S. Chan and Noel R Krieg.	1988	Microbiology	Mc Graw Hill, New Delhi.
3.	Mukherji.S. and A.K. Ghosh.	1996.	Plant Physiology	New Central Book Agency,(P) Ltd. Kolkatta.

**Pedagogy:** Powerpoint, lecture, seminar, quiz and discussion.

#### Links for blended learning

S.No.	Unit	Topic	Link for the topic
1.	Unit I	Secondary structure of dicot stem	<a href="https://www.youtube.com/watch?v=SiZiTeQ-nHk">https://www.youtube.com/watch?v=SiZiTeQ-nHk</a> <a href="https://www.youtube.com/watch?v=LzFDghMoMRQ">https://www.youtube.com/watch?v=LzFDghMoMRQ</a>



		Secondary structure of dicot root	<a href="https://www.youtube.com/watch?v=bbgwE-h84iE">https://www.youtube.com/watch?v=bbgwE-h84iE</a>
2.	Unit II	Types of endosperm	<a href="https://www.youtube.com/watch?v=EgiET_piGpA">https://www.youtube.com/watch?v=EgiET_piGpA</a>
		Development of dicot and monocot embryos	<a href="https://www.youtube.com/watch?v=DPcSTA3EUE4">https://www.youtube.com/watch?v=DPcSTA3EUE4</a> <a href="https://www.youtube.com/watch?v=x26Fg8ltCGw">https://www.youtube.com/watch?v=x26Fg8ltCGw</a>
3.	Unit III	Osmosis and diffusion	<a href="https://www.youtube.com/watch?v=eeOcGX5qPp8">https://www.youtube.com/watch?v=eeOcGX5qPp8</a> <a href="https://www.youtube.com/watch?v=iP6PtdhgzSk">https://www.youtube.com/watch?v=iP6PtdhgzSk</a>
		Transpiration	<a href="https://www.youtube.com/watch?v=zt9ja6p8q6U">https://www.youtube.com/watch?v=zt9ja6p8q6U</a>
		Plant growth regulators - Auxin, Cytokinin	<a href="https://www.youtube.com/watch?v=Py2O9rXENIg">https://www.youtube.com/watch?v=Py2O9rXENIg</a> <a href="https://www.youtube.com/watch?v=DMWB9b58Rt4">https://www.youtube.com/watch?v=DMWB9b58Rt4</a>
4.	Unit IV	Medium preparation (MS medium)	<a href="https://www.youtube.com/watch?v=eMv_PMNPYMc">https://www.youtube.com/watch?v=eMv_PMNPYMc</a>
		Hardening and field transfer	<a href="https://www.youtube.com/watch?v=YodPROvjroU">https://www.youtube.com/watch?v=YodPROvjroU</a>
5.	Unit V	Methods of sterilization	<a href="https://www.youtube.com/watch?v=Bh-ytzY5uVY">https://www.youtube.com/watch?v=Bh-ytzY5uVY</a>
		Culture media- serial dilution techniques	<a href="https://www.youtube.com/watch?v=OLz9JOrJepU">https://www.youtube.com/watch?v=OLz9JOrJepU</a> <a href="https://www.youtube.com/watch?v=Ppe_bgnPFHU">https://www.youtube.com/watch?v=Ppe_bgnPFHU</a>

### Course Designer

Dr. R. Sumathi

COURSE NUMBER	COURSE NAME	CATEGORY	L	T	P	CREDIT
PL21AP1	Allied Paper - Practical	Allied	-	-	60	2

### Preamble

- To observe and identify the different types of Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms.
- To obtain knowledge on anatomy of plants.

### Course outcomes

On the successful completion of the course, students will be able to

CLO Number	CO Statement	Knowledge Level
CLO1	Differentiate the different forms of Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms.	K1
CLO2	Preparation of culture media.	K2
CLO3	Illustrate the internal structure of plant tissues.	K3
CLO4	Analyse the various pigments in plants	K3

### Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1.	M	S	M	M	M
CLO2.	S	S	M	S	S
CLO3.	M	M	M	M	M
CLO4.	S	S	S	S	M

S- Strong; M-Medium

### Syllabus

#### Semester- III

30 hrs

#### Specimens

Bryophytes - Habit of *Riccia*

Pteridophytes - Habit of *Lycopodium cernuum*, *L. clavatum*, *L. phlegmaria*

Gymnosperms - Habit of *Cycas*, Male cone, Female cone

Taxonomy - Study of plants belonging to the families (Annonaceae, Rutaceae, Rubiaceae, Lamiaceae, Amaranthaceae, and Poaceae) and their economic importance

Ecology- Habit of *Nerium*, *Opuntia*, *Helianthus*, *Hibiscus*, *Hydrilla*, *Nelumbium*

#### Slides

Algae - *Volvox*- Daughter colonies, Oogonia and Antheridia. Fungi - *Saccharomyces*-Single cell structure

Bryophytes - *Riccia*- Reproductive Structures-Antheridium, Archegonium and Sporangium

Pteridophytes - *Lycopodium*- L.S. of Cone  
Gymnosperms - *Cycas*- T.S. of Corolloid root

**Sectioning**

Bryophytes - *Riccia*- T.S. of  
Thallus Pteridophytes -  
*Lycopodium*- T.S. of Stem

Gymnosperms - *Cycas* - T.S. of Leaflet, T.S. of Rachis

**Demonstration** – cutting, layering, Grafting and bonsai

**Semester- IV**

**30 hrs**

**Slides**

Anatomy - Simple Tissues (Parenchyma, Sclerenchyma and Collenchyma), Complex Tissues (Xylem and Phloem)

Embryology- T.S. of Mature anther, 8- nucleated Embryosac, Mature Embryo

**Sectioning**

Anatomy- Primary structure of Dicot stem, root and leaf  
Primary structures of Monocot stem and root  
Secondary structure of stem and root

**Experiments**

Physiology - Determination of osmotic potential by Plasmolytic method.

Separation of leaf pigment by Paper chromatography.

Microbiology- Preparation of Potato Dextrose Agar Medium, Serial dilution techniques

**Demonstration Experiments**

Physiology – hill reaction,

Tissue culture – sterilization, preparation of MS medium, inoculation, callus induction and organogenesis.

**Spotters** Microbiology – fermentor, culture methods

**Course Designers**

Dr. R. Sumathi

COURSE NUMBER	COURSENAME	Category	L	T	P	Credit
NM22DTG	DESIGN THINKING	Theory	30	-	-	2

**Preamble:**

1. To expose the students to the concept of design thinking as a tool for innovation
2. To facilitate them to analyze the design process in decision making
3. To impart the design thinking skills

**Course Outcome**

On the successful completion of the course, students will be able to:

CLO Number	CLO Statement	Knowledge Level
CLO1	Understand the concepts of Design thinking and its application in varied business settings	K1
CLO2	Describe the principles, basis of design thinking and its stages	K2
CLO3	Apply design thinking process in problem solving	K3
CLO4	Analyse the best practices of design thinking and impart them in business and individual day to day operations.	K4

**Mapping with Programme Outcomes**

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	M	M	S	S
CLO2	M	S	S	M	M
CLO3	S	S	S	M	S
CLO4	S	S	S	S	S

S-Strong; M-Medium

**UNIT –1**

**(6 Hours)**

DesignThinkingOverview: Introduction to DesignThinking and Design Research Strategies - Design Thinking Skills

**UNIT– II**

**(6 Hours)**

Design Thinking Mindset- Principlesof DesignThinking-Basis for design thinking- Design Thinking Hats - Design thinking team

**UNIT–III**

**(6 Hours)**

Empathize - definition - Listen & Empathize with the Customers and/ or Users - Tools andTechniques

**UNIT–IV**

**(6 Hours)**

Define -Definition -Definingthe Problem -Tools andTechniques-Journey mappingand Ideate - definition - Ideation techniques

**UNIT –V**

**(6 Hours)**

Prototype-Definition-Prototype Alternate Solutions-Test the Solutions-Visualization-Story

Telling - Cautions and Pitfalls - Best Practices

**TextBooks:**

S. No.	Author(s)	TitleoftheBook	Publisher	Year of Publication
1.	Christian Mueller-Roterberg	HandbookofDesignThinking Tips&Toolsforhowtodesign thinking	Amazon Kindle Version	2018
2	GavinAmbrosePaul Harris	DesignThinking	AVAPublishing Switzerland	2010
3	Sambrant Srivastava and Vijay Kumar	A Text Book of Design Thinking	Vayu Education of India	2022

**ReferenceBooks:**

Sl.No.	Author(s)	TitleoftheBook	Publisher	Year of Publication
1	Maurício Vianna YsmarViannaIsabel K. Adler BrendaLucena BeatrizRusso	DesignThinking-Business Innovation	MJVPress	2011
2	MoritzGekeler	Apracticalguidetodesign thinking	Friedrich-Ebert-Stiftung	2019
3	J.Berengueres	TheBrownBookofDesign Thinking	UAEUniversity College,AlAin	2014

**BlendedLearningLinks**

UNIT	TOPICS	LINK
UNIT I	Introduction to DesignThinking	<a href="https://www.digimat.in/nptel/courses/video/109104109/L01.html">https://www.digimat.in/nptel/courses/video/109104109/L01.html</a>
	DesignThinkingskills	<a href="https://www.youtube.com/watch?v=b-9Id-Jt_PI">https://www.youtube.com/watch?v=b-9Id-Jt_PI</a>
UNIT II	Principles& Basis of DesignThinking	<a href="https://youtu.be/6-NRiom8K9Y">https://youtu.be/6-NRiom8K9Y</a>
	DesignThinking hats	<a href="https://www.youtube.com/watch?v=bc-BvFQDmmk">https://www.youtube.com/watch?v=bc-BvFQDmmk</a>
UNIT III	Empathize	<a href="http://acl.digimat.in/nptel/courses/video/109104109/L02.html">http://acl.digimat.in/nptel/courses/video/109104109/L02.html</a> <a href="http://acl.digimat.in/nptel/courses/video/109104109/L03.html">http://acl.digimat.in/nptel/courses/video/109104109/L03.html</a> <a href="https://youtu.be/ls2mqHs02B0">https://youtu.be/ls2mqHs02B0</a>
UNIT IV	Define	<a href="http://acl.digimat.in/nptel/courses/video/109104109/L04.html">http://acl.digimat.in/nptel/courses/video/109104109/L04.html</a> <a href="https://youtu.be/veixQsRnZZU">https://youtu.be/veixQsRnZZU</a> <a href="https://youtu.be/6-bDSKZJEAM">https://youtu.be/6-bDSKZJEAM</a>
	Ideate  Prototype	<a href="http://acl.digimat.in/nptel/courses/video/109104109/L11.html">http://acl.digimat.in/nptel/courses/video/109104109/L11.html</a> <a href="http://acl.digimat.in/nptel/courses/video/109104109/L12.html">http://acl.digimat.in/nptel/courses/video/109104109/L12.html</a> <a href="http://acl.digimat.in/nptel/courses/video/109104109/L13.html">http://acl.digimat.in/nptel/courses/video/109104109/L13.html</a> <a href="http://acl.digimat.in/nptel/courses/video/109104109/L15.html">http://acl.digimat.in/nptel/courses/video/109104109/L15.html</a>

UNIT V	Testing	<a href="http://acl.digimat.in/nptel/courses/video/109104109/L16.html">http://acl.digimat.in/nptel/courses/video/109104109/L16.html</a> <a href="http://acl.digimat.in/nptel/courses/video/109104109/L17.html">http://acl.digimat.in/nptel/courses/video/109104109/L17.html</a> <a href="http://acl.digimat.in/nptel/courses/video/109104109/L18.html">http://acl.digimat.in/nptel/courses/video/109104109/L18.html</a> <a href="http://acl.digimat.in/nptel/courses/video/109104109/L19.html">http://acl.digimat.in/nptel/courses/video/109104109/L19.html</a>
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<b>JOB1753</b>	<b>Job oriented course – Phytopharmaceutical science</b>	<b>Category</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
		<b>JOC</b>	<b>40</b>	<b>-</b>	<b>20</b>	<b>--</b>

### Preamble

- To understand the basic concepts of herbal medicine
- To identify the quality of the herbal drugs
- To know the simple methods of preparation of herbal medicine

### Syllabus

**Unit I** **8 hours**  
Crude drug- Definition, classification of crude drugs- morphological, chemical and pharmacological classification. Study of organized and unorganized crude drugs.

**Unit II** **8 hours**  
Collection of crude drugs- Aerial and underground parts. Processing of crude drugs - drying methods, packing, labelling and marketing of crude drugs. Extraction of crude drugs - soxhlet extraction and steam distillation.

**Unit III** **8 hours**  
Evaluation of crude drugs - organoleptic evaluation- texture, taste and odour; microscopic evaluation - trichomes, stomata and palisade tissues. Physical evaluation- Moisture content, extractive values and fluorescent analysis.

**Unit IV** **8 hours**  
Biological sources of popular medicinal plants used in traditional system of medicine at industrial level. *Aconitum napellus*, *Aloe vera*, *Alpinagalanga*, *Croton tiglium*, *Eclipta alba*, *Semecarpusanacardium*, *Strychnusnuxvomica*, *Withaniasomnifera*, *Zingiberofficinalis* and *Maducalongifolia*.

**Unit V** **8 hours**  
Traditional systems of medicine- basic concepts of Siddha and Ayurveda. Herbal formulations- Internal medicine- Churanam, vadagam, tablet, parpam and legium; External applications - oil and ointment.

### Text Books

1. Kokate, K., A.P. Purohit and S.B. Gokhale, 2007. Pharmacognosy, 39<sup>th</sup>Edn. NiraliPrakahan, India.
2. Saharan, Moond, Chouhan and Gupta, 2008. Principles of Pharmacognosy, Agrobios, India.

### Reference Books

1. Tyler, E.V., Brady, R.L. and Robbers, E.J., 1981. Pharmacognosy. 9<sup>th</sup>edn. Lea and Febiger, Philadelphia.
2. Trease, G.E. and E.C. Evans, 1983. Pharmacognosy. 12<sup>th</sup> edition, Bailliere Tindall, Eastbourne, U.K.

***Pedagogy: Power point presentation, Lecture, seminar, quiz and discussion and demonstration***

**Practical:**

**20 hrs**

1. Morphology and medicinal uses of *Alpinia galanga*, *Withania somnifera*, *Glycyrrhiza glabra*, *Zingiber officinalis*, *Gloriosa superba*, *Pongamia pinnata* and *Maduca longifolia*.
2. Physical evaluation- Estimation of moisture content
3. Extractive value of any one plant powder with Polar and non-polar solvent using soxhlet apparatus
4. Qualitative analysis of Alkaloids, tannins and terpenoids
5. Preparation of herbal medicine – Churanam, Tablet, Syrup, legium, oil and ointment.

***Supporting activities***

**External source:** 50% of the theory and practicals will be handled by the expert's from external agencies

**Field study:** Students will be taken for local trip to identify the plants at the field level.

**Industrial visit-** to Pharmaceutical industry.

**Course designers**

Dr. M. Kamalam